School of Management

A Holistic Model for E-learning 3.0 for Higher Education Institutions in Mauritius

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This thesis is presented for the Degree of
Doctor of Philosophy
Of
Curtin University

March 2020

DECLARATION

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Human Ethics (For projects involving human participants/tissue, etc)
The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number # RDBS-02-15 and # HRE2016-0142.

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Date: 06.03.2020

ABSTRACT

The higher education landscape across the world is undergoing considerable change. Countries are being forced to reconsider their educational systems to better prepare their graduates for the increasingly competitive, complex and global world and to maintain their market share and a competitive edge by adhering to the demands of the technological age. E-learning is often seen as the means of meeting these challenges. It not only eliminates the barriers of time and space for increased access to higher education, but promotes authentic, innovative and lifelong learning through new and emerging technologies and improved teaching and learning practices for enhanced learning performances. Efforts are now being directed towards the development of E-learning 3.0 systems based on the new emerging Semantic Web technologies to revolutionise E-learning practices. Considered as the next generation of the Web, the Semantic Web or Web 3.0 within the education domain is all about expressing knowledge in machine interpretable form, by enhancing the metadata associated with learning materials, thereby allowing for better knowledge handling by machines. Through ontologies, as the formal representation of learning domains, E-learning 3.0 is seen as an opportunity for better personalised access to learning materials based on users' specific needs and for supporting better conditions for learning materials composition and reuse within the E-learning environment.

The literature reveals a number of E-learning 3.0 models showcasing both critical Semantic Web characteristics and E-learning critical success factors (CSFs). However, these models and the Semantic Web characteristics and E-learning CSFs highlighted in them vary considerably from one to another, failing to establish a collective set of E-learning 3.0 characteristics that holistically considers both Semantic Web characteristics and E-learning CSFs. Additionally, research in E-learning 3.0 models in the context of Small Island Developing States (SIDS) is scarce. Consequently, this study aims to bridge these gaps with its overarching contribution of developing a holistic E-learning 3.0 model, which merges Semantic Web characteristics and E-learning CSFs within the higher education context of a small island developing state, namely Mauritius.

Mauritius has the vision of becoming a knowledge hub and a centre of excellence in higher education in the region by transforming its educational landscaping through ICT, E-learning and innovative teaching and learning practices. Having all the

necessary ingredients to foster E-learning, coupled with an increased keenness to embrace new innovative technologies to support the move towards a knowledge economy, as demonstrated by the policies and strategic plans of its Government and tertiary institutions, Mauritius is an ideal candidate for this study.

A mixed-methods approach consisting of two surveys and exploratory case studies was used in this study to examine the initial holistic E-learning 3.0 model, derived from a comprehensive literature review of Semantic Web characteristics and E-learning CSFs. A total of 300 students and 105 lecturers from Mauritian tertiary institutions were surveyed via two online questionnaires to gather their perceptions on E-learning 3.0 in the Mauritian higher education context. A preliminary analysis of the surveys' data was conducted, revealing mixed results from participants on different aspects of E-learning 3.0, particularly where the traditional roles of students and lecturers were challenged. A factor analysis was then carried out to obtain an improved list of E-learning 3.0 components, reflecting a more consistent interpretation of the surveys' data in the form of a revised holistic E-learning 3.0 model. The case study approach, as the qualitative phase of the study, was then employed to further validate and extend the surveys' outcomes. It consisted of interviews with 20 lecturers and 7 administrative personnel from Mauritian higher education institutions as well as an analysis of publicly available documents from the Mauritian Government and tertiary institutions. Deductive and inductive content analysis were used to examine interviewees' responses. Manual coding was employed for a thorough identification of themes to deductively confirm the findings from the literature review and the surveys, and to inductively capture new emerging themes. Interview findings were further corroborated by documents' findings, resulting in the final holistic 3.0 E-learning model, which reinforced critical E-learning 3.0 aspects derived from this study while highlighting some fundamental considerations for a holistic representation of E-learning 3.0. The need for a gradual and guided move towards E-learning 3.0 was stressed, with a proper understanding of the basics of E-learning across stakeholders considered as a requisite to establishing the necessary groundworks for E-learning 3.0. The final model also emphasised the urgent need for a change in mindset and culture as a steppingstone towards fully embracing E-learning and subsequently E-learning 3.0. It pinpointed the culture of isolation prevailing in the higher education environment in the country, not just between students, but more significantly between lecturers, as a major hindrance towards E-learning 3.0. It also highlighted the critical

need to establish the necessary awareness and support mechanisms for shared content responsibility, intellectual property rights, student-centered teaching and the appropriate regulatory frameworks to better harness the benefits associated with E-learning 3.0.

Therefore, through the merging of key Semantic Web characteristics and E-learning CSFs, validated through a combination of quantitative and qualitative approaches, a comprehensive E-learning 3.0 model was developed. The model shows eight main characteristics for a holistic representation of E-learning 3.0 for the Mauritian higher education context., namely 'Content Management', 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Web 3.0 System', 'Support', 'Trust' and 'Mindset and cultural shift', each with its own associated sub-characteristics. These characteristics and their associated sub-characteristics highlight essential considerations and the many barriers and challenges that need to be addressed by different stakeholders in Mauritius to establish E-learning 3.0 in the higher education context. The final holistic E-learning 3.0 model, therefore, acts as a realistic guide for the implementation of E-learning 3.0 in Mauritius, in line with the Government vision of making the country a knowledge hub and gateway to higher education in the region and the strategic plans and initiatives of tertiary institutions to adopt new emerging technologies that enhance innovative teaching and learning practices.

While the holistic E-learning 3.0 model is limited to the perceptions of students, lecturers and administrative personnel of higher education institutions in Mauritius, it provides grounds for future research avenues. The same model can be evaluated in the future as Mauritius matures in its E-learning initiatives, thereby acting as a monitoring mechanism to track progress made by higher education institutions and the Government in their E-learning agendas, strategic plans and visions. Future works could involve widening the research scope to include other higher education institutions' stakeholders, educational settings and developing countries including other SIDS.

ACKNOWLEDGEMENTS

In the name of Allah, the Most Gracious, the Most Merciful

All praise and thanks be to God, the Almighty for allowing me to pursue this journey. You are sufficient for us and You are the best disposer of affairs (Quran 3:173).

My sincere thanks and appreciation to my supervisor, Dr. Tomayess Issa for being by my side throughout this journey. Your guidance, feedback, advice, encouragements and constant reassurances have been critical and invaluable for me to carry out and complete this project. Despite being an offsite student with a time zone different from yours, you were always accessible and available to answer my queries and alleviate my concerns. I am extremely grateful for your unwavering support all the way and it has been a privilege knowing you and working with you. I would also like to extend my thanks to Professor Vanessa Chang and Dr Pedro Isaias for their valuable feedback during the course of this study.

I am grateful to all the participants in this project, the students, the lecturers and the administrative personnel from the Mauritian universities for taking time from their busy schedules to participate in the surveys and interviews of this study. Your contributions made all the difference in the findings of this research. Thank you.

To my Mama, this is for you. Had it not been for your encouragement and continued motivation, this journey would not even have started *Alhamdulillah*. You are our greatest blessing and I hope I have made you proud.

To my husband, Fardeen, thank you for being by my side. Your patience with me in all my crazy moments, your constant reminders for backups and more importantly your devotion and care to me and the boys are just some of the reasons why you are so special. You are my rock and I love you. My babies, Zakiy, Yahya and Hanaan, Mama has finally finished her project! Thank you for being so patient with Mama when she was working on the computer, for checking on my progress and for the hugs and kisses that kept me going. You are my world and Mama loves you ‘big one sky sky’.

To my sisters, Fatma, Hannah, Dija and Shaakirah. Thank you for always being here for me, for all your words of wisdom in times when I doubted myself and for your constant *duas*, love and support. You are truly my best friends.

To Unayza, our 10 o'clock calls were often my time to catch a breath from the busy routines. Thanks to you and Wasseed for spoiling the boys and for being here for us to have a place to go to other than home.

Finally, thank you to my extended family and in-laws for your *duas* and well wishes. They meant a lot to me throughout this journey.

This research is supported by an Australian Government Research Training Program (RTP) Scholarship.

PUBLICATIONS

Hajee Ahmud-Boodoo, Raadila Bibi Mahmud. 2015. "E-Learning and the Semantic Web: A Descriptive Literature Review." In *Artificial Intelligence Technologies and the Evolution of Web 3.0*, 66. IGA Global.

Hajee Ahmud-Boodoo, Raadila Bibi Mahmud, Tomayess Issa, Vanessa Chang, and P Isaias. 2017. "Content Management and Support in 3.0 E-Learning Model." In *eLmL-International Conference on Mobile, Hybrid, and On-line Learning*, 17-24.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Information technology and the Internet have created new opportunities in the education domain, including the broadening of access to education through E-learning. The move towards E-learning in higher education is considered an attractive alternative to the traditional classroom environment for a number of reasons. These include the need to increase access in order to meet the education and training needs of the population, particularly in situations where the academic program calendars do not meet the learners' work and family responsibilities and programme offerings do not meet the learners' needs (Volery and Lord 2000). The flexibility and scalability associated with E-learning allows it to cater for the increased demand for higher education, thereby alleviating the time and capacity constraints of the traditional classrooms (Pudaruth et al. 2010; Chao and Chen 2009).The highly competitive job market has renewed its emphasis on the employability skills and higher order thinking of graduates, forcing higher education institutions to rethink their approaches in order to meet the needs of their learners (Kennedy 2010). The requirements for computer literacy, critical thinking, analytical and synthesising skills, coupled with the need to remain current and at the cutting edge of technology to survive in the competitive higher education sector, have compelled tertiary institutions to adopt more modern teaching and learning practices with an IT-centered approach, via alternatives like E-learning (Selim 2007b; Gotthardt et al. 2006; Agboola 2006). Furthermore, with the increasing interest in lifelong learning towards the building of knowledge societies where learners are more autonomous with emphasis given to knowledge construction as opposed to information transmission, E-learning is considered essential to meet such needs (Snae and Brueckner 2007; Tetiwa and Brueckner 2004).

Indisputably, E-learning has redefined the way education is dispensed across the world. Efforts are now being directed towards the development of educational systems that will revolutionise E-learning practices (Rokou, Rokou and Rokos 2004; Snae and Brueckner 2007). The emergence of E-learning 3.0 systems, based on the new technology of the Semantic Web, represents such an effort. As the name suggests, the Semantic Web, also known as Web 3.0 to emphasise it being an extension of the current Web 2.0, is all about adding meaning to the Web so that information on the

Web can be more easily understood and manipulated by computers and application agents and hence be used more effectively by humans (Bucos, Dragulescu and Veltan 2010; Berners-Lee, Hendler and Lassila 2001a; Wahlster et al. 2006). As a promising technology to meet E-learning requirements, the Semantic Web is seen as the solution to the large-scale user-generated content on the Web, which "*confuses a selection decision*", by providing semantically enriched content, thereby enabling better content composition, navigation and access (Shah 2012, 113; Stojanovic, Staab and Studer 2001).

With the pressing need to have efficient and just-in-time learning processes with content customised to specific user's needs (Stojanovic, Staab and Studer 2001), the use of Semantic Web technologies in E-learning, or E-learning 3.0, has become more significant (Castellanos-Nieves et al. 2011). Backed by educational ontologies, which is the formal representation of learning domains, E-learning 3.0 promises better conditions for representing, composing, reusing and sharing learning materials within an E-learning environment by allowing for a richer description and retrieval of learning content (Pah et al. 2007; Castellanos-Nieves et al. 2011). Furthermore, the Semantic Web technology is better suited to the constructivist idea of learning where greater control is given to the learners to manage their knowledge, aligning with the rising need and trend to create knowledge societies, thereby making E-learning 3.0 an attractive opportunity (Olaniran 2010). In fact, the recent developments with the Semantic Web technologies is paving the way for successful and sustainable E-learning solutions (Sridharan, Deng and Corbitt 2008).

With the many benefits that the Semantic Web promises to bring to E-learning, the literature reveals several researches on the Semantic Web and technologies within E-learning. Works on E-learning 3.0 reveal key characteristics of the Semantic Web, which often include E-learning critical success factors (CSFs). However, the Semantic Web characteristics and E-learning CSFs identified in the different researches varied from one model to the other, failing to establish a collective set of E-learning 3.0 characteristics that holistically considers both Semantic Web characteristics and E-learning critical success factors. Furthermore, works on E-learning 3.0 also revealed a lack of empirically validated researches, particularly in the context of developing countries including a noticeable dearth of research amongst lower middle income countries and Small Island Developing States (SIDS).

Mauritius, a small island developing state, with a strong vision to turn into the knowledge hub of the region, wants to embrace emerging technologies to remain at the cutting edge (Human Resource Development Council 2006; National ICT Strategic Plan 2007; Gillwald and Islam 2011). The Mauritian Government wants to transform the educational landscape of the country through ICT and E-education (Gillwald and Islam 2011). In fact, in the wake of becoming a digital nation, Mauritius regroups all the necessary ingredients in fostering E-learning (Pudaruth et al. 2010). E-learning is seen as part of the solution towards converting the island into the regional knowledge hub it aspires to be, in assisting with the capacity constraints of the higher educational infrastructure and in promoting an environment of lifelong learning to support its human resource, as one of the island's most important resources, in a highly competitive job market (Pudaruth et al. 2010; Allybokus 2015; Human Resource Development Council 2006). It has now become increasingly important that graduates leave higher education with the necessary technological skills, problem-solving capabilities and high order skills they will require in the work place and consequently embedding E-learning throughout their studies is seen as essential (Browne et al. 2010). Yet, E-learning in Mauritius continues to be mostly the delivery of information over the Internet in static ways (Pudaruth et al. 2010). Taking these into consideration, as well as the gaps in the literature gaps for E-learning 3.0, this research, therefore, aims at identifying the required E-learning 3.0 characteristics for developing a holistic E-learning 3.0 model within the context of the higher education sector of Mauritius. It is envisioned that the holistic E-learning 3.0 model will assist Mauritius and similar countries, in their E-learning initiatives as well as in their endeavours to embrace emerging technologies such as the Semantic Web, particularly in the higher education sector.

The rest of this chapter introduces the key aspects of this study namely the Semantic Web and E-learning CSFs. A brief justification of the need for a holistic E-learning 3.0 model is then provided. The research objectives and research questions are presented next followed by an overview of the research significance. The research methodology used in this study is then summarised. The chapter ends with an outline of the thesis chapters and a summary.

1.2 The Semantic Web

Web content is "*machine readable*" but not "*machine understandable*" (Lassila 1998, 30). Search engines can scan information on the Web using keywords but are not able to interpret the underlying context within which those keywords are used. Therefore, as the name suggests, the 'Semantic Web', a term coined by Tim Berners-Lee, the inventor of the Internet, is all about adding meaning to Web contents to allow machines to understand these meaning or 'semantics' for better reasonings (Bucos, Dragulescu and Veltan 2010; Berners-Lee, Hendler and Lassila 2001a; Rashid, Khan and Ahmed 2013; Bidarra and Cardoso 2007). Berners-Lee, Hendler, and Lassila (2001a, 3) stated that "*The Semantic Web will bring structure to the meaningful content of Web pages, creating an environment where software agents roaming from page to page can readily carry out sophisticated tasks for users*". It will allow information to be stored "*with syntactical rules intended for human understanding*" as well as "*with semantic rules in a format*" thus permitting software agent "*to find, share and integrate*" them more easily (Bidarra and Cardoso 2007, 4).

Therefore, with the Semantic Web technologies, machines will be able to reason about Web contents and present only the relevant results and inferences to users, thereby addressing the information overload problem of the current Web towards realising the vision of having the right information in the right context with the right level of details to the right person at the right time (Berners-Lee, Hendler and Lassila 2001a; Lassila 1998). This adaptation of content to meet users' specific needs as opposed to them having a long list of websites, which they have to go through to obtain the required information, makes the Semantic Web appealing to the education world. It is seen as an opportunity to personalise learning through the enhancement of metadata associated with learning materials (Snae and Brueckner 2007). By providing semantic mark-ups of learning content through annotations, with pointers to relevant shareable educational ontologies, which play the crucial role of facilitating the common understanding of contents, the Semantic Web technologies make it possible for learning materials to be easily located, accessed, shared, reused and contextualised to meet users' specific needs (Devedzic 2004; Stojanovic, Staab and Studer 2001; Ghaleb et al. 2006). In fact, as pointed out by Sridharan, Deng, and Corbitt (2008, 919), "*embracing recent developments in semantic web approaches…can pave way for the successful and sustainable e-learning solutions*".

The literature reveals several works on Semantic Web technologies in the field of E-learning, particularly within the higher educational context. These E-learning 3.0 researches identified key Semantic Web characteristics, often revolving around the complexities of the Semantic Web technology and its implementation, but also capturing underlying E-learning CSFs. However, the various works on E-learning 3.0 models highlighted different Semantic Web characteristics and E-learning CSFs, denoting a clear lack of a collective set of E-learning 3.0 characteristics based on a comprehensive merging of Semantic Web characteristics and E-learning CSFs. Furthermore, the challenges associated with the Semantic Web, while often being specific to the Semantic Web technology and its implementation, such as systems interoperability, ontologies standardisation, complexities with semantic mark-ups amongst others (Rego et al. 2010; Aroyo and Dicheva 2004 ; Gladun et al. 2009; Devedzic 2004), are also, essentially, the challenges associated with E-learning in general (Miranda, Isaias and Costa 2014a). Consequently, the consideration of E-learning CSFs for a holistic representation of E-learning 3.0 characteristics becomes even more indispensable.

1.3 E-learning and its critical success factors (CSFs)

Literature abounds in E-learning CSFs research, but within the contexts of E-learning 3.0 models, the E-learning CSFs that are emphasised vary considerably across works. Critical success factors (CSFs) in E-learning are "*those activities and constituents that must be addressed in order to ensure its successful accomplishment*" (Masoumi 2006, 4). As pointed out by Volery and Lord (2000, 216), identifying and understanding the critical success factors of online delivery of education is essential as E-learning is more than just re-implementing "*conventional models borrowed from classroom-based or distance education focused on passive transmission*". Much has been stated in the literature about different aspects of E-learning that need to be considered for its effective implementation, including the pedagogical, technological and organisational considerations amongst others (Fresen 2007; Selim 2007b; Masoumi 2006; Sridharan, Deng and Corbitt 2010; Papp 2000). However, while many of these critical factors align with key Semantic Web characteristics from the literature, they are often superficially discussed, completely omitted or their entwined facets overlooked (Sridharan, Deng and Corbitt 2008).

As the uptake of E-learning continues to grow in both developed and developing countries, so does the urge to adopt new emerging technologies like the Semantic Web, as "*a means of solving authentic learning and performance problems"* by some, or just "*hopping onto the bandwagon"* by others *"simply because they do not want to be left behind*" (Govindasamy 2001, 287). Thus, establishing, understanding and integrating a holistic synthesis of E-learning CSFs become essential in setting a strong foundation for the effective implementation of E-learning 3.0.

1.4 Research purpose - The need for a holistic E-learning 3.0 model

The motivations behind E-learning vary between developed and developing countries (Bhuasiri et al. 2012; Gulati 2008). Developing a strong knowledge economy, enhancing innovative teaching and learning practices and increasing lifelong learning are often reasons put forward for the adoption of E-learning and related emerging technologies in developed countries (Gulati 2008). On the other hand, developing countries generally adopt to E-learning in order to address the increased demand for higher education and the capacity constraints of the traditional classroom settings. Often, their keenness to embrace new technologies is simply a means of tendering to the norms or an attempt to pursue being at the cutting edge of technology for competitive advantage (Chao and Chen 2009; Powell, Davies and Taylor 2012; Perraton 2000). But as stated by Perraton (2000), the need to relate technologies to the concerned audience forces one to consider the pre-requisites that are required to be in place for these technologies to be useful for education. The holistic E-learning 3.0 model is precisely intended to do this by providing a comprehensive set of factors based on the merging of Semantic Web characteristics and E-learning CSFs, that needs to be considered towards the move to E-learning 3.0. By considering both key Semantic Web characteristics and E-learning CSFs, the holistic E-learning 3.0 model in this research not only addresses a significant gap in the literature, but also acts as a comprehensive and realistic guide for higher education institutions in their E-learning and E-learning 3.0 endeavours.

Furthermore, the need for a holistic E-learning 3.0 model in the context of the higher education sector in Mauritius is pertinent for three main reasons: (1) the country's quest to transform its educational landscape, particularly in the higher education sector, through ICT and E-learning and innovative technologies (Gillwald and Islam 2011; Human Resource Development Council 2006), (2) the vision of the Mauritian

Government to make the country a knowledge hub and a gateway for post-secondary education in the region as well as a leader in E-learning and education technology, coupled with its keenness to embrace emerging technologies towards achieving this vision (Ministry of Technology & Communication & Innovation 2018; Gillwald and Islam 2011; Tertiary Education Commission Mauritius 2015) and (3) as a small developing island, addressing the lack of empirically validated research on E-learning 3.0 within the context of SIDS, by capturing the perceptions of critical higher educational stakeholders to develop a holistic E-learning 3.0 model. The resulting model as well as the recommendations emerging from the findings of this study, therefore, not only identifies the characteristics critical for a holistic representation of E-learning 3.0 in the Mauritian higher educational context, but also provides a realistic action plan for higher education stakeholders, including the tertiary institutions and the Government, to support their E-learning agendas. Therefore, the holistic E-learning 3.0 model sets the basis for a sustainable adoption and implementation of new emerging technologies and practices in the country.

1.5 Research objectives and questions

The focus of this study is on developing a holistic E-learning 3.0 model for the higher education institutions of Mauritius through a combination of key Semantic Web characteristics and E-learning CSFs. The model will group and highlight critical considerations for E-learning 3.0 for the Mauritian higher education sector, thereby acting as a realistic guide for higher education stakeholders in their endeavours and progress towards implementing E-learning 3.0. Additionally, the model will provide a conceptual foundation for future research in E-learning 3.0 within the Mauritian context, which can then be further extended to other developing countries, including SIDS. Therefore, the main and sub objectives of this research are:

- **Main Objective**

  Determine the E-learning 3.0 characteristics required to develop a holistic E-learning 3.0 model.

- **Sub Objective**

  Ascertain the critical success factors of implementing and sustaining E-learning 3.0 in higher education institutions of Mauritius, based upon the perceptions and viewpoints of the education stakeholders.

In order to achieve these research objectives, two research questions (RQ1 and RQ2) have been formulated to develop the holistic E-learning 3.0 model, as follows:

- **RQ1**: What are the E-learning 3.0 characteristics required to develop a holistic E-learning 3.0 model?
- **RQ2**: What are the critical success factors of implementing and sustaining E-learning 3.0 in higher education institutions of Mauritius, based upon the perceptions and viewpoints of the education stakeholders?

1.6 Research significance

From a theoretical angle, the lack of conceptual models combining Semantic Web characteristics and E-learning CSFs for a holistic representation of E-learning 3.0 has been noted (as discussed in Chapter 2). Adding to that is the apparent dearth of research on E-learning 3.0 within the context of small island developing states, Mauritius being one such example. The holistic E-learning 3.0 model, therefore, contributes to the literature by providing deeper insights into the field of E-learning and its emerging trends, namely the Semantic Web and E-learning 3.0, within the context of a small developing nation. Such a model can also prove useful to similar countries with endeavours in E-learning and supporting technologies such as the Semantic Web.

From a practical angle, the outcomes of this research will assist in reshaping approaches towards E-learning and associated emerging trends, namely E-learning 3.0, within the Mauritian higher education sector and beyond. Aligning with the vision of the Mauritian Government to make the country the gateway to post-secondary education and a knowledge hub of the region, coupled with higher education institutions' strategic plans to engage in teaching and learning practices that promotes lifelong learning, this study is of significant interest to higher educational stakeholders by setting out a realistic blueprint for E-learning and E-learning 3.0 implementation. The holistic E-learning 3.0 model derived from this study provides the foundation for a sustained adoption and implementation of E-learning 3.0 within the Mauritian higher education context. It addresses the gaps between theory and practice with respect to the critical considerations to be made towards a realistic move to E-learning 3.0 within the higher education context of such a small island developing state. Consequently, it acts as a concrete and pragmatic guide to key higher education stakeholders including the tertiary institutions and the Government in their endeavours to embrace new E-learning technologies and innovative practices. The resulting holistic E-learning 3.0

model from this study and its associated recommendations will, therefore, allow higher education institutions in Mauritius to better attend to their E-learning initiatives in order to achieve their strategic objectives while at the same time contribute to the Government's vision of making the country a knowledge society.

1.7 Overview of research methodology

This research adopts the pragmatism philosophy, capitalising on the benefits of both quantitative and qualitative methods to obtain the best possible outcomes in answering the research questions (Tashakkori, Teddlie and Teddlie 1998; Goles and Hirschheim 2000). The study begins with a comprehensive literature review to identify key Semantic Web characteristics and E-learning CSFs leading to the development of an initial holistic E-learning 3.0 model. This is followed by the quantitative phase consisting of the administration of two surveys, one to students and another one to lecturers from Mauritian higher education institutions. A preliminary analysis of the surveys' data followed by an exploratory factor analysis result in a revised holistic E-learning 3.0 model. To further validate and extend the surveys' findings, the qualitative phase consisting of the case study approach, in the form of interviews with lecturers and administrative personnel from Mauritian tertiary institutions and analysis of documents from universities and the Government, are carried out. Content analysis of interviews' data and documents culminate in the final holistic E-learning 3.0 model.

1.8 Thesis outline

This thesis is organised in six chapters as outlined below:

- **Chapter 1: Introduction** provides an overview of the research and introduce key concepts relevant to this study such as the Semantic Web and E-learning CSFs. The research objectives and questions are presented and a brief outline of the research significance and research methodology is provided. The organisation of the thesis is presented at the end of this chapter.
- **Chapter 2: Literature Review** presents a thorough literature review on Semantic Web characteristics and E-learning CSFs. The gaps in the literature are highlighted to justify the research before the initial holistic E-learning 3.0 model derived from the literature review is presented. The chapter ends with the research scope, explaining the context within which this study is conducted.

- **Chapter 3: Research Methodology** explains the research objectives, research questions and research significance of this study before a critical analysis of different research paradigms, approaches and methods are presented with aim of adopting the most appropriate research design for this study. The chapter provides justifications for the chosen research design including a detailed explanation of the chosen mixed method approach consisting of a quantitative survey phase followed by a qualitative case study phase. Details pertaining to the collection techniques, data analysis strategies and tools employed as well as ethics considerations are also discussed.
- **Chapter 4 – The Surveys** discusses the survey process. Details are provided on the surveys' participants, structure, administration and data analysis before presenting the revised holistic E-learning 3.0 model based on the surveys' outcomes.
- **Chapter 5 – The Interviews and Documents** provides details on the case approach adopted in this study through the use of interviews and documents analysis. It explains the interview process and provides details on the interview participants and the interview questions design. The interview data gathering process is elaborated and the data analysis process is explained. Interview findings are discussed and corroborated with findings from key documents from the higher education institutions and the Government of Mauritius. The final holistic E-learning 3.0 model is presented, based on the outcomes of the interviews and documents analysis.
- **Chapter 6 – Conclusions** concludes the thesis with a summary of the overall research, an overview of the research findings and research contributions. Recommendations from this study are presented, the research limitations are discussed and future research directions are outlined. The chapter is followed by the reference list and appendices.

1.9 Chapter summary

This chapter provides an overview of this research. The chapter begins with an introduction to the Semantic Web and E-learning CSFs before outlining the need for the holistic E-learning 3.0 model. This research combines Semantic Web characteristics and E-learning CSFs for the development of a holistic E-learning 3.0 model in the context of Mauritian higher education institutions. The model is the first

of its kind as, to date and to the best of the researcher's knowledge, no such model has been developed, which captures a collective set of semantic Web characteristics and E-learning CSFs within the context of a small island developing state. The model serves as a realistic guide for E-learning initiatives and emerging trends such as E-learning 3.0 for higher education institutions and stakeholders. It also aligns with the vision of the Mauritian Government to use E-learning and emerging technologies in its endeavours to turn the country into a knowledge hub and a gateway to post-secondary education. An overview of the research methodology explains the mixed methods approach adopted in this study, starting with the quantitative phase in the form of surveys followed by the qualitative phase in the form of interviews and documents analysis. The chapter ends with an outline of the thesis chapters.

The next chapter consists of the literature review on Semantic Web and E-learning CSFs to develop an initial holistic E-learning 3.0 model.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature on E-learning 3.0 models, Semantic Web characteristics and E-learning CSFs in order to provide a combined and comprehensive set of factors for a holistic representation of E-learning 3.0, which has, to date, failed to be established as a collective set, as indicated by the literature review. The chapter establishes the scope of the literature review and then presents an overview of the Web evolution addressing Web 3.0 (the Semantic Web) in particular. The chapter also draws a parallel between the evolution of the Web and E-learning, with a focus on E-learning and the Semantic Web (E-learning 3.0). A detailed review of works on E-learning 3.0 are then provided for developed and developing countries, culminating in a set of main characteristics for E-learning 3.0. The challenges associated with the Semantic Web is discussed next, highlighting the importance of considering E-learning CSFs for a holistic representation of E-learning 3.0, leading to a thorough review of works on E-learning CSFs. Both reviews led to the identification of common themes, resulting in a combined list of characteristics based on the Semantic Web and E-learning CSFs. Gaps in the literature, following the reviews, are identified, providing the rationale for this study. The initial holistic E-learning 3.0 model is presented next based on the combined list of Semantic Web characteristics and E-learning CSFs, addressing the gaps found in the literature reviews and guiding the rest of this research. The research scope is then defined.

2.2 Scope of the literature review

According to Webster and Watson (2002), the literature review is an essential approach to conceptualise research areas as well as synthesise prior research. For the purpose of this study, a descriptive literature review approach has been adopted to allow the researcher to conduct a comprehensive literature search to collect as much relevant information as possible on E-learning 3.0 characteristics in higher education based on the Semantic Web characteristics, E-learning CSFs and existing E-learning 3.0 models. The descriptive literature review allowed for the revealing of an interpretable pattern from existing literature following a systematic procedure of searching, filtering and classifying (Guzzo, Jackson and Katzell 1987).

Webster and Watson (2002) recommends a structured approach to determine the source materials for a review using a three-stage process namely:

- Stage 1: Starting with leading journals in order to locate relevant academic literature as a primary literature collecting approach.
- Stage 2: Use citations from articles identified in stage 1 to determine prior articles to be considered.
- Stage 3: Identify key articles which cite articles identified in stages 1 and 2 to determine their inclusion in the review.

For the purpose of this literature review, the approach proposed by Webster and Watson (2002) was applied, as much as possible, to identify relevant materials.

The first step of the literature review is to identify relevant literature through computer and manual searches. With the Semantic Web being a recently emerging technology, the researcher used online databases search as the main collecting approach instead of manual searches. In fact, online databases search is considered as the dominant approach for research related to contemporary phenomenon in the field of Information Systems (Petter and McLean 2009; Sabherwal, Jeyaraj and Chowa 2006; Hwang and Thorn 1999).

In order to gather as many relevant articles as possible for this study, a number of scholarly databases were accessed including ProQuest, ScienceDirect, Emerald, Business Source Complete, SpringerLink, ACM Digital Library, Wiley Online Library and IEEE Xplore since most of these online databases cover almost all of the IS World's top 50 IS journals and top 10 IS conferences (Schwartz and Russo 2004; Levy and Ellis 2006). Several search terms were used for this research including synonyms and combinations of different words. Terms such as "Semantic Web", "Semantic Web and E-learning", "Semantic Web and E-learning in Higher Education", "Web 3.0 and E-learning", "E-learning 3.0" and "E-learning 3.0 models" were used to identify articles on Semantic Web characteristics and E-learning 3.0 models. The researcher also used the search terms "Semantic Web and Ontologies", "Web 3.0 and Ontologies" and "Ontologies" to try and gather information on Semantic Web characteristics since the term ontology is a repeating term in articles related to the Semantic Web. Similarly, "Critical Success Factors for E-learning", "E-learning critical success factors", "E-learning CSFs" and "E-learning critical success factors in higher education" were used to gather articles containing essential E-learning characteristics. The initial search from online databases yielded approximately 650 articles.

Articles were then analysed to determine their relevance to the study. This was done by scanning the title and abstract and excluding any irrelevant articles. Around 180 articles remained and their full texts were reviewed. As recommended by Webster and Watson (2002), citations in the selected articles were also used as a means of finding more relevant materials, many of which were already included in the set of selected articles. Additionally, other articles which cited the selected ones were reviewed for relevance using the first title as a starting point, followed by the abstract and then a full text review. Once again, many articles were already part of the selected set. The repeated articles within the filtering process were considered enough indication that the majority of articles had been covered. As a result, the reviewed literature was considered comprehensive and included both theoretical and empirical studies. Along with scholarly papers, conference papers, online books, reports and websites were also cited in this literature review as they contained information relevant to this study.

The systematic academic literature search resulted in 129 articles, pertinent to this literature review, which addressed E-learning 3.0 models, Semantic Web characteristics and E-learning CSFs. To ensure that the articles were relatively recent, all the articles retained (except for two) were dated between year 2001 to year 2016. The two articles with an earlier date range that were consulted were mostly used to trace the history of key terms or to cite definitions and theories. Table 2.1 below summarises the source of information obtained for this literature review.

Table 2.1: Sources of articles for the literature review

Sources	**Number of articles in the literature review**
Journals	85
Conference papers	27
Reports	9
Online books/ books' chapters	5
Websites	3

The rest of the chapter is divided into multiple sections for a comprehensive review of E-learning 3.0 models, Semantic Web characteristics and E-learning CSFs.

2.3 Evolution of the Web – from Web 1.0 to Web 3.0

The Semantic Web is often associated with the concept of Web 3.0, which is considered as the new generation of the Web (Barassi and Treré 2012; Stojanovic, Staab and Studer 2001). To better understand the concept of Web 3.0 and hence the concept of the Semantic Web, a review of the evolution of the Web is appropriate. The

World Wide Web (WWW) was invented in 1989 with HTML-written Web pages displayed on browsers, as a means of global information sharing (Berners-Lee 1996). Since then, the Web has evolved with the availability of new Web technologies, with three different trends namely Web 1.0, Web 2.0 and Web 3.0 (Guha 2009).

2.3.1 Web 1.0

Web 1.0 is a term used to describe the early stages of the Internet (Miranda, Isaias and Costa 2014a). Web 1.0 was all about converting printed media into digital media to make them available online (Guha 2009). It describes "*a system of interlinked, hypertext documents accessed via the Internet*", meant for viewing, with limited user participation (Naik and Shivalingaiah 2008, 500). It is commonly known as the 'read only' Web and is characterised by the availability of static content, with minimal interactions between websites (Dominic and Pilomenraj 2014; Rubens, Kaplan and Okamoto 2011). Users could contact website authors via the authors' published contact details, such as email addresses, but there was no direct contact between them and the authors or between them and the content (Rubens, Kaplan and Okamoto 2011).

2.3.2 Web 2.0

Web 2.0, a term coined by Tim O' Reilly (O'Reilly 2007), also commonly known as the 'read and write' Web, provides a user experience based on social interactivity, collaboration and information sharing (Miranda, Isaias and Costa 2014a). It enabled social networking and information sharing spaces including Facebook, Twitter, YouTube, LinkedIn, Wikipedia and Blogger amongst others. Its core lies in users' ability to create, annotate, index, edit and share content including tacit knowledge (Dwivedi et al. 2011; Abbott 2010). As opposed to Web 1.0, Web 2.0 "*is no more a one way publisher-reader medium but is a bidirectional knowledge creation and sharing system*" (Guha 2009, 460). However, while the basis for collaborative content creation was laid, with the use of authoring tools and sharing platforms, Web 2.0 also resulted into an "*explosion of information*", which is highly disorganised, leading to inefficient, irrelevant searchers, not meeting users' needs (Miranda, Isaias and Costa 2014a, 92). The lack of data about data (metadata) for Web contents made the sorting and organisation of content harder, increasing the need for "*improving the knowledge discovery in the web along with its expansion*" (Guha 2009, 460). Consequently, the problem of information organisation on the Web has heightened the need critical need

for the management of information and has led to a new vision of the Web, namely Web 3.0 (Bergman 2001).

2.3.3 Web 3.0 – the Semantic Web

Originating from the inventor of the Internet, Tim Berners-Lee, Web 3.0 "*is not a separate Web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation*" (Berners-Lee, Hendler and Lassila 2001a, 3-4). The term Web 3.0 has been used since at least 2008 with increased "*emphasis on data and its descriptions at its core*" in order to "*facilitate new forms of linkage between data (as opposed to simply links between web pages) and support new forms of manipulation and presentation of data*" (Powell, Davies and Taylor 2012, 5). Web 3.0 encompasses efforts to create a Web where machines are able to "*search and process web contents, based on their meanings and find relationships between them using inference rules and organizational tools*" (Dominic and Pilomenraj 2014, 11). It will enable Web users to contribute information on the Web in ways that allow computers to understand, process and exchange them and, as such, is often described as the 'read-write-collaborate' Web (Dwivedi et al. 2011; Miranda, Isaias and Costa 2014a). In fact, the idea behind Web 3.0 is to make the Web more intelligent and intuitive in finding the right information for users, by providing meaning and relevance to Web contents (Miranda 2014 a). In simple terms, Web 3.0 is "*where services are not simply retrieving information based on keywords, but are trying to 'understand' what users want and to return the most relevant content*" (Powell, Davies and Taylor 2012, 13). It "*concentrates on identifying the meaning of content" as opposes to "identifying keywords and expressions*" (O'Connell 2011, 36). Therefore, the adding of knowledge to Web contents, using machine understandable languages, will allow machines to carry out most tasks and decisions and software agents to process information (Hassanzadeh and Keyvanpour 2011). However, contents on the Web have, so far, been machine readable but not machine understandable (Wahlster et al. 2006). Therefore, central to the provision of meaning to Web contents is the actual description of the contents, that provide machine understandable semantics, thereby transforming the Web from a "*Web of links*" to a "*Web of Meaning*"; hence the term Semantic Web and the interchangeable use of the terms Web 3.0 and Semantic Web throughout the literature (Wahlster et al. 2006, 2). In this research, the term Semantic Web and Web 3.0 are also used interchangeably.

2.4 The Semantic Web and its layers

As explained in section 2.3.3 above, the Semantic Web is intended to provide the basis for intelligent applications enabling more efficient use of information through the collections of knowledge and information repositories (Schoop, Moor and Dietz 2006). The Semantic Web is meant make the Web "*more relevant"* by adding structure and logic to it, through the establishment of rules for reasoning and the organisation of Web content in its most common form of meaning (Olaniran 2010, 19; Berners-Lee, Hendler and Lassila 2001a). The provision of meaning to content to allow interpretation and intelligent filtering by machines is dependent upon the accurate descriptions of Web content, that is, metadata (data about data). With metadata defined, linked and stored in a standardised way, by means of annotation of Web content, information on the Web will have meaning that "*is explicitly interpretable by software processes rather than just being implicitly interpretable by humans*" (Hassanzadeh and Keyvanpour 2011, 28).

As stated by Berners-Lee, Hendler, and Lassila (2001b, 1), for the Semantic Web to work, computers must have access to "*structured collections of information and sets of inference rules that they can use to conduct automated reasoning*", known as knowledge representation. To achieve this, a number of Semantic Web technologies must come into play. In line with this, a brief overview of the layers of the Semantic Web, as shown in Figure 2.1, is provided below:

- Markup Language (XML), which allows authors of documents or Web pages to tag (annotate) Web pages or part of it, although it does not, however, explain what the tags are used for (Berners-Lee, Hendler and Lassila 2001b; Rudman and Bruwer 2016). These tags, as such, do not provide semantics to the Web content.
- Resource Description Framework (RDF), used to express meaning and represent data about data (metadata) and as such provides a means for adding semantics to Web documents. RDF expresses meaning by means of a triple expression in the form of subject, verb and object, that may be used to describe relationships between data (Ghaleb et al. 2006; Rudman and Bruwer 2016). While the subject refers to the resource (e.g. Web page), the verb is a property of the resource (e.g. is the author of) and the object is what is being referred to by the verb (e.g. another webpage) (Berners-Lee, Hendler and Lassila 2001b). This triple expression is considered to be the natural way to describe the vast majority of the data processed

by machines (Berners-Lee, Hendler and Lassila 2001b). Uniform Resource Identifiers (URIs) are used to identify the subjects, verb and objects (just like a link on a Web page), allowing for anyone to define a new concept or verb, thereby providing scalability. However, this also implies that the same term could mean different things and different terms could mean the same thing, depending on how they are tagged and expressed by authors. RDF provides a domain-neutral mechanism for describing metadata but does not actually define the semantics of the domain.

- Ontologies, considered a critical component of the Semantic Web, is the solution to this issue of shared meaning in the context of semantic knowledge. Bucos, Dragulescu, and Veltan (2010, 415) stated that "*the success of the Semantic Web depends strongly on the proliferation of ontologies*" as they "*structure underlying data for the purpose of comprehensive and transportable machine understanding*". An ontology is "*an explicit specification of a conceptualization*" (Gruber 1993, 199). In order for machines to understand semantic meanings, those meanings and relationships have to be established through common standards by defining ontologies within different domains. Ontologies represent the formal common agreement about the meaning of data (Shah 2012). They consist of "*semantic networks of concepts, relations and rules that define the meaning of information resources*", such that information can be organised into customised databases and ready to be delivered to end users according to their preferred needs (Olaniran 2010, 19; De Moor 2005; Lytras and Naeve 2006). Ontologies "*are well-suited for describing heterogeneous, distributed and semistructured information sources that can be found on the Web. By defining shared and common domain theories, ontologies help both people and machines to communicate concisely, supporting the exchange of semantics and not only syntax*" (Stojanovic, Staab and Studer 2001, 24). However, ontologies "*merely serve to standardize and provide interpretations for Web content, but are not enough to build the Semantic*" (Ghaleb et al. 2006, 66). Critical to making Web contents machine understandable are semantic markups. Semantic markups of Web pages and documents are annotations which make use of the terminologies used by ontologies and contain pointers to the network of ontologies (Ghaleb et al. 2006).
- Logic which enables intelligent reasoning with meaningful data (Rudman and Bruwer 2016)

- Proof whereby information provided on the Semantic Web are verified before trusted (Gil and Artz 2007; Rudman and Bruwer 2016)

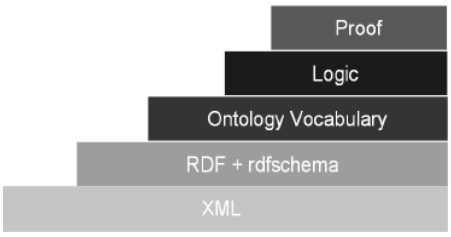


Figure 2.1: Semantic Web Layers
(Stojanovic, Staab and Studer 2001)

2.5 E-learning and the Web evolution

E-learning has continued to evolve alongside the Web. Being essentially an education process via the use of technology and online media, E-learning continued to adapt to new available technologies resulting in E-learning 1.0, E-learning 2.0 and E-learning 3.0 (Dominic and Pilomenraj 2014; Miranda, Isaias and Costa 2014a; Rubens, Kaplan and Okamoto 2011; Albu 2014). Miranda, Isaias, and Costa (2014a) drew a parallel between the evolution of the Web (outlined in Section 2.3) and that of E-learning as follows: the 'read-only' characteristic of Web 1.0 is represented by online content availability within E-learning 1.0, students creating and sharing content within E-learning 2.0 is attributed to the 'read-write' characteristic of Web 2.0 and the introduction of collaborative methods and spaces within E-learning 3.0 aligns with the 'read-write-collaborate' characteristic of Web 3.0. An overview of the different types of E-learning is presented below.

2.5.1 E-learning 1.0

With Web 1.0 came the notion of E-learning 1.0, with the focus being the provision of learning content by the instructors to learners within an online learning environment. Parallel to Web 1.0, Learning Management Systems (LMS) gained popularity and started to replicate traditional educational processes online with content administration, database organisation, communication tools and tasks solutions, with no actual change to teaching methodologies, apart from the provision of content outside of the classroom setting (Dominic and Pilomenraj 2014; Miranda, Isaias and Costa 2014a; Bessenyei 2008). E-learning 1.0 is, therefore, "*the technologically supported variant of traditional knowledge distribution forms, the virtual extension of textbooks and classroom teaching*" (Bessenyei 2008, 6).

2.5.2 E-learning 2.0

E-learning 2.0 added content creation and sharing and interaction capabilities to the aspect of content provision. With new Web tools allowing for more sharing and interactivity including the use of social networks, wikis, podcasts and blogs, E-learning 2.0 changed the focus from "*what*" is being taught" to "*how*" it is being taught (Miranda, Isaias and Costa 2014a, 101). E-learning 2.0, therefore, is more learner-centric and incorporates the social aspects of learning theories, such as constructivism and social constructionism, given the social platform capabilities of Web 2.0 (Dominic and Pilomenraj 2014; Rubens, Kaplan and Okamoto 2011).

2.5.3 E-learning 3.0

"The notion of e-Learning 3.0 emerged from the increasing popularity of Web 3.0 as an educational asset" (Miranda, Isaias and Costa 2014b, 184). It is envisioned that with E-learning 3.0, the focus will shift from "*what to learn*" to "*how to learn*" and where "*meaning will be socially constructed and contextually reinvented, and teaching will be done in a co-constructivist manner*" within the premise of seamless technologies (Moravec 2004, quoted in Rubens, Kaplan and Okamoto 2011, 5). Learning will be more personalised and responsive to the individual learner's needs, while at the same time, more collaborative, as a result of the semantically enhanced machine understandable educational content that allow for automatic use and interpretation by E-learning systems (Rubens, Kaplan and Okamoto 2011; Miranda, Isaias and Costa 2014a).

It is predicted that the characteristics of the Semantic Web will revolutionise E-learning by offering several key benefits including:

- Improved content accessibility and delivery via the use of ontologies, allowing learning materials to be linked and easily accessed through semantic queries.
- Better responses with intelligent agents organising and filtering information, leading to faster and more accurate search results based on users' needs and requests.
- Personalised learning content with ontologies allowing users to customised their searches and queries.
- Greater adaptivity of learning content through semantic annotations.
- Integrated E-learning platforms for different learning activities.

- Collaborative learning content generation and management as the Web becomes more decentralised.

(Miranda, Isaias and Costa 2014a; Sheeba, Begum and Bernard 2012)

Consequently, E-learning 3.0 is rapidly becoming "*an appealing tool for education due to its promise of increased personalisation, effective knowledge management and improved interactive and collaborative instruments*" (Miranda, Isaias and Costa 2014b, 184). This has resulted in many researches on the development of E-learning models based on the Semantic Web (E-learning 3.0 models). Table 2.2 highlights the main change to teaching and learning with the E-learning evolution. A thorough discussion of the works on E-learning 3.0 models and the Semantic Web in the literature are provided next.

Table 2.2: Teaching and learning with E-learning evolution

(Adapted from Miranda, Isaias, and Costa (2014a), Miranda, Isaias, and Costa (2014b) and Rubens, Kaplan, and Okamoto (2011))

E-learning 1.0	**E-learning 2.0**	**E-learning 3.0**
- Pre-established learning process - Content provision from instructors to learners via Learning Management Systems - Didactic tools, communication tools and interactive exercises introduced to enhance learning - Incorporates the learning theories of instructivism, behaviourism and cognitivist	- Collaboration, information exchange and social learning over passive learning - High quality content generation - Students interact and socialise through social networking services - Social aspects of learning theories introduced to learning namely constructivism and social constructivism	- Semantic Web ready content (metadata), which are machine understandable, via the widespread use of ontologies - Real time learning and real time collaboration - Intelligent solutions to Web searching, documents management and content organisation via intelligent agents enabling smarter and more personalised and collaborative learning

2.6 The Semantic Web and E-learning – E-learning 3.0

As discussed above, the education domain can benefit significantly from what the Semantic Web has to offer. With E-learning being much more than just the transfer of educational materials online, extending to "*effectively transforming web-based content delivery to learner-centred interactive e-learning with supporting technologies and*

learning resources", the Semantic Web is considered a promising technology in meeting those requirements (Sridharan, Deng and Corbitt 2010, 264). Semantic E-learning systems, or E-learning 3.0 systems, as termed in this research, "*can offer a rich set of services that personalize the way content is made available to the user, by providing a well-structured database that allows better knowledge handling by machines*" (Bucos, Dragulescu and Veltan 2010, 415-416). Through the enhancement of metadata associated with learning materials, linked to ontologies, the Semantic Web provides better opportunities for the composition of user-specific courses and content and the reuse of learning materials (Snae and Brueckner 2007; Stojanovic, Staab and Studer 2001). Learning materials can be broken down into smaller chunks or learning objects, which can be tagged with semantically-enriched metadata via their linkage to relevant ontologies, thereby facilitating the process of searching, locating and reusing of appropriate content that meets one's needs (Govindasamy 2001).

Ontologies are considered the backbone of the Semantic Web (Ding 2001). They play a crucial role in enabling the representation, processing, sharing and reuse of knowledge within the E-learning 3.0 systems as they allow for the specification of the conceptualization of a specific domain in terms of concepts, attributes, and relationships (Ghaleb et al. 2006; Bucos, Dragulescu and Veltan 2010). They facilitate the creation of semantic relationships between learning contents to enhance the learning process within the E-learning environment (Pah et al. 2007). Ontologies enable learning domains to be described from different perspectives allowing for a richer description and retrieval of contents and as such "*plays the role of a binding factor that brings various knowledge items and processes together to provide a richer and integrated view of the knowledge domain to the learners*" (Pah et al. 2007, 285). Therefore, different dimensions of learning materials can be described, via their metadata linked to the relevant ontologies, including the actual description of the content of the learning materials, the pedagogical context in which they can be used as well as the sequence or structural relationships for which they can be used (Stojanovic, Staab and Studer 2001). Consequently, such semantically annotated learning materials, linked to the appropriate ontologies, enable customised learning materials to be presented to learners as well as the building of learning sequences based on the needs of the instructors and the learners (De Nicola, Missikoff and Schiappelli 2004; Dwivedi and Bawankan 2013; Shrivastava, Sharma and Bawankan 2012). This combination of learning resource management, pedagogical considerations and

technologies is critical towards sustainable E-learning, which the Semantic Web technologies is paving the way for (Sridharan, Deng and Corbitt 2008).

The need to organise and structure the overload of information available online, coupled with the need to adapt and contextualise learning content to users' needs, accentuated the importance of developing education models that meet the expectations of the education community. Consequently, the Semantic Web has been increasingly researched to adapt it to E-learning in view of benefitting from the numerous benefits it promises.

An overview of current works in the literature on Semantic Web and E-learning 3.0 are presented below, followed by the identification of the main characteristics of the Semantic Web based on the works examined in the literature review.

2.6.1 Review of current works on E-learning 3.0

Several E-learning models and frameworks based on the Semantic Web have been proposed in the literature, highlighting different Semantic Web characteristics as well as different aspects E-learning. Ontologies as the key enabler of the Semantic Web technology have also been thoroughly discussed in the literature on Semantic Web and E-learning 3.0. Since it is not possible to discuss all available works on the Semantic Web within the E-learning context, the most relevant, according to the researcher, are discussed below.

2.6.1.1 Review of current E-learning 3.0 models and frameworks

Stojanovic, Staab, and Studer (2001) proposed an approach for implementing the E-learning environment using Semantic Web technologies with ontology-based descriptions for content, context and structure of learning materials to enable personalised access. The contents of learning materials representing semantically identical concepts are mapped to the content ontology. Similarly, different learning materials representing similar contexts, such as, an example, an introduction, an explanation or a discussion, are linked to the context ontology to allow for context relevant searching of learning content based on user preferences. Learning contents are also defined in terms of their structuring relations such as Prev, Next, IsPartOf, Requires, IsBasedOn, and are linked to the structure ontology to enable self-paced learning and efficient information search. The main elements of the architecture are shown in Figure 2.2 below. Learning content is annotated to represent content, context and structure allowing for the personalisation of learning content which is then

achieved through semantic querying based on the three-dimensional search space of content, context and structure defined by the ontology. Navigation through the collection of learning materials is determined by the ontological relations between concepts in the content and context ontologies and the navigational structure defined by the authors in the structure ontology. These components are linked to the inference server, the main purpose of which is to answer queries and derive knowledge from the knowledge warehouse. The knowledge warehouse is the repository for learning content documents, metadata of content, the ontologies and other facts required to allow the inference engine to answer queries. The focus of the model is on semantically enhanced learning content through annotations and metadata descriptions to support course delivery and personalisation within the E-learning environment.

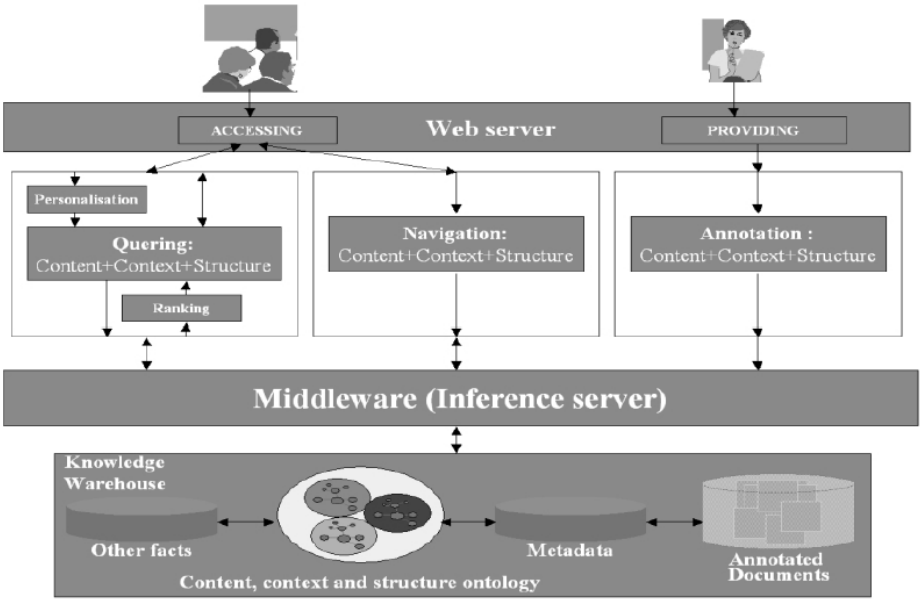


Figure 2.2: E-learning based on the Semantic Web
(Stojanovic, Staab and Studer 2001)

The same model was replicated by Pandit (2010) and Qassimqwaider (2012). The elements of the models include the access interface which is an "*integrated interface*" to allow users to interact with the system, the services consisting of personalisation via the user model, annotation, navigation and authentication, the inference engine for "*intelligent*" deductions via interactions with the knowledge base and the knowledge base consisting of the ontologies, the learning resources, the metadata, and other information including user records (Qassimqwaider 2012, 15). Figure 2.3 depicts the conceptual model as outlined in Qassimqwaider (2012).

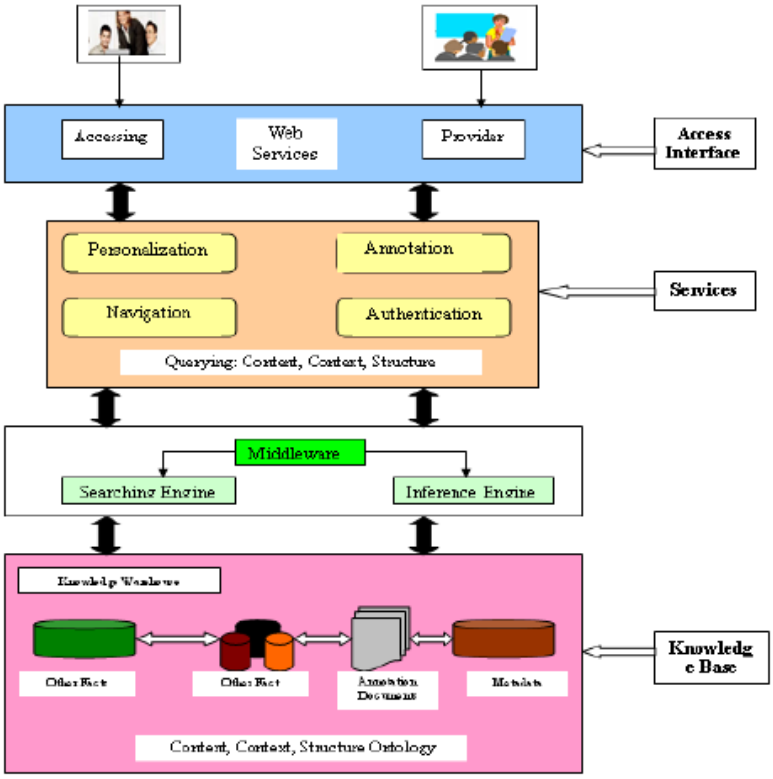


Figure 2.3: Semantic E-Learning Portal Architecture
(Qassimqwaider 2012)

Šimić, Gašević, and Devedžić (2004) proposed an intelligent learning management system (ILMS) architecture for Web-based environment for the development of E-learning courses based on the Semantic Web. The ILMS, as outlined in Figure 2.4, has four main elements: administrative tools, teacher tools, student tools and repositories. The administrative tools support the maintenance of students' and teachers' records, courses, security aspects of the ILMS and the administration of the domain knowledge including the management of ontologies and learning objects representing the learning content. The student tools assist the students with knowledge acquisition. They capture the student profiles including their interests, skills and predispositions to determine the student models for personalised learning. They also allow the students to navigate through the learning space, collaborate with other students, teachers and experts and access assessments tools and help tools. The repositories store the data metadata and ontologies with which the administrative, teacher and student tools interact to allow content to be expressed in different ways making it easier for course composition, reuse and retrieval. The model has similar components to that proposed by Stojanovic, Staab, and Studer (2001) including the data and metadata repositories (the knowledge

base warehouse in Stojanovic, Staab, and Studer (2001), annotation tools, student profiler and student model designer (personalisation in Stojanovic, Staab, and Studer (2001), course navigator, course management and ontology management. The main difference is that this model has grouped the different functionalities of the E-learning system into the four main categories (administrative tools, student tools, teacher tools and repositories) and includes some other aspects of the E-learning environment including assessment, help, collaboration and security not explicitly outlined in Stojanovic, Staab, and Studer (2001).

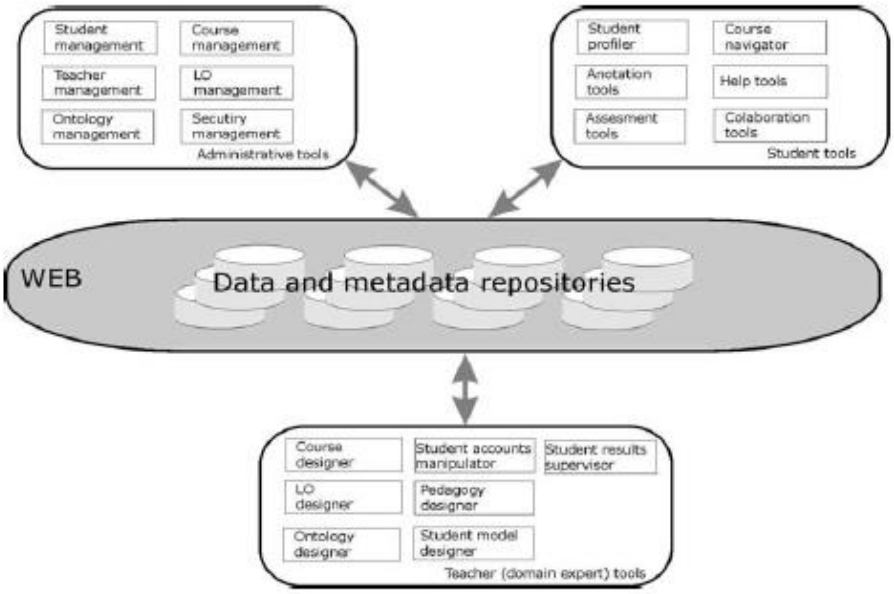


Figure 2.4: ILMS Architecture based on the Semantic Web
(Šimić, Gašević and Devedžić 2004)

Devedzic (2004) presented the scenario for education within the Semantic Web setting to further support adaptivity within a Web based learning environment including the collection of data about the student to create the student model, adapting the presentation of course materials and its sequencing based on students' needs and grouping students appropriately to promote collaboration. The model captures basic educational activities such as teaching, learning, collaboration and assessment, depicted in a Semantic Web setting. Pedagogical agents have the role of assisting with locating, browsing, selecting, arranging and integrating learning materials from educational servers to support individualised and collaborative learning. They access learning content on the educational servers through different educational services. These contents are enhanced with pedagogical aspects such as instructional design and learning theories via semantic mark-ups pointing to educational ontologies, required

for the personalisation of learning tasks. The educational servers use a presentation planner to select, prepare and customise domain materials presented to students, as well as build and modify the student model, depending on learning progress, to provide learning sessions based on students' needs. Figure 2.5 provides an overview of the educational server which captures the main inferences based on ontologies to deliver customised learning content within the E-learning environment. While there is no detailed view of a knowledge base as opposed to previous models discussed, this model provides a clear overview of the key aspects of learning in general such as pedagogy, learning, assessment and collaboration together with Semantic Web components mainly ontology, the presentation planning, the student model, the domain and the pedagogical agents.

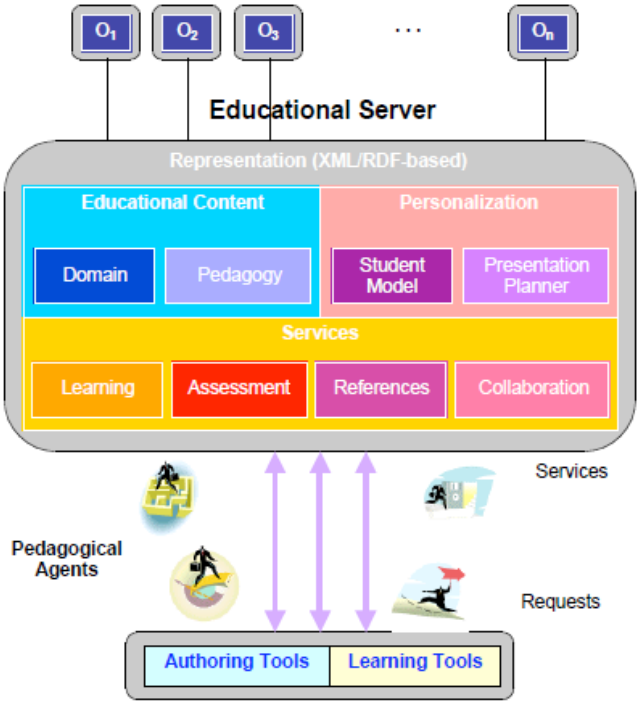


Figure 2.5: Educational Server within Semantic Web
(Devedzic 2004)

Moreale and Vargas-Vera (2004) proposed an E-learning services architecture offering semantic-based services to student and lecturers via the browsing and obtaining of information through Web services. Users have access to the semantic portal via the user interface or the personal learning assistant. Once a service is registered, it can be invoked through the service broker, which then matches the requested service to the closest service that can provide that functionality. Services are linked to ontologies

and other resources and databases to provide the most relevant information to users. The model shows how semantic services within the E-learning environment enable better content management through "*inferences in the background*" taking into consideration student preferences (Moreale and Vargas-Vera 2004, 114). These semantic services allow students "*to determine their learning agenda and be in control of their own learning*" through semantic querying of learning materials and construction of their courses based on preferences, needs and prior knowledge as well as allow lecturers to describe contents that "*stand on their own*" using appropriate context that allows personalised learning materials to be delivered to students (Moreale and Vargas-Vera 2004, 114). Figure 2.6 provides an overview of the architecture of the E-learning services. The services outlined capture the general functionality of an E-learning environment.

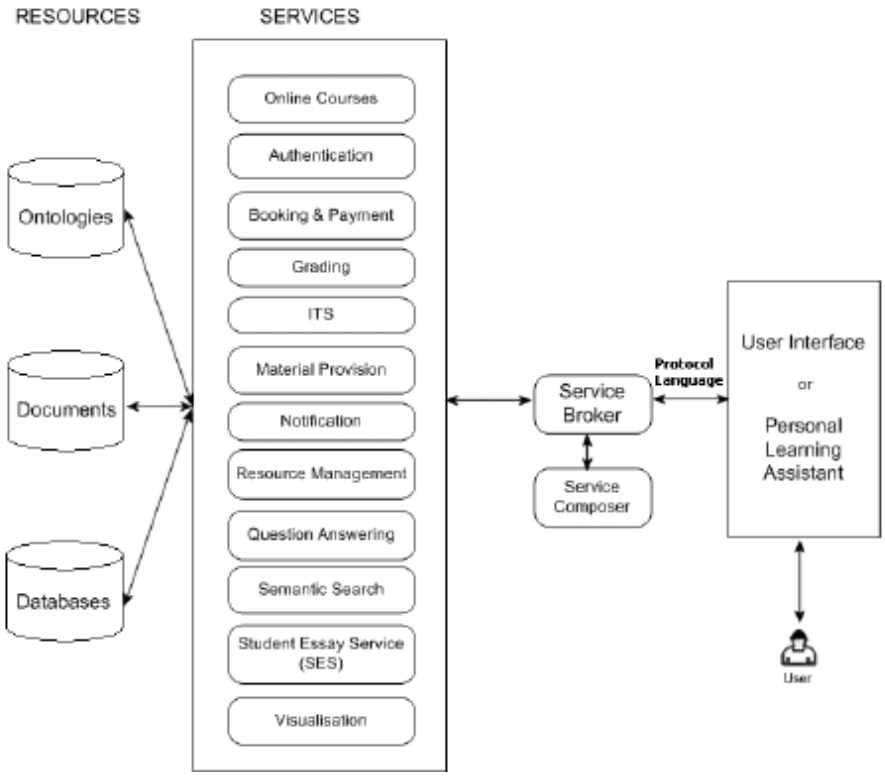


Figure 2.6: Proposed Architecture for e-Learning Services
(Moreale and Vargas-Vera 2004)

Ghaleb et al. (2006) proposed an E-learning model using Semantic Web technology with two sets of services namely Student Services and Instructor Services, each representing a number of activities within the E-learning environment, as outlined in Figure 2.7. Similar to Moreale and Vargas-Vera (2004), services are composed and

then invoked via the service broker. In this model, however, the services are grouped into Student Services and Instructor Services, thereby streamlining the functionalities offered by the system. Users access the different services via the user interface. The services are linked to a repository of databases including ontologies to ensure the most appropriate ones are delivered to users. The model comprises four main components: the student, instructor, evaluation and delivery. The student entity receives the learning content while the instructor's entity ensures the right content is made available to the students. Students' performances are measured using an evaluation component with details being stored within the database. Customised learning content is made available to students via the delivery component. The model relies heavily on "*ontological knowledge*" supported by the use of metadata to describe learning resources for "*contextual learning*" and searching (Ghaleb et al. 2006, 67). Course sequencing is made possible via the knowledge base where learning resources are described in terms of metadata linked to ontologies. The model stresses the importance of metadata (via the formal description of learning resources using RDF) as well as ontologies in delivering customised learning content within the Web-based learning environment.

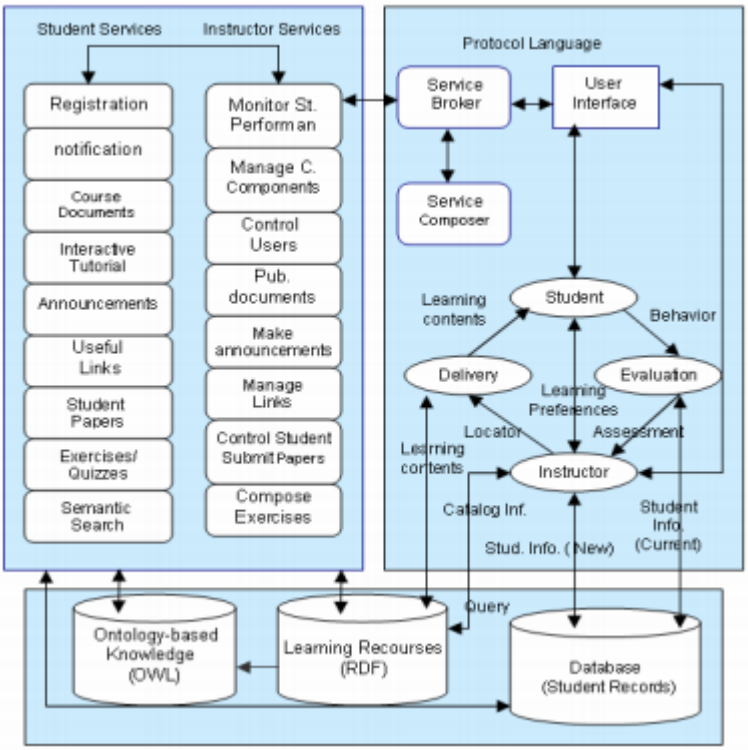


Figure 2.7: Web based e-learning system based on Semantic Web technology (Ghaleb et al. 2006)

Shrivastava, Sharma, and Bawankan (2012) extended the model provided by Ghaleb et al. (2006) to include a number of E-learning agents as outlined in Gregg (2007). The model provides learning materials to learners based on their prior knowledge and understanding. It consists of learners and instructors as the two main users interacting with different agents to operate within the Semantic E-learning environment. Just as described in Ghaleb et al. (2006), learners search for a course and the search is handled by the service broker. A successful search results in a course registration. Learners can also register for a notification service if they do not find the course they want. Once registered, learners receive course materials, tutorials, assessments and other course-related content as set by the instructors. Their behaviour is observed within the learning environment and course sequencing is adapted based on the their learning progress. The model further supports a number of E-learning agents interacting with instructors and learners namely, the Instruction agent, the Lesson Planning agent, the Resource Location agent, the Learner Centred agent, and the Collaboration agent. The Instructor interacts with the Instruction Agent to tailor and sequence learning materials based on learners' needs and the Lesson Planning Agent to plan the course. The Resource Locator Agent helps the instructor to obtain the required learning materials by checking the ontology database for relevant content. Contents are saved in the Instructor database for future use. Learners are notified and presented with the selected learning materials, which are also stored on the student database. Learners can interact with the Learner Centered Agent for feedback, which in turn communicates to the Personalised Agent to build and update the learners' personal profiles. Queries from learners, such as request for study materials, are handled by the Personalised Agent based on the learners' learning style and preferences. The Personalised Agent queries the Resource Locator Agent, which in turn interacts with the ontology database for the most appropriate content. The Collaborative Agent promotes interaction between the learners and instructors in the form of queries from learners to instructors and responses to queries from instructors to learners. Figure 2.8 shows the proposed model with the different agents interacting with each other.

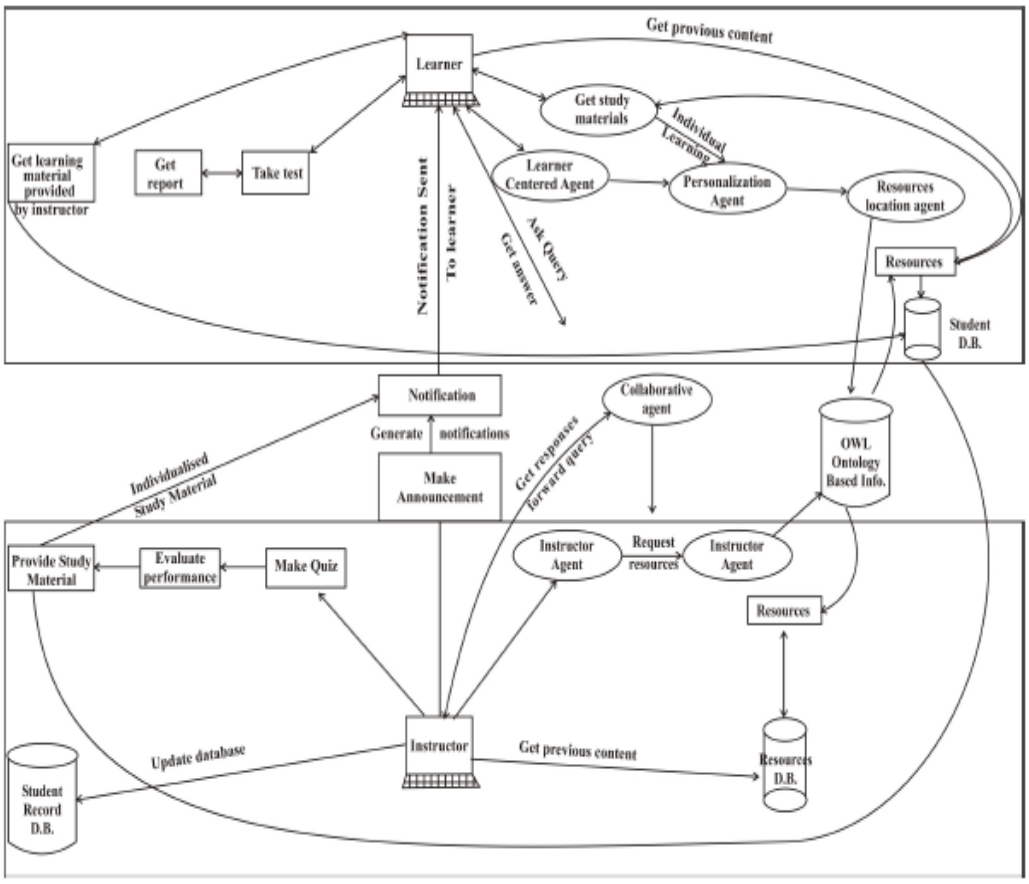


Figure 2.8: E-Learning Model Based on Semantic Web
(Shrivastava, Sharma and Bawankan 2012)

The concept of services linked to ontologies is also depicted in the model proposed by Rashid, Khan, and Ahmed (2013) in the form of an Ontology based E-Learning Management System, with six subsections including Registration and Confirmation, Course document distribution, Annotation, Assessment, Useful links and Tutorials and Help and Discussion as outlined in Figure 2.9. Similar to Moreale and Vargas-Vera (2004) and Ghaleb et al. (2006), the course query is handled by the service broker and results in either a successful course being found or a registration to a notification service. Registration requests is sent to the Instructor which works with the confirmation tools to check for learner's validity. A valid registration results in the student management tools performing several activities including creating a learner's profile and creating a student record in the database. Learning contents are annotated by authors, instructors and learners and converted into semantically enriched content linked to ontologies to allow for ease of semantic querying and retrieval. The Instructor searches for the course content best suited to the learners' needs, facilitated by

ontological knowledge added to learning content. The assessment tools evaluate the learner's performance through examinations, quizzes and exercises. The Useful Links and Tutorials tools further support learners in the learning process with the update information tool ensuring that any update to a particular link covers all related content. The Help and Discussion tools allow learners to carry out semantic search, navigate available courses and have discussions within the learning environment. Both the semantic search and the course navigation are done by querying the knowledge base consisting of semantically-enhanced learning resources linked to ontologies. While the model does not contribute any new functionalities or aspects of the Semantic Web within the E-learning environment from previous models discussed so far, it provides a detailed view of how the services interact with each other and with the knowledge base to offer semantically-enriched content and services to users.

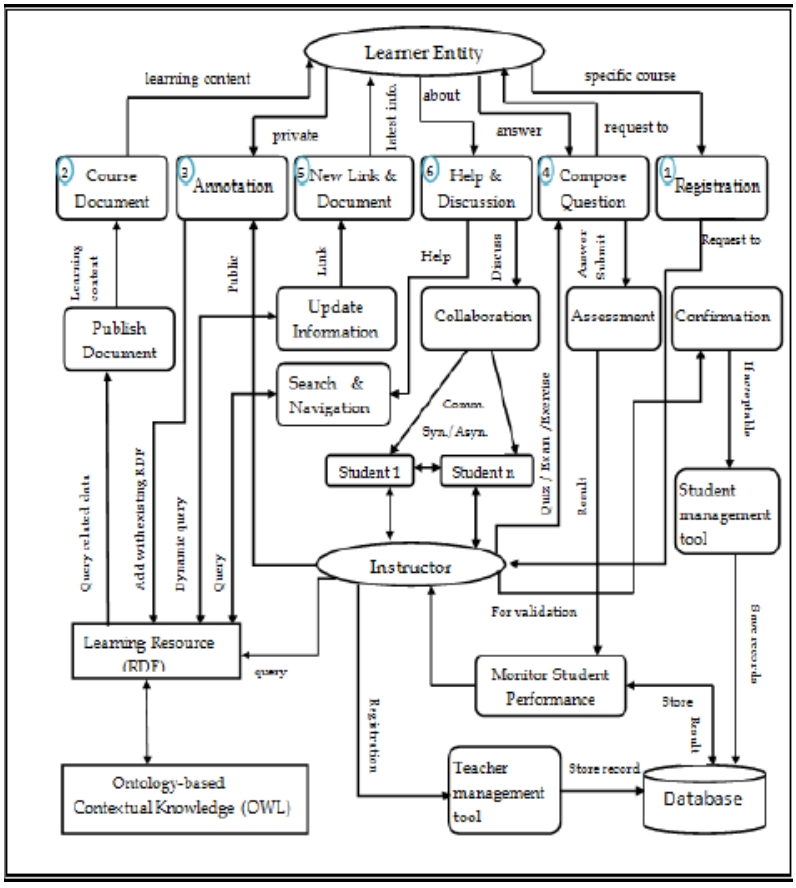


Figure 2.9: Proposed Model of E-learning Management System using Semantic Web Technology (Rashid, Khan and Ahmed 2013)

Shamsi and Khan (2012) proposed a conceptual Semantic E-learning framework capturing the key elements of Semantic E-learning platform which include the users

and their access levels, the interfaces allowing the users to interact with the system, services that handle background processes and the knowledge base consisting of a number of repositories. Figure 2.10 outlines the Semantic E-learning framework, which has many features and functions similar number of models previously discussed including Stojanovic, Staab, and Studer (2001), Šimić, Gašević, and Devedžić (2004), Ghaleb et al. (2006) and Qassimqwaider (2012). The knowledge base component of the model is a repository where ontologies, metadata, inference rules, educational resources and course descriptions and user profiles are stored. The search engine allows for the knowledge base to be queried, while the interface layer enables users to interact with the system, and the access layer acts as a "*security layer between the users and the system*" (Shamsi and Khan 2012, 13). Other key elements include annotation of learning resources and metadata to allow learning content to be semantically described.

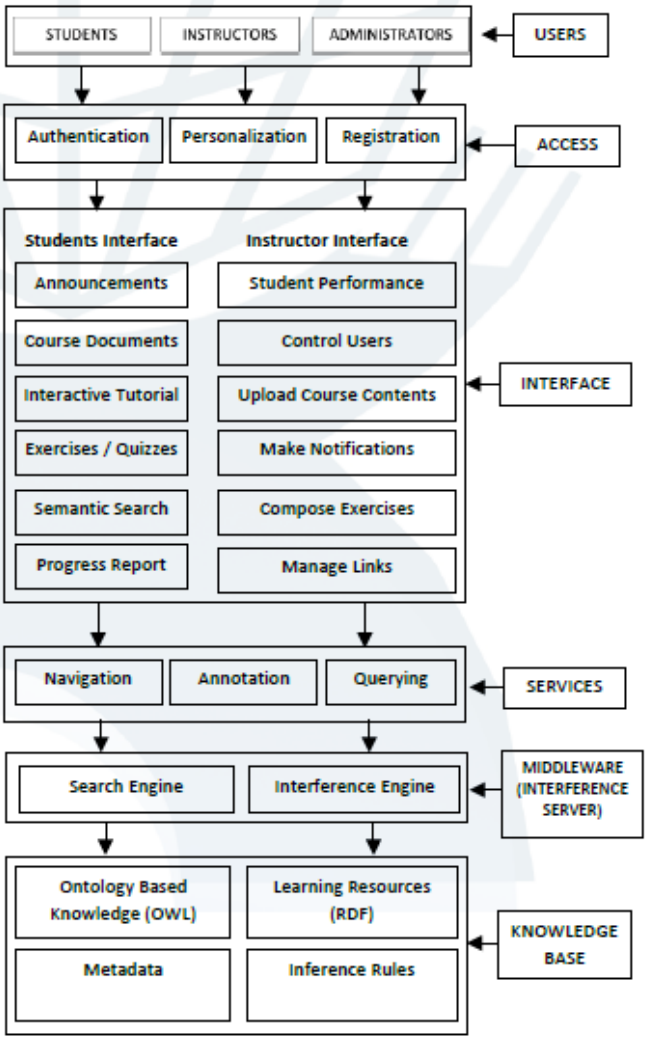


Figure 2.10: Conceptual Architecture for Semantic E-learning
(Shamsi and Khan 2012)

Altameem (2014) provided a framework similar to that of Shamsi and Khan (2012) consisting of users, registration and authentication, user interfaces and services, secure access and the knowledge base as shown in Figure 2.11. In this model, the services are grouped into General services and Core Academic services as opposed to Student and Instructor services as in the Ghaleb et al. (2006) and Shamsi and Khan (2012) models, although they relate to a similar set of activities. The General Services are more focussed on the student side of system interaction such as personalisation, semantic query, notification, sharing and discussion. On the other hand, the Core Academic services comprise academic activities such as course documents, uploading and downloading of content, adding/deleting of courses, interactive tutorials, presentation, quizzes and progress report. Users interact with the system based on their registration and access rights. The secure access layer provides additional security to allow uses to access the network in order to interact with the knowledge base. The knowledge base is the repository of databases, which includes metadata, ontologies, inference rules and semantically-annotated learning resources using RDF. The new component added to the knowledge base is the cloud database, which allows easy access to records.

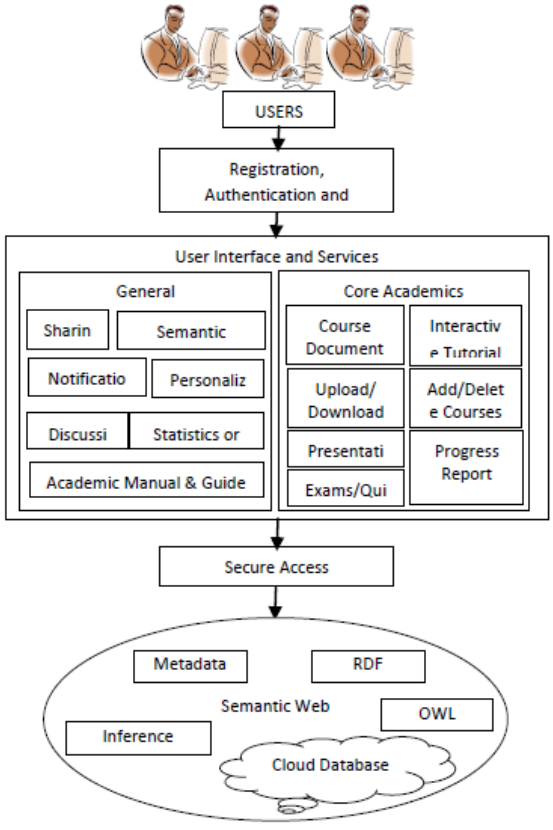


Figure 2.11: Semantic-based E-Learning Framework (Altameem 2014)

The use of different agents to support learners and instructors within a Semantically active E-learning environment is also proposed by Dwivedi and Bawankan (2013) as shown in Figure 2.12. The Instructor carries out different functionalities such as registering and authenticating learners, providing the online classes, providing the materials, answering queries and evaluating learners' performances. The Learner requests login and signs into the system, takes online classes, interacts with the learning materials, asks queries and takes tests. The model operates in the same way as the model proposed by Shrivastava, Sharma, and Bawankan (2012), consisting of the Instruction Agent, the Lesson Planning Agent, the Learner Centered Agent, the Personalisation Agent, the Collaborative Agent and the Resource Location Agent. Instructors interact with the Instruction Agent and the Lesson Planning Agent to provide customised learning materials in the right sequence to learners based on their prior knowledge and learning styles. The Learner Centered Agent and the Personalisation Agent ensure that learners receive the right learning materials to match learners' needs. The Collaboration Agent ensures effective interaction between the learners and instructors in the form of queries, responses and feedback. The Resource Locator Agent locates resources semantically, making use of ontologies linked to the services supported in the E-learning environment.

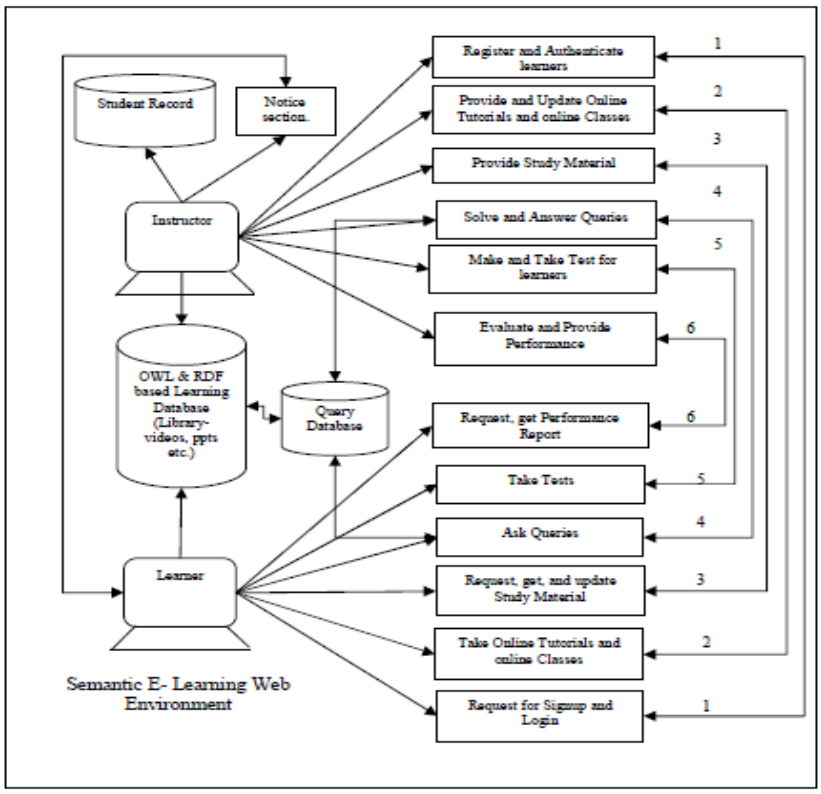


Figure 2.12: Semantically Active E-Learning System
(Dwivedi and Bawankan 2013)

The model proposed by Huang, Webster, et al. (2006) makes use of personal agents interacting with the knowledge base to provide a personalised learning experience to learners based on pedagogical information set up by instructors. The model is dependent on the context model used to capture "*semantic context aware information service*" through the semantic mark-ups of content (Huang, Webster, et al. 2006, 358). The intelligent Semantic E-learning framework offers semantic information processing, learning process support and personalised learning within an integrated learning environment as outlined in Figure 2.13. Instructors prepare the learning materials, provide the contextual descriptions of learning objects, design the learning paths of students based on their needs and design the required assessments and activities for the course. On the other hand, learners' profiles are captured by the intelligent agents to assist in catering for a more personalised learning experience. Information captured from instructors and learners are stored in the knowledge base used by intelligent agents to provide course sequencing adapted to meet learners' needs based on their profiles and on the pedagogical information and tools set up by instructors. During the learning process, learners interact with personal agents via the semantic-based interface to retrieve content based on the context model. Throughout the learning process, the intelligent agents continue to gather information on learners, such as their learning progress, and communicate with other agents and the knowledge base to provide the best learning paths or the most adequate learning experience.

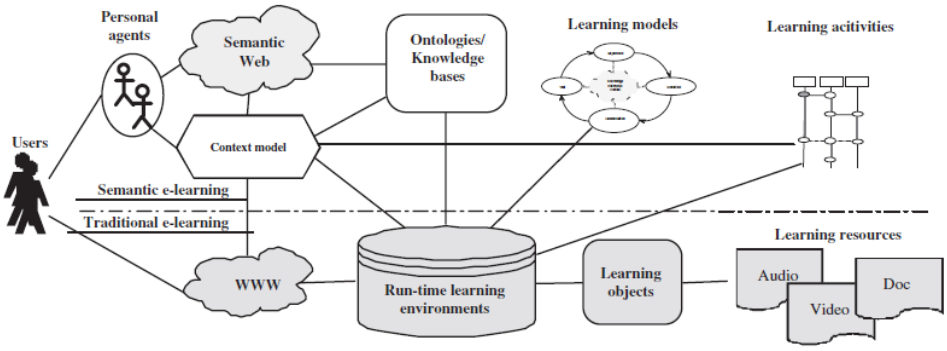


Figure 2.13: Semantic E-learning Framework
(Huang, Webster, et al. 2006)

The ontology-driven E-learning system (O-DEST) proposed by Snae and Brueckner (2007) outlines a unified platform for logging, assessing, delivering of learning content, managing records and reporting within a Semantic context based on ontologies, although not much is discussed in the model in terms of how ontologies

are used to semantically enriched content, context and the processes. The structure and design of O-DEST is depicted in Figure 2.14, which includes details of the lessons, learning and teaching design, interface design and metadata for E-learning system. Details of the lessons include the structure of each chapter to meet objectives of the course. The learning and teaching designs include the most appropriate teaching methods to motivate learners in their learning and allow them to self-assess their progress. The interface design needs to be attractive and easy to navigate. The metadata for the E-learning system is the formal representation of the main processes within the E-learning setting. It covers security aspects such as system login, the course syllabus including content and assessments, the teaching approach such as lecturers, quizzes, case studies and examples, the evaluation, prior to the start of the course to assess learners' levels of knowledge and during and after the course to assess learners' progress, communication between learners and teachers in the form of Web boards, the help system for teachers and learners in the form of emails, Web boards and FAQs, promotion of information and news to ensure learners are notified of important events and finally facilities which represent such functionalities like assignments submissions and marking and the E-learning system update via the Content Management System. The model provides a good overview of the different aspects of E-learning albeit with few details on the semantic aspects of the E-learning environment. While it is understood that the Metadata E-learning System component represents how the different services offered within the E-learning environment are to be semantically enriched, through linkages to ontologies, no further elaboration is provided within the proposed structure of O-DEST.

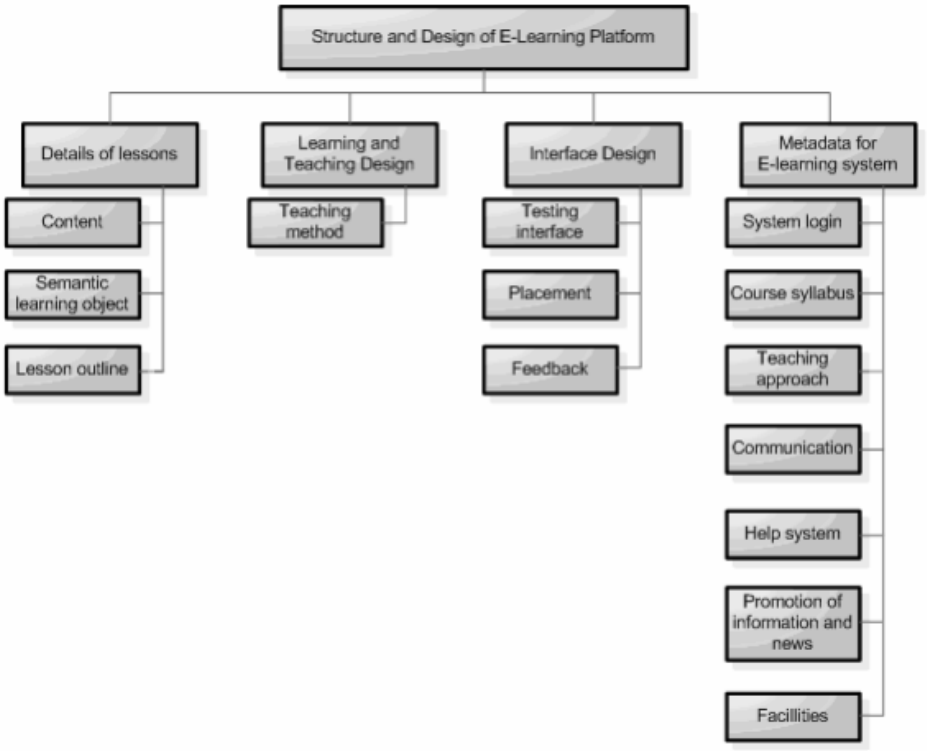


Figure 2.14: Structure and design of O-DEST
(Snae and Brueckner 2007)

In an attempt to provide a framework for the easy development of a semantic Web-based educational system for authors and developers, Bittencourt et al. (2009) provided a reference model for the Semantic Web-based learning environment as shown in Figure 2.15. The model depicts different roles including the teachers, the learners, the authors, the group role and the developer. Each of these roles relates to specific aspects of the learning environment such as the requirement to "*monitor learners' interactions*" carried out by the teacher role, interacting with education content to achieve educational goals carried out by the learner role, "*educational content*", "*instructional process*" and personalisation done via the author role, collaboration via the group role and dealing with setting up the semantic Web based environment carried out by the developer role (Bittencourt et al. 2009, 304). Other components of the model are ontologies which are aimed at "*more carefully define parts of the data*" and to "*allow interaction between data*" of different formats (Bittencourt et al. 2009, 304), the interface environment facilitating easy interaction between the semantic learning environment and the users and educational resources to represent the learning objects for the purpose of personalised learning.

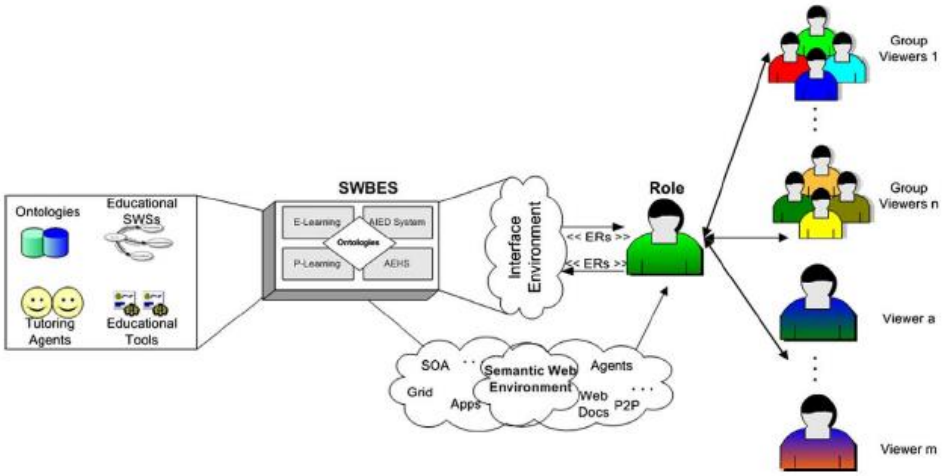


Figure 2.15: Semantic Web-based Educational System
(Bittencourt et al. 2009)

Bucos, Dragulescu, and Veltan (2010) proposed an educational ontology to model Web-based E-learning systems for higher education. The educational ontology represents higher education entities including the university, the faculties, the students, the lecturer and the courses, defined with respect to their roles within a Web-based E-learning system. Four important aspects of the E-learning system are outlined in the model namely a model of students' educational plans, course materials in the proper sequencing, establishing curricula based on students' interests and monitoring students' evolution within the learning environment. These four aspects have repeatedly been included in previous models discussed, establishing them as key aspects of the Semantic E-learning environment.

Mahmoud, Abd-El-Hafeez, and Badawy (2013) proposed a framework for Semantic E-learning consisting of three tiers: an online search, an RDF generator and a SPARQL query as shown in Figure 2.16. The model provides a more technical perspective on the requirements of the Semantic Web where content is analysed and converted into RDF triples using the RDF generator and stored in RDF databases to allow them to be semantically searched using SPARQL query. The purpose of the framework is to provide customised content to learners since learners are likely to have individual learning styles and capabilities. The key aspect retained from this framework, a critical recurring characteristic of the Semantic Web from previously outlined models as well, is the need to have adequate content representation for any kind of semantic structure to prevail within the E-learning environment. In fact, the semantic structure of content

allows for quick access to content that meets the needs of the learners and enables resources to be combined and reused into different learning topics.

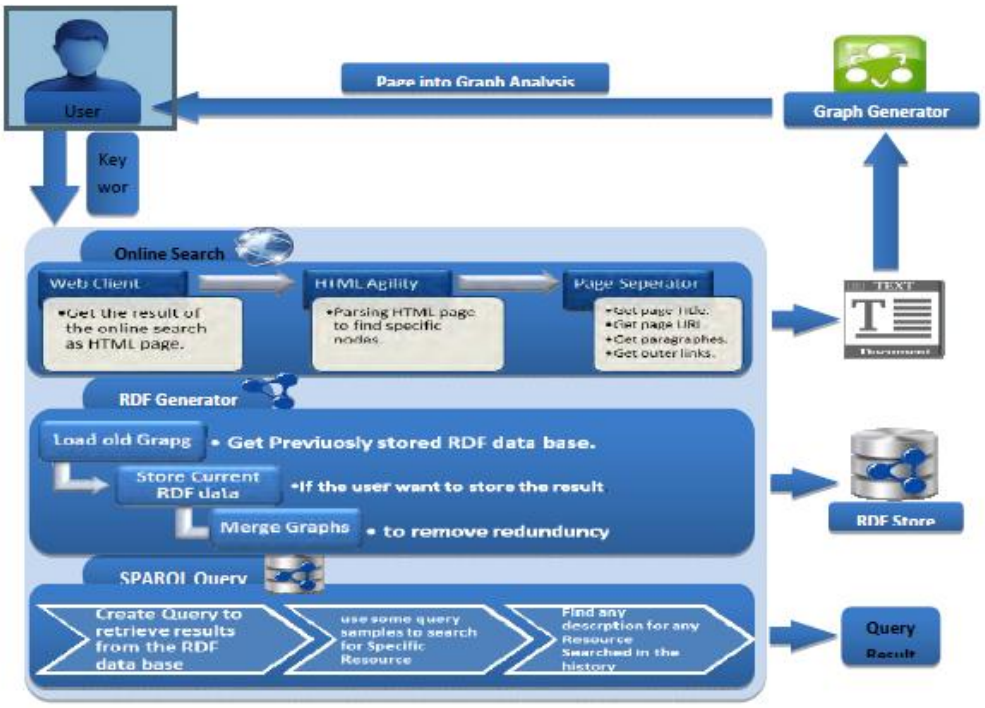


Figure 2.16: Framework for E-learning System based on Semantic Web
(Mahmoud, Abd-El-Hafeez and Badawy 2013)

2.6.1.2 Review of current works on ontologies and E-learning

The literature review also revealed many articles on ontologies capturing critical aspects of E-learning using the Semantic Web such as learning content representation, pedagogy, and personalised learning amongst others. Some of these works are discussed below.

Guo and Chen (2006), similar to Stojanovic, Staab, and Studer (2001), proposed an ontology-based descriptions of learning resources (metadata), using content, context and structure, to enable flexible and personalised access of materials by students. The metadata of content allows for "*semantically identical concepts*" to be expressed by "*different terms from the domain vocabulary*", the metadata of context allows for "*context-relevant searching*" for learning materials based on users' preferences and the metadata for structure supports students' self-paced learning based on their knowledge level, preferences and *"the semantic dependencies that exist between different learning chunks*" (Guo and Chen 2006, 443). The model introduces two operations to achieve a semantic solution: semantic querying and semantic mapping.

Semantic querying refers to the "*process of obtaining the description of a term from ontology"* while Semantic mapping allows issues related to "*differences in terminologies"* to be sorted through the use of a "*shared understanding*" of terms and mapping of ontologies related to the same concepts as shown in Figure 2.17 (Guo and Chen 2006, 444-445).

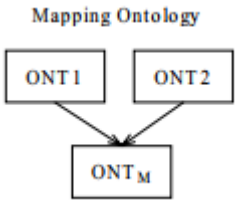


Figure 2.17: Ontology Mapping
(Guo and Chen 2006)

A similar model is proposed by Alsultanny (2006) where the E-learning model makes use of Semantic Web technologies through the description of content, context and structure of learning materials using a metadata application profile to capture the metadata needs, based on metadata standard specification. The model, as shown in Figure 2.18, allows for customised content to be delivered to students. The circles in the model are the activities that occur within the E-learning environment while the rectangles are the outcomes. The knowledge space conceptual model as well as a domain and content ontology, based on the structure and domain being taught, are used to manage the knowledge representation of learning resources in order to provide a workflow of customised learning to students. The student conceptual model and matching student ontology are used to map the student profile to a machine understandable repository of students' profiles based on needs and preferences.

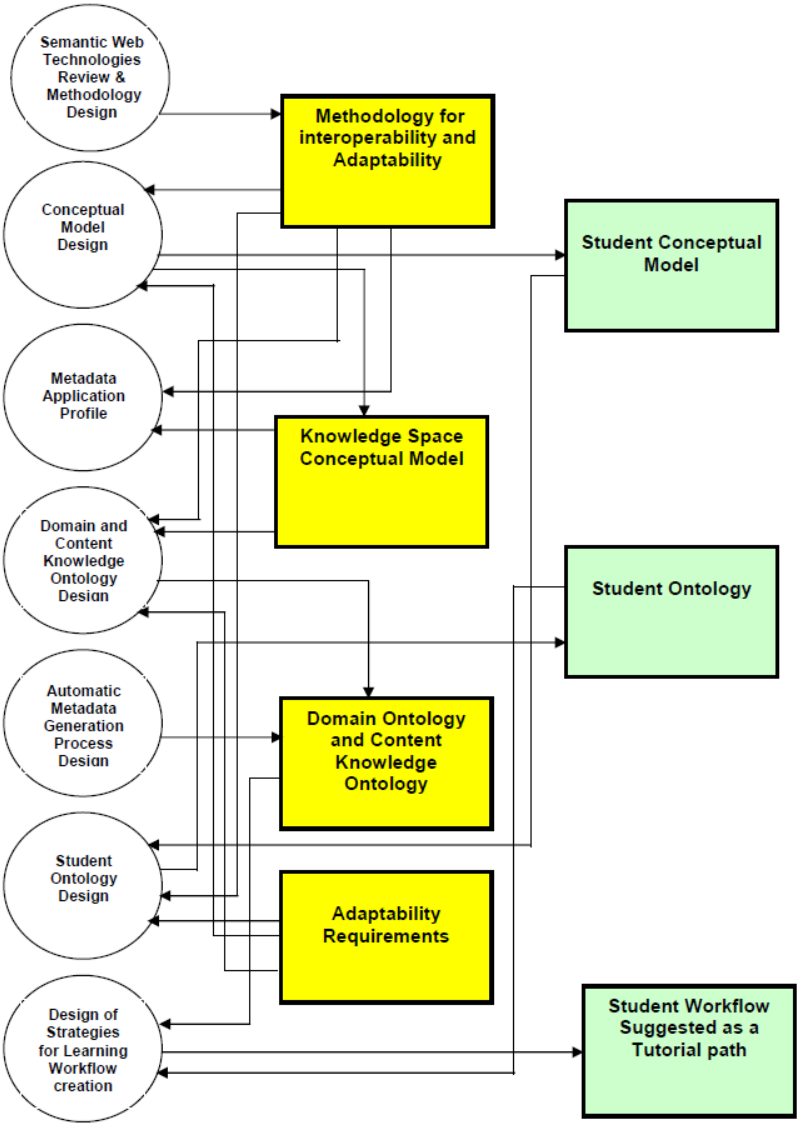


Figure 2.18: E-Learning System Overview based on Semantic Web (Alsultanny 2006)

Central to the conceptual framework based on ontologies for knowledge management in E-learning systems proposed by Pah et al. (2007) is the systematic approach to knowledge management which is considered an "*essential pre-requisite to enabling learners and knowledge seekers to access relevant materials as and when it is required*" (Pah et al. 2007, 283). According to the authors, ontologies play a key role in supporting effective knowledge creation and acquisition within an E-learning environment. The framework, as outlined in Figure 2.19, consists of five main elements including knowledge creation, knowledge extraction, knowledge classification, knowledge retrieval and knowledge sharing and use. Knowledge creation involves clearly defining and integrating tacit and explicit knowledge.

Knowledge extraction is all about capturing metadata of content including alternative terminologies through annotations. Knowledge classification is the grouping of domain areas into classes with common properties and is a critical phase for the ontology creation. Once the classification and clarification of topics in a domain are clear, they can be converted into usable ontologies using formal representation language such as RDF. Learners can retrieve knowledge via a query interface and requests to a search engine with support from the ontology allowing them to obtain an integrated view of information and ease of navigation based on their needs. The sharing and utilisation of knowledge occur when learners interact with content and obtain feedback on their learning progress which can be fed back to the system for the next set of learners. In fact, ontology is viewed as the "*binding factor"* that allows for the interrelating, combining and thereby reuse of knowledge units (Pah et al. 2007, 285). While the focus of the research is on the use of ontologies for knowledge management, Pah et al. (2007) supported various other elements they considered important for an effective Web-based environment, including the right institutional support, accessibility as the user will "*not care about didactics*" if his/her needs are not met, and the use of a personal user profile to enhance semantic based retrieval for the "*best individual results*"(Pah et al. 2007, 284).

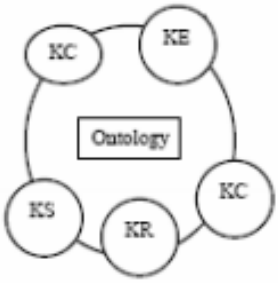


Figure 2.19: Framework for ontology based knowledge management in Web based learning (Pah et al. 2007)

Huang, Yang, et al. (2006) proposed an Educational Knowledge Service System (EKSS) where the metadata of learning resources are linked to ontologies to enable better knowledge creation, processing, querying and retrieval. Learners interact with a Knowledge Service Interface in oder to access materials customised to their specific needs as depicted in Figure 2.20. The model introduces a Knowledge Processing Unit, the main of which is to intergrate the decentralised knowledge associated with the issue of semantic heterogeneity. It also includes the use of a Personal Knowledge Search Engine which provides annotation for learning resources based on learners' profiles,

allowing customised content and learning paths to be offered to learners based on their needs.

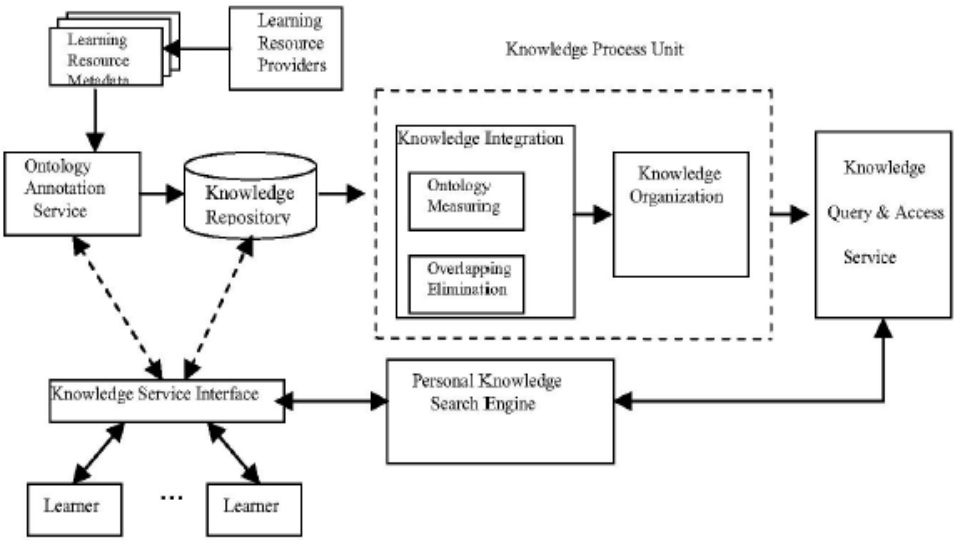


Figure 2.20: Educational Knowledge Service System (EKSS)
(Huang, Yang, et al. 2006)

Yanyan and Mingkai (2008, 910) proposed a knowledge portal to "*effectively support e-learning, enabling flexible knowledge acquisition, knowledge refinement and maintenance, as well as knowledge retrieval and accessing".* Similar to previously-discussed models, the knowledge portal includes the learner profile, the learning repository, authoring support and ontologies linked to learning resources. It also has a strong focus on knowledge management with different knowledge modules performing well-defined activities to semantically structure content. Instructors and learners can access and maintain learning resources via the portal's user interface. The reference ontology component captures the common terminologies with respect to the specific domains of the learning environment, which is then connected to the learning repository, thereby establishing the foundation for the semantically-interconnected learning resources for better knowledge management. Other components of the portal include the knowledge acquiring module, the knowledge refinement module and the knowledge retrieval module. Knowledge acquiring is provided by instructors and domain experts through authoring tools by defining instructional strategies and metadata of learning resources that conform to the domain ontology. To support knowledge creation within the E-learning environment, which occurs via interactions between learners and instructors, data mining technologies are adopted for

"*recognizing and tracking topics in the interaction process*". The Knowledge Refinement module ensures that resources are linked to the appropriate topics in the domain ontology and the Knowledge Retrieval module allows learners to obtain results based on their information needs. Figure 2.21 provides an overview of the knowledge portal architecture.

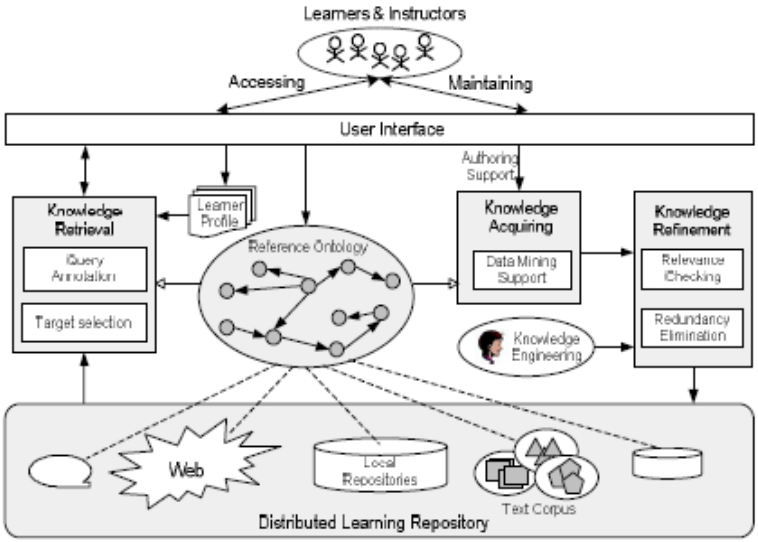


Figure 2.21: Architecture of E-learning Knowledge Portal
(Yanyan and Mingkai 2008)

Holohan et al. (2005) proposed an ontology-based content navigation system (OntAWare) for students and tutors based on learning objects and a sequencing algorithm. The system allows tutors to select and customise new and existing ontologies and use appropriate teaching and learning strategies to generate learning objects which are then presented to students. The system offers the option to tutors to sequence the presentation of the learning objects to their students or to allow varying degree of free student navigation using available on-screen links. Students, in turn, are provided with learning content in the form of learning objects customised to their preferences, where their learning patterns are monitored at the time of the lesson delivery, with a corresponding adaptive navigation guidance. The system monitors the students' movements, providing them with the option to navigate the system and the learning contents based on their needs and preferences. An outline of the system architecture is presented below in Figure 2.22.

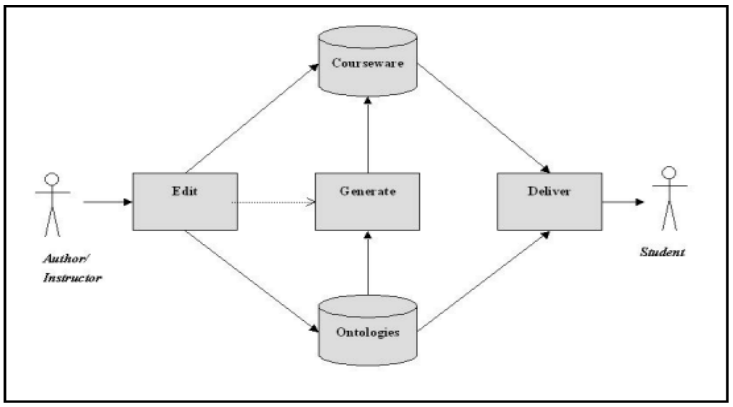


Figure 2.22: Functional Architecture of OntAWare
(Holohan et al. 2005)

De Nicola, Missikoff, and Schiappelli (2004) proposed a method for creating E-learning courses by semantically annotating learning objects in order to support teachers in "*flexibly building learning paths*" and students in "*customising and extending the courses according to their needs*" (De Nicola, Missikoff and Schiappelli 2004, 773). They proposed an ontology defining key concepts related to courses and a two-level organisation of learning resources with the upper level focussing on the concepts related to course topics in the domain ontology and the lower level linking resources to their related concepts as outlined in Figure 2.23. The ontologies assist teachers to build a course via semantic annotation of learning objects, which are learning resources splits into different chunks. Students can then access the courses by following the learning paths defined by teachers based on the ontology mapping of learning objects and can dynamically modify the learning paths according their specific needs. Both teachers and learners can build a learning sequence by choosing relevant concepts and corresponding learning resources based on needs. Apart from the matching of learning resources to domain concepts through ontologies, no other aspects of E-learning are discussed in this model.

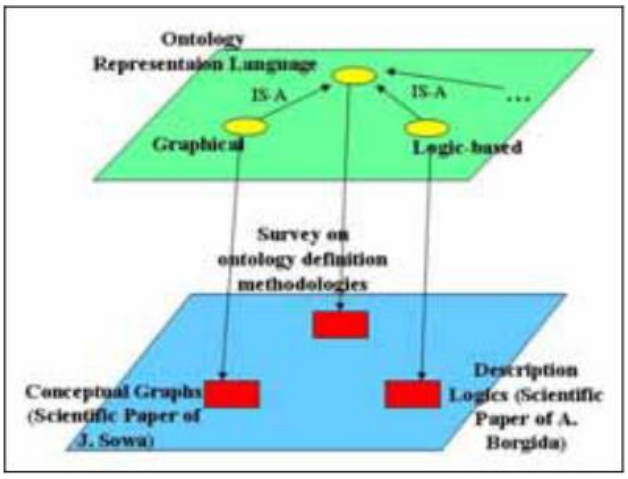


Figure 2.23: Two Level Organisation of Information in Ontology Based Course
(De Nicola, Missikoff and Schiappelli 2004)

A similar approach is proposed in Neri (2005) and Neri and Colombetti (2009), with a strong focus on matching and delivering learning content to learners, based on the right pedagogy that suit the learners' needs. A two-phase course sequencing functionality, namely content planning and delivery planning is outlined. During the content planning, the outline of the course is created based on how it will be presented to students and includes the pedagogical aspects such as the teaching approaches. The delivery planning phase is where content is filled with actual resources from the resource repository. Metadata are used to organise learning resources via links to resource ontologies based on pedagogical style of the teachers. Semantic descriptions enable the mapping of concepts to pedagogical ontologies to allow teachers to deliver courses that promote efficient learning based on the student profile.

With the aim of providing a framework for the organisation of learning objects based on pedagogical design categories, Wang (2009) proposed an ontology of learning objects repository for pedagogical knowledge sharing. The framework groups learning objects into different pedagogical categories comprising the learning subject, the learning objective, the instructional method, the delivery instrument, the assessment instrument, and the assessment outcome, via the use of metadata. The ontology of learning objects repository is then formed by mapping learning content to the identified pedagogical categories and synthesizing these categories through their inheritance and semantic relationships as outlined in Figure 2.24.

		TO					
		Learning Subject	Learning Objective	Instructional Method	Delivery Instrument	Assessment Instrument	Assessment Outcome
FROM	Learning Subject	Is_a Has_a	Achieves				
	Learning Objective		Is_a Has_a	Is_achieved_ through	Is_achieved_ through	Is_assessed_ by	Is_measured_ by
	Instructional Mrthodl			Is_a Has_a	Uses	Applies	Is_measured_ by
	Delivery Instrument				Is_a Has_a	Is_assessed_ by	Is_measured_ by
	Assessment Instrument					Is_a Has_a	Generates
	Assessment Outcome						Is_a Has_a

Figure 2.24: Semantic Relationship between Learning Objects Categories (Wang 2009)

The mapping of content to educational pedagogy was also discussed in Srimathi (2010) and Srimathi and Srivatsa (2008), where E-learning standards (SCORM), semantic educational servers and instructional design principles were combined to provide user-specific courses via semantic querying. The authors used authoring, sequencing and aggregation tools to provide semantically enriched courses that are "*sequenced and navigated based on learner profile and dynamic responses*" (Srimathi 2010, 37). While most of the discussions centred on coding and representing the ontology in Protégé, the importance of capturing pedagogical aspects of content within the E-learning environment stood out as the main element of the discussions.

Hiekata et al. (2007) proposed a Semantic Web based E-learning framework using the document management system ShareFast as shown in Figure 2.25. ShareFast allows learning processes to be visualised as hierarchical workflows with documents attached to tasks within the workflows. Within the E-learning environment, teachers create workflows that students can follow for their learning. A student log history, which includes feedback from students on their learning, is kept. The log history can then be viewed by teachers to assist them in understanding the learning behaviour of students and thereby determining customised workflows to meet students' needs. Teachers and students can also interact with each other using discussion threads. Not much is discussed in terms of how semantic structure is achieved as ShareFast provides the functionalities to build the workflows with matching content. The model, nonetheless, confirms some critical Semantic Web characteristics including customised provision of learning materials (via workflows) adapted to learners' needs and behaviour.

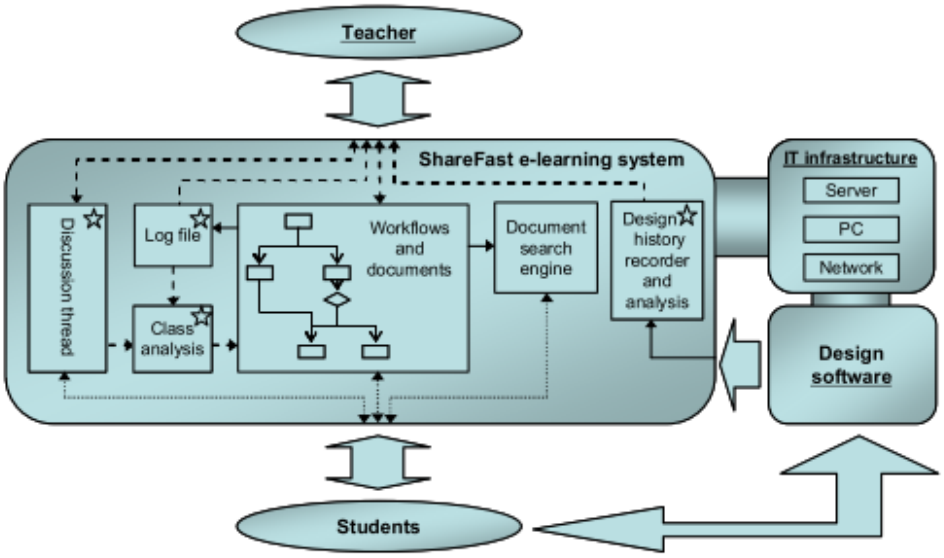


Figure 2.25: Educational Framework using ShareFast
(Hiekata et al. 2007)

Pramitasari et al. (2009) proposed a framework for personalisation in E-learning using a student model ontology as shown in Figure 2.26. The model is based on the work proposed by a number of authors namely Jovanovic et al. (2007), Henze, Dolog, and Nejdl (2004) and Paneva (2006). The student model ontology consists of three ontologies: the student learning style, the student performance and the student personal data. The student learning style ontology is developed from results inferred from questionnaires given to students. The student performance ontology reflects students' achievements and learning progress during their course of study. The student data ontology captures students' personal information and course and faculty information. The combination of the three ontologies to make up the student model ontology is "*considered important to describe the student profile*", highlighting, once again, the criticality of the student profile component for customised learning delivery (Pramitasari et al. 2009, 3).

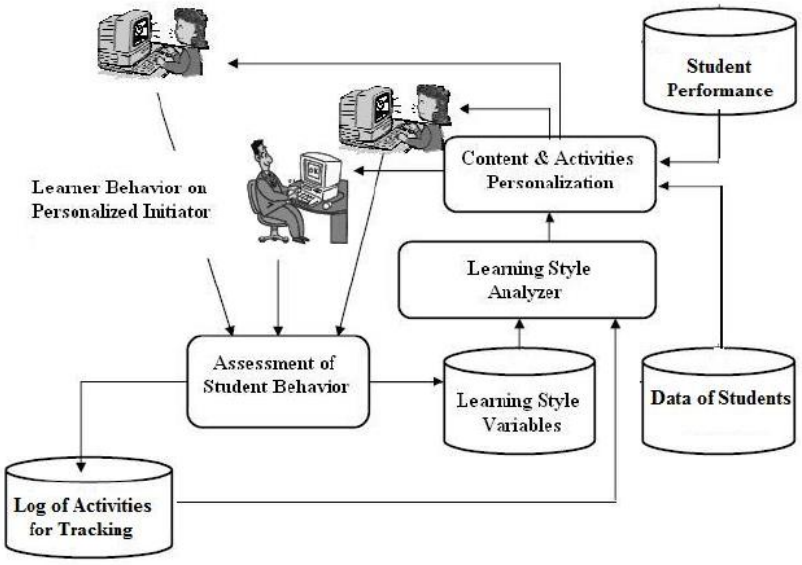


Figure 2.26: Framework of Personalisation Model in E-learning
(Pramitasari et al. 2009)

Fouad et al. (2011) proposed a personalised E-learning environment based on semantic and personalised search of learning content by comparing learning profiles with learning objects as depicted in Figure 2.27. They proposed the development of ontological models for both the learning profiles of students and the learning resources/learning objects to assist with the mapping of the most appropriate resources for learners based on profiles. To describe both the learner profile and the learning objects, the use of metadata following IEEE LOM standards are used. Learning resources are described in terms of learning objects "*which are reusable chunks of content*" consisting of the instructional content as well as the practice learning and assessment content (Fouad et al. 2011, 123). The learning profile consists of the "*learner's knowledge, interests, goals, background and individual traits*" as well as the learning styles which is "*the way people prefer to learn*" (Fouad et al. 2011, 123). The system then recommends the learning objects based on the learning profiles by the matching of learning objects metadata in the learning objects repository with the learning profile, through semantic querying linked to the domain ontology. The model emphasises how the use of learning objects linked to ontologies supports the reuse of learning content within an E-learning environment. It also elaborates on the learner profile components including how learner styles can be determined by the learners' actions and interactions in the E-learning system using other models and guidelines

proposed in the literature on learning style categories and traits as outlined in Sangineto (2008), Chen and Zhang (2008) and Latham et al. (2010).

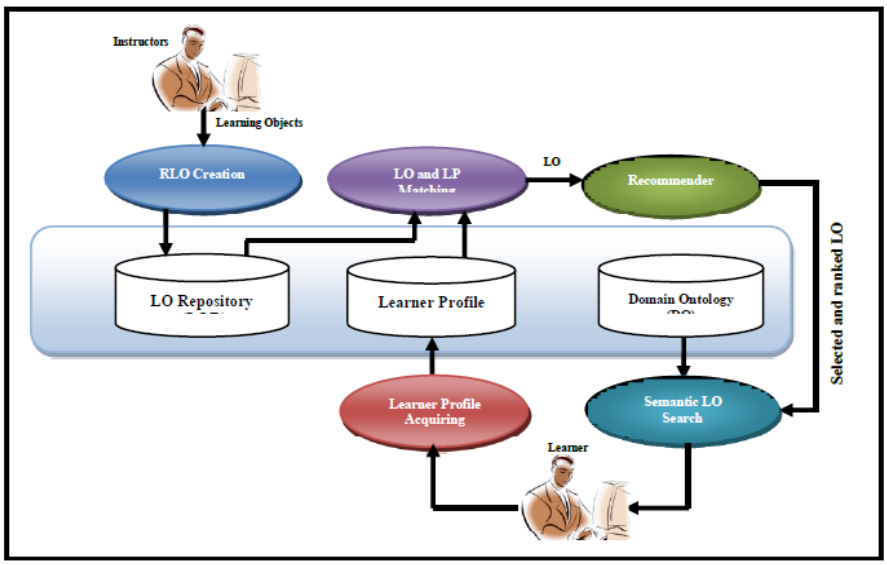


Figure 2.27: Learner Profile and Learning Objects mapping within a Semantic Web-Based Environment (Fouad et al. 2011)

The personalised learning model based on the Semantic Web proposed by Jinghua (2011) has two parts: the information model and the process model. The information model is ontology-based and consists of information about the domain knowledge, the learning resources and the learners' preferences. The domain ontology describes the domain knowledge used to support the personalisation of the learning path, the resource ontology describes the learning resources, the instruction ontology relates to the learning design and strategies and the learner ontology captures the student profile based on preferences, knowledge level and progress. The learning process model captures the learning path of the students including the learning activities, the resource selection and learner's progress required to update the learner ontology.

The model has similarities with the one proposed by Fouad et al. (2011), especially the information model which captures information required for the semantic structure of the learning environment. The personalised process model involves several strategies. The first one is the knowledge point selection where an initial learning path is selected for learners based on the domain ontology and the learner ontology. Then there are the learning activities strategies, which relate to the customisation of learning activities for learners such as lecture, test, homework, based on the learner's ontology and the course character. The strategies for resource selection depend on the domain ontology, learner ontology and instruction ontology to adapt the right selection of

resources based on learners' needs. These strategies are used to regularly update the learner ontology to obtain the most up-to-date leaning preferences and profile for optimum personalisation.

Sudhana, Raj, and Sikamani (2013) proposed an ontological approach to support personalised learning within an E-learning environment consisting of the learning repository and the learner model, both represented using ontologies as shown in Figure 2.28. The system is made up of several modules, each providing distinct services within the E-learning environment. The user interface provides the navigation and search capabilities of learning materials. The learner model ontology interacts with the learner model repository where learner preferences, obtained through the learner registration process or through the user interface during learning time, are stored. The model also consists of the domain ontology, which captures the knowledge representation of learning materials in the domain knowledge repository to denote the meaning, context and learning preferences associated with the learning resources. The personalised learning support module maps the relevant resources to learners' preferences and input queries to provide personalised learning. It interacts with the learner management module and the domain management module, which provide the required environment and capabilities for learners' registration, progress monitoring, and activities as well as the environment to update and maintain learning content. With personalised learning central to this model, it provides a detailed overview of the learner preferences model consisting of the mapping of learning materials to the domain knowledge and the learning style of learners. Learner preferences are also grouped into content-specific needs to support the domain knowledge as well as an educative support preference to assist with the pedagogical aspect of the learning resources including the context, level of difficulty, types and technical details amongst others.

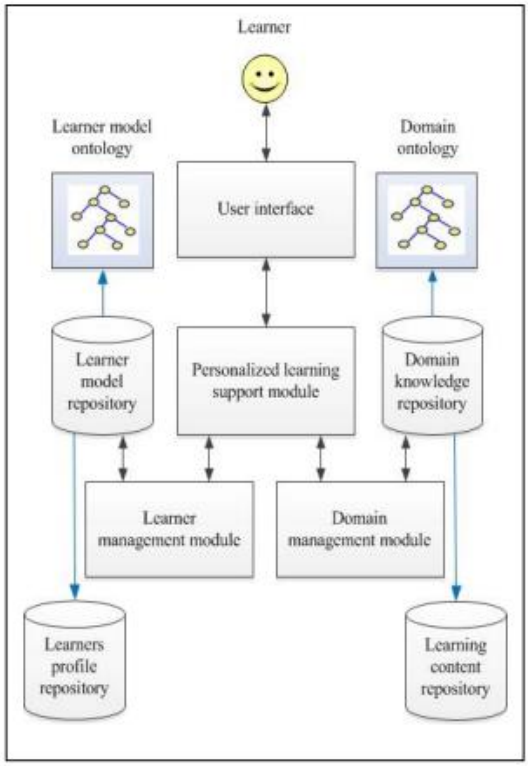


Figure 2.28: Architecture Overview of Personalised E-Learning System
(Sudhana, Raj and Sikamani 2013)

The work proposed by Ahmed, Shaik, and Aouad (2006) focusses on the pedagogical and technical concepts of the Semantic Web within E-learning. It describes an approach for the development of an ontology to define educational content for the construction education domain both semantically and pedagogically, to enable a platform-independent architecture for the educators and learners. In phase 1 of the project, an ontology for the construction education domain is designed and developed. A construction domain education server is developed in phase 2 with semantic content, consisting of a learning content repository, semantically enriched using OWL statements and linked to the developed ontology to provide logical meaning and relationships for ease of use and retrieval by application agents. In phase 3, the E-learning application framework is put together using a Semantic Web application development kit. An overview of the phases is shown in Figure 2.29 below.

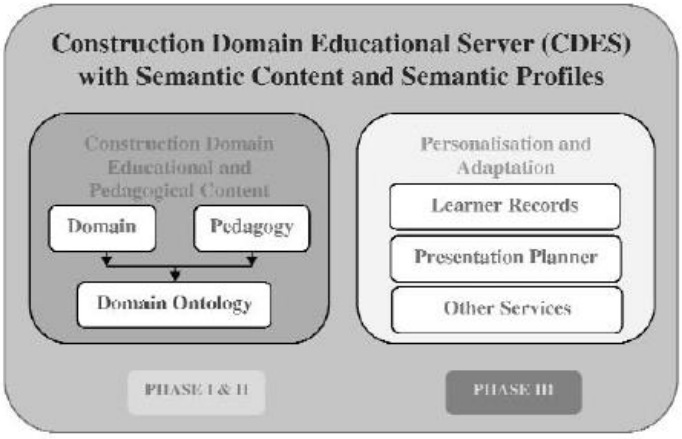


Figure 2.29: Semantically enriched educational and pedagogical educational server (Ahmed, Shaik and Aouad 2006)

2.6.2 E-learning 3.0 in developed and developing countries

Table 2.3 provides a summary of the works discussed in sections 2.6.1.1 and 2.6.1.2, highlighting the main Semantic Web characteristics from each of the models reviewed. All discussed models and frameworks from the literature review that relate to developed countries are presented first, followed by those from developing countries. The Semantic Web concept originated in the United States of America with the initial work of Berners-Lee, Hendler, and Lassila (2001a). Since then, the Semantic Web has been extensively researched in the developed world. The review of the literature revealed several aspects of the educational settings highlighted within a Semantic Web environment, via the use of ontologies, as shown in Table 2.3. Many of the models developed were then used as the foundation for other models, especially in developing countries.

As a matter of fact, there is a significant presence of research on E-learning 3.0 models and frameworks from developing countries. However, it can also be noted that many of the models and frameworks proposed were derived from the authors' own literature reviews, often just combining different models into one or simply using synonymous to represent the same concepts as previous models in the literature. A lack of empirically validated models with no or limited data evidence from participants was also noted.

Many of the models and frameworks discussed, as shown in Table 2.3, have been proposed by countries such as India, China Saudi Arabia, Brazil and Indonesia, which, while still being categorised as developing countries, are also considered among the 20 largest economies of the word according to the G20 Turkey (2015). Thailand and

Serbia are considered as upper middle-income economies according to the World Bank (Stefanovic, Prokic and Rankovič 2010) and Romania is considered the third fastest growing economy in the European Union (The World Bank 2015a).

Interest in the Semantic Web and E-learning 3.0 models is also noted in developing nations with lesser income, classified by the World Bank as middle to lower-income economies. The need to build knowledge-based societies with "*just-in-time/at work-place/customized/on-demand process of learning*" is prevalent and with the Semantic Web quickly evolving into reality as the next generation of the Web, the interest in this field is flagrant (Mahmoud, Abd-El-Hafeez and Badawy 2013, 698). Whether the country is facing economic, social or political unrests such as Jordan (The World Bank 2015b) and Egypt (The World Bank 2015c) or aspiring to be a middle income economy such as Bangladesh (The World Bank 2015d; The Asia Foundation 2014), the Semantic Web is undoubtedly being seriously considered as the next stage of the Web, hence the prevailing interest.

There is, nonetheless, a clear lack of E-learning 3.0 models and frameworks for Small Island Developing States in the literature. Therefore, it is important to extend this body of research to include these nations in order to optimise the benefits that the Semantic Web can offer.

2.6.3 Semantic Web characteristics identified from the literature review

The literature review also revealed recurrent Semantic Web characteristics in the works discussed (as seen from the column 'Characteristics of model/framework' of Table 2.3). In fact, these characteristics are related to each other and often to a main concept under which they can be grouped. Following the careful examination of the E-learning 3.0 models reviewed from the literature, the researcher identified five main recurring themes under which the Semantic Web characteristics could be grouped. Using terminologies similar to that in the literature (such as Personalised Learning, Pedagogy and Collaboration) or based on the concepts that the Semantic Web characteristics were referring to within the respective works from the literature (such as Content Management, Web 3.0 System), the recurring themes were named as 'Content Management', 'Personalised Learning', 'Pedagogy', 'Web 3.0 System', and 'Collaboration'.

The Semantic Web characteristics identified in each of the examined works have been grouped under one of the five recurring themes as shown in the last column of Table

2.3, namely ‘Matching of Semantic Web characteristics to the 5 identified recurrent themes’. Each theme has been colour coded for easier identification, with a legend of the colour code used shown as a repeated first row header of Table 2.3.

Table 2.3: Literature review on Semantic Web and E-learning for developed and developing countries – Prepared by the Researcher

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
Developed Countries						
E-learning based on the Semantic Web	Stojanovic, Staab, and Studer (2001)	Germany	Presents an approach for implementing E-learning scenario using Semantic Web technologies, through semantic descriptions of context, content and structure of learning materials.	Literature Review/ Model development	Course Ontology	Web 3.0 System
					Learning materials descriptions (metadata)	Content Management
					Learning materials production (creation and reuse)	Content Management
					Semantic querying of learning materials	Content Management
					Navigation of learning materials	Content Management
					Personalisation	Personalised Learning
					Usability and Access	Web 3.0 System
					Knowledge Warehouse – ontology, metadata, other data	Web 3.0 System
Semantic Services in E-Learning	Moreale and Vargas-Vera (2004)	United Kingdom	The outline of an E-learning services architecture with Semantic Web services to	Literature Review and Case Study based on 93 students' essays	Access via user interface	Web 3.0 System
					Services linked to ontologies	Web 3.0 System
					Semantic mark-ups of content (annotation)	Content Management

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
			students and tutors.		Semantic search	Content Management
					Learning materials production and provision	Content Management
					context	Pedagogy
					Pedagogy and course sequencing	Pedagogy
					Personalised Learning	Personalised Learning
An Intelligent Semantic E-learning Framework using Context-Aware Semantic Web Technologies	Huang, Webster, et al. (2006)	United Kingdom	Presents a Semantic E-learning framework with semantic information processing, learning process support and personalised learning through personal agents, ontologies and	Literature Review/ Model Development	Personal Agents	Web 3.0 System
					Context Model	Web 3.0 System
					Semantic Mark-ups	Content Management
					Ontologies & knowledge base	Web 3.0 System
					Learner's model	Personalised Learning
					Course design and sequencing	Pedagogy

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
			semantic context model.			
Adaptive E-Learning Content Generation based on Semantic Web Technology	Holohan et al. (2005)	Ireland	Presents an ontology based content navigation system (OntAWare) for students and tutors based on learning objects and a sequencing algorithm.	Model Development	Ontologies	Web 3.0 System
					Course sequencing	Pedagogy
					Customised content delivery based on students' preferences	Personalised Learning
						Content Management
Ontological Support for E-learning courses	De Nicola, Missikoff, and Schiappelli (2004)	Italy	Presents an approach to semantically enriched E-learning courses through the annotated learning objects to allow for flexible learning path building by teachers and customised	Literature Review/ Model Development	Ontologies	Web 3.0 System
					Learning resources mapping to domain concepts	Content Management

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
			courses to students.			
Ontology based learning objects sequencing Ontology-based learning objects search and course generation	Neri (2005) Neri and Colombetti (2009)	Italy	Uses ontological reasonings for learning objects sequencing in building a course outline and matching the course with resources from the learning materials repository.	Model Development	Course sequencing	Pedagogy
					Pedagogy	Pedagogy
					Learners' needs	Personalised Learning
					Course outline	Pedagogy
					Matching learning content to pedagogical aspects – teaching methods	Pedagogy
					Semantic descriptions of learning resources	Content Management
Ontology of Learning Objects Repository for Pedagogical Knowledge Sharing	Wang (2009)	USA	Proposes an ontological model for the organisation of learning objects based on pedagogical design categories.	Literature Review/ Model Development	Pedagogy – subject, learning objective, instructional method, delivery instrument, assessment instrument and assessment outcome	Pedagogy
					Ontologies	Web 3.0 System

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
Design Engineering Educational Framework Using ShareFast: A Semantic Web-Based E-Learning System	Hiekata et al. (2007)	Japan	Presents an educational framework using ShareFast to provide a mapping of design documents to workflows based on metadata enriched with semantic Web technology.	Model Development and two experimental case studies based on students in ship design classes	Documents linked to workflows	Content Management
					Course sequencing	Pedagogy
					Learner's behaviour	Personalised Learning
					Interaction	Collaboration
					Feedback	Pedagogy
An Ontology of Construction Education for Elearning via the Semantic Web	Ahmed, Shaik, and Aouad (2006)	United Kingdom	Develops an educational server based on a construction educational ontology and semantically and pedagogically enriched learning content.	Model development using pilot survey via the use of a preliminary questionnaire	Ontology	Web 3.0 System
					Pedagogically enriched content	Content Management
						Pedagogy
					Personalisation and adaptation	Personalised
Developing Countries						

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
Semantic Web and Intelligent Management Systems (ILMS)	Šimić, Gašević, and Devedžić (2004)	Serbia and Montenegro	The Integration of Semantic Web technologies in intelligent learning systems – known as intelligent learning management system (ILMS).	Literature Review/ Model Development	Administrative tools – maintenance of records, security management, domain knowledge management	Web 3.0 System
					Student tools – student profile, course navigator, annotation, collaboration, assessment	Personalised Learning
						Content Management
						Web 3.0 System
						Pedagogy
						Collaboration
					Teacher tools – pedagogy, course composition and sequencing	Pedagogy
					Data and metadata repositories	Web 3.0 System
Education and the Semantic Web	Devedzic (2004)	Serbia and Montenegro	A survey of the basics of the Semantic Web and its importance in the Web-based	Literature Review	Student Model	Personalised Learning
					Course sequencing	Pedagogy
					Collaboration	Collaboration
					Teaching & Learning	Pedagogy
					Assessment	Pedagogy
						Content Management

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
			educational applications.		Pedagogical agents interacting with learning materials	Web 3.0 System
					Instructional designs and learning theories	Pedagogy
					Semantic Mark-ups	Content Management
					Ontologies	Web 3.0 System
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Jordan	Semantic Web based model for E-learning system based on RDF data model and OWL ontology language.	Literature Review/ Model Development and comparison of data from two surveys, namely a paper quiz vs. a computer-based quiz, with 30 students' participants each	Access via user interface	Web 3.0 System
					Registration	Web 3.0 System
					Notification	Web 3.0 System
					Semantic Search	Content Management
					Learning content retrieval	Content Management
					Learning content provision	Content Management
					Learning resources descriptions (Metadata)	Content Management
					Course sequencing	Pedagogy
					Context	Pedagogy
					Personalised learning	Personalised Learning
					Evaluation	Pedagogy

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
					Knowledge repository including ontologies and other databases	Web 3.0 System
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Bangladesh	Model for E-learning management system using Semantic Web technologies with course syllabus, teaching methods, learning activities and learning styles.	Literature Review/ Model Development	Registration	Web 3.0 System
					Course document	Pedagogy
					Annotation	Content Management
					Query	Content Management
					Help and Discussion	Collaboration
					Search	Content Management
					Navigation	Web 3.0 System
					Usability and Access	Web 3.0 System
					Assessment	Pedagogy
					Collaboration	Collaboration
					Content Ontology	Web 3.0 System
					Semantically Enriched Learning Resources	Content Management
					Evaluation	Pedagogy
					Other databases	Web 3.0 System
Development of an E-learning System Incorporating	Shamsi and Khan (2012)	Saudi Arabia	Conceptual framework based on ontology-based descriptions of content,	Literature Review/ Model Development & interviews	Authentication	Web 3.0 System
					Personalisation	Personalised Learning
					Registration	Web 3.0 System
					Evaluation	Pedagogy
					Semantic search	Content Management

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
Semantic Web			context and structure of learning materials for flexible and personalised access.	of deans and administrative staffs in Saudi Arabian universities, more specifically in graduate studies, E-transaction, E-learning and distance education	Assessments	Pedagogy
					Course content provision	Content Management
					Course content retrieval	Content Management
					Course navigation	Web 3.0 System
					Annotation	Content Management
					Knowledge base – ontologies, inference rules, metadata, learning resources in RDF	Web 3.0 System
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Saudi Arabia	Framework for an E-learning system based on the Semantic Web technology, software agents and Web services.	Interviews of several academics and administrators from different Arabian universities and observation	Registration	Web 3.0 System
					Authentication & Secure Access	Web 3.0 System
					Course Content	Content Management
					Assessments	Pedagogy
					Progress Reports	Pedagogy
					Interactive Tutorials	Pedagogy
					Personalisation	Personalised Learning
					Notification	Web 3.0 System
					Discussion	Collaboration
					Sharing	Collaboration

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
				of the number of activities and visits of the system by faculty members and students of three universities with an estimated total population of more than 16000 combined	Semantic Search	Content Management
					Knowledge Base	Web 3.0 System
A New Framework Semantic Web Technology Based E-Learning	Shrivastava, Sharma, and Bawankan (2012)	India	Propose an E-learning model based on the Semantic Web which uses a number of e-learning agents.	Literature Review/ Model Development	Course registration	Web 3.0 System
					Notification	Web 3.0 System
					Course content search and retrieval	Content Management
					Assessment	Pedagogy
					Course planning and sequencing	Pedagogy

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
					Ontology for course content	Web 3.0 System
					Learner profile	Personalised Learning
					Interaction	Collaboration
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	India	A review of semantic Web and E-learning followed by a proposed model of semantically active E-learning system with E-learning agents, semantic Web services and ontologies including an implementation on Protégé.	Literature Review/ Model Development	Registration	Web 3.0 System
					Authentication	Web 3.0 System
					Provision of study materials	Content Management
					Evaluation & assessments	Pedagogy
					Access materials	Content Management
					Database query	Web 3.0 System
						Content Management
					Course planning and sequencing	Pedagogy
					Learner profile	Personalised Learning
					Ontology	Web 3.0 System
					RDF based learning databases	Web 3.0 System
					Collaboration	Collaboration
Ontology-Driven E-Learning System	Snae and Brueckner (2007)	Thailand	Presents an ontology-driven E-learning system for the Thai	Literature Review/ Model Development	System login	Web 3.0 System
					Course Syllabus	Pedagogy
					Teaching Approach	Pedagogy
					Learning Evaluation	Pedagogy

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
			learning environment (O-DEST) which consists of an ontology for the E-learning process for students, teachers and administrative personnel.		Communication	Collaboration
					Help	Collaboration
					Promotion and News	Collaboration
					Content	Content Management
					Feedback	Collaboration
					Interface design	Web 3.0 System
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	Brazil	Presents a computational model for Semantic Web-based educational system with focus on the challenges to build such a system and on ways to make such system's development easier and more useful for	Literature Review/ Model Development and a case study involving law students to interact with the system	Educational content	Content Management
					Educational tools	Pedagogy
					Learner's goals	Personalised Learning
					Personalisation	Personalised Learning
					Instructional process	Pedagogy
					Collaboration	Collaboration
					Ontologies	Web 3.0 System
					Systems interface	Web 3.0 System

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
			developers and authors.			
Semantic Web Ontology for E-learning in Higher Education	Bucos, Dragulescu, and Veltan (2010)	Romania	Presents an educational ontology that represents Web-based E-learning system for higher education with an implementation in the ontology editor Protégé-OWL.	Literature Review/ Model Development and implementation using Protégé-OWL	Student Model and Educational plans	Personalised Learning
					Course sequencing	Pedagogy
					Establishing curricula	Pedagogy
					Students' progress monitoring	Pedagogy
A framework for an E-learning system based on semantic Web	Mahmoud, Abd-El-Hafeez, and Badawy (2013)	Egypt	Presents a framework for the implementation of E-learning system based on the Semantic Web using desktop C# application, data visualisation tools, HTML Web page parser, SPARQL RDF	Model Development and implementation using desktop C# application, data visualisation tools, HTML Web page parser,	Semantic structure of content	Content Management
					Reuse	Content Management
					RDF triples	Web 3.0 System

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
			query language and RDF generating tools.	SPARQL RDF query language and RDF generating tools		
Semantic Approach for E-learning System	Guo and Chen (2006)	China	Discusses how Semantic Web technologies can be applied to E-learning system for customised learning content and includes an E-learning scenario ontology for describing the content, context and structure of learning materials as well as semantic querying and semantic mapping.	Model Development through sample e-learning scenario to illustrate approach	Learning Resources Descriptions (metadata)	Content Management
					Content, Context, Structure	Content Management Pedagogy Content Management
					User preferences, types and knowledge level	Personalised Learning
					Course sequencing	Teaching Principles and Pedagogy
					Personalisation	Personalised Learning
					Ontologies	Web 3.0 System
					Semantic Querying	Content Management
					Semantic Mapping	Content Management

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
E-Learning System Overview based on Semantic Web	Alsultanny (2006)	Jordan	Presents an E-learning system using the Semantic Web via the use an ontology-based description of content, context and structure of learning materials to allow the automatic generation of hypertext structures to achieve personalised access to learning materials.	Literature Review/ Model Development	Student Model	Personalised Learning
					Knowledge Representation	Content Management
					Content, context and structure	Content Management
						Pedagogy
						Content Management
					Course sequencing	Pedagogy
					Ontologies	Web 3.0 System
Conceptual framework based on ontologies for knowledge management	Pah et al. (2007)	Romania	Presents a framework for knowledge management in Web-based	Model Development	Knowledge management – creation, extraction, classification, retrieval, sharing	Content Management
					Organisational support	Collaboration

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
in e-learning systems			system based on ontology.		Personal user profile	Personalised Learning
					Accessibility	Web 3.0 System
					Didactics	Pedagogy
Semantic Web-Based Educational Knowledge Service System for E-learning	Huang, Yang, et al. (2006)	China	Presents an Educational Knowledge Service System (EKSS) where knowledge service functionalities, such a knowledge creation, knowledge process and knowledge search, are embedded into Semantic Web services to allow learning materials retrieval within an E-learning environment.	Model Development	Annotation	Content Management
					Learner profile	Personalised Learning
					Learning Resources Metadata	Content Management
					Ontology	Web 3.0 System
					Knowledge Repository	Web 3.0 System
					User Interface – access, store, view, search	Web 3.0 System

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
Towards a knowledge portal for E-learning based on Semantic Web	Yanyan and Mingkai (2008)	China	Presents a knowledge portal with knowledge processing, knowledge collection and acquisition, knowledge maintenance and knowledge retrieval based on semantic Web technologies.	Model Development	Knowledge acquisition	Content Management
					Knowledge refinement	Content Management
					Knowledge maintenance	Content Management
					Knowledge retrieval	Content Management
					Knowledge accessing	Content Management
					Ontologies	Web 3.0 System
					Authoring tools	Content Management
					Learner profile	Personalised Learning
					Learner and instructor interactions	Collaboration
Identification of Ontology Based Object Using Instructional Design Knowledge representation of LMS using ontology	Srimathi and Srivatsa (2008) Srimathi (2010)	India	Presents an ontology based approach to organise learning materials around semantically enriched learning to include pedagogical, pragmatic and technological components	Model Development and implementation	Pedagogy	Pedagogy
					Sequencing and navigation	Pedagogy
					Learner profile	Personalised Learning
					Instructional design principles	Pedagogy
					Semantic querying	Content Management
					Semantic educational servers	Web 3.0 System

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
			through instructional design.			
Development of student model ontology for personalization in an e-learning system based on semantic Web	Pramitasari et al. (2009)	Indonesia	Presents a student model ontology based on student prior knowledge and learning style for personalised learning within an E-learning system.	Literature Review/ Model Development and implementation of a semantic portal	Learner's behaviour	Personalised Learning
					Student Ontology: student learning style, student performance and student personal data	Web 3.0 System
Using Semantic Web to support Advanced Web-Based Environment	Fouad et al. (2011)	Saudi Arabia/ Egypt	Performs personalised semantic search and recommendations of learning materials within an E-learning environment based on a comparison of the learner profiles	Literature Review/ Model Development	Personalised Learning	Personalised Learning
					Learning Profile ontology	Web 3.0 System
					Learning Objects ontology	Web 3.0 System
					Metadata	Content Management
					Reuse	Content Management
					Domain ontology	Web 3.0 System
					Semantic querying	Content Management

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
			and learning objects metadata.			
A semantic Web based personalized learning service for programming course in e-learning	Jinghua (2011)	China	Proposes a personalised strategy for programming courses based on an information model and a process model enriched with Semantic Web technologies.	Literature Review/ Model Development	Information Model – domain knowledge, learning resources, learners' preferences	Content Management
					Ontologies: domain ontology, resource ontology, instruction ontology, learner ontology	Web 3.0 System
					Student profile: preferences, knowledge level and progress	Personalised Learning
					Process Model – learning path of students, knowledge point of selection, learning activities selection, strategies for resource selection	Pedagogy
An Ontological Approach to	Sudhana, Raj, and	India	Proposes an architectural overview of an	Literature Review/	Personalised Learning	Personalised Learning
					Education Support Preferences	Personalised Learning

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**Characteristics of model/framework**	**Matching of Semantic Web characteristics to the 5 identified recurrent themes**
Support Personalized E-Learning System	Sikamani (2013)		ontology-based E-learning system consisting of an ontological representation of a learner model and a domain model for personalised learning.	Model Development and implementation of a Web-based prototype at the research centre of the computer science department in Dr M G R University, Chennai, India	Domain knowledge representation	Content Management
					Ontologies: learner, domain	Web 3.0 System
					User Interface – query	Web 3.0 System
					Content, learning resources mapped to ontologies	Content Management
					Learner profile repository	Web 3.0 System
					Learning content repository	Web 3.0 System

2.6.3.1 Semantic Web characteristics and associated sub-characteristics identified from the literature review

Further examinations of the identified Semantic Web characteristics namely 'Content Management', 'Personalised Learning', 'Pedagogy', 'Web 3.0 System', and 'Collaboration' showed that each of them could be categorised into a number of sub-characteristics, as shown in Appendix A. The sub-characteristics were named in line with the literature review and based on the concepts they represent, similar to the naming of the main characteristics. The resulting Semantic Web characteristics and associated sub-characteristics are shown in Table 2.4, retaining the same colour codes as used in Table 2.3.

Table 2.4: Semantic Web characteristics and associated sub-characteristics based on the literature review (Prepared by the Researcher)

Main Characteristics	**Sub-Characteristics**
Content Management	Content creation
	Content retrieval
	Content reuse
	Semantic search
	Knowledge representation
Personalised Learning	Student model
Pedagogy	Syllabus
	Course design and sequencing
	Assessment and evaluation
	Teaching strategies
	Context
Web 3.0 System	Knowledge and other repositories
	Ontologies
	Usability
	Accessibility
	Security
Collaboration	Interaction and sharing

It can be clearly observed from the literature review that 'Content Management' was a prevailing characteristic of the Semantic Web. It includes learning resources creation, retrieval, reuse, search and their semantic representation via annotation, metadata and mark ups. Therefore, its associated sub-characteristics are 'Content creation', 'Content retrieval', 'Content reuse', 'Semantic search' and 'Knowledge representation'.

Similarly, 'Personalised Learning', often termed 'personalisation', was also commonly found to be a key Semantic Web characteristic. Associated with it was the

recurring sub-characteristic ‘Student model’ capturing students’ needs, behaviour, educational plan, preferences, knowledge level and progress.

The literature also revealed the characteristic ‘Pedagogy’ as a recurring aspect within E-learning 3.0. It consists of the ‘Syllabus’, the ‘’Course design and sequencing’, ‘Assessment and evaluation’ of programs being delivered, the ‘Teaching strategies’ and didactic employed and the ‘Context’ associated with learning materials that are delivered to learners within the E-learning environment.

Key to the Semantic Web, as mentioned in numerous works, was the actual system’s components, termed as ‘Web 3.0 System’. The associated sub-characteristics are ‘Knowledge and other repositories’, ‘Ontologies’, ‘Usability’, ‘Accessibility’ and ‘Security’.

The recurring characteristic ‘Collaboration’ included interaction between learners and instructors, help, communication, feedback and sharing. Consequently, its sub characteristic is ‘Interaction and sharing’.

The groupings of the Semantic Web characteristics with their associated sub-characteristics following Table 2.4 and Appendix A, will, consequently, assist in the building an initial E-learning 3.0 model capturing the main characteristics of the Semantic Web.

2.7 Challenges for E-learning 3.0

A number of challenges for the Semantic Web have been identified in the literature including (1) those related to achieving interoperability among various educational systems and unified authoring support for content creation and dissemination (Rego et al. 2010; Aroyo and Dicheva 2004), (2) the challenges and complexities associated with the use of ontologies including the different approaches in their creation with no set standard method (Gladun et al. 2009; Devedzic 2004), (3) the complexities associated semantic mark-up to ontologies as a seamless process for general users who are not ontology experts (Devedzic 2004) and (4) security and privacy challenges resulting from the mashups of interconnected data across countries (Hussain 2012).

However, many of the challenges for E-learning 3.0 relates to general issues within an E-learning environment, that have repeatedly concerned the education community and at times, impede E-learning acceptance. Once such challenge is the Information and Communication Technology (ICT) infrastructure. The Semantic Web relies heavily on

the Web for the exchange of data (Valkering et al. 2016). This increased reliance on technologies leads to a number of technological and socio-cultural implications that need to be addressed (Olaniran 2010). One such aspect that requires consideration is the level of access to technology, especially in less economically developed countries (Olaniran 2010). The availability of a network infrastructure, including genuine consideration of the issue of access and/or bandwidth to support the creation of semantically rich content and E-learning 3.0 systems, is a key enabler for countries to be able to progress towards E-learning 3.0. In fact, findings from research carried out by Powell, Davies, and Taylor (2012, 31) shows that "*many of the challenges that have been faced in the application of ICT tools*"…"*still plague*" the promotion of the Semantic Web and hence E-learning 3.0 systems.

The issue of access leads to another key consideration: that of security. Security requirements for E-learning systems, such as authentication/authorisation and access control mechanisms are as essential in E-learning 3.0 systems, with particular attention to the protection of strategic knowledge resources (Upadhyaya, Rao and Padmanabhan 2008). As stated by Olaniran (2010, 25), "*Knowledge in the semantic web world resides in metadata*", which are located on different databases, making them machine-accessible and hence susceptible to unauthorised access and use. In fact, Lee et al. (2005, 50) stated that because semantic knowledge management systems "*can capture more articulated organizational knowledge that would otherwise have remained as tacit knowledge within an individual*", the "*externalized once-tacit explicit knowledge can now easily be transferred to collaborators or be amenable to theft*".

Collis and Strijker (2004) pointed out that the Semantic Web's capability to adapt to learners' needs in E-learning, as one of its key benefits that is rapidly gaining prominence, brings about the additional challenge of linking learning content to context, which is often subjective and determined to be appropriate by those creating and labelling the content (authors and/or teachers) and those selecting and using the content (users/learners). Moreover, Collis and Strijker (2004, 2) also stated that *"the reusability of an electronic learning resource depends on its fit with the language, culture, curriculum, computer-use practices, and pedagogical approaches of the potential learners and their instructors".* This is further supported by Sridharan, Deng, and Corbitt (2008, 102), who stated that "*the successful and sustained adoption of e-learning necessitates an effective combination of pedagogies, technologies and*

effective management of resources" as well as the requirements to appropriately consider " *the critical success factors entwined among each of these facets*".

Furthermore, apprehensions that instructors and learners may not be ready to use such advanced technologies, such as the Semantic Web, as they may still be "*struggling*" to adapt to existing versions of the Web and E-learning, cannot be overlooked (Hussain 2012, 16).

Visibly, many of the challenges associated with E-learning 3.0 systems are not new and relate to essential aspects to be considered in any E-learning environment, not just E-learning 3.0. As pointed out by Miranda, Isaias, and Costa (2014b, 184), "*The majority of the challenges deriving from e-Learning 3.0 are common to its predecessors' versions*". Consequently, this imposes the need to review some of the critical success factors for E-learning in general to ensure that E-learning characteristics relevant to E-learning 3.0 systems are identified.

2.8 E-learning and E-learning critical success factors

The term E-learning, also written as E-Learning, e-learning, e-Learning and eLearning has been defined in several ways in the literature (Romiszowski 2004; Musa and Othman 2012; Bhuasiri et al. 2012). According to Sun et al. (2008, 1183-1184), E-learning is "*the use of telecommunication technology to deliver information for education and training*" and is "*a web-based system that makes information or knowledge available to users or learners and disregards time restrictions or geographic proximity*". It refers to "*innovative approaches to education delivery via electronic forms of information that enhances the learner's knowledge, skills or other performance*" (Siritongthaworn et al. 2006, 138). According to Sridharan, Deng, and Corbitt (2008, 103), the main purpose of E-learning is to "*leverage transfer of knowledge, not just from the experts to learners but also from learners to learners, including both tacit (informal knowledge) and explicit knowledge (formal knowledge), through various means facilitated by information and communication technologies (ICT)*. Govindasamy (2001, 288) stated that "*real value of e-Learning lies not in its ability to train just anyone, anytime, anywhere*", but rather in its ability "*to train the right people to gain the right skills or knowledge at the right time*". E-learning has various benefits including increased access to information, on-demand content availability, interactivity, increased flexibility, and ability to meet the disparate needs of learners via personalised learning and self-pacing (Bhuasiri et al. 2012).

The literature revealed several factors critical to the success of E-learning in developed and developing countries. Critical success factors are "*those areas that must be critically taken care of for any organization to be successful"* (Freund 1988, quoted in Musa and Othman 2012, 141). The critical success factors for E-learning are the determinants of E-learning adoption and effectiveness and are crucial for its successful implementation (Bhuasiri et al. 2012).

An overview of researches on E-learning CSFs from developed and developing countries are presented below followed by the identification of the main CSFs for E-learning based on the works discussed from the literature review.

2.8.1 Review of current works on E-learning critical success factors

Numerous researches have been carried out to identify, investigate and validate overall E-learning CSFs, with different set of factors produced. The critical factors determined were, in most cases, derived from the authors' findings based on their respective observations and experiences, the participants and respondents used in the research and the sampling techniques employed (Lin, Ma and Lin 2011; Musa and Othman 2012). Many of those researches have focussed on very specific aspects of E-learning and investigated critical success factors pertaining specifically to those dimensions, including but not limited to the identification of CSFs in terms of E-learning acceptance, critical instructors' and learners' factors within the E-learning environment, the criticality of technological factors, pedagogical factors and their importance to E-learning and organisational perspectives on E-learning CSFs, as discussed below. Since it is not possible to discuss all available works on E-learning CSFs in the literature, the researcher outlined some of the works with common themes as that identified for the Semantic Web (see section 2.6.3), in order to identify overall E-learning CSFs relevant to a holistic E-learning 3.0 system.

Volery and Lord (2000) suggested a framework for the critical success factors in online education based on an empirical study involving forty-seven college students. The framework focuses on three main aspects of E-learning: technology including ease of access and navigation, interface design and interaction, the instructor including attitudes towards students, technical competence and interaction in the classroom and students' prior experience and use of technology. These critical success factors align with previous discussions on the Semantic Web characteristics and challenges including accessibility and usability, students' previous experience and interactions.

Papp (2000, 104) discussed several critical success factors that "*enable distance learning to thrive*", with a focus on the actual courses to be delivered. Once more, many of the critical success factors relate to the essential characteristics and sub-characteristics identified for the Semantic Web. The first CSF proposed is Intellectual Property through the provision of clear guidelines regarding learning materials ownerships to try and decrease the reluctance of faculties to make available learning materials online. Papp (2000) also suggested that the suitability of the course for online learning, where faculties analyse their pedagogical approaches to determine whether courses can be successfully adapted for an online learning environment, is critical to the success of E-learning. Moreover, he stated that a clear understanding of the amount of work required to build an online course, as opposed to face-to-face courses, makes the transition to an E-learning environment easier. In addition, Papp (2000) also suggested that the right support to run E-learning courses and the right platforms contribute significantly to the success of E-learning.

Soong et al. (2001) identified key student's and instructor's characteristics such as their technical competencies, mindset and the instructor's effort and motivational skills as part of E-learning CSFs. The authors emphasised the importance of instructors investing "*adequate time and effort*" in resources to make them "*user-friendly" and useful*" (Soong et al. 2001, 119). This strong focus on resources within the online environment has a direct link to content creation, retrieval and search identified as part of the Semantic Web characteristics. The authors also stated that online course design should "*encourage high level of interaction*", the IT infrastructure needs to be good and adequate support should be provided "*not only for training the instructors, but also for handling instructors' and students' queries throughout the semester*" (Soong et al. 2001, 119).

Oliver (2001, 225) stated that for online learning to succeed, it needs to "*sit comfortable with teachers and students*". Hence, teacher expertise and student readiness are considered as critical success factors for E-learning. This includes teachers' characteristics such as their technology currency, the required support provided to them in terms of training and the teaching strategies involving technology. Similarly, key students' characteristics include their technology literacy and their ability to self-learn. Oliver (2001, 227) also identified reusable learning objects as "*fundamental components*" for online courses and as a "*cleverer*" and "*more strategic*" way of creating resources. He stated that reusable learning designs allows "*the*

provision of learning designs that guide learners" with content meeting their needs within a "*student-centered settings that support students' development of self-learning and metacognition and collaboration with others*". Technology infrastructure is yet again considered as another CSF for online learning including the effective and efficient storage, delivery and access of online courses. Oliver (2001, 227) further stated that "*the provision of adequate technology infrastructure for online learning is an expense that all institutions need to face*".

Khan (2005) identified eight critical dimensions of an E-learning environment consisting of pedagogical, technological, interface design, evaluation, management, resource support, ethical, and institutional factors. Each of these dimensions consists of a number of sub-factors to provide guidance on planning, designing, evaluating and implementing E-learning. The CSFs proposed by Khan (2005) provide a comprehensive overview of E-learning CSFs and are often used as a reference point for other studies on E-learning CSFs. The study confirms the researcher's observation that E-learning CSFs involve recurring dimensions, such as pedagogy, technology and support. It is also noted that many of the E-learning CSFs identified by Khan (2005) are similar to the characteristics and sub-characteristics identified for the Semantic Web.

McPherson (2004) identified five fundamental aspects of E-learning: organisational, technological, curriculum design, instructional design and course delivery. Each of these critical aspects of E-learning was then further investigated in a number of related studies to identify their critical components (McPherson and Baptista Nunes 2006b, 2006a; McPherson and Baptista Nunes 2007a; McPherson and Baptista Nunes 2007b). McPherson and Baptista Nunes (2006b, 554) stressed the importance of organisational support for E-learning to be adequately embraced within the higher education sector with universities having the responsibility to facilitate the process "*by proposing and agreeing goals through consensual debate, supporting strategies appropriately and then realising these through common commitment*". McPherson and Baptista Nunes (2006b, 554-555) further stated that higher education institutions have "*the power to facilitate, influence or even impede the development of e-learning courses*" and the "*need for strong champions to support e-learning and guarantee buy in from institutional stakeholders*" is critical. In terms of technological critical success factors for E-learning, the study carried out by McPherson and Baptista Nunes (2006a) identified 189 technological critical success factors for E-learning grouped into 11

clusters: organisation issues, design issues (pedagogical, usability and access), delivery issues (learner support and feedback/evaluation), technological infrastructures and technological reliability, interoperability/standards, software issues, Web issues, bandwidth, technological appropriateness, computer mediated communication issues and technical support. While E-learning technologies can be described as the underlying infrastructure required to run E-learning courses, the technological critical success factors extend far beyond the ICT infrastructure. In fact, McPherson and Baptista Nunes (2006a, 9) stated that "*e-Learning cannot be attributed solely to the acquisition of leading edge technologies, but is far more dependent on what is done with these ICTs in terms of both design and delivery"*.

Having a good pedagogical model which is "*centered and focused on the learner*", "*contextualized*", "*subject to thorough processes of evaluation*" and which "*provide*[s] *processes of inclusion and attend to student motivation in the learning process*" is one of the CSFs identified by McPherson and Baptista Nunes (2007a, 5) required in order to design and develop a coherent and consistent curriculum design and development to ensure the successful implementation of E-learning. Other aspects of pedagogy considered as critical include the ability to adopt new teaching and learning methods that support active learning approaches "*based on learning by doing and personalization of content and learning paths*", different assessment strategies and student feedback (McPherson and Baptista Nunes 2007a, 6). Structured, updated and relevant content was another CSF identified as well as clear curriculum design and development processes which should be a formal process "*contextualised by both institutional and learning contexts*" (McPherson and Baptista Nunes 2007a, 6). This leads to clear learning outcomes which is "*holistic*" in nature resulting from a team effort of academics, technologists, subject matter experts and students (McPherson and Baptista Nunes 2007a, 6). Consequently, selecting the right team with the necessary skills is considered another CSF for curriculum design and development process.

The appropriate design and development of the E-learning environment and the related critical success factors are elaborated in McPherson and Baptista Nunes (2007b). Instructional systems design is considered "*as specialised methodologies which assist and support the activities necessary to produce e-learning environments and include management procedures to control the process of deployment of resources and the communication between all the agents actively involved"* (McPherson and Baptista

Nunes 2007b, 244). As a result, four CSFs were identified for instructional systems design namely effective collaboration between all staff involved, suitability of the pedagogical approach, addressing the challenge of designing for learning and attending to process issues. Collaboration is "*deemed crucial to the success of E-learning*" (McPherson and Baptista Nunes 2007b, 242). Contributions from the educationalists who are responsible for content creation and curriculum design, subject matter experts who are responsible for the primary source materials and the technologists who are responsible for designing, developing and implementing the E-learning environment are considered critical to the creation of an effective education environment (McPherson and Baptista Nunes 2007b). Similarly, pedagogical approaches used within the E-learning environment need to be compatible with the programs and learning outcomes and objectives of the institution, taking into consideration "*organizational constraints and facilities, as well as technological infrastructures and their inherent limitations"*(McPherson and Baptista Nunes 2007b, 243). Factors such as personalised learning, quality and appropriateness of learning materials, usability and accessibility are also regarded as critical aspects of instructional systems design. The last CSF was divided into four categories namely the design process of the whole E-learning environment, the academic acceptance, staff development and evaluation. When it comes to E-learning delivery, McPherson and Nunes (2008) identified four CSFs relating to staffing, delivery model, training and leadership issues. In terms of staffing, establishing attributes, experience and availability of both students and staff is considered critical. The delivery model includes the adoption of appropriate pedagogical models as well as appropriate evaluation models. Training includes identifying needs of staff and providing appropriate training and adequate support to students. Leadership issues includes support, sufficient resourcing, understand motivation for engagement and ensuring agreed strategies are adequately implemented.

The five fundamental aspects for E-learning as proposed by McPherson (2004) and their related CSFs align to a large extent with the characteristics identified for the Semantic Web. There are overlaps of CSFs identified in the studies which further highlight their relative importance within the E-learning environment.

The CSFs that affect the success of the E-learning environment from students' perspectives, as identified by studies conducted by Selim (2007a) bear resemblance to those identified by Oliver (2001). The instructor's characteristics were found to be the

most critical factor, followed by support and technology and student's characteristics. The instructor's characteristics consisted mostly of the ability of the instructor adopt the correct teaching styles and approaches within the E-learning environment through the efficient and effective use of available technology. Support consisted of adequate university support to students enrolled in online courses and is *"not limited to technical assistance and troubleshooting"* but includes other aspects such as *"library and information availability*" (Selim 2007a, 409). Technology consisted of ease of access and infrastructure, with ease of use considered the most critical factor within the technological dimension. The technological infrastructure included access to computer labs and the reliability of the computer network and student information systems. The consideration of previous student previous experience with the use of computers and their motivation to learn within the E-learning environment was the most critical factor within the students' characteristic dimension followed by the ability to interact with classmates and teachers in class discussions and the course content and design.

Sun et al. (2008), in a survey conducted to investigate the critical success factors affecting learners' satisfaction in E-learning, identified learner computer anxiety, instructors' attitude towards E-learning, E-learning course flexibility, E-learning course quality, perceived usefulness, perceived ease of use and diversity in modes of assessment, as critical factors affecting learners' perceived satisfaction. In order to reduce learners' computer anxiety and thereby increase learners' positive attitude towards technology, the strengthening of technology-related education and training is recommended. Similarly, giving the right support to instructors can influence their attitudes towards E-learning, causing them to be more willing to participate in the online environment. The study also revealed that key to students' perceived satisfaction within the E-learning environment is the course design, the teaching materials, the level of interactions and the level of assistance and support available from both the technical and instructional perspectives. While technology in the study had no significant effect on learner satisfaction because the students did not experience technical difficulties or poor internet quality, it denoted that reliable and user friendly technology has a direct effect on learners' satisfaction as "*poor technology with slow response time or frequent technical difficulties definitely matters*" (Sun et al. 2008, 1195). In terms of assessment, the study revealed that diversified assessment methods

motivate students to " *exhibit their best efforts in different evaluation schemes so as to proceed with e-learning activities seriously and effectively*" (Sun et al. 2008, 1195).

A study conducted by Sridharan, Deng, and Corbitt (2010, 272) showed that pedagogies, technologies and the management of learning resources "*significantly influence the effectiveness of e-learning*". In fact, the literature review conducted within the study revealed that pedagogies, technologies and learning resource management are "*mutually independent*" and their "*seamless integration*" is critical for a successful E-learning environment (Sridharan, Deng and Corbitt 2010, 272). The study also showed that providing prompt feedback to students, supporting teachers in their knowledge transfer endeavours and using technologies efficiently to motivate learning affect the effectiveness of E-learning. Other critical aspects considered in the study is the need for a collaborative learning environment with a "*clear understanding of the pedagogical theory behind collaborative technologies*" and "*proactive participation*" of teachers in effectively using collaborative modes of learning (Sridharan, Deng and Corbitt 2010, 274). The study also revealed that adapting learning resources and pedagogies to "*suit individual levels, styles, and preferences in learning*" improve E-learning effectiveness (Sridharan, Deng and Corbitt 2010, 274). Interestingly, the Semantic Web supported by the use of ontologies and metadata was proposed as a means of integrating pedagogy, technology, learning resources management, collaboration and personalised learning within the E-learning environment, so much so that the e-learning success model proposed in terms of critical factors for E-learning have clear similarities to the identified Semantic Web characteristics and sub-characteristics, including such aspects as availability, accessibility, adaptability and reusability.

Karunasena, Deng, and Zhang (2012) proposed an E-learning success model with four main CSFs: personal knowledge management, collaboration, instructional support and the management of learning resources, backed by Web 2.0 technology, to achieve E-learning effectiveness in terms of critical thinking skills, satisfaction, learning outcomes and good grades. Personal knowledge management refers to how learners use information and learning resources to construct knowledge. Collaboration is all about facilitating learning through interactions among peers and between peers and instructors. Instructional support in terms of assistance to learners through feedback, assessments, encouragements and the use of multiple teaching styles is considered critical to promote learner-centered learning. Learning resource management consists

of resource searching, sharing and reuse and presenting them in a manner that is user friendly and consistent across the learning environment. The model conceptualises that Web 2.0 technology, together with identified CSFs, will achieve E-learning effectiveness.

According to McGill, Klobas, and Renzi (2014, 31), "*the sustainability of e-learning is believed to be influenced by a variety of factors*". Studies conducted by the authors revealed that ongoing institutional support, whether financial or technical, is critical to the sustained success of E-learning. Support to teachers and developers to continually adapt to the E-learning initiatives and to be part of the development and enhancement of the E-learning initiatives were also considered key. The ability to keep up with evolving technology within the E-learning environment including the "*maintenance of technology that is up to date, mature and stable*" was another critical factor put forward for the success of E-learning (McGill, Klobas and Renzi 2014, 31).

Govindasamy (2001) identified five critical pedagogical principles for effective teaching and learning within E-learning: content development, storing and managing content, packaging content, student support and assessment. Govindasamy (2001, 292) placed importance on learning objects to represent content stating that "*e-Learning content must be designed and developed in smaller manageable chunks*" to increased contents' "*share-ability and reusability"*. The author further stated that content properly managed, in the form of learning objects and the use of metadata facilitates more effective search within the E-learning environment as well as better content packaging into full courses. The author (2001, 292) also emphasised the importance of instructors having the right support to move into the role of content developers where "*they must be amply enabled with the right knowledge and be given a reasonable amount of time to transform*" from "*mere instructors*"…"*to assume the role of content experts, instructional designers, graphic artists, media producers, programmers, and instructors*". Providing students with support within the E-learning environment while they are interacting with content and allowing them to provide feedback on their experience is another critical parameter identified by the study. The final critical factor considered was assessment, both summative and formative, as the main tool to "*reinforce the learning approach a student adopts*" (Govindasamy 2001, 295). The strong focus on learning objects and metadata to support better content management is seen to be part of E-learning success factors, similar to the literature review's findings on E-learning 3.0. Additionally, the study also suggests support and

collaborative work as essential elements to allow content to be managed and to assist students to adapt to the E-learning environment.

Studies conducted within Nigerian universities found that adequate funding support, good IT infrastructure (internet service quality, software and hardware quality) and E-learning awareness are critical factors that ensure the continued development and success of the E-learning environment in the country (Folorunso, Shawn Ogunseye and Sharma 2006).

The study conducted by Fresen (2007) was quite comprehensive and covers many CSFs identified by previously discussed works since the main part of the study comprised of a comparative analysis of the literature. The taxonomy of CSFs for Web-supported learning identified were then refined and validated by the author's colleagues through a case study. Six main CSFs were highlighted in the study including Institutional factors, Technology factors, Lecturer factors, Student factors, Instructional design factors and Pedagogical factors. Each of these factors consisted of a number of sub-factors, which elaborated on the main factor.

In a study conducted by Masrom, Zainon, and Rahiman (2008), two main factors related to E-learning CSFs within a university environment, namely technological and institutional support, were examined. These two factors, as previously indicated, are recurring across E-learning CSFs observed in various studies in the literature. The results of the study indicated that the most critical measures for the technological factor relates to the ease of access and the ICT infrastructure including the browser efficiency, the ease of navigation, and the network reliability. The most critical measure for institutional support was the availability of technical support and help desk.

Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012) analysed 19 papers published between 2002 and 2012 to review and synthesise the critical success factors for online distance learning in higher education, many of which relate to E-learning 3.0 characteristics and sub-characteristics discussed previously. Institutional management as the first factor is linked to organisational support. Learning environment as the second factor covers accessibility, usability, ICT infrastructure and interactive learning. Instructional design as the third factor is directly linked to the teaching and pedagogical characteristic. Services support as the fourth factor refers to the right technical support including training, helpdesk and collaboration between

teachers and students and course evaluation as the last identified CSF includes formative and summative evaluation of the online courses.

Musa and Othman (2012) surveyed 450 undergraduate university students at the Universiti Teknologi in Malaysia to identify the critical success factors for E-learning from students' perspectives. They identified reliable IT infrastructure, especially the speed of the Internet, as the most critical factor for E-learning success from students' point of view. The second E-learning CSF identified was the student's characteristics comprising of the right environment to support learning by participation, interaction between students and their peers and between students and instructors and the availability of course content in a timely manner.

Lwoga (2014) found that instructor, technology and information were critical factors, which significantly affect users' perceived usefulness within the online learning environment. Instructor quality was determined by the ability for instructors to communicate with learners and to respond to learners' queries. Technology quality was associated with response time, interactivity, ease of navigation and the user interface as well as the system functionalities, considered critical "*in enhancing utilization and satisfaction of e-learning systems*" (Lwoga 2014, 15). Information quality was about the quality of content within the E-learning environment including "*accurate, updated, reliable, readable and well formatted course* contents" found critical to learners' perceived usefulness of the online courses and their learning processes (Lwoga 2014, 15). Perceived usefulness was then identified as "*a key determinant of user satisfaction, which in turn predicted continual usage intention of the e-learning systems*" (Lwoga 2014, 16). The three key dimensions identified in the study relates to recurrent E-learning CSFs identified including collaboration, technology and ICT infrastructure. Information quality has a direct link to the content characteristic identified as part of the Semantic Web characteristics.

Baggio (2011) considered trust as a critical success factor for E-learning environments, which must be cultivated and maintained for learners to be successful. The author identified two types of trust for E-learning: trust in the technology and trust in the humans using the technology. However, as stated by Friedman, Khan, and Howe (2000, 36), "*people trust people, not technology*". Thus, in this regard, trusting the technology also means that the system is available and accessible without any technical problems, and relevant and timely help is available to ensure that the system is fixed and maintained to run properly (Baggio 2011). Baggio (2011, 6) also pointed out that

participants interact in the E-learning environment with "*their own unique and complex combination of perspectives, attitudes, preconceived notions, and biases depending on the originator's previous experience with the technology, the course, the content, the humans, or any other aspect of their environment*". In such an environment, trust is imperative and not an option and must be cultivated at every level of the learning environment to promote an successful learning experience "*free from the constraint of deceit"* (Baggio 2011, 6). Baggio (2011, 2) further stated that it is "*natural to wonder the trustworthiness of the source*" within an E-learning environment and until relationships are established through "*repeated interactions*" only then can participants determine whether "*the source, technological or human, is deemed reliable and trustworthy*". The author reiterated that online learning programs "*must be grounded in trust*" and this can be achieved by means of support and collaboration within an E-learning environment (Baggio 2011, 2).

Jameson et al. (2006, 250) argued that E-learning "*thrive in collegial environments*" where participants share their knowledge and "*engage proactively*" in team works, collective learning, and shared knowledge construction. They further stated that such collegial participation can only exist when there is an atmosphere of trust where the input of every participant is valued without "*fear of reprisals*" and "*without undue competition*" (Jameson et al. 2006, 250). Trust, as a critical factor in E-learning, enhances intellectual conflicts for effective collaborative knowledge building and promotes a safe learning environment for the sharing of ideas and for achieving critical thinking for shared knowledge (Kirschner and van Bruggen 2004; Jameson et al. 2006).

Mason and Lefrere (2003) also advocated trust as a critical success factor as lifelong learning is enabled through E-learning. The authors argued that collaboration within an E-learning environment is "n*ot necessarily a straightforward matter of agreeing to do something together*" so as to enhance one's learning experience (Mason and Lefrere 2003, 262) and trust is a "*primary enabler*" for collaboration, learning and knowledge sharing effectiveness in E-learning (Mason and Lefrere 2003, 269). In fact, Mason and Lefrere (2003, 260) further stated that for E-learning to mature and be accepted, technologies that are being used must be trusted by being "*validated, properly supported and that conform to established technical standard*". Such technologies need to have trust encoded into their sub-systems to ensure privacy and security.

Establishing relationships within the E-learning environment that encourage and enhance feelings of safety and trust are important to E-learners and allow them to perceive that they have established a connection with their instructors and peers, thereby reinforcing trust into the system and promoting more effective learning and user satisfaction (Sun et al. 2008). This argument is supported by von Kortzfleisch and Winand (2000) who proposed a trust concept whereby students trust their instructors to meet their educational needs and whereby instructors have to use trust building means, such as prompt feedback and high degree of interaction, to create trust with their students. Similarly, in a study conducted by Wang (2014), trust is found to be crucial to the success of E-learning and is a requisite component of the student-teacher relationship for optimum learning to take place.

Interestingly, trust is also considered as a "*central component*" of the Semantic Web vision (Artz and Gil 2007, 58). Within the Semantic Web context, with information freely and readily available, trust is built on top of the ontology rules, logic and proof layer (see Figure 2.1 for the Semantic Web architecture) as a means of verifying the source of information is what it claims to be.

2.8.2 E-learning CSFs in developed and developing countries

Following the literature review on E-learning CSFs, as outlined in section 2.8.1, it is observed that developing countries face unique E-learning challenges as compared to developed countries (Bhuasiri et al. 2012). They face obstacles in terms of the infrastructure, resources availability, information access, support from institutions, reliability of the technology, personal characteristics of instructors and learners as well as cultural, political and economic barriers (Raab, Ellis and Abdon 2001; Naresh and Reddy 2015; Brinkerhoff 2006; Olaniran and Agnello 2008; Gulati 2008). On the other hand, with the focus of E-learning for developed countries more towards achieving an effective knowledge economy and enhancing lifelong learning (Gulati 2008), the E-learning CSFs tend to focus more on improving the technology, striking the right balance between pedagogical requirements and technological use, increasing students' and teachers' satisfaction, improving interaction and collaboration within the online environment and ensuring the general effectiveness of the E-learning environment (Naresh and Reddy 2015; Liaw, Huang and Chen 2007; Gilbert, Morton and Rowley 2007; Ozkan and Koseler 2009; Douglas and van Der Vyver 2004; Fuller, Vician and Brown 2006; Lee and Mendlinger 2011).

Table 2.5 provides a summary of the works discussed in section 2.8.1, highlighting the E-learning CSFs from each of the researches reviewed, starting with the developed countries and followed by the developing countries.

2.8.3 E-learning CSFs identified from the literature review

It is noted that the E-learning CSFs often relate to the same concepts and as such can be grouped together. At the same time, many of the E-learning CSF identified are similar to previously identified Semantic Web characteristics (section 2.6.3); hence these CSFs can be grouped under these very same Semantic Web characteristics. Consequently, after a careful and thorough examination of the E-learning CSFs from the works discussed in section 2.8.1, the researcher identified seven main recurring E-learning CSFs themes, termed as main E-learning CSF under which the E-learning CSFs from the literature review can be grouped. These themes, termed as the main E-learning CSFs, comprise four previously identified Semantic Web characteristics namely, 'Content Management', 'Personalised Learning', 'Pedagogy' and 'Collaboration' and three new themes, namely 'System', 'Support' and 'Trust'. Themes were named using similar terminologies as that in the literature or based on the E-learning CSFs associated with them and their related concepts.

For each of the works discussed, their identified E-learning CSFs have been grouped under one of the seven recurring themes as shown in the last column of Table 2.5, namely 'Matching of E-learning CSFs to the 7 identified recurrent themes'. Each theme has been colour coded for easier identification, with a legend of the colour code used shown as a repeated first row header of Table 2.5. Where the themes are the same as those identified for the Semantic Web characteristics (namely 'Content Management', 'Personalised Learning', 'Pedagogy' and 'Collaboration'), the colour codes are kept the same as those used for the Semantic Web characteristics (Table 2.4).

Table 2.5: Summary of E-learning critical success factors for developed and developing countries – Prepared by the Researcher

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
Developed Countries							
Critical success factors in online education	Volery and Lord (2000)	France and Australia	An identification of the key success factors of online education based on the case of a business course in an Australian University.	Survey administered to 47 students enrolled in the course Global Business 570	Technology	Ease of access and navigation	System
						Interface Design	System
						Level of interaction	Collaboration
					Instructor	Attitudes towards students	Personalised Learning
						Technical competence	
						Classroom interaction	Collaboration
					Student	Previous use of technology	Personalised Learning
						Previous computer knowledge	
Critical Success Factors for Distance Learning	Papp (2000)	USA	An exploration of the CSFs that will aid faculty and institutions to	Author's observations after teaching 3 separate online courses and	Intellectual properly		Content Management
					Suitability for a DL environment		Content Management
							Pedagogy

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
			develop distance learning courses.	after discussion with online courses teachers			System
					Building the course		Pedagogy
					Course Content		Content Management
					Be prepared for possible problems		System
							Support
					The platform		System
					Measuring success		Pedagogy
Critical success factors for on-line course resources	Soong et al. (2001)	Singapore	A study to evaluate hypotheses on the critical success factors for online courses in a tertiary setting.	Multiple case study based on 3 online courses with information for the study gathered from interviews with instructors, surveys of students in courses being investigated and analysis	Instructor's time and effort put into the resources		Personalised Learning
							Content Management
					Instructor's motivational skills		Personalised Learning
					Instructor's Technical Competence		
					Student's Technical Competence		
					Student's Mindset (about learning)		
					Instructor's Mindset (about learning)		
					Level of collaboration		Collaboration
					Perceived IT Infrastructure	Good ICT Infrastructure	System
						Technical Support	Support

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
				of archived records and informal conversations with technical staff for online learning courses			
Strategies for assuring the quality of online learning in Australian higher education	Oliver (2001)	Australia	Study addressing the major issues confronting the successful adoption and sustained use of Online learning in Australian higher education.	Literature review and observation of status of online technologies in the Australian university sector.	Teacher expertise in online teaching	Teaching online	Personalised Learning
						Using technology in teaching	Pedagogy
						Technology currency	Personalised Learning
						Teacher training	Support
					Student Readiness	Technology skills	Personalised Learning
						Access to technology	
						Self-regulated learning	
					Technology Infrastructure	Courseware delivery systems	System

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
						Technology infrastructure	
						Service provision	
					Reusable learning objects		Content Management
					Reusable learning designs		Pedagogy
E-Learning QUICK Checklist	Khan (2005)	USA	Provides an outline of the critical dimensions required for E-learning.	Author's observation and experience	Pedagogical	Content analysis	Pedagogy
						Audience Analysis	
						Goal Analysis	
						Medium Analysis	
						Design Approach	
						Learning Strategies	
					Technological	Infrastructure Planning	System
						Hardware	
						Software	
					Interface Design	Page and Site Design	System
						Content Design	
						Navigation	
						Accessibility	
						Usability	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
					Evaluation	E-learning content development process evaluation	Pedagogy
						Assessment	
						Program Evaluation	
					Management	Content Development	Content Management
						Delivery and Maintenance	Pedagogy
					Resource Support	Online support	Support
						Online resources	
						Offline resources	
					Ethical	Social and political influence	Support
						Cultural diversity	
						Bias	
						Geographical diversity	
						Learner diversity	
						Digital divide	
						Etiquette	
						Legal issues	
					Institutional	Need assessment	Support

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**			**Matching of E-learning CSFs to the 7 identified recurrent themes**
						Financial readiness		
						Infrastructure readiness		
						Cultural readiness		
						Content readiness		
Organisational issues for e-learning - Critical success factors as identified by HE practitioners	McPherson and Baptista Nunes (2006b)	UK with participants across different countries, not limited to the UK	Study to identify organisational critical success factors for E-learning implementation in higher education.	Literature review was conducted to identify the initial framework for the five fundamental aspects of E-learning followed by focus group interviews with participants identified from targeted workshops within	Organisational Factors	Leadership, structural and cultural	Good communicational leadership	Support
						Design	Balanced collaborative, multi-skilled design and development	Pedagogy
							Tutor, academic and learner involvem	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**			**Matching of E-learning CSFs to the 7 identified recurrent themes**
				conferences including educational practitioners, researchers, administrators and technologists			ent in the design process	
							Efficient technical support	
						Technological	Reliable, robust and secure ICT Infrastructure	System
								Trust
						Delivery	Existence of institutional e-learning Champions	Support
Flying High or Crash	McPherson and Baptista	UK with participant	Study to identify and	Literature review was	Technological factors	Organisational Issues		Support

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**			**Matching of E-learning CSFs to the 7 identified recurrent themes**
Landing? Technological Critical Success Factors for e-Learning	Nunes (2006a)	s across different countries, not limited to the UK	assess technological critical success factors that affect the design, development and delivery of E-learning.	conducted to identify the initial framework for the five fundamental aspects of E-learning followed by focus group interviews with participants identified from targeted workshops within conferences including educational practitioners, researchers, administrator		Design Issues	Pedagogical	Pedagogy
							Usability	System
							Access	System
						Delivery Issues	Learner Support	Support
							Feedback /Evaluation	
						Technological Infrastructure Issues		System
						Technological Reliability		Trust
						Interoperability/Standards		System
						Software Issues		
						Technological appropriateness		
						Computer Mediated Communication Issues		
						Technical Support		Support
						Web Issues		System
						Bandwidth		

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**			**Matching of E-learning CSFs to the 7 identified recurrent themes**
				s and technologists				
Kindling a passion for acquiring new knowledge: critical success factors for creating appropriate curricula for e-Learning	McPherson and Baptista Nunes (2007a)	UK with participants across different countries, not limited to the UK.	Study identifying the critical success factors in teaching and learning for curriculum design and development to ensure successful implementation of E-learning.	Literature review was conducted to identify the initial framework for the five fundamental aspects of E-learning followed by focus group interviews with participants identified from targeted workshops within conferences including	Curriculum Design and Development	Pedagogical Considerations	Good Pedagogical Model	Pedagogy
							Context	
							Evaluation	
							Teaching and Learning Methods	
							Personalisation	
							Student feedback	
						Content Considerations	Up-to-date	Content Management
							Relevant	
							Structured	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**			**Matching of E-learning CSFs to the 7 identified recurrent themes**
				educational practitioners, researchers, administrators and technologists		Curriculum Design and Development Process Considerations	Formal Process	Pedagogy
							Contextualised	
							Team Effort	
						People and Skills Considerations		Personalised Learning
Negotiating the Path from Curriculum Design to E-Learning Course Delivery: A Study of Critical SuccessFactors for Instructional	McPherson and Baptista Nunes (2007b)	UK with participants across different countries, not limited to the UK	Study on the critical success factors for Instructional Systems design to develop coherent and consistent E-learning environments and assist	Literature review was conducted to identify the initial framework for the five fundamental aspects of E-learning followed by focus group interviews	Instructional Systems Design	Collaboration between all staff involved		Collaboration
						Suitability of the pedagogical approach		Pedagogy
						Addressing the challenge of designing for learning		
						Attending to process issues		

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
Systems Design			with the successful implementation of E-learning courses.	with participants identified from targeted workshops within conferences including educational practitioners, researchers, administrators and technologists			
Critical issues for e-learning delivery: what may seem obvious is not always put into practice	McPherson and Nunes (2008)	UK with participants across different countries, not limited to the UK.	Investigation and analysis of the critical success factors to deliver E-learning within higher education	Literature review was conducted to identify the initial framework for the five fundamental aspects of E-learning	E-learning delivery	Staffing	Support
						Delivery Model	Pedagogy
						Training	Support
						Leadership issues	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
			courses and programmes.	followed by focus group interviews with participants identified from targeted workshops within conferences including educational practitioners, researchers, administrators and technologists			
Critical success factors for e-learning acceptance: Confirmatory factor models	Selim (2007a)	United Arab Emirates	Studies conducted to identify the critical success factors for an E-learning	Literature review of published work on e-learning critical success	Instructor characteristics	Attitude towards and control of technology	Personalised Learning
						Teaching Style	
					Support		Support
					Technology	Ease of access	System
						Infrastructure	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
			environment as perceived by students.	factors followed by a survey to 538 university students and a confirmatory factor analysis to validate the factors derived	Student characteristic	Computer competency	Personalised Learning
						Interactive collaboration	
						E-learning course content and design	
What drives a successful e-Learning? An empirical investigation of the critical success factors influencing learner satisfaction	Sun et al. (2008)	Taiwan	Study conducted to identify the critical success factors for user satisfaction within an E-learning environment.	Initial model based on literature review followed by interviews with experienced e-learning learners followed by	Learner computer anxiety		Personalised Learning
					Instructor attitude towards e-Learning enhanced via support		Personalised Learning
					e-Learning course flexibility		Content Management
							Pedagogy
					e-Learning course quality		
					Perceived usefulness		System

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
				questionnaires provided to 16 e-learning courses at 2 public universities in Taiwan with 295 valid responses. The collected data was analysed using multiple regression analysis	Perceived ease of use		
					Diversity in assessments		Pedagogy
Critical success factors in e-learning ecosystems: a qualitative study	Sridharan, Deng, and Corbitt (2010)	Australia	Evaluation of the critical success factors for sustainable e-learning in an e-learning	Initial model based on literature review followed by a set of systematic interviews	Pedagogical Strategy	adaptive	Pedagogy
						Collaborative	
						Explorative	
						Interactive	
						Concept Map	
						Blended	
						Supporting technologies	System

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**			**Matching of E-learning CSFs to the 7 identified recurrent themes**
			ecosystem framework.	with e-learning stakeholders to develop an E-learning success model	Technology and Other Factors	Supporting learning objects		
						Supporting management activities		
					Management Factors	Management	Capture	Content Management
							Organise	
							Authenticate	
							Retrieve	
							Reuse	
						Metadata	Content Metadata	
							Context Metadata	
							Structure Metadata	
							Validation Metadata	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
						Learner Profile Metadata	
A Web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	Australia/ China	Proposal of a Web based E-learning success model in higher education.	Literature review on E-learning critical success factors	Personal Knowledge Management	Recording information	System
						Classifying information	
						Organising information	Content Management
						Integrating information	
						Represent knowledge	
					Collaboration	Discussing with peers	Collaboration
						Discussing with instructor	
						Sharing resources	
						Accessing shared resources	
						Participating in group activities	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
					Instructional Support	Using multiple teaching strategies	Support
						Designing activities	
						Encouraging collaboration	Pedagogy
						Assessing student work	
						Providing feedback	
					Managing Learning Resources	Consistent presentation	Content Management
						Facilitating search of resources	
						Facilitating reuse of resources	
						Facilitating sharing of resources	
					Web 2.0 Technology	Generating content	Content Management
						Aggregating content	
						Sharing content	
						Reusing content	
						Co-authoring	
						Contributing to content	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
						Communicating synchronously	
						Subscribing to content	
Critical Success Factors for the continuation of e-learning initiatives	McGill, Klobas, and Renzi (2014)	Australia and Italy	Study conducted to examine the critical success factors for a sustained E-learning environment and the continuation of E-learning initiatives in universities.	Review of 64 empirical papers published in peer-reviewed literature to develop a first set of factors followed by a questionnaire sent to the authors of selected papers on the study with 70 valid responses	Institutional Support	Financial Support	Support
						Technical Support	
					Teachers and Development Involvement		Support
					Keeping up to date with technology		Personalised Learning

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**	**Matching of E-learning CSFs to the 7 identified recurrent themes**
Anonymity and learning in digitally mediated communications: authenticity and trust in cyber education	Baggio (2011)	USA	A study to analyse the different components of trust as a critical success factor in digitally mediated learning and to develop a framework for trust within an E-learning environment.	Literature review on trust in virtual teams and in digitally mediated environment	Trust in Technology	Trust
					Trust in users of the technology	Trust
					Sharing of resources	Collaboration
					Interaction among learners	Collaboration
					Support to learners	Support
Trust, collaboration, e-learning and organisational transformation	Mason and Lefrere (2003)	USA	Discussion on the role of trust and collaboration in organisational transformatio	Literature review of models and schemas to identify the role of trust and collaboration	Trust: Technologies that work	Trust
					Trust: Standards and protocols	
					Trust: Knowledge sharing	
					Trust: activities	
					Trust: Consensus building	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
			n and E-learning within shared contexts.	within E-learning contexts			
Building Trust in E-Learning	Wang (2014)	USA	A study to develop a framework on the social and technical factors that can influence students' perception about the trustworthiness of E-learning courses.	Web based survey of 4th year university participants in an American university with 398 respondents and 361 considered for final analysis	Trust in Course Instruction	Prior positive experience	Personalised Learning
						Good reputation	Trust
						High information and design quality	Pedagogy
							Content Management
							System
						Contact Details	Support
						Instructor's assertiveness	Personalised Learning
						Instructor's responsiveness	
						A sense of care and community	Support
							Collaboration
						Reliable and Timely access	System
							Trust

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
					Trust in the Privacy and Security	Privacy and security policy statement	Trust
						Security Mechanisms	
						Third party privacy assurance or standard	
Trust Online	Friedman, Khan, and Howe (2000)	USA	A discussion and conceptual framework on factors that affect the use of technologies within an online environment.	Literature review	Reliability and security of the technology		Trust
							System
					Privacy		Trust
					Online interpersonal interactions		Collaboration
Building trust and shared knowledge in communities of e-learning practice	Jameson et al. (2006)	UK	Study to propose two theoretical models for collaborative leadership	Literature review on the attributes of collaborative team leaderships	Participation in an atmosphere of trust		Trust
					Knowledge sharing		Collaboration
					Collaborative leadership		Collaboration

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**	**Matching of E-learning CSFs to the 7 identified recurrent themes**
			within an E-learning environment.	and communities of E-learning practices of eLISA and CAMEL 2005-06 E-learning projects		
Trust in electronic learning and teaching relationships: the case of "WINFO-Line"	von Kortzfleisch and Winand (2000)	Germany	A study on how to create trust in Web based learning environment.	Using WINFO-Line, a virtual teaching and learning environment on the Web to test the trust concept proposed following a literature review	Interaction	Collaboration
					Student trusting instructors	Trust
					Institutional Support	Support
					Employment of trust building means by instructors	Trust
					Readiness of actors to trust	Personalised Learning
					Integration: mutual discussions	Collaboration
Developing Countries						

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**	**Matching of E-learning CSFs to the 7 identified recurrent themes**
Successful implementation of e-learning Pedagogical considerations	Govindasamy (2001)	Malaysia	Study of critical success pedagogical factors for E-learning.	Literature review on pedagogical principles and through reflection made based on the author's person experiences and observation	Developing Content	Content Management
					Storing and managing content	
					Packaging Content	Pedagogy
					Student support	Support
					Assessment	Pedagogy
An exploratory study of the critical success factors affecting the acceptability of E-learning in Nigerian universities	Folorunso, Shawn Ogunseye, and Sharma (2006)	Nigeria	Investigation of the critical success factors for e-learning acceptance in Nigerian universities.	Survey to private, public and state-owned universities in Nigeria with 1600 questionnaires sent to lecturers and students,	Funding Support	Support
					IT Infrastructure	System
					E-learning Awareness	Personalised Learning

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
				1433 questionnaires received and 1127 valid responses considered			
A taxonomy of factors to promote quality web-supported learning	Fresen (2007)	South Africa	Investigation of the factors that directly affect the quality of Web-supported learning opportunities.	Comparative analysis of the literature on critical success factors for E-learning reviewed and validated by a case study	Institutional Factors	Technology Plan	Support
						Infrastructure	
						Student Consultation	
						Institutional programme evaluation	
						Organisational change	
						Student selection and entry into course	
					Technology Factors	Appropriate use	System
						Reliability	
						Accessibility	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
						IT support and training for lecturers	
						IT support and training for students	
						Appropriate bandwidth and download demands	Support
						Management of student data	System
					Lecturer Factors	Interaction with students	Collaboration
						Feedback to students	Support
						Professional training	Personalised Learning
						Evaluation of teaching competence	
						Academic background	
						Community and empathy	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
					Student Factors	Communication	Personalised Learning
						Time management	
						Self-directed learning	
						Client expectations	
						Critical thinking	
						Motivation	
						Problem solving	
						Client satisfaction	
					Instructional Design factors	Group learning	Collaboration
						Engagement	
						Higher cognitive levels	Pedagogy
						Learning resources	Content Management
						Learning materials	
						Interactivity	Pedagogy
						Standards	
						Course evaluation	
						Inclusively	
						Student motivation	
						Modular chunks	
						Use of media	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
						Use of images, graphics, animation	
						Complete learning package	
						Layout and presentation	
						Usability	
						Reusable learning objects	
						Reusable learning designs	
					Pedagogical factors	Learning outcomes	Pedagogy
						High expectations	
						Assessment strategies	
						Diversity	
						Clearly stated expectations	
						Self-reflection	
						Non-threatening environment	
						Research methodology	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
						Relevance of content	
						Accuracy of content	
						Currency of content and learning resources	
						Continuous improvement	
						Educationally significant goals	
						Adaptable, sustainable, scalable	
						Learner centred environment	
						Multiple learning pathways	
Critical Success in E-learning: An Examination of Technological and Institutional	Masrom, Zainon, and Rahiman (2008)	Malaysia	Study to identify the critical measures associated with E-learning CSFs	Survey questionnaire administered to 500 first year diploma students from the college of Science and	Technological factor – Ease of Access and ICT Infrastructure	Browser efficiency	System
						Ease of use of course website	
						Computer network reliability	
					Institutional Support Factor	Technical support/help desk	Support

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
Support Factors			technological and institutional support factors.	Technology with 274 valid responses. Data was analysed using SEM and Confirmatory factor analysis			
Critical Success Factors for Online Distance Learning in Higher Education: A Review of the Literature	Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012)	Thailand	A review of 19 papers published during 2002-2012 and selected from the Chulalongkorn University reference database was conducted. The aim of	Analysis and synthesis of the literature review	Institutional Management	Market Research	Support
						Program Framework	
						Operational Plan	
						Cost Effectiveness	
					Learning Environment	Course Management System	System
						Technical Infrastructure	
						Interactive Learning	
						Access and Navigation	
							Collaboration

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**		**Matching of E-learning CSFs to the 7 identified recurrent themes**
			the review was to identify the CSFs for online distance learning in higher education.		Instructional Design	Clarification and Objectives	Pedagogy
						Content Quality	Content Management
						Learning Strategies	Pedagogy
						Psychology of learning	
						Learning assessment	
					Services Support	Training	Support
						Communication tools	
						Helpdesk	
					Course Evaluation		Pedagogy
Critical Success Factors in E-learning: An Examination of Technology and Student Factors	Musa and Othman (2012)	Malaysia	Investigation of the critical success factors affecting E-learning from students' perspectives within the	Survey questionnaire administered to 850 first-, second- and third-year undergraduate students at the Faculty of	Technological Characteristics		System
					Student's characteristics	Student's computing – learning by participation	Personalised Learning
						Student collaboration – with fellow students and instructors	Collaboration

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**	**Matching of E-learning CSFs to the 7 identified recurrent themes**
			Malaysian higher education institutions.	Computer Science and Information Systems in the year 2010/2011 with 450 valid responses used for the study using exploratory factor analysis	Student content – availability of course materials in a timely manner	Content Management
					Assessment	Pedagogy
Critical success factors for adoption of Web-based learning management systems in Tanzania	Lwoga (2014)	Tanzania	Study conducted to analyse the critical success factors for the adoption of Web-based learning management	An initial model was developed based on an adapted version of the Information System Success model	Instructor Quality	Personalised Learning
					System Quality	System
					Information Quality	Content Management

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/ Framework	**Author(s) & Year**	**Country**	**Description of Study**	**Research Approach**	**E-learning Critical Success Factors**	**Matching of E-learning CSFs to the 7 identified recurrent themes**
			systems in Tanzania.	followed by a survey conducted at Muhimbili University of Health and Allied Science (MUHAS)in Tanzania. The questionnaire was sent to 408 first year undergraduate students with a 66.7 response rate. Responses were analysed using SEM data analysis		

2.8.3.1 E-learning CSF and associated sub-factors from the literature

The seven themes under which E-learning CSFs from the literature review were categorised were further examined, following which, the E-learning CSFs were categorised into sub-themes as shown in Appendix B. The sub themes were named using terms similar to those in the literature and based on the CSFs associated with them as well as their related concepts. Where the sub themes were similar to those identified for the Semantic Web sub-characteristics (see section 2.6.3.1), the same naming was used. Following this grouping, the E-learning CSFs derived from the literature review can be represented as shown in Table 2.6.

Table 2.6: E-learning critical success factors and sub-factors based on the literature review (Prepared by the Researcher)

Main Critical Success Factors	Sub-Critical Success Factors
Content Management	Content development and maintenance
	Reuse
	Knowledge representation
Personalised Learning	Student's characteristics
	Lecturer's characteristics
Pedagogy	Course design and sequencing
	Assessment and evaluation
	Teaching strategies
Collaboration	Interaction
	Sharing of resources
System	Usability
	Accessibility
	ICT infrastructure
Support	Instructional support
	Organisational support
Trust	Technology reliability and security
	Trust between students
	Trust between students and lecturers

Oliver (2001, 227) stated that "*critical to the success of online delivery strategies within higher education institutions is the prevalence of materials and resources to support the learning settings*. In fact, several E-learning CSFs relate to learning content and resources including content generation, development, maintenance, reuse and representation and as such was grouped under the main theme 'Content Management' to align with the related Semantic Web characteristic. The sub-factors are Content development and maintenance', 'Reuse' and 'Knowledge representation'.

In order to provide a 'Personalised Learning' environment, the literature revealed the student's and instructor's characteristics as key factors to be considered. The student's

specific learning needs that "*suit individual levels, styles, and preferences"* as well as the student's and instructor's technical competence, mindset, E-learning awareness and readiness to trust and work within the E-learning environment, have been considered critical to the effectiveness of E-learning (Sridharan, Deng and Corbitt 2010, 274; von Kortzfleisch and Winand 2000; Selim 2007a; Fresen 2007; Sun et al. 2008). Consequently, 'Personalised Learning' as another main E-learning CSF regroups 'Student's characteristic's' and 'Lecturer's characteristic's' as its sub factors.
Similar to the Semantic Web characteristic, the literature revealed 'Pedagogy' as a recurrent CSF for E-learning. It includes the curriculum and instructional design and development, the delivery model capturing the teaching strategies and the evaluation and assessment methods. Therefore, the related sub-factors are 'Course design and sequencing', 'Assessment and evaluation' and 'Teaching strategies'.
"*Effective online learning environments require some forms of interaction and collaboration among students as well as between learners and instructors*" (Cheawjindakarn, Suwannatthachote and Theeraroungchaisri 2012, 63). Once again, aligning with the Semantic Web characteristics, 'Collaboration' as a critical CSF includes learning through interactions including discussions between learners, between learners and instructors, participation in group learning, and exchanging resources (Karunasena, Deng and Zhang 2012). Its sub-factors are, therefore, 'Interaction' and 'Sharing of resources'.
Central to the success of E-learning is the "*the efficient and effective use of IT in delivering e-learning based components of a course*" (Selim 2007a, 399). Hence, the reliability, robustness and security of the ICT infrastructure as well as the ease of access and navigation, captured under 'System' is considered as another CSF for E-learning. The associated sub-factors are 'Usability', 'Accessibility' and 'ICT Infrastructure'.
'Support' as another recurring CSF for E-learning in the literature consists of 'Instructional support' and 'Organisational support' including training and technical support, financial support, leadership support, feedback and evaluation and ethical considerations.
Building and sustaining trust in E-learning is considered a critical factor to ensure effective commitments and reduce uncertainties amongst its stakeholders, particularly students and instructors (von Kortzfleisch and Winand 2000; Wang 2014). As another main CSF derived from the literature review, the 'Trust' factor captures 'Technology

reliability and security', 'Trust between students' and 'Trust between students and lecturers' as its sub-factors.

The groupings of E-learning CSFs as shown in Table 2.6 and Appendix B, combined with the Semantic Web characteristics and sub-characteristics identified (Table 2.4 and Appendix A), will assist in the building of an initial holistic E-learning 3.0 model in line with the research questions of this study.

2.9 Semantic Web Characteristics and E-learning CSFs - combined

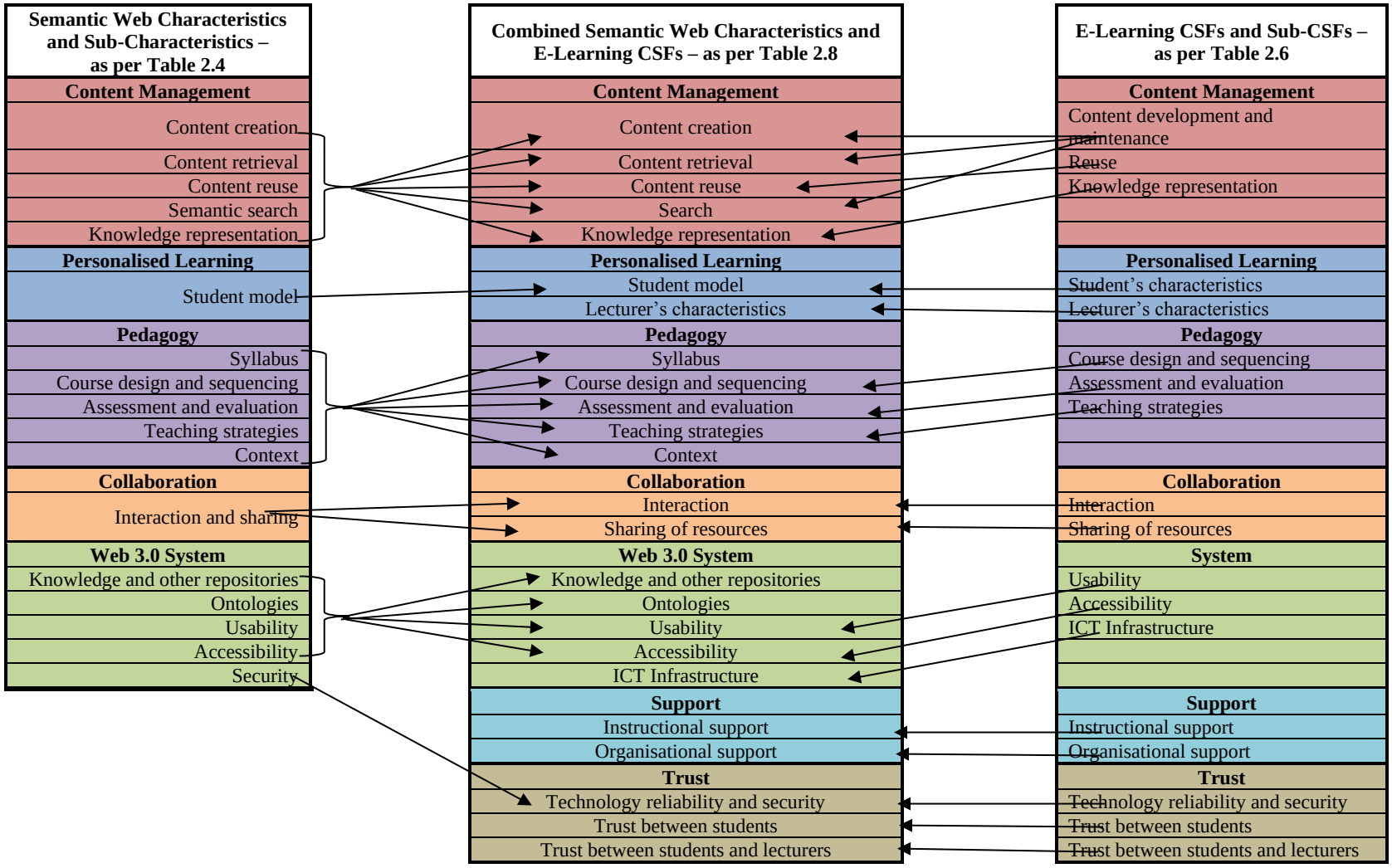
The careful and thorough examination of Semantic Web characteristics resulted in the identification of five main recurrent characteristics, namely 'Content Management', 'Personalised Learning', 'Pedagogy', 'Web 3.0 System' and 'Collaboration', each with their associated sub-characteristics, as described in section 2.6.3, Table 2.3, Table 2.4 and Appendix A.

Similarly, E-learning CSFs were grouped under seven main themes: 'Content Management', 'Personalised Learning', 'Pedagogy', 'Collaboration', 'System', 'Support' and 'Trust', each with their associated sub factors, as described in section 2.8.3, Table 2.5, Table 2.6 and Appendix B.

As a result of the many similarities between the Semantic Web characteristics and E-learning CSFs and due to the grouping of similar themes, a combined set of characteristics and associated sub-characteristics, representing both the Semantic Web characteristics and E-learning CSFs, is proposed by the researcher. This merging of the Semantic Web characteristics with E-learning CSFs has two main objectives namely: (1) streamlining overlaps between Semantic Web characteristics/sub-characteristics and E-learning CSFs/sub CSFs, and (2) retaining unique characteristics/sub-characteristics of the Semantic Web and E-learning CSFs/sub CSFs. As such, this merge is a steppingstone towards a holistic representation of E-learning 3.0 based on Semantic Web characteristics and E-learning CSFs.

Table 2.7 explains how Table 2.4 and Table 2.6 were merged to produce the combined list of Semantic Web characteristics and E-learning CSFs for a holistic representation of E-learning 3.0, followed by details of the merge, provided next.

Table 2.7: Combining Semantic Web characteristics and E-learning CSFs – Prepared by the Researcher



Following the merging of Table 2.4 and Table 2.6, as shown diagrammatically in Table 2.7, the resulting characteristics for a holistic representation of E-learning 3.0 based on the Semantic Web characteristics and E-learning CSFs are: 'Content Management', 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Web 3.0 System', 'Support' and 'Trust', each with its associated sub-characteristics as outlined below.

'Content Management' retained all the sub-characteristics under the Semantic Web characteristics/sub-characteristics category as they also represent the sub CSFs for E-learning. These include 'Content creation', 'Content retrieval', 'Content reuse', 'Search' and 'Knowledge representation'. In fact, the sub-CSF 'Content development and maintenance' under the E-learning CSFs category is taken to be represented by the sub-characteristics 'Content creation', 'Content retrieval', 'Content reuse' and 'Search'. The sub characteristic 'Semantic search' was, therefore, changed to 'Search' as a broader term to represent this aspect both under the Semantic Web characteristic and E-learning CSF.

Under the 'Personalised Learning', the 'Student model' and 'Student's characteristics' were combined into one and termed 'Student model' as they both represent the profiles of students. The 'Lecturer's characteristics' was also retained as another sub-characteristic. Thus, 'Student model' and 'Lecturer's characteristics' were the resulting sub-characteristics for 'Personalised Learning'.

'Pedagogy' retained all the sub-characteristics under the Semantic Web category as they also captured the corresponding CSF and sub CSFs for E-learning. These include 'Syllabus', 'Course design and sequencing', 'Assessment and evaluation', 'Teaching strategies' and 'Context'.

The 'Collaboration' CSF and associated sub CSFs 'Interaction' and 'Sharing of resources' were retained following the merge as they also represented the sub-characteristic for 'Collaboration' under the Semantic Web category.

The characteristic 'Web 3.0 System' for the Semantic Web and 'System' for E-learning CSFs were as 'Web 3.0 System' consisting of a combination of all sub-themes from both the Semantic Web characteristics and E-learning CSFs, except for 'Security'. The 'Security' sub-characteristic was moved to the 'Trust' characteristic to align with the similar sub-theme of 'Technology reliability and security' as identified under E-learning CSFs. Therefore, the resulting sub-characteristics for 'Web 3.0 System' were 'Knowledge and other repositories', 'Ontologies', 'Usability', 'Accessibility' and 'ICT Infrastructure'.

The CSFs ‘Support’ and ‘Trust’ and associated sub CSFs belonged to the E-learning CSF category only. Following the merge, they were all retained. Therefore, the associated sub-characteristics for ‘Support’ remained as ‘Instructional support’ and ‘Organisational support’ while for ‘Trust’, they remained as “Technology reliability and security’ including the ‘Security’ aspect under the Semantic Web category, ‘Trust between students’ and ‘Trust between students and lecturers’.

The resulting combined list, as shown in Table 2.8 below, will assist in the building of an initial holistic E-learning 3.0 model capturing both Semantic Web characteristics and E-learning CSFs.

Table 2.8: Combined Semantic Web characteristics and E-learning CSFs – Prepared by the Researcher

Main Characteristics	**Sub-Characteristics**
Content Management	Content creation
	Content retrieval
	Content reuse
	Search
	Knowledge representation
Personalised Learning	Student model
	Lecturer’s characteristics
Pedagogy	Syllabus
	Course design and sequencing
	Assessment and evaluation
	Teaching strategies
	Context
Collaboration	Interaction
	Sharing of resources
Web 3.0 Systems	Knowledge and other repositories
	Ontologies
	Usability
	Accessibility
	ICT Infrastructure
Support	Instructional support
	Organisational support
Trust	Technology reliability and security
	Trust between students
	Trust between students and lecturers

2.10 Research gaps

A comprehensive review of the literature on E-learning 3.0 models showed that a great deal of focus has been given to Semantic Web technologies, particularly how ontologies are used to optimise different aspects of the E-learning 3.0 environment including content management, personalised learning, and pedagogy. Often, in these works, other critical aspects of E-learning, such as collaboration, support and trust,

were omitted or discussed superficially. On the other hand, despite many independent studies on the different facets of E-learning such as pedagogies, technologies and learning resources, there is a lack of a model which considers the entwined aspects of these characteristics, which as pointed out by Sridharan, Deng, and Corbitt (2010), is critical for developing sustainable E-learning.

The literature review also revealed several similarities between the Semantic Web characteristics and E-learning CSFs, as shown in sections 2.8.3 and 2.9, with the combined list of Semantic Web characteristics and E-learning CSFs for E-learning 3.0 shown in Table 2.8. However, it also revealed a clear gap in existing models, which fail to establish a collective set of characteristics that captures both key Semantic Web characteristics and E-learning CSFs. Table 2.9 below provides an overview of the literature gaps and shows that none of the models discussed captured all the different and critical characteristics for E-learning 3.0 based on a combination of Semantic Web characteristics and E-learning CSFs. This, consequently, warrants the need for deeper investigations to find an optimal mix of Semantic Web characteristics and E-learning CSFs to represent a holistic E-learning 3.0 model.

The Semantic Web concept has been covered extensively in theory. However, as discussed in section 2.6.2, many of the E-learning 3.0 models, particularly for developing countries, were not empirically validated or tested and were often derived from the authors' own literature reviews and the use of synonyms to represent existing works and concepts. This spurs the need for more research to have a realistic representation of E-learning 3.0, which is empirically validated.

Limited research on E-learning 3.0 among lower-income developing countries, particularly Small Island Developing States (SIDS) nations were also noted. The study is, therefore, further intended to bridge this gap by empirically validating the research within a small island developing nation, namely Mauritius, which has high IT dependencies and where the government is promoting E-learning initiatives in line with its vision of becoming a center of excellence and a knowledge hub in the region (Human Resource Development Council 2006; National ICT Strategic Plan 2007). It is envisaged that, by studying this model from the Mauritian higher education institutions' perspectives, insights into a more realistic representation of E-learning 3.0 will be provided, addressing not only the dearth of E-learning 3.0 research from a practical angle, but also the lack of empirically validated findings within the mostly unexplored context of a small island developing nation.

Table 2.9: Research gaps – a literature review snapshot

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Work on Semantic Web Characteristics and E-learning 3.0																									
E-Learning based on E-learning based on the Semantic Web	Stojanovic, Staab & Studer (2001)	✓	✓	✓	✓	✓	✓	x	x	✓	x	x	✓	x	x	✓	✓	✓	✓	✓	x	x	x	x	x
e-Learning System based on Semantic Web	Pandit (2010)	✓	✓	✓	✓	✓	✓	x	x	✓	x	x	✓	x	x	✓	✓	✓	✓	✓	x	x	✓	x	x
Semantic Web Technologies Applied to E-Learning System	Qassimqwaider, Walid (2012)	✓	✓	✓	✓	✓	✓	x	x	✓	x	x	✓	x	x	✓	✓	✓	✓	✓	x	x	✓	x	x
Semantic Web and Intelligent	Simic, Gasevic &	✓	✓	✓	✓	✓	✓	x	x	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	x	x	✓	x	x

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Management Systems (ILMS)	Devedzic (2004)																								
Education and the Semantic Web	Devedzic (2004)	✓	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	X	X	X	X
Semantic Services in E-Learning	Moreale& Vargas-Vera (2004)	✓	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	X	X	✓	✓	X	✓	✓	X	X	X	X	X
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	✓	✓	✓	✓	✓	✓	X	✓	✓	✓	X	✓	X	X	✓	✓	✓	✓	✓	X	X	X	X	X
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan and Ahmed (2012)	✓	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	✓	X	X
Development of an E-learning System	Shamsi and Khan (2012)	✓	✓	✓	✓	✓	✓	X	X	✓	✓	X	✓	X	X	✓	✓	✓	✓	✓	X	X	✓	X	X

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Incorporating Semantic Web																									
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	x	x	✓	x	x
A New Framework Semantic Web Technology Based E-Learning	Shrivastava, Sharma, and Bawankan (2012)	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	x	✓	✓	x	✓	✓	✓	✓	✓	x	x	x	x	x
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	x	✓	✓	x	✓	✓	✓	✓	✓	x	x	✓	x	x
An intelligent semantic e-learning framework using	Huang, Webster, et al. (2006)	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	x	x	✓	✓	✓	✓	✓	x	x	x	x	x

Literature Review	Author(s) & Year	Content Management					Personalised Learning		Pedagogy					Collaboration		Web 3.0 System					Support		Trust		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
context-aware Semantic Web technologies																									
Ontology-Driven E-Learning System	Snae & Brueckner (2007)	✓	✓	x	x	✓	x	x	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	x	x
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	✓	✓	x	✓	✓	x	x	✓	x	x	✓	x	✓	✓	✓	✓	✓	✓	✓	x	x	x	x	x
Semantic Web Ontology for E-learning in Higher Education	Bucos, Dragulescu & Veltan (2010)	✓	✓	x	x	x	✓	x	✓	✓	✓	✓	x	x	x	✓	✓	x	x	✓	x	x	x	x	x
A framework for an E-learning system based on semantic Web	Mahmoud, Abd-El-Hafeez, and	✓	✓	✓	✓	✓	x	x	x	x	x	x	x	x	x	✓	✓	x	x	✓	x	x	x	x	x

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
	Badawy (2013)																								
Semantic Approach for E-learning System	Guo & Chen (2006)	✓	✓	✓	✓	✓	✓	x	x	✓	x	x	✓	x	x	✓	✓	✓	✓	✓	x	x	x	x	x
E-Learning System Overview based on Semantic Web	Alsultanny (2006)	✓	✓	✓	✓	✓	✓	x	x	✓	x	x	✓	x	x	✓	✓	✓	✓	✓	x	x	x	x	x
Conceptual Framework based on ontologies for knowledge management in e-learning systems	Pah, Maniu, Maniu& Damian (2007)	✓	✓	✓	✓	✓	✓	x	x	x	x	✓	✓	x	x	✓	✓	✓	✓	✓	x	✓	x	x	x
Semantic Web-Based Educational Knowledge Service System for E-learning	Huang et al (2006)	✓	✓	✓	✓	✓	✓	x	x	✓	x	x	x	x	x	✓	✓	✓	✓	✓	x	x	x	x	x

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Towards a knowledge portal for E-learning based on Semantic Web	Yanyan and Mingkai (2008)	✓	✓	✓	✓	✓	✓	x	x	✓	x	x	✓	✓	x	✓	✓	✓	✓	✓	x	x	x	x	x
Adaptive E-Learning Content Generation based on Semantic Web Technology	Holohan et al. (2005)	✓	✓	x	x	x	✓	x	x	✓	x	x	x	x	x	x	✓	x	x	x	x	x	x	x	x
Ontological Support for E-learning courses	De Nicola, Missikoff & Schiappelli (2004)	✓	✓	✓	✓	✓	x	x	✓	✓	x	x	✓	x	x	✓	✓	x	x	✓	x	x	x	x	x
Ontology based learning objects sequencing	Neri (2005)	✓	✓	✓	✓	✓	✓	x	✓	✓	x	✓	✓	x	x	✓	✓	x	x	✓	x	x	x	x	x
Ontology-based learning objects search and course generation	Neri & Colombetti (2009)	✓	✓	✓	✓	✓	✓	x	✓	✓	x	✓	✓	x	x	✓	✓	x	x	✓	x	x	x	x	x

Literature Review	Author(s) & Year	Content Management					Personalised Learning		Pedagogy					Collaboration		Web 3.0 System					Support		Trust		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Ontology of Learning objects Repository for Pedagogical Knowledge Sharing	Wang (2009)	x	x	x	✓	x	x	x	✓	✓	✓	✓	✓	x	x	x	✓	x	x	x	x	x	x	x	x
Identification of Ontology Based Object Using Instructional Design	Srimathi & Srivastav (2008)	✓	✓	x	✓	✓	✓	x	✓	✓	x	✓	✓	x	x	✓	✓	x	x	✓	x	x	x	x	x
Knowledge representation of LMS using ontology	Srimathi (2010)	✓	✓	x	✓	✓	✓	x	✓	✓	x	✓	✓	x	x	✓	✓	✓	x	✓	x	x	x	x	x
Design Engineering Educational Framework Using ShareFast: A Semantic Web-Based E-Learning System	Hiekata et al. (2007)	✓	✓	x	x	✓	✓	x	✓	✓	x	x	✓	✓	x	✓	✓	x	x	✓	x	x	x	x	x

Literature Review	Author(s) & Year	Content Management					Personalised Learning		Pedagogy					Collaboration		Web 3.0 System					Support		Trust		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Development of student model ontology for personalization in an e-learning system based on semantic web	Pramitasari (2009)	x	x	x	x	x	✓	x	x	x	x	x	x	x	x	✓	✓	x	x	x	x	x	x	x	x
Using Semantic Web to support Advanced Web-Based Environment	Fouad et al. (2011)	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	x	x	x	x	✓	✓	x	x	✓	x	x	x	x	x
A semantic web based personalized learning service for programming course in e-learning	Jinghua (2011)	✓	✓	✓	✓	✓	✓	x	x	✓	x	x	✓	x	x	✓	✓	✓	✓	✓	x	x	x	x	x
An Ontological Approach to Support	Sudhana, Raj, and Sikamani (2013)	✓	✓	✓	✓	✓	✓	x	x	✓	x	✓	✓	x	x	✓	✓	✓	✓	✓	x	x	x	x	x

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Personalized E-Learning System																									
An Ontology of Construction Education for Elearning via the Semantic Web	Ahmed, Shaik, and Aouad (2006)	✓	x	x	x	x	x	x	x	✓	x	x	x	x	x	x	✓	x	x	x	x	x	x	x	x
Work on E-Learning Critical Success Factors (E-learning CSFs)																									
Critical success factors in online education	Volery and Lord (2000)	x	x	x	x	x	x	✓	x	x	x	✓	x	✓	✓	x	x	✓	✓	✓	x	x	x	x	x
Critical Success Factors for Distance Learning	Papp (2000)	✓	✓	x	x	x	x	x	✓	x	✓	x	x	x	x	x	x	x	x	✓	x	✓	x	x	x
Critical success factors for on-line course resources	Soong et al. (2001)	✓	✓	x	x	✓	x	✓	x	x	x	x	x	✓	✓	x	x	✓	✓	✓	✓	x	x	x	x

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Strategies for assuring the quality of online learning in Australian higher education	Oliver (2001)	✓	✓	✓	x	✓	x	✓	x	✓	x	✓	✓	✓	✓	x	x	✓	✓	✓	✓	✓	x	x	x
E-Learning QUICK Checklist	Khan (2005)	✓	✓	x	x	✓	x	x	✓	✓	✓	✓	x	x	x	x	x	✓	✓	✓	✓	✓	x	x	x
Organisational issues for e-learning Critical success factors as identified by HE practitioners	McPherson and Baptista Nunes (2006b)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	✓	✓	✓	✓	x	x
Flying High or Crash Landing? Technological Critical Success Factors for e-Learning	McPherson and Baptista Nunes (2006a)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	✓	✓	✓	✓	✓	✓	✓	✓	x	x

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Kindling a passion for acquiring new knowledge: critical success factors for creating appropriate curricula for e-Learning	McPherson and Baptista Nunes (2007a)	✓	✓	x	x	✓	x	✓	✓	x	✓	✓	✓	✓	x	x	x	x	x	x	✓	x	x	x	x
Negotiating the Path from Curriculum Design to E-Learning Course Delivery: A Study of Critical Success Factors for Instructional Systems Design	McPherson and Baptista Nunes (2007b)	x	x	x	x	x	x	x	✓	✓	✓	✓	✓	✓	x	x	x	x	x	x	x	x	x	x	x

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Critical issues for e-learning delivery: what may seem obvious is not always put into practice	McPherson and Nunes (2008)	x	x	x	x	x	x	x	✓	✓	✓	✓	✓	x	x	x	x	x	x	x	x	✓	x	x	x
Critical success factors for e-learning acceptance: Confirmatory factor models	Selim (2007a)	✓	✓	x	x	✓	x	✓	✓	✓	x	✓	x	✓	✓	x	x	✓	✓	✓	✓	✓	x	x	x
What drives a successful e-Learning? An empirical investigation of the critical success factors influencing learner satisfaction	Sun et al. (2008)	✓	✓	x	x	✓	x	✓	✓	x	✓	✓	x	x	x	x	x	✓	✓	x	✓	✓	x	x	x

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Critical success factors in e-learning ecosystems: a qualitative study	Sridharan, Deng, and Corbitt (2010)	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	x	x
A web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	✓	✓	✓	✓	✓	x	x	✓	x	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	x	✓	x	x	x	x
Critical Success Factors for the continuation of e-learning initiatives	McGill, Klobas, and Renzi (2014)	x	x	x	x	x	x	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	✓	✓	x	x	x
Anonymity and learning in digitally mediated communications:	Baggio (2011)	x	x	x	x	x	x	x	x	x	x	x	x	✓	x	x	x	✓	✓	✓	x	✓	✓	✓	✓	✓

Literature Review	Author(s) & Year	Content Management					Personalised Learning		Pedagogy					Collaboration		Web 3.0 System					Support		Trust		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
authenticity and trust in cyber education																									
Trust, collaboration, e-learning and organisational transformation	Mason and Lefrere (2003)	x	x	x	x	x	x	x	x	x	x	x	x	✓	x	x	x	x	x	✓	x	x	✓	✓	✓
Building Trust in E-Learning	Wang (2014)	✓	✓	x	x	✓	x	✓	✓	✓	x	✓	x	✓	x	x	x	✓	✓	✓	✓	✓	✓	✓	✓
Trust Online	Friedman, Khan, and Howe (2000)	x	x	x	x	x	x	x	x	x	x	x	x	✓	x	x	x	✓	✓	✓	x	x	✓	✓	✓
Building trust and shared knowledge in communities of e-learning practice	Jameson et al. (2006)	x	x	x	x	x	x	x	x	x	x	x	x	✓	✓	x	x	x	x	x	x	x	✓	✓	✓

Literature Review	Author(s) & Year	**Content Management**					**Personalised Learning**		**Pedagogy**					**Collaboration**		**Web 3.0 System**					**Support**		**Trust**		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Trust in electronic learning and teaching relationships: the case of "WINFO-Line"	von Kortzfleisch and Winand (2000)	x	x	x	x	x	x	✓	✓	x	x	✓	x	✓	✓	x	x	✓	✓	x	x	x	✓	✓	✓
Successful implementation of e-learning Pedagogical considerations	Govindasamy (2001)	✓	✓	✓	✓	✓	x	x	✓	✓	✓	✓	✓	x	x	x	x	x	x	x	✓	✓	x	x	x
An exploratory study of the critical success factors affecting the acceptability of E-learning in Nigerian universities	Folorunso, Shawn Ogunseye, and Sharma (2006)	x	x	x	x	x	x	✓	x	x	x	x	x	x	x	x	x	✓	✓	✓	x	✓	x	x	x
A taxonomy of factors to promote quality	Fresen (2007)	✓	✓	✓	x	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	x	x

Literature Review	Author(s) & Year	Content Management					Personalised Learning		Pedagogy					Collaboration		Web 3.0 System					Support		Trust		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
web-supported learning																									
Critical Success in E-learning: An Examination of Technological and Institutional Support Factors	Masrom, Zainon, and Rahiman (2008)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	✓	✓	✓	x	✓	x	x	x
Critical Success Factors for Online Distance Learning in Higher Education: A Review of the Literature	Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012)	✓	✓	x	x	✓	x	x	✓	x	✓	✓	x	✓	✓	x	x	✓	✓	✓	✓	✓	x	x	x
Critical Success Factors in E-learning: An Examination of	Musa and Othman (2012)	x	x	x	x	x	x	x	x	x	x	x	x	✓	✓	x	x	x	✓	✓	x	x	x	x	x

Literature Review	Author(s) & Year	Content Management					Personalised Learning		Pedagogy					Collaboration		Web 3.0 System					Support		Trust		
		Content creation	Content retrieval	Content reuse	Knowledge representation	Search	Student model	Lecturer's Characteristics	Syllabus	Course design and	Assessment and evaluation	Teaching Strategies	Context	Interaction	Sharing of resources	Knowledge and other repositories	Ontologies	Usability	Accessibility	ICT Infrastructure	Instructional Support	Organisational Support	Technology reliability and security	Trust between students	Trust between students and lecturers
Technology and Student Factors																									
Critical success factors for adoption of web-based learning management systems in Tanzania	Lwoga (2014)	✓	✓	x	x	✓	x	✓	x	x	x	x	x	✓	✓	x	x	✓	✓	✓	x	x	x	x	x

Given the above-mentioned gaps, this study aims to develop a holistic E-learning 3.0 model that captures both the Semantic Web characteristics and E-learning CSFs. To the best of the researcher's knowledge, no systematic work exists on characterising a collective set of factors for E-learning 3.0, capturing both Semantic Web characteristics and E-learning CSFs. The proposed model is not exhaustive as it does not claim to capture every possible characteristics and sub-characteristics for E-learning 3.0 model. However, the focus is on articulating the most prominent factors of E-learning 3.0 through the combination of the Semantic Web characteristics and E-learning CSFs, derived from numerous previous studies, as outlined in the literature review, so that the proposed initial holistic E-learning 3.0 model can be evaluated empirically as an integrated entity.

The initial holistic E-learning 3.0 model is now ready to be defined and discussed in the next section, followed by the research scope which will provide more information about Mauritius, where the research will be conducted.

2.11 The Initial Holistic E-learning 3.0 Model

The initial holistic E-learning 3.0 model has been developed from the combined characteristics of Semantic Web and E-learning CSFs as outlined in Table 2.8 and discussed in Section 2.9. It consists of seven main characteristics namely 'Content Management', 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Web 3.0 System', 'Support' and 'Trust', each with a number of associated sub-characteristics, as shown in Figure 2.30 below. Appendix A and Appendix B show the related works from the literature review for the seven main characteristics and their associated sub-characteristics. The components of the initial holistic E-learning 3.0 model are discussed next.

2.11.1 Content Management

Oliver (2001) pointed out the criticality of the prevalence of learning materials and resources within the E-learning settings. Pertaining to that, 'Content Management' is one of the main characteristics of the initial holistic E-learning 3.0 model and refers to the management of learning resources within the E-learning 3.0 environment. It includes the creation, retrieval, reuse and searching of learning materials as well as the maintenance and manipulation of content to allow knowledge to be constructed (Karunasena, Deng and Zhang 2012). 'Content creation' refers to the creation and provision of learning resources within the online environment while 'Content

retrieval' refers to the access of learning materials and resources (Stojanovic, Staab and Studer 2001; Moreale and Vargas-Vera 2004; Dwivedi and Bawankan 2013). 'Content reuse', especially via the use of reusable learning objects, is considered as a fundamental component of online learning courses to assist in making the development and production of learning resources more cost effective and less time consuming (Oliver 2001). Sridharan, Deng, and Corbitt (2010, 264) consider the "*effective management of learning resources through capturing, eliciting, organizing, retrieving and reusing various learning resources*" and the "*identification of the characteristics describing learning resources for their reuse*" to be key considerations for content management within an E-learning environment. In fact, the description of learning resources, in terms of metadata, allows for resources to be combined into useful learning materials, thereby promoting reuse (Stojanovic, Staab and Studer 2001). As stated by Govindasamy (2001, 292), "*content must be designed and developed in smaller manageable chunks*", known as learning objects and be tagged with metadata to assist in the process searching and locating. Semantically annotated learning materials, together with the use of ontologies, enable the organisation of customised learning courses that can be delivered to users based on their needs (Stojanovic, Staab and Studer 2001). Hence, 'Knowledge representation' as another sub-characteristic under 'Content Management' represents learning resources' descriptions, annotation and semantic mark ups. Furthermore, Stojanovic, Staab, and Studer (2001, 5) stated that learning material, in itself, "*is useless, unless it can be searched and indexed easily*". Therefore, the 'Search' sub characteristic of 'Content Management' captures the querying and the searching of learning materials and resources in the E-learning 3.0 environment by users or pedagogical agents.

2.11.2 Personalised Learning

'Personalised Learning', as another main characteristic of the initial holistic E-learning 3.0 model, is considered a critical aspect of semantic systems and refers to the provision of tailored learning contents to students based on their needs, (Bucos, Dragulescu and Veltan 2010). Its first sub-characteristic, the 'Student model', is where "*individual learners differences and the profiles of individual learners*" are considered for the provision of personalised learning within a Web based learning environment (Šimić, Gašević and Devedžić 2004, 11)**.** The E-learning system needs to capture the students' profiles by "*creating a specific model*" that describes the skills, knowledge,

predisposition, interests and learning styles of students such that customised educational contents can be delivered to them based on the model (Šimić, Gašević and Devedžić 2004, 3). Similarly, the literature review of E-learning CSFs revealed the 'Student's characteristics' as a critical factor for consideration in E-learning and include the student's technical competence, the mindset, the predisposition and prior experience (Volery and Lord 2000; Soong et al. 2001; Oliver 2001; McPherson and Baptista Nunes 2007a; Selim 2007a; Fresen 2007; Musa and Othman 2012). Consequently, the student profiles and characteristics to support personalised learning customised to students' needs are represented by the sub-characteristic 'Student model'. Additionally, the provision of a personalised learning environment requires contribution and support from the lecturers. They must be able to disregard the traditional way of teaching, embracing teaching approaches that make learning more collaborative where students are active participants in their learning rather than passive recipients of learning materials and knowledge. Lecturers' attitudes towards the technology and their students, their technical competence, skills and experiences, their involvement, in terms of time and effort they put into the resources, and their motivation and mindset to operate within the E-learning environment were critical aspects found in the literature for E-learning and hence 'Lecturer's characteristics' was considered as another sub-characteristic of 'Personalised Learning' (Volery and Lord 2000; Soong et al. 2001; Oliver 2001; McPherson and Baptista Nunes 2007a; Selim 2007a; Sun et al. 2008; McGill, Klobas and Renzi 2014; Wang 2014; Lwoga 2014; Fresen 2007).

2.11.3 Pedagogy

A recurrent characteristic of the Semantic Web characteristics and E-learning CSFs and a main characteristic for the initial holistic E-learning 3.0 model is 'Pedagogy'. As stated by McPherson and Baptista Nunes (2006a, 7), "*when adopting ICT technology, pedagogical thinking cannot be ignored".* Govindasamy (2001, 296) stated that failure to consider pedagogical principles when implementing E-learning can significantly undermine the implementation process and can result "*in faculty members resisting the change, learners staying away from the e-Learning courses, poor performance of learners, and poor quality of content*" amongst others. Sridharan, Deng, and Corbitt (2010) pointed out that sustainable E-learning is dependent upon the effective combination of technologies, learning resources management and

pedagogical considerations with a learner centered focus. The sub-characteristics associated with Pedagogy comprise all the different factors that must be considered to allow students to acquire knowledge and develop skills based on their individual needs. They are the syllabus to be delivered, the course design and sequencing, the assessment and evaluation for and of the courses, the teaching strategies employed within the learning environment, and contextualised delivery of learning materials. Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012) stated that clear learning goals and objectives and clear syllabus are critical pedagogical aspects. As such, the sub-characteristic 'Syllabus' provides the road map for the students to navigate through the course content and deliverables and consists of the guidelines and overview of the courses within the E-learning 3.0 environment. Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012) also pointed out that a clearly defined learning pathway that allow students to define their own learning to meet specific needs, and well-designed learning materials are critical pedagogical aspects to be considered. As stated by Pah et al. (2007), students will not care about didactics as long as their needs are not satisfied and the necessary information is not delivered to them. With the benefits of having semantically enriched learning content through ontologies and metadata, providing resources to students based on their needs is made possible. Hence, 'Course design and sequencing' as another sub-characteristic of 'Pedagogy', relates to the structure and coherence of the different courses' components including the learning materials and resources and how these are presented to students, in terms of the learning and content sequence, to facilitate meaningful learning within the E-learning 3.0 environment (Devedzic 2004; Ghaleb et al. 2006; Shrivastava, Sharma and Bawankan 2012). The 'Assessment and evaluation' sub-characteristic refers to the monitoring of students' progress and performance throughout the course and measures the progress towards objectives and outcomes and evaluates the online course in terms of learning that is occurring (Selim 2007a). The 'Teaching strategies' sub characteristic is where lecturers employ multiple teaching strategies to ensure that the students' educational needs are met, rather than just simply delivering learning content to them (Jinghua 2011; Karunasena, Deng and Zhang 2012). It is about matching learning content to pedagogical aspects and ensuring that learners are responsible for and actively engaged in their learning (Neri 2005; Pah et al. 2007; Snae and Brueckner 2007; Neri and Colombetti 2009). This is further supported by 'Context' as another sub-characteristic, whereby learning content are described and

linked to a context to allow for context-relevant searching and delivery of learning materials according to students' preferences (Ghaleb et al. 2006).

2.11.4 Collaboration

"Effective online learning environments require some forms of interaction and collaboration among students as well as between learners and instructors" (Cheawjindakarn, Suwannatthachote and Theeraroungchaisri 2012, 63). Such interactions include discussions between learners, between learners and instructors, participation in group learning and the exchanging of resources (Karunasena, Deng and Zhang 2012). Hence, 'Collaboration', as another main characteristic for the initial holistic E-learning 3.0 model, has 'Interaction' and 'Sharing of resources' as its sub-characteristics. In fact, collaboration between students and their peers, between students and their teachers and between learners and the study materials can help solve problems and improve learning effectiveness and progress (Sun et al. 2008). Furthermore, given that learning is a social process, interactions within the E-learning environment allow students to be active participants in the learning process, through discussions, feedback and the sharing of resources and knowledge, thereby promoting greater opportunities for effective and in-depth learning (Soong et al. 2001; Snae and Brueckner 2007).

2.11.5 Web 3.0 System

The characteristic 'Web 3.0 System' consists of the E-learning system enriched with Semantic Web technologies including the use of ontologies. As another main characteristic identified for the initial holistic E-learning 3.0 model, it consists of 'Knowledge and other repositories', 'Ontologies', 'Usability', 'Accessibility' and 'ICT infrastructure' as its sub-characteristics. The 'Knowledge and other repositories' sub characteristic represents all repositories and storage within the E-learning 3.0 environment including students' records, annotated learning content and their associated metadata, inference rules, course descriptions and other information such as students' models (Shamsi and Khan 2012; Ghaleb et al. 2006; Stojanovic, Staab and Studer 2001). 'Ontologies' as discussed in sections 2.5.3 and 2.6, provide the framework to support the knowledge bases required for Semantic Web to facilitate the access to and the sharing and reuse of learning contents. As Pah et al. (2007, 285) stated, ontologies are the "*binding factor that bring various knowledge items and processes together*", to allow for the "*interrelating, combining and thus reusing*"

resources and knowledge units for knowledge construction. Furthermore, the system navigation and the interface design should be user-friendly and facilitate the learning experience of the learners within the E-learning environment (Volery and Lord 2000; Cheawjindakarn, Suwannatthachote and Theeraroungchaisri 2012). Hence, 'Usability', as another sub-characteristic of 'Web 3.0 System', captures clear and logical navigation of the course within the E-learning environment including consistent and user-friendly visual structure allowing students to quickly find what they are looking for. Learners should also be able to access the course without technical or navigational errors (Baggio 2011). Thus, as another sub-characteristic of 'Web 3.0 System' is 'Accessibility' in terms of learning materials access, technology access by students and instructors and access to the ICT infrastructure as explained by McPherson and Baptista Nunes (2006a). Additionally, Semantic systems can positively affect access to learning materials by providing structured databases that allow better knowledge handling by machines through the use of ontologies (Bucos, Dragulescu and Veltan 2010). E-learning creates the "*necessity for effective and efficient systems for the storage, delivery and access of online courses*" such that "*the provision of adequate technology infrastructure for online learning is an expense that all institutions need to face* (Oliver 2001, 227). Therefore, "*ensuring that the university IT infrastructure is rich, reliable and capable of providing the courses with the necessary tools to make the delivery process as smooth as possible is critical to the success of e-learning"* (Selim 2007a, 399). This includes the need for a "*stable and consistent platform*" to cater for materials development and course delivery as well as the provision of adequate and reliable technology access with robust security, data protection, adequate transmission and communication with appropriate bandwidth and reliable hardware and software (Oliver 2001, 227; McPherson and Baptista Nunes 2006a; Selim 2007a). These are represented by the 'ICT infrastructure' sub-characteristic.

2.11.6 Support

'Support' consisting of 'Instructional support' and 'Organisational support' is another main characteristic of the initial holistic E-learning 3.0 model. Baggio (2011, 18) pointed out that in the online learning environment, it "*is very important that learners feel supported by humans, but also by the technology system through which they access the content"*. Oliver (2001, 225) stressed the importance of teacher support and how

"*it is necessary for institutions to ensure that their teachers have appropriate skills and expertise in not only the delivery of online courses and programs but also their design and development"*. Support in terms of training offered to both students and lecturers to allow them to *"proactively embrace innovative technologies"* within an environment of multiple teaching styles, prompt provision of feedback and encouragements to students for their learning and interactive activities are considered critical (Sridharan, Deng and Corbitt 2010, 276; Karunasena, Deng and Zhang 2012). The sub characteristic 'Instructional support' represent these. In terms of 'Organisational support', both students and teachers need support from their institutions in order to effectively engage within an E-learning environment (Pah et al. 2007). As stated by McPherson (2002), the organisation has the power to facilitate and control the development of E-learning courses since all forms of formal e-learning occur within an organisational context. Hence, 'Organisational support', as another sub-characteristic, constitutes of technical support such as IT support and helpdesk, financial and administrative support through the provision of appropriate infrastructure and its maintenance, management initiatives in terms of staffing, training, ethical considerations, E-learning courses evaluation and promotion and learning content support through the adequate provision of learning content that meet students' needs (Khan 2005; McPherson and Baptista Nunes 2006b; McPherson and Nunes 2008; Masrom, Zainon and Rahiman 2008).

2.11.7 Trust

Trust is essential to ensure effective commitment and to reduce the level of uncertainty within the E-learning environment (Wang 2014) and is, therefore, one of the main characteristics of the initial holistic E-learning 3.0 model. Wang (2014, 11) further stated that trust is central to the success of E-learning and defined it as "*the degree to which a student is willing to rely on the e-learning system and has faith and confidence in the instructor*". The system needs to be secure and reliable so that students can "*overcome the fear of potentially wasting time and money, disclosing sensitive information, and losing submitted work*" Wang (2014, 10). Hence, 'Technology reliability and security' is one of the sub-characteristics of 'Trust'. An effective online learning environment necessitates that learners establish relationships that enhance feelings of safety and trust. Hence, 'Trust between students', as another sub-characteristic, is critical especially for knowledge sharing, collaborative activities, and

consensus building with the learning environment (Mason and Lefrere 2003; Jameson et al. 2006). 'Trust between students and lecturers' is considered a pre-requisite for maximal learning to occur. Feedback on students' learning progress through different evaluation and assessment methods and tools allows learners to perceive that they have established a connection between them and the instructors, thereby reinforcing trust in the system and promoting more effective learning and user satisfaction (Sun et al. 2008).

2.11.8 The initial holistic E-learning 3.0 model

The resulting E-learning 3.0 model, as shown in Figure 2.30, is a holistic synthesis of Semantic Web characteristics and E-learning CSFs derived from the literature review. Consequently, the proposed model addresses one of the major gaps identified in this literature review, namely the lack of a collective set of characteristics that captures key Semantic Web characteristics and E-learning CSFs. It is envisaged that, by studying this model from the perspective of Mauritian higher education, the dearth of E-learning 3.0 in the mostly unexplored context of a small island developing state and the lack of empirically validated E-learning 3.0 models in developing countries will be addressed. The initial holistic E-learning 3.0 model proposed below will be further enriched by data collected from key stakeholders, namely students, lecturers and administrative personnel, from the higher education institutions in Mauritius. The proposed model at the end of this study is intended to work as a blueprint for future researches for E-learning 3.0 implementation in Mauritius and other developing countries.

The next section defines the research scope and provides an overview of the Mauritian context on which this study will be based on.

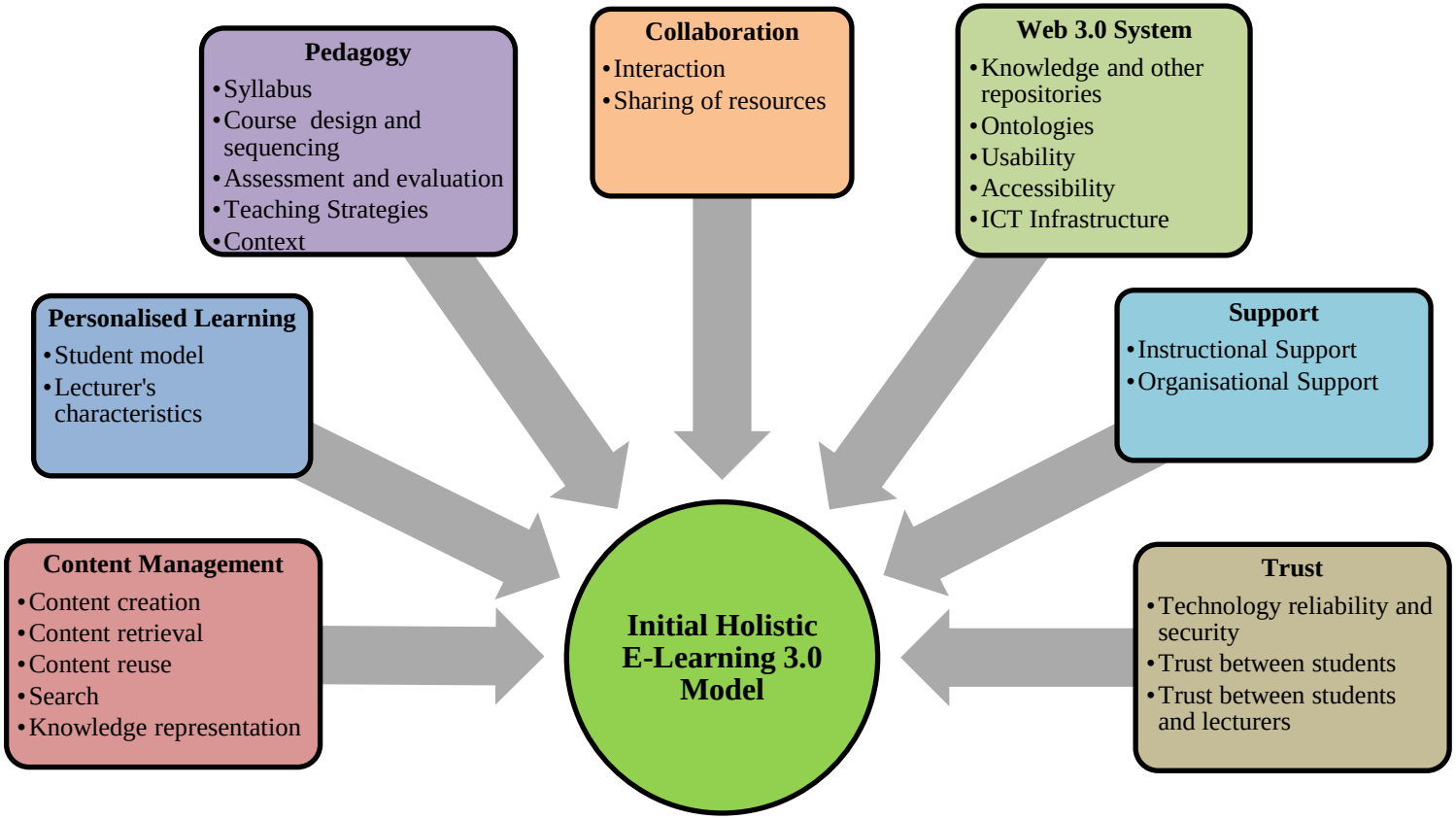


Figure 2.30: Initial Holistic E-learning 3.0 Model – Prepared by the Researcher

2.12 Research scope

As identified in the research gaps, there is a lack of empirical findings within small island developing states when it comes to E-learning 3.0. In an attempt to bridge this gap as well as to develop a holistic and realistic E-learning 3.0 model, this research is applied to higher education institutions in Mauritius, which despite being a small island developing nation, has achieved great successes in its higher education sector as discussed in the sections below.

2.12.1 The Mauritian context

Discussions on developed and developing countries in terms of both the Semantic Web characteristics and E-learning CSFs have, so far, shown that researches among developing nations concentrated mostly on upper-income range economies with only few studies conducted on low-income range economies. Moreover, a clear lack of research on E-learning 3.0 amongst Small Island Developing States has also been observed. Mauritius is a middle-income, small island developing country with a high IT dependency (The World Bank 2016). In fact, the ICT sector has now been propelled into its new role as the third pillar of the Mauritian economy, after the finance and tourism sectors (Oolun, Ramgolam and Dorasami 2012). In view of repositioning the country to meet the needs of an increasingly competitive knowledge based and globalised economy, the Government of Mauritius aims to make the country a regional multi-disciplinary centre of excellence. In fact, the Mauritian Government in recent years has been aiming to transform the country into a knowledge hub which is "*responsive to new ideas and technological change*" with "*knowledge intensive*" sectors engaging in lifelong learning (Human Resource Development Council 2006, 2). The knowledge hub will have as functions "*the generation, application and transmission of knowledge, making a close link between educational institutions, service providers and firms*" (Pudaruth et al. 2010, 1). As stated by Gokulsing (2014, 452), the idea of a knowledge hub "*is concerned with building a country's capacity to better integrate itself into the global economy, through the generation, acquisition and transmission of knowledge to support of various economic sectors, in view of fostering social and economic development*". Central to the positioning of the country as a knowledge hub and making it a key player in the region is the "*considerable emphasis*" that needs to be laid on the post-secondary education sector *"making it of a world class status, in order to attract international students, reputable institutions*

of higher learning and highly-qualified academics and researchers worldwide" (Human Resource Development Council 2006, 10). In fact, Mauritius aims to become a centre of excellence in education, attracting students from all over the regions as well as international universities (Pudaruth et al. 2010; National ICT Strategic Plan 2007; Gillwald and Islam 2011). However, this also implies dealing with the major constraint of capacity in terms of infrastructure and trained labour force. As one of the solutions to this capacity hurdle, the country has been giving more attention to E-learning as an option for the delivery of education, especially post-secondary studies, at a cheaper cost (Pudaruth et al. 2010). With the Government heavily investing in the ICT sector, E-learning is seen as part of the solution in converting the country into a knowledge hub, while at the same time assisting with increasing and widening access to higher education and complementing the educational infrastructure needs that come with it (Pudaruth et al. 2010). To this regard, Mauritius is, undeniably, a strong candidate for E-learning 3.0 as discussed in the next sections.

2.12.2 Mauritius and ICT

Mauritius is on the verge of becoming a digital island according to Pudaruth et al. (2010). The country is considered to be at the "*forefront of digital development*" with a "*large segment of its ICT policy being dedicated to education*" (Hennessy et al. 2010, 29). According to the Budget 2014, the Government of Mauritius is "*investing heavily on digitization of education*" with around 1.2 billion rupees allocated to the acquisition of computer devices for students (Ministry of Finance and Economic Development 2014, 9). The National ICT Strategic Plan was a five-year plan introduced in order to bring ICT to the forefront of the economy in the larger quest of making the country an ICT hub regionally and globally (Gillwald and Islam 2011). The plan provides significant policy guidelines to "*successfully embrace the knowledge economy journey and to respond to the dynamic changes occurring*" in the ICT sector (Oolun, Ramgolam and Dorasami 2012, 162). It focuses on strategic areas of intervention including improved access through a comprehensive broadband strategy, a review of the legal and regulatory ICT framework in the country, human resources requirements including the need to create an "*ICT literate nation*" and the strengthening of the cyber security framework, amongst others (Oolun, Ramgolam and Dorasami 2012, 162). The country is ranked first in the African region for ICT development (International Telecommunications Union 2015). Its ICT development Index, which measures the

progress of economies towards becoming information societies, is on the rise, recording a 33% increase from 2013 to 2014 (Statistics Mauritius 2015). The quality of the Internet access continues to improve with incoming and outgoing capacity increasing by 43.3% to 17,077.0 mbps and bandwidth for incoming and outgoing traffic registering a rise of 43% per inhabitant at a rate of 13534.7 bits per second in 2014 (Statistics Mauritius 2015). To further promote access and to increase broadband penetration, the Government is supporting the installation of Wireless Fidelity (Wi-Fi) networks across the country (Oolun, Ramgolam and Dorasami 2012). In a bid to turn Mauritius into Intelligent Mauritius (i-Mauritius), the National Broadband Policy 2020 was introduced to strategically outline clear national goals and policies for broadband affordability and coverage including the commitment of resources to the development of infrastructure (Ministry of Information and Communication Technology 2012). ICT initiatives within the education sector, from the primary school level all the way to the tertiary education level, are now an integral part of the Government's agenda. The Government, while envisioning e-education plans, has put forward a number of schemes to transform the educational landscape using ICT and a number of projects related to e-learning (Tertiary Education Commission 2007; Gillwald and Islam 2011). Whether it is the increasing platform of digital tools and content in primary schools including the digitisation of primary school curriculum and the use of low cost technological equipment such as laptops and interactive projectors (the Sankore project), the one-to-one tablets project in secondary schools, increased training and support offered to staff on the use of educational technologies at the tertiary level or more investments in E-education initiatives, the country is endeavouring to align itself with global trends in education in line with its vision of becoming the knowledge hub and centre of excellence for post-secondary education in the region (Subrun and Subrun 2015; Gunness 2011).

2.12.3 Mauritius and education

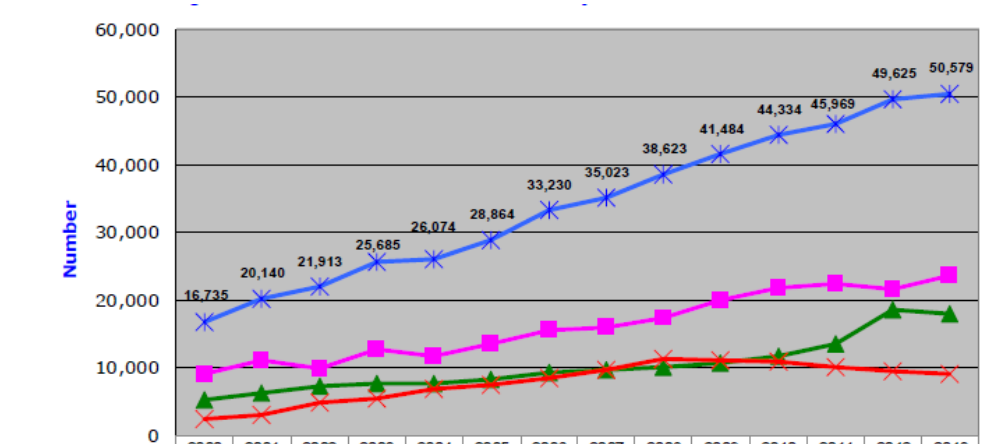
Education in Mauritius plays a key role in the country's success ever since its accession to independence in 1968. The country is ranked 45th in the world market place according to the Global Competitiveness Index 2013-2014 with education being a key contributing factor in the country's ability to emerge as a competitive economy over the years (Schwab 2014; Pudaruth et al. 2010). Investment in the education sector is a continuing reality in the country, since the advent of free education in 1976, with an

average of 13.5% of government expenditure directed towards the education sector (Statistics Mauritius 2014).

The Mauritian educational model is a 6-5-2 model with six years of primary education starting at the age of five, followed by five years of secondary education and then two years of higher secondary education, which is often followed by higher education at universities (Oolun, Ramgolam and Dorasami 2012). The education system in Mauritius, for many years, has been one which is "*exam-oriented*" with a highly competitive learning environment that "*promotes the development of memorisation and lower order thinking skills at the expense of creativity and higher order thinking*" and where knowledge is "*more often imposed instead of inviting critical thinking and reasoning from the learners*" (Ajaheb 2011, 3). "*Teaching methodologies put most of the onus on rote learning, and the assessment in examinations follow the same patterns*" where students answer the exams questions based on what they have memorised Rughooputh (2003, 10). However, recently, a shift to try and promote a learning environment, beyond the traditional face-to-face classrooms, where learners can "*acquire competencies like autonomous learning, collaborative working, authentic problem solving and an ability to adapt to a rapidly changing world*" could be sensed (National ICT Strategic Plan 2007, 71). This trend has been encouraged by the job markets seeking multi-skilled graduates who are capable of transferring and applying book knowledge to real-life situations, who can demonstrate critical thinking and who can working independently as well as collaboratively (Boulton-Lewis et al. 2001; Ackerman, Gross and Perner 2003). In fact, the Mauritian Government is aware of the importance of its human resource, as one of the country's most important resource, and wants to invest in education to enhance its human capital (Bunwaree 2001). With the Government's backing of a number of initiatives, the country is now aiming at reformed curricula with "*more emphasis on information, investigation, communication and social skills*", where learning content is adapted to real-life contexts, assessment methods are more diversified and instructional methods "*that stimulate active learning*" are employed with a strong "*focus on individual interests and needs*" (National ICT Strategic Plan 2007, 73). Students are encouraged to be more responsible for their own learning, with efforts being made side-by-side to promote a collaborative learning environment and to offer more options for flexible learning in terms of time and location.

2.12.4 Higher education in Mauritius

Higher education or post-secondary education is often referred to as tertiary education in Mauritius (Gokulsing 2014). "*Tertiary Education is expected to contribute significantly to building the skills and intellectual capacity of the country to enable it to sustain its development and creating a knowledge-based economy*" (Ministry of Education and Culture and Human Resources 2009a, 109). Consequently, Mauritius is experiencing a paradigm shift in its approach to tertiary education to support its quest to become the "*quality destination for higher education*" and knowledge hub in the region (Human Resource Development Council 2006, 11). Demand for post-secondary education registered a growth averaging 9.5% annually for the period 2000-2012 with a continuous increase in the number of enrolments in publicly-funded higher education institutions as shown in Figure 2.31 (Tertiary Education Commission 2014).



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Publicly Funded Institutions	9,057	11,021	9,880	12,710	11,713	13,397	15,464	15,880	17,372	19,882	21,766	22,442	21,562	23,627
Private / DE	5,255	6,100	7,242	7,507	7,515	8,110	9,293	9,612	10,003	10,663	11,661	13,464	18,603	17,994
Overseas	2,423	3,019	4,791	5,468	6,846	7,357	8,473	9,531	11,248	10,939	10,907	10,063	9,460	8,958
Total Enrolment	16,735	20,140	21,913	25,685	26,074	28,864	33,230	35,023	38,623	41,484	44,334	45,969	49,625	50,579

Figure 2.31: Evolution of Enrolment in Tertiary Education, 2000-2013

The higher education sector is dominated by the two main public universities, namely the University of Mauritius (UOM) accounting for around 24% of the total tertiary enrolment and the University Technology Mauritius (UTM) with around 10% (Tertiary Education Commission 2014). The country also has a number of other publicly-funded institutions, focussed on very specific fields including the Mauritius Institute of Education (MIE) for teacher training and education, the Mahatma Gandhi Institute (MGI) and the Rabindranath Tagore Institute (RTI) for Arts and Cultural studies, the Universite des Mascareignes (UdM) with Business Management and IT courses, the Mauritius Institute of Training and Development (MITD) mostly

delivering engineering courses at the Diploma level, the Mauritius Institute of Health (MIH) offering diploma in the nursing and emergency medicine fields and the Fashion and Design Institute (FDI) offering fashion and design courses. Overall, the publicly-funded tertiary institutions accounts for around 47% of the total student enrolments in the country with the rest being provided by overseas universities (around 18%), private providers and distance mode education (around 35%) (Tertiary Education Commission 2014).

Interestingly, 19.3% of the student population (9769 students in total) pursued tertiary education through distance mode in 2013 (Tertiary Education Commission 2014). In fact, Mauritius is now trying to promote Web-based learning as a supplementary approach to traditional teaching methods and as a collaborative tool for distance education (Pudaruth et al. 2010).

2.12.5 E-learning and the need for E-learning 3.0 in Mauritius

The concept of distance education in Mauritius emerged in the 1990s with a Centre for Distance Learning established in 1993, following the need to adapt teaching and learning strategies that meet the needs and expectations of students and lectures, especially in areas where conventional teaching and learning methods were inadequate (Santally 2012). The Virtual Centre for Innovative and Lifelong Learning (VCILT) was created in 2001, as a sub unit of the University of Mauritius, with main objective to pioneer E-learning in the country in an effort to modernise the distance education concept (Virtual Centre for Innovative Learning Technologies 2015a). The Centre provided its first virtual campus on behalf of the University of Mauritius in 2001 offering five online and Web-enhanced modules in collaboration with Simon Frasier University (Santally and Senteni 2005). The aim of such initiative was to provide a framework whereby resources and technology are made available to students and staff in an environment supporting flexible teaching and learning (Santally and Senteni 2005). Alongside that initiative was the Learning Object Repository (LOR) project whereby learning content were to be described using metadata to allow for reusability and interoperability in order to reuse and share resources internally and with the external world (Santally, Govinda and Senteni 2004). Since then, the VCILT has moved into the prominent role of the main E-learning provider for higher education in the country and leader in E-learning and education technology, with a number of key E-learning initiatives to its name (Virtual Centre for Innovative Learning Technologies

2015a). Now operating under the name of the Centre for Innovative Lifelong Learning (CILL) since 2014, it is responsible for providing and developing initiatives for lifelong learning, supporting students and instructors to operate within an E-learning environment and challenging traditional pedagogical prototypes for effective teaching and learning. It has evolved into a centre responsible for E-learning delivery and for supporting academics to operate within an E-learning environment with respect to technology, pedagogy and management tools for learning content preparation (Virtual Centre for Innovative Learning Technologies 2015a). The CILL now offers a range of online/semi-online courses for the University of Mauritius, ranging from the Diploma level up to the Masters level, as well as targeting specific E-learning aspects including courses on education technology focussing on current practices regarding the design and development of learning resources within an E-learning environment and courses for educators, academics and E-learning practitioners to empower them in their E-learning confidence and approaches (Virtual Centre for Innovative Learning Technologies 2015b). With CILL positioning itself as a pioneer in E-education in the country, it aspires to become a leader in E-learning and education technology in the region and globally (Virtual Centre for Innovative Learning Technologies 2015a).

With the growing impetus of promoting Web-based learning, and as a concrete initiative to denote the sincere effort towards E-learning by the Government, Mauritius witnessed the opening of its first Open University in 2012, namely the Open University of Mauritius (OUM) (Open University of Mauritius 2014). It has as its main aim the use of technology and flexible learning mode to promote better quality education, lifelong learning and training accessibility where learners can study without the need to be physically present on a university campus (Open University of Mauritius 2014; Pudaruth et al. 2010). Since then, the OUM has been running over 70 programmes in open and distance learning mode thereby "*freeing learners from constraints of time and place*" and increasing access to education (Open University of Mauritius 2015, 9)
.

As demand for higher education continues to increase in Mauritius, aligned with the Government's aim of having one graduate per family, E-learning is considered a favourable initiative for greater access to tertiary education by eliminating the need to travel to traditional institutions and be confined to particular schedules and overcoming issues related to limited classroom capacity and prohibitive costs of building new facilities (Santally 2012; Wagner, Hassanein and Head 2008). In fact,

with the reinforcement of the country's ICT infrastructure, supported by the shift towards a student-centered learning environment, E-learning is an attractive alternative to promote flexible learning within the country and to attract international universities and students from all over the region. As it is, Mauritius is "*an ideal platform to attract students from Sub-Saharan Africa*" for higher education since the regulatory framework is already in place to allow foreign universities and tertiary educational institutions to legally operate within the country (Gunness 2011, 5).

However, despite initiatives by the CILL and the Government, there has been an overall under-utilisation of technologies to enhance learning, with E-learning platforms usually seen as a means of delivering information on the Internet in static ways (Pudaruth et al. 2010). Thus, critical for the move to E-learning and modern distance education technologies are the requirements for an underlying educational and pedagogical model for the design and development of courses as well as a learner support model to avoid "*the trap of e-learning technologies misconceptions*" where E-learning is simply "*just go on Moodle.org, download and install the learning platform, put some contents, enrol your students and there you go!*"(Santally 2013, 21).

With the Semantic Web seen as a promising technology to meet E-learning requirements, and Mauritius's willingness to transform its educational landscape through ICT and E-education, it is the ideal candidate for this study. The development of an E-learning 3.0 model for the Mauritian higher education sector will not only address the dearth of researches in E-learning 3.0 for Small Island Developing States but will also provide critical insights towards the sustainable implementation of E-learning 3.0, that align with the vision and strategic planning of the Government and tertiary institutions in the country. Previously outlined initiatives like the LOR project, which has laid down the basis for key E-learning 3.0 aspects such as learning content descriptions and reuse, as well as a continually improving attitude to encourage new pedagogical approaches through the use of new education technologies, personalised learning and collaboration, further support this claim (Santally and Senteni 2005, 2006; Gunness 2011). With Mauritian higher education institutions such as the University of Mauritius through the CILL showing keenness to pioneer new E-learning initiatives including embracing new emerging technologies and adopting new innovative practices, such a model can be a "*realistic*" representation of E-learning 3.0, highlighting the gap between theory and practice with respect to the critical aspects for considerations for a sustained and effective adoption and implementation

of E-learning 3.0 in the context of this small developing nation. Additionally, with Mauritius aspiring to become a leader in higher education, E-learning and education technology in the region (Veer Ramjeawon and Rowley 2017; Virtual Centre for Innovative Learning Technologies 2015a), the E-learning 3.0 model can be extended to other developing countries with similar E-learning agendas, while laying the foundation for future researches in E-learning 3.0 for developing countries, particularly small island developing states.

This study will be conducted within the contexts of public and private higher education institutions in Mauritius. It is envisaged that the resulting E-learning 3.0 model from this study will encourage higher education institutions in Mauritius to exploit their E-learning potential, thereby meeting their goals and those of the Government.

2.13 Chapter summary

Chapter 2 provides a critical review of the literature on Semantic Web characteristics and E-learning CSFs to frame this work. It outlines the evolution of the Web from Web 1.0 to Web 3.0 and explains the Semantic Web and ontologies in the context of Web 3.0. A parallel is then drawn between the evolution of the Web and E-learning, with further details provided on E-learning 3.0 and the layers of the Semantic Web. A large portion of this chapter is dedicated to a comprehensive review of works carried out on Semantic Web characteristics and E-learning 3.0 models. This led to the identification of some key Semantic Web challenges resulting in a critical review of E-learning CSFs. Both the reviews highlight recurring themes across the Semantic Web characteristics and E-learning CSFs.

The reviews also depict the critical need for a holistic E-learning 3.0 model and reemphasises the significance of this research because none of the previous works on Semantic Web characteristics, E-learning 3.0 models and E-learning CSFs captured all the characteristics that emerged from these reviews. Semantic Web characteristics and E-learning CSFs identified were therefore merged to generate a new initial E-learning 3.0 model backed by research theory.

The initial holistic E-learning 3.0 model is enhanced by studying it within the higher education sector of a small island developing nation, namely Mauritius, thereby addressing a critical gap in the literature. The chapter highlights some key aspects of the Mauritian economy and E-learning trends to provide some context within which the study will be carried out.

The next chapter discusses the research objectives, research questions and the theoretical and practical significance of this study. The research methodology adopted in this study is then elaborated.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the main elements that drive this research. The research objectives are elaborated, based on which the research questions are framed. Addressing the 'why' of this research, the theoretical and practical significance of developing a holistic E-learning 3.0 model within the Mauritian higher educational context are discussed next. The rest of the chapter focuses on the research methodology adopted in this study to answer the research questions. The choice of the IS research paradigm, the research approach and the research methods and design used in this study are presented. Details are provided on the data collection and analysis for this study followed by how the outcomes are presented to the readers. The chapter ends with details about the ethical considerations, an overview of the research process and the chapter summary.

3.2 Research objectives and Research questions

The aim of this research is to identify the E-learning 3.0 characteristics required to develop a holistic E-learning 3.0 model, consisting of Semantic Web characteristics and E-learning critical success factors (CSFs). The crucial need for such a model was discussed and evidence in Chapter 2, which denoted a clear gap in the categorisation of a collective set of factors for E-learning 3.0, following a rigorous and structured search approach in the literature review. Despite the many similarities between Semantic Web characteristics and E-learning CSFs, the literature revealed that works on E-learning 3.0 models inclined more towards the technology with often limited or no discussions on other critical aspects of E-learning, while the entwined aspects of E-learning CSFs are often overlooked. As shown in Table 2.9, models in the literature failed to capture all the different and critical characteristics for E-learning 3.0 based on a combination of Semantic Web characteristics and E-learning CSFs. Consequently, the need to have a holistic representation of E-learning 3.0 based on Semantic Web characteristics and E-learning CSFs constitutes the basis of this research.

Mauritius, as discussed in Chapter 2 (see Section 2.12), is an ideal candidate for this study for several reasons: (1) the Mauritian Government's initiatives to transform the country's educational landscaping through ICT and E-education, particularly within

the tertiary education sector (Gillwald and Islam 2011; Human Resource Development Council 2006), (2) its quest to be the knowledge hub in the region as well as a leader in E-learning and education technology within higher education (Human Resource Development Council 2006; Veer Ramjeawon and Rowley 2017), (3) its keenness to pioneer new E-learning initiatives including embracing new emerging technologies and adopting new innovative practices (Virtual Centre for Innovative Learning Technologies 2015a) and (4) its contribution to address the lack of empirically validated research in the field of E-learning 3.0, particularly from the perspective of small island developing countries (as outlined in section 2.10). Therefore, the study focuses on the development of a holistic E-learning 3.0 model for Mauritian higher education institutions. It seeks to gather the perceptions of the main users of E-learning systems including students, lecturers and administrative personnel (those staff engaged in course creation and development) from higher education institutions.

It is envisaged that this study will provide critical insights into the factors to be considered for a holistic representation of E-learning 3.0 for Mauritian higher education institutions. This will facilitate the development of an E-learning 3.0 model that provides a realistic guide for the adoption and sustained implementation and use of E-learning 3.0 to key higher education stakeholders including the tertiary institutions and the Government.

3.2.1 Research objectives

The main objective and sub-objective of this research are, therefore:

- **Main Objective**

  Determine the E-learning 3.0 characteristics required to develop a holistic E-learning 3.0 model.

- **Sub-Objective**

  Ascertain the critical success factors of implementing and sustaining E-learning 3.0 in higher education institutions of Mauritius, based upon the perceptions and viewpoints of the education stakeholders.

3.2.2 Research questions

Based on the main and sub-research objectives, the research questions below have been framed to identify the E-learning 3.0 characteristics required for the development of the holistic E-learning 3.0 model.

- **RQ1**: What are the E-learning 3.0 characteristics required to develop a holistic E-learning 3.0 model?
- **RQ2**: What are the critical success factors of implementing and sustaining E-learning 3.0 in higher education institutions of Mauritius, based upon the perceptions and viewpoints of the education stakeholders?

3.3 Research significance

Addressing the 'why' of this research, two important contributions are made: theoretical and practical.

3.3.1 Theoretical contribution

This research proposes a new conceptual model for E-learning 3.0 taking into account the perception of students, lecturers and administrative personnel from the Mauritian higher education sector. It is significant as it contributes in bridging the gaps found in the literature (as discussed in Chapter 2) for a model that captures both Semantic Web characteristics and E-learning CSFs in a holistic way. Additionally, by taking into consideration the perspectives of students, lecturers and administrative personnel from the Mauritian higher education institutions, this research addresses the lack of empirically validated models with no or limited data evidence from participants. It also adds to the literature by providing an insight into E-learning 3.0 within the context of a small island developing nation, which remains highly unexplored as seen in the literature review. As a result, the model can be useful to other small island developing states with an agenda to embrace new technologies in their E-learning endeavours.

3.3.2 Practical contribution

From a practical angle, the outcomes of this research align with the E-learning and lifelong learning initiatives of tertiary institutions and the vision and strategic plans of the Government of Mauritius. The Centre for Innovative and Lifelong Learning (CILL), as discussed in section 2.12.4, is seeking to become a leader in E-learning and education technology in the region and globally, via the delivery of online/semi online courses (Virtual Centre for Innovative Learning Technologies 2015a). The University of Mauritius (UOM) continues to undertake University-wide strategies for the use of online learning with ongoing investments in the training of staff in innovative teaching practices (Tertiary Education Commission 2012). One such example is the mandatory

post-graduate certificate in teaching and learning for all academic staff at UOM with a module on Educational Technologies delivered fully online to better prepare the lecturers for online course delivery and the use of technology-enhanced teaching strategies (Gunness 2011). Similarly other public and private institution such as the University of Technology of Mauritius (UTM) and Charles Telfaire Campus, amongst others, continue to pursue innovative teaching practices with a student-centered focus through the delivery of innovative and contemporary curricula (University of Mauritius 2015; Tertiary Education Commission 2008; Charles Telfaire Campus 2015). The Open University of Mauritius (OUM) is strengthening the development and production of its online learning resources to provide world-class program delivery and continues to invest in its staff's professional development in open and distance learning and education pedagogy (Tertiary Education Commission 2015).

On the other hand, the Mauritian Government's vision and commitments to transform the country into a knowledge hub can be clearly seen in a number of its strategic plans, policies and investment initiatives (Human Resource Development Council 2006; Gillwald and Islam 2011; Ministry of Technology & Communication & Innovation 2018) . A key component to this endeavor is the expanding and strengthening of E-learning within tertiary institutions, supported by an increased investment in ICT infrastructure and a push towards a student-centered learning environment to promote lifelong learning (Ministry of Education and Culture and Human Resources 2009a; Gunness 2011; Tertiary Education Commission 2007). As the main regulatory Government body for tertiary institutions in the country, one of the main goals of the Tertiary Education Commission (TEC) is to develop and promote online learning as a means of increasing access to tertiary education and lifelong learning locally and regionally (Tertiary Education Commission 2007).

Given the above, this study is, undoubtedly, significant for both public and private tertiary institutions in Mauritius as well as for the Government. With the Semantic Web seen as a promising technology for E- learning requirements, by integrating E-learning CSFs and Semantic Web characteristics, this study establishes a holistic guide that will assist tertiary institutions and the Government to better harness the numerous benefits that E-learning and the Semantic Web can bring in their pursuit of excellence in education, particularly in online learning.

The holistic E-learning 3.0 model developed from this study is also particularly significant to bridge the gap between theory and practice through the identification of

key E-learning 3.0 characteristics that realistically represent the Mauritian context. It provides a realistic picture of the needs and concerns to be addressed by higher education stakeholders in Mauritius towards the move to emerging and innovative E-learning technologies like E-learning 3.0. The perceptions of the students, lecturers and administrative personnel will offer critical insights into the issues that must be considered by the higher education institutions, the Government, the students, the lecturers and the content providers for a sustainable adoption and implementation of E-learning 3.0 in the country. Consequently, the holistic E-learning 3.0 model derived from this study establishes a concrete and pragmatic action plan for the move to E-learning 3.0 for the Mauritian higher education sector, while laying the foundation for further researches in E-learning 3.0 for the country and other small island developing states.

3.4 The research methodology

With the research objectives, questions and significance established, the research methodology is discussed next. The research methodology outlines the research process used in this study to answer the research questions. Based on the research 'onion' presented by Saunders, Lewis, and Thornhill (2009), the research methodology discusses the research paradigm adopted in this study, followed by the research approach and methods used, leading to the center of the 'onion' where the process for data collection and analysis are outlined. Ethical approval considerations and a research process flow are also presented at the end of this section.

3.4.1 Information System (IS) research paradigms

There are different approaches to Information Systems (IS) research with a number of considerations to be made to ensure the best approach is adopted for the study at hand (Becker and Niehaves 2007). These approaches, commonly referred to as the IS paradigms, guide the research and its underlying research strategy (Becker and Niehaves 2007; Saunders, Lewis and Thornhill 2009). There are three main IS paradigms namely positivist philosophy (also known as positivism), interpretive philosophy (also known as interpretivism) and critical philosophy (also known as critical realism) (Orlikowski and Baroudi 1991). The pragmatism philosophy, comprising a combination of research paradigms, that work best for the particular research program under study, has also been advocated in IS research (Goles and Hirschheim 2000; Johnson and Onwuegbuzie 2004).

As stated by Lincoln, Lynham, and Guba (2011), every research paradigm encompasses four views namely (1) ontology (what is the nature of reality?), (2) epistemology (what is the relationship between the researcher and what is being researched?), (3) axiology (what is the role of values during the process of knowledge formation?) and (4) methodology (what is the process of research?). Methodologies can primarily be grouped as either quantitative (gathering, analysis, interpretation and presentation of numerical information), qualitative (gathering, analysis, interpretation and presentation of narrative information) or mixed methods which combines both quantitative and qualitative approaches (Teddlie and Tashakkori 2009). Comparing the paradigms using these four dimensions, as shown in Table 3.1, is deemed important to ensure the most appropriate paradigm is chosen (Grix 2004). Each paradigm is also discussed in the context of information system in the next sub-sections below with the choice of the paradigm for this study outlined and justified.

Table 3.1: Comparison of IS research paradigms

(Orlikowski and Baroudi 1991; Chen and Hirschheim 2004; Saunders, Lewis and Thornhill 2009; Lincoln, Lynham and Guba 2011; Tsang 2014)

Dimensions of Comparison	**Positivism**	**Interpretivism**	**Critical Realism**	**Pragmatism**
Ontology (nature of reality)	• Reality exists objectively and independently from human experiences	• Reality is subjective and constructed through human and social interactions	• Objective reality, without overlooking the social contexts within which such reality occurs	• Reality is what is useful, practical and works
Epistemology (nature of knowledge)	• Hypothesis • testing theories • Seek to generalise results through causal relationships	• Knowledge is gained through human interaction and understanding the phenomenon in natural settings	• Knowledge is acquired by understanding the society and its history	• Knowledge is derived from the considerations of multiple views
Axiology (values underlying the research)	• Research is value free • Researcher dissociated from the data and maintains an objective stance	• Research is value bound • Researcher is part of what is being researched and is interactive, cooperative and participative in the data collection process.	• Research is value laden • Researcher is biased by personal views and experiences, affecting the research findings	• Values play an important role in results interpretation • Research adopts both objective and subjective views
Methodology (process to lead to the research results)	• Objective measurement used to collect research evidence • Typically employs quantitative methodologies (such as survey) to answer the research questions	• Qualitative methods • In-depth investigations with researcher engaged in the social context	• Can be both quantitative and/or qualitative • Method(s) must fit the subject matter	• Mixed methods (both quantitative and qualitative)

3.4.1.1 Positivism

The positivist philosophy of IS research believes that "*reality exists objectively and independently from human experiences*" (Chen and Hirschheim 2004, 201). It adopts a reductionist approach, where problems are broken down into smaller theory-driven statements with a focus on generating hypotheses for possibilities of a generalisation of results (Creswell 2003). It is deeply centered around logic, value-free objective research, transcending cultural and social beliefs, with scientific methods seen as the accepted approach for knowledge acquisition, irrespective of the domain of study (Goles and Hirschheim 2000). IS research is said to be classified as positivist *"if there is evidence of formal propositions, quantifiable measures of variables, hypothesis testing, and the drawing of inferences about a phenomenon from a representative sample to a stated population*" (Orlikowski and Baroudi 1991, quoted in Klein and Myers 1999, 69). As such, this approach typically employs quantitative methodologies to answer the research questions (Saunders, Lewis and Thornhill 2009; Chen and Hirschheim 2004).

3.4.1.2 Interpretivism

While IS research has been traditionally guided by positivism, its tendency to provide generalisation of results based on a representation sample as well as its disregard for the social context are often criticised (Orlikowski and Baroudi 1991). For these very reasons, interpretivism is seen as the opposite of positivism as it adopts the position that "*knowledge of reality is a social construction by human actors*" and the assumption of "*objective data collected by the researcher can be used to test prior hypotheses or theories*" does not stand (Walsham 1995, 376). In fact, interpretive study attempts to "*understand phenomena through accessing the meanings that participants assign to them*" with the intent to "*understand the deeper structure of a phenomenon*" (Orlikowski and Baroudi 1991, 380). Unlike positivism, it does not predefine dependent and independent variables of the study but instead focuses on "*complexity of human sense making*" based on human interaction and the social contexts (Klein and Myers 1999, 69). Therefore,, it prefers qualitative methodologies, engaging the researcher in the social context (Chen and Hirschheim 2004). It is also argued that interpretivism is "*more than just a focus on human constructs and society*" as the main drivers of change as it also rejects the positivist notion of "*causality and scientific method*" (Smith 2006, 196). While, undoubtedly, the understanding of phenomenon

within the cultural and contextual situations is considered a major strength of interpretivism, it is argued that this is also the philosophy's main weakness as the biases and subjectivity that participants may bring to meanings could be misleading (Orlikowski and Baroudi 1991).

3.4.1.3 Critical realism

The critical paradigm challenges the "*status quo*" by exposing "*deep-seated, structural contradictions within social systems*" so as to transform "*alienating and restrictive social conditions*" (Orlikowski and Baroudi 1991, 381). It assumes an objective reality, similar to positivism, without overlooking the social contexts within which such reality occurs (Tsang 2014). With critical realism, knowledge is acquired by understanding the society and its history and at the same time by understanding the social-cultural conditions of the people who directly or indirectly shape the society and its realities (Orlikowski and Baroudi 1991). Consequently, critical realism favours longitudinal explorations based on historical studies and ethnography, which as pointed out by Saunders, Lewis, and Thornhill (2009), can be time consuming.

3.4.1.4 Pragmatism

Given the strengths and weaknesses associated with the different paradigms, the need for the co-existence of these different philosophies became prevalent, giving rise to the pragmatism philosophy, for a more balanced stream of research (Tashakkori, Teddlie and Teddlie 1998; Goles and Hirschheim 2000). Pragmatisms adopts a pluralist approach where researchers can use "*whatever philosophical and/or methodological approach",* that "*works best for the particular research program under study"* (Tashakkori, Teddlie and Teddlie 1998, 5). Pragmatism places the research question at the centre of all considerations, giving importance to both the subjective and objective views of the phenomenon being studied, in an attempt to gather the best results (Teddlie and Tashakkori 2009).

3.4.1.5 The chosen research paradigm

This study seeks to identify the required E-learning 3.0 characteristics to develop a holistic E-learning 3.0 model for the Mauritian higher educational institution (as outlined in section 3.2.1) and therefore, a single research approach for this study was deemed inadequate. A more diverse approach was considered to allow for a comprehensive representation of E-learning 3.0 within higher education in Mauritius,

while at the same time, to benefit from the strengths of different paradigms and minimise on their associated weaknesses. Ontologically, the researcher sought to benefit from the rigour and validity of objectivity with details of social constructivism. With the objectivity that comes with positivism, research participants from higher education institutions could provide a generalised view on E-learning 3.0 across higher education institutions in Mauritius. On the other hand, the interaction and involvement of participants in natural settings could provide an integral and enriched view on the development of the holistic E-learning 3.0 model, deemed critical for a comprehensive representation of the model. These social and interactive aspects associated with the gathering of participants' perceptions and sense-making seek to capitalise on the strengths of interpretivism. While this research does not involve historical studies, it is centered around the critical components of the Mauritian education system, particularly at the higher education level and as such adds a critical realist feel to the study. Epistemologically, the consideration of multiple views was sought in order to gain a more comprehensive and enriched knowledge of the phenomenon being studied. Methodologically, taking a diverse approach to this study brings out the benefits of both quantitative and qualitative approaches, offering more options regarding the way the research can be carried out to provide the best possible outcomes in answering the research questions. Therefore, this need for paradigm plurality guided the researcher towards the pragmatism philosophy as the main choice for this study.

3.4.2 Research approaches: deductive v/s. inductive

Two opposing views exist in terms of the research approach to be adopted, namely the deductive approach versus the inductive approach. In deductivist research, "*there is a well-established role for existing theory since it informs the development of hypotheses, the choice of variables, and the resultant measures which researchers intend to use*" (Ali and Birley 1999, 104). A deductive approach requires the researcher to start "*with an abstract, logical relationship among concepts then move(s) towards concrete empirical evidence*" to test if a theory is right or wrong (Neuman 1997, 46). On the other hand, the inductive approach begins "*with detailed observations of the world and move towards more abstract generalisations and ideas*" (Neuman 1997, 334). It requires the collection of data which are then analysed to derive patterns and meanings with the researcher observing and refining concepts in order to "*develop*

empirical generalisations and identify preliminary relationships" to develop the theory (Neuman 2000, 49).

3.4.2.1 The chosen research approach

This study is exploratory in nature and is therefore not based on hypotheses, as it seeks to determine the components of a holistic E-learning 3.0 model for the Mauritian higher education sector by considering both Semantic Web characteristics and E-learning CSFs. It seeks to start with a broader idea of the Semantic Web characteristics and E-learning CSFs and then refine these components to reflect an accurate representation of E-learning 3.0 within the Mauritian higher educational context. With these in mind, an inductive approach is more appropriate for this study.

3.4.3 Research methods

According to Mingers (2001), the research method refers to a structured set of activities that assist the researcher to generate valid and reliable research results. A number of research methods for IS research have been proposed in the literature, most of them grouping these methods as quantitative and qualitative methods (Alavi, Carlson and Brooke 1989; Galliers 1990; Orlikowski and Baroudi 1991). Following the choice of the pragmatism approach as the research philosophy and the inductive approach as the research strategy, the researcher considered commonly used inductive research strategies, both quantitative and qualitative, that could be employed in this study. Chen and Hirschheim (2004) identified surveys, case studies and action research as the most common methods, while Myers (2009) also included ethnography and grounded theory.

3.4.3.1 Action research

Action research is "*an iterative process involving researchers and practitioners acting together on a particular cycle of activities, including problem diagnosis, action intervention, and reflective learning*" (Avison et al. 1999, 94). As this study does not involve practical problem solving, this method was not considered. Furthermore, action research would have required the researcher to work with higher educational stakeholders in Mauritius, including the students and the lecturers, on an ongoing basis, which could have proven to be a challenge given their varying schedules in an educational environment.

3.4.3.2 Ethnography

While ethnography was an attractive option for this study as it considers the "*social interactions, behaviours, beliefs and perceptions that occur within groups and organizations"*, it relies not only on fieldwork but also on "*the participation of the observer in the personalized settings of an organization or community*", thereby requiring "*long term participation*" for an appropriate understanding of the phenomenon under study (Jebreen 2012, 163). Given the time constraint of this study and the lengthy duration of the ethnography approach, this research method was ruled out.

3.4.3.3 Grounded theory

Grounded theory is considered as a comprehensive research method for theory generation, which provides context-based explanations of Information System phenomena and "*potentially allows for the emergence of original and rich findings that are closely tied to data*" (Orlikowski 1993, quoted in Urquhart, Lehmann and Myers 2010, 358). However, grounded theory is often considered a time consuming and laborious process, the timeframe of which is difficult to (Myers 2009; Hussein et al. 2014). Consequently, just like ethnography, this research method was ruled out due to the time constraint of this study.

3.4.3.4 Surveys

Surveys are considered the most popular research method in IS research (Orlikowski and Baroudi 1991; Creswell 2003; Chen and Hirschheim 2004). It is "*a system for collecting valid information from or about people to describe, compare, or explain their knowledge, attitudes, and behavior*" (Fink 2010, 152). Surveys are essentially quantitative in nature and gather data by the popular means of questionnaires (Chen and Hirschheim 2004; Saunders, Lewis and Thornhill 2015; Palvia, Midha and Pinjani 2006). The survey questionnaire allows participants to respond to the same set of questions in a predetermined order, allowing the collection of standardised data from a sizeable population in an economical way (Saunders, Lewis and Thornhill 2015). Hence, surveys tend to be used for exploratory and descriptive research, particularly where large volumes of data need to be collected from a population. Given the fact that this study is centered around the higher education sector in Mauritius, consisting of both public and private tertiary institutions, it is critical to capture the views of the wide population of tertiary institutions' stakeholders to ensure an accurate and holistic

representation of E-learning 3.0. Therefore, the survey method is deemed as an appropriate strategy for reaching the target population in an economical way (Saunders, Lewis and Thornhill 2015). However, it is argued that surveys are inflexible, particularly during the data collection stage as the questionnaires cannot be modified once the survey is underway and may not be suitable when in-depth data and detailed understanding of context are sought (Pinsonneault and Kraemer 1993; Gable 1994). Consequently, it is recommended that this research method be combined with other methods, such as case studies, to strengthen the robustness of results (Kaplan and Duchon 1988; Gable 1994).

3.4.3.5 Case Study

According to Benbasat, Goldstein, and Mead (1987, 370) , a case study "*examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities (people, groups, or organizations)*" and where "*no experimental control or manipulation is used*". Case studies investigate "*a contemporary phenomenon within its real-life context*" (Kaplan and Duchon 1988, 576). It addresses the 'how' and 'why' behind a phenomenon, through interaction with participants, with the aim of developing an in-depth understanding of the phenomenon in real life (Yin 2009; Benbasat, Goldstein and Mead 1987). While it is mostly considered a qualitative approach, its findings can also be mixed in nature (Kaplan and Duchon 1988; Yin 2009). Case study is considered particularly appropriate for research which is at an early stage and where few previous studies have been carried out (Benbasat, Goldstein and Mead 1987). As discussed in Chapter 2, E-learning 3.0 is in the infancy stage in Mauritius with much still needing to be done in the area of E-learning itself. Given the richness of data, in a natural setting, that the case study approach can bring to this research, this method was considered another ideal candidate. The case study method will allow the researcher to explore the 'how' and the 'why' behind E-learning 3.0 in the real-life context of tertiary institutions in Mauritius and to "*understand the nature and complexity of the processes taking place*" (Benbasat, Goldstein and Mead 1987, 370). Nonetheless, the "*problem of generalization is often perceived as the chief drawback of case study research"*, where its findings cannot be readily generalised to other settings due the small sample size involved (Bryman 1989, 172; Lee 1989; Dube and Pare 2003; Tsang 2014). However, since this research is explanatory in nature with an inductive approach being used, this

limitation of the case study approach does not pose any problem as "*exploratory studies are not intended to be generalizable to a population*" (Pinsonneault and Kraemer 1993, 91).

3.4.3.6 The chosen research methods

The comparison of research methods clearly showed that survey and case study are the two preferred methods for this study. The survey will be an inexpensive way of collecting standardised data on E-learning 3.0 from a sizeable population namely education stakeholders of higher education institutions in Mauritius, thereby ensuring a proper reflection of the survey population and a large enough data set for analysis (Cavana, Delahaye and Sekaran 2001; Saunders, Lewis and Thornhill 2009; Kelley et al. 2003). The case study, through interaction and involvement with participants in a natural setting, will, on the other hand, allow for a rich and in-depth understanding of how E-learning 3.0 is perceived by education stakeholders in Mauritius (Yin 2009; Benbasat, Goldstein and Mead 1987).

Consequently, this research will adopt a mixed-methods approach, consisting of both survey and case study. Mixed methods is "*where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language in a single study*" (Johnson and Onwuegbuzie 2004, 17). Quantitative research emphasises objective measurements, often through numerical analysis,, where the results can be "*generalised to the population*" to explain a phenomenon, while qualitative research "*aims to provide an in-depth understanding of the world as seen through the eyes of the people being studied*" (Wilmot 2005, 53). The mixed-methods approach has been chosen for several reasons. It aligns with the pragmatism philosophy chosen for this study, advocating the use of both quantitative and qualitative methods for a more comprehensive research (Teddlie and Tashakkori 2009). As stated by Creswell (2003, 24), "*A mixed methods design is useful to capture the best of both quantitative and qualitative approaches*". The use of multiple sources and different methods for data collection ensures a wider coverage, resulting in a deeper understanding of the phenomenon being studied than would otherwise have been achieved (Bonoma 1985; Kaplan and Duchon 1988). The survey (quantitative approach) will allow for greater generalizability of findings while the case study (qualitative approach) will allow for greater flexibility and context rich data. The case study will compensate for the lack of depth associated with the survey by providing

richer explanations on the how and why of the study at hand, thereby yielding more robust results (Kaplan and Duchon 1988; Markus and Robey 1988). In this way, the strengths of each method make up for the other's weaknesses (Kelle 2006). The mixed-methods approach also allows for triangulation: checking whether the research findings obtained through one method correspond with the findings obtained by another (Harden and Thomas 2005). This increases confidence in the validity of research findings, particularly when converging results are obtained by multiple methods (Wiggins 2011; Kelle 2006; Harden and Thomas 2005). Finally, a mixed-methods approach responds to the numerous calls for the adoption of a pluralistic approach to IS research, allowing for different dimensions of real-life situations to be considered for richer and contextualised perspectives (Mingers 2001; Chen and Hirschheim 2004).

3.4.4 Research method design for mixed method

Once the choice of a mixed-methods approach was made, the next consideration was the research method design in terms of the time order of each method and their priorities in the study (Johnson and Onwuegbuzie 2004). For this study, a sequential explanatory design was adopted, with the quantitative data collected and analysed first (through the survey), followed by the qualitative data collection and analysis (through the case study), with both methods carrying the same priority in the study (Terrell 2012; Ivankova, Creswell and Stick 2006). This approach has the major strength of being relatively straight-forward with distinct phases of equal consideration and priority, although it could be time consuming (Terrell 2012; Moghaddam, Walker and Harre 2003). With this design, "*Researchers often present these studies in two phases, with each phase clearly identified in headings in the report*" (Creswell 2008, 560). The quantitative phase provides the researcher with a general understanding and a wide view of the research problem, which can then be further explained and refined, by "*exploring participants' views in more depth*", during the qualitative phase (Ivankova, Creswell and Stick 2006, 5; Creswell 2003). With little known about E-learning 3.0 within the Mauritian higher educational context, the quantitative phase will allow the researcher to gather a general understanding of the status of E-learning 3.0 within the country, to build on findings from the literature review, before proceeding to the qualitative phase to consolidate the survey findings. Therefore, the findings from the case study approach will triangulate and, at the same time, extend the survey outcomes

(Terrell 2012; Teddlie and Tashakkori 2009). This process will allow the researcher to revise and refine results from both methods to generate a final holistic E-learning 3.0 model.

Based on the above, this research will be carried out in phases. An initial holistic E-learning 3.0 model is first developed based on the findings from the literature review (as discussed in Chapter 2). This initial model will then be reviewed in the quantitative phase of the study, resulting in a revised holistic E-learning 3.0 model. Then the qualitative phase of the study will confirm and/or revise the findings from the quantitative phase to culminate into a final holistic E-learning 3.0 model.

The next sections describe in more detail the data collection and analysis process including the unit of analysis, the quantitative phase and the qualitative phase.

3.4.5 Unit of analysis

Prior to data collection, it is important to identify the units of analysis for the research, which could be individuals, groups or an entire organisation (Benbasat, Goldstein and Mead 1987; Yin 2009). For this study, the focus of the analysis is that of the groups as opposed to the individuals. These include groups of students, lecturers and administrative personnel (including course designers and educational technologists) from the higher education institutions in Mauritius, as per the research questions (see section 3.2.2). It is important to note that during the qualitative phase of this study, although participants will be interviewed individually and not in groups, their opinions and comments will be analysed and discussed collectively.

3.4.6 The quantitative phase – Survey

In this study, the quantitative phase is the survey administration phase. The survey is considered a major instrument to allow the researcher to gather data from the large population of tertiary institutions in Mauritius in an economical way (Saunders, Lewis and Thornhill 2009). While survey response rates are usually low with follows-ups needed, it is, as discussed in section 3.4.3.4, an inexpensive way of collecting standardised data from a sizeable population, at their own convenience, thereby ensuring a proper reflection of the survey population and a large enough data set for analysis (Cavana, Delahaye and Sekaran 2001; Saunders, Lewis and Thornhill 2009; Kelley et al. 2003). For this study, survey questionnaires were used to gather data from participants on their opinions and attitudes towards E-learning 3.0, based on findings

from the literature review. The next sub- sections provide an overview of the survey data collection and analysis processes with details provided in Chapter 4.

3.4.6.1 Survey participants

In line with the research questions of this study (as discussed in section 3.2.2), tertiary institutions from Mauritius, both public and private, were considered as the main population. The researcher used the Tertiary Education Commission (TEC) website to gather a list of public and private tertiary institutions in Mauritius, the TEC being the legislated body that oversees and manages tertiary education in the country (Tertiary Education Commission Mauritius 2016c, 2016b, 2016a). Students and lecturers from Mauritian tertiary institutions were targeted as the main participants for the survey. As pointed out by Saunders, Lewis, and Thornhill (2015), surveys is an appropriate strategy to reach the target population in an economical way and given that students and lecturers make up the larger population of tertiary institutions in Mauritius, they were considered to be appropriate participants for the quantitative phase of this study. Their participation in the surveys would provide a general understanding and an expanded view of E-learning and E-learning 3.0 in Mauritius, in line with the explanatory nature of this study, followed by the qualitative phase where in-depth perceptions of lecturers and administrative personnel would be sought to refine and enhance the survey's outcomes (Creswell 2007). Additionally, the information displayed on different universities' websites and reports indicated that course design and content creation, which were otherwise thought to be distinct roles of administrative personnel, were more than often part of the roles of lecturers and not carried out by the administrative personnel per se or as part of a different administration team altogether (Open University of Mauritius 2016b; UTS 2016; Tertiary Education Commission 2015; Open University of Mauritius 2016a). Hence, lecturers' participation in the survey would also cover perceptions on the course design and content creation aspects of the E-learning 3.0 model. Consequently, students and lecturers from public and private universities were targeted as the main survey participants.

3.4.6.2 Survey data collection

The researcher contacted all the universities listed on the TEC website to gather as many participants as possible for the surveys. This exercise proved challenging for several reasons outlined below:

- Given that the researcher is based in a different country, on-site gathering of responses from students and lecturers was not an option due to the time and budget constraints of this research.
- Getting in touch with the large number of students to participate in the student survey remotely was difficult. The researcher contacted both public and private universities in Mauritius via email to try and discuss ways that the surveys could be distributed to their students. The researcher proposed ideas such as posting a link on the universities' websites or distributing the survey via the respective tertiary institutions' student management systems using the email addresses of students. Most universities did not respond. Only one private tertiary institution responded advising that they were unable to get their students to participate in the survey.
- Obtaining responses from lecturers proved to be just as challenging. The researcher directly contacted as many lecturers as possible via their email addresses listed on the university websites to invite them to participate in the lecturers' survey. Most of them did not respond despite being sent follow-up emails.

Following these challenges, after consultation with the research supervisor, it was decided to outsource the survey data collection to a local and well-known market and social research agency in Mauritius namely, De Chazal Du Mée Research (DCDM) Research (DCDM Research 2015) to facilitate the gathering of participants. Details of the survey population and response rate are provided in Chapter 4.

3.4.6.2.1 Web-based survey

With the surveys to be administered by DCDM in Mauritius and the researcher being based in Australia, after consultation with the research supervisors, it was decided to use Web-based surveys to facilitate the monitoring of the survey administration and the response rate from a distance. 'Qualtrics' Online Survey Tool (Qualtrics 2015) from Curtin Business School was chosen as the tool to make the surveys available to participants. Despite concerns that the response rate of Web-based surveys is highly dependent on Internet and email technology as well as participants' characteristics (Shih and Fan 2009), using Web-based survey via Qualtrics provides numerous benefits (Fleming and Bowden 2009; Ilieva, Baron and Healey 2002; Fan and Yan 2010; Dillman 2000) as outlined below:

- The tool can be accessed from anywhere and at any time.

- The tool is easy to use and manage.
- The tool is readily available at no cost to the researcher from Curtin Business School.
- Response rate can be easily monitored.
- Participants can only complete the survey once using the link provided.
- Responses are anonymous. Only the survey creator (in this case the researcher) and the collaborators (in this case the research supervisors) with whom the surveys have been shared can view responses.
- Results can be accessed immediately and in different formats leading to easier analysis.
- Participants have a more dynamic interaction with the survey as opposed to emails and paper-based surveys.
- The tool allows the survey questionnaires to be designed in a user-friendly manner, with options of including different features such as progress bar, navigation buttons and prompts for reminders to participants to respond to unanswered questions, thereby increasing the chance of obtaining fully completed surveys.

3.4.6.3 Survey structure and questionnaires

Two survey questionnaires were designed, one for the students and one for the lecturers of Mauritian tertiary institutions, to ensure the questionnaires were as customised as possible for a greater response rate. Given that the main aim of the surveys was to confirm and revise, if necessary, the initial holistic E-learning 3.0 model, the questionnaires were primarily based on the initial model and the literature review. This ensured content validity, being the degree to which the data collection instrument (this case the survey questionnaires) represents the constructs being measured (De Vaus 2002; Rusticus 2014). Furthermore, to ensure face validity, both questionnaires were checked by the supervisors of this study, to identify and rectify any problems, prior to the administering the questionnaires (Hair et al. 2010). Details of the questionnaires' design are provided in Chapter 4.

3.4.6.4 Survey data analysis

Both the students' and the lecturers' surveys were analysed using the program Statistical Package for the Social Sciences (SPSS) version 22.0. For each survey, a

preliminary data analysis was first conducted on the collected data, followed by a factor analysis, to validate the initial holistic E-learning 3.0 model derived from the literature review and to identify an improved list of factors for the E-learning 3.0 model respectively.

There are two types of factor analysis techniques namely Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA) (Yong and Pearce 2013). While CFA is used to evaluate a priori hypotheses and is largely driven by theory (Distefano and Hess 2005), EFA is "*heuristic*" and "*exploratory in nature*" and "*allows the researcher to explore the main dimensions to generate a theory, or model from a relatively large set of latent constructs often represented by a set of items*" (Williams, Onsman and Brown 2010, 3). In line with the inductive approach used for this research, EFA was used to confirm the validity and reliability of the survey items. It enabled the grouping of latent variables or factors under the identified characteristics of the E-learning 3.0 model, thereby offering a more consistent interpretation of the survey data. The reliability of factor items for each identified factor was then determined through their internal consistency using Cronbach alpha index (Cronbach 1951).

Results of the analysis of both surveys were combined to generate a revised holistic E-learning 3.0 model. Details of the survey analysis and the revised holistic E-learning 3.0 model are presented in Chapter 4.

3.4.7 The qualitative phase – Case study (Interviews and Documents)

The qualitative phase of this study involves the use of the case study method, as discussed in sections 3.4.3.5, 3.4.3.6 and 3.4.4. It has the main aim to confirm and extend findings from the survey phase. Details about the cases as well as the data collection techniques are presented in the next sub-sections.

3.4.7.1 Selection of cases

Prior to collecting the case study data, it is essential to select the cases (Eisenhardt 1989). "*Central to case research design is the decision to include one or several cases in the project*" (Benbasat, Goldstein and Mead 1987, 373). While single case is ideal for critical and extreme cases (Benbasat, Goldstein and Mead 1987), the use of multiple cases provides a more robust and rich description of the phenomenon, backed by strong and deeply-grounded empirical evidence (Eisenhardt and Graebner 2007;

Yin 1994). Since the aim of this research is to develop a holistic model for E-learning 3.0, the multiple case design was adopted.

The case study phase has aim to confirm and extend the survey's findings. Hence, it was important to have case candidates showing experience and expertise in E-learning course delivery and designs. At the same time, for a broader and comprehensive perspective on E-learning 3.0 to ensure a holistic representation, case candidates with no dedicated E-learning program and/or department were deemed important to be included in this study phase. While public institutions are dominant in Mauritius (Tertiary Education Commission Mauritius 2016c, 2016b), considering private institutions as case candidates was essential to have a balanced and in-depth views and perceptions on E-learning 3.0 in the country. Consequently, case candidates needed to be chosen based on their size (courses offered, students' enrolled and staff employed), their experiences with E-learning (or not) and types (public or private).

Cases were selected using theoretical sampling which are "*particularly suitable for illuminating and extending relationships and logic among constructs*" (Eisenhardt and Graebner 2007, 27). The Tertiary Education Commission (TEC) website was consulted to get the full list of public and private tertiary institutions in Mauritius. Individual institution's website was then scanned to select the institutions that met the established criteria. Consequently, five institutions were chosen to be part of this phase. Out of these five institutions, two were private institutions and two clearly showed strong E-learning engagement with dedicated E-learning programs and departments as well as staff in the roles of educational technologists and instructional and online course designers.

3.4.7.2 Data collection

A number of data collection techniques are available for case study including interviews, documentation, direct observation and questionnaires (Benbasat, Goldstein and Mead 1987; Eisenhardt 1989). For this study, observation was ruled out as it would involve the researcher being on site of numerous tertiary institutions and observing participants over an extended period of time, something not considered feasible budget-wise and timewise, given that the researcher is based in Australia and the participants are based in Mauritius. The questionnaire, being the data collection tool for the quantitative phase of the study and thus already used, was also ruled out. On the other hand, the interview is the most widely-used data collection technique for the

case study in a qualitative approach and is used extensively in IS research (Polkinghorne 2005; Creswell 2003; Mack 2005; Schultze and Avital 2011), while documents are also considered an important source of information for the case study approach (Yin 2009; Miles and Huberman 1994). Yin (2009, 115) recommends the use of multiple sources for the case study approach as it "*allows an investigator to address a broader range of historical and behavioural issues*" for added rigour to the findings with the *"development of converging lines of inquiry, a process of triangulation and corroboration"*. Therefore, both interviews and documents were considered as methods for data collection in the qualitative phase of this study. An overview of the data collection phase and analysis for both methods are outlined next with details provided in Chapter 5.

3.4.7.3 Interview

The interview is distinct from other research approaches as it thoroughly engages its participants and allow the generation of "*deeply contextual, nuanced and authentic accounts of participants' outer and inner worlds, that is, their experiences and how they interpret them*" (Schultze and Avital 2011, 1). It is an interaction consisting of an interviewer (the researcher) asking questions to an interviewee, who respond accordingly (Teddlie and Tashakkori 2009). The purpose of an interview in case studies "*is to gather descriptions of the life-world of the interviewee with respect to interpretation of the meaning of the described phenomena*" (Kvale 1983, 174). While interviews can be time consuming and can result in a large volume of data which may be difficult to transcribe, it is, nonetheless, considered an effective data collection tool for gathering rich data and in-depth perspectives from participants about the phenomenon being studied (Mahoney 1997; Bolderston 2012).

3.4.7.3.1 The interview participants

The number of participants in the interview phase does not need to be as substantial as that of the quantitative phase (Bowling 2002; Teddlie and Yu 2007; Crouch and McKenzie 2006). In fact, samples for qualitative studies tend to be small, "*derived purposefully rather than randomly*" with aim of seeking "*the richness of data about a particular phenomenon*" and studying it in depth and detail (Tuckett 2004, 48; Miles and Huberman 1994). With a relatively smaller sample size required for the interview phase as compared to the survey phase, the main participants for the interviews were the lecturers and the administrative personnel. Given that the aim of this phase of the

research is to gather an in-depth understanding of E-learning 3.0 in Mauritius, lecturers and administrative personnel were considered ideal participants for the interviews as they are the experts in course delivery and design, allowing them to bring a rich and complex understanding and perspective of the phenomenon under study (Mack 2005). They were identified from their respective tertiary institutions' websites, from which their contact details were also obtained. All participants were initially contacted via email inviting them to participate in the interview. More details on the process of identifying and contacting participants for the interview phase are provided in Chapter 5.

3.4.7.3.2 Interview data collection

A number of ways are available for the collection of data via interview including face-to-face interview, group interview and remote interview via telephone or the Internet and computer-mediated tools such as email and Skype (Bolderston 2012; Opdenakker 2006; Hanna 2012). Face-to-face and group interviews were opted out given the different locations of the researcher and the participants and the challenges associated with getting participants from different tertiary institutions together at one time for a group remote interview. The researcher considered the options of telephone interviews, email interviews and Skype interviews, due to their practical benefits of not requiring the researcher to travel to another country to collect the data (Evans, Elford and Wiggins 2008; Hanna 2012). To encourage maximum participation, the researcher decided to offer all three options to participants. In this way, participants could choose their preferred data collection approach, which help to ensure the quality of the collected data.

3.4.7.3.2.1 Participants' interview preferences (Email and telephone)

While Skype interviews provide both the researcher and the interviewees with the benefits of face-to-face interviews, such as synchronous real-time interaction (Hanna 2012), none of the participants chose that option, which might be due to their busy schedules or their reluctance to participate in a 'virtual' face-to-face interaction with the researcher (Weller 2015). Only one participant opted for a telephone interview specifying that it be a 'weekend' call. As a matter of fact, telephone interviews, other than being time and cost effective and more personalised, offer the practical benefit associated with arranging and scheduling the interview (Bolderston 2012; McCoyd and Kerson 2006). All other participants selected the email interview option.

Email interviews as a data collection approach in qualitative study has increasingly become an acceptable approach in research studies (Seymour 2001; Reid, Petocz and Gordon 2008). As stated by Bowden and Galindo-Gonzalez (2015, 79), "*Using computers to collect qualitative data easily fits into most contemporary technologically imbued lifestyles. In particular, email has become a normal and responsible mode of communication*". Email interviews offer numerous benefits:

- It provides greater flexibility to the participants to respond to the interview questions at their own time and pace, thereby promoting a safer atmosphere for interviewees to share their personal experiences (Opdenakker 2006; Bowden and Galindo-Gonzalez 2015; Bowker and Tuffin 2004).
- It reduces the research cost and time as there is no requirement for travel to in order to interview (Opdenakker 2006; Bowden and Galindo-Gonzalez 2015).
- It provides a deep interpretation of data collected, by allowing the researcher to "*iteratively interpret data before asking follow-up questions*" (Bowden and Galindo-Gonzalez 2015, 80).
- It offers a seeming sense of anonymity, allowing participants to be more open about their experiences, thereby adding to the richness of the collected data (McCoyd and Kerson 2006).
- It eliminates the need for transcription, thereby preventing transcriber bias, particularly present when translating audio data to textual data, while at the same time allowing the researcher to move to data analysis quicker (Gibson 2010).

Despite the numerous advantages of email interviews, it has its drawbacks such as its dependency on technology, its lack of social cues and delays in receiving responses, with the risk of participants forgetting to respond altogether (Opdenakker 2006; Bowden and Galindo-Gonzalez 2015). While reminders can be used to mitigate delayed responses and increase response rate (Opdenakker 2006), it is also argued that email interviews "*tend to be more complete, to include more self-reflection by respondents, and to be seemingly more candid*" (McCoyd and Kerson 2006, 390) with the interviewees more at ease to "*confide in machines that are viewed as non-judgmental, rather than directly to another person*" (Turkle 1995, quoted in McCoyd and Kerson 2006, 390). This holds particularly true for interview participants in this study who preferred the email option as opposed to direct interaction with the

researcher (such as interviews via skype), with participants providing detailed answers to the questions, supported by examples on numerous occasions.

3.4.7.3.2.2 Gathering responses from participants

For the email interviews, the researcher, after careful discussions with the research supervisors, decided to use 'Qualtrics' tool from Curtin Business School as the main tool to gather the interviewees' initial responses. The interview questions were set on Qualtrics and a customised link was generated to access the questions via the link. Qualtrics was chosen for the following reasons:

- Since the interview questions are via a customised link, participants can access them anytime anywhere, providing them with more flexibility.
- Qualtrics allows the participants to select their respective roles as either a 'Lecturer' or an 'Administrative Personnel'' as the first question, which then gives them the list of interview questions based on their roles, making the interview more customised.
- Qualtrics conditional logic tools allows questions to be displayed to participants based on their responses to previous questions, providing a more streamlined list of interview questions to participants with a clearer flow.
- The interview questions are more easily and neatly designed on Qualtrics with the use of text boxes to capture participants' responses as well as option buttons to capture specific responses where required.
- Participants can answer the questions at their own ease and convenience, with fewer interviewer and response biases (Miles and Huberman 1994). While interviewer bias occurs when the body language, language or tone of the interviewer leads the interviewee to respond in a manner which may not reflect the truth, response bias occurs when the interviewees provide answers which are perceived to conform to acceptable or even negative behaviours (Saunders, Lewis and Thornhill 2009). With Qualtrics allowing the participants to view the questions prior to answering them, both these forms of biases can be decreased since they allow participants to be better prepared (Saunders, Lewis and Thornhill 2009).
- With the responses already in text format, transcription is not required.

- Responses are anonymous. Only the interview creator (in this case the researcher) and the collaborators (in this case the research supervisors) with whom the interviews have been shared can view responses.

Follow-ups with participants, where required, were subsequently done via emails.

For the single telephone interview, the researcher phoned the participant at the mutually agreed date and time. During the interview, the participant's responses were recorded on a printed list, which the researcher printed prior to the telephone phone call. The interview questions were emailed to the participant prior to conducting the telephone interview to reduce interviewer and response biases and to allow the participant to be better prepared.

Details about the data collection process for the interviews are provided in Chapter 5.

3.4.7.3.2.3 Interview structure and questions

There are three main categories of interviews: structured, unstructured and semi-structured (Oates 2005; Saunders, Lewis and Thornhill 2009). Structured interviews involve a predetermined set of questions, which need to be rigidly adhered to, thereby limiting the freedom of both the interviewer and the interviewee (Berg 2012; Alshenqeeti 2014; Cohen 2000). Unstructured interviews, on the other hand, have no predefined list of questions, creating an open situation, giving greater flexibility and freedom to the interviewer and interviewee (Holstein and Gubrium 2001; Cohen 2000). Semi-structured interviews provide a middle ground whereby the interviewer can have a list of predefined questions to guide the interview and at the same time has the flexibility to probe the interviewee further for more insights (Saunders, Lewis and Thornhill 2009; Yin 2009; Alshenqeeti 2014). With unstructured and semi-structured interviews recommended for exploratory research (Oates 2005), the researcher adopted a semi-structured interview approach to allow for a predefined set of questions to be formulated based on the surveys' findings and the revised E-learning 3.0 model following the quantitative phase of the study and, at the same time, to allow for the added flexibility of seeking more information for deeper insight.

As the main aim of the interviews is to triangulate and extend the findings from the surveys, the questions for the interviews were derived from the surveys' outcomes as well as the literature review. Details of the interview questions are provided in Chapter 5, Appendix L and Appendix M.

3.4.7.3.3 Interview data analysis

"*Theme identification is one of the most fundamental tasks in qualitative research*" (Ryan and Bernard 2000, 1) and content analysis is the process commonly used in qualitative study to identify themes from collected data (Zhang and Wildemuth 2009). Content analysis is "*a process designed to condense raw data into categories or themes based on valid inference and interpretation*" (Zhang and Wildemuth 2009, 2). Hsieh and Shannon (2005, 1278) defined content analysis as a "*research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns*". They also identified three main approaches to qualitative content analysis: the conventional approach, whereby codes are directly identified from the text, the directed approach where themes are identified based on existing theory and prior research, and the summative approach involving the counting of word frequencies and the comparing of key words. Content analysis can also be either deductive or inductive (Elo and Kyngäs 2008). While deductive content analysis validates data based on existing theory or prior research (Hsieh and Shannon 2005), inductive content analysis allows the grouping of similar emerging data under new themes and categories through careful examination and comparison (Zhang and Wildemuth 2009).

3.4.7.3.3.1 Deductive (directed approach) and inductive (conventional approach) content analysis

The directed and conventional approaches were adopted for this study. With a *priori* set of characteristics and sub-characteristics for E-learning 3.0 identified from the literature review and the surveys, the directed approach allowed data belonging to existing themes (characteristics/sub-characteristics of E-learning 3.0 model) to be deduced. The conventional method, on the other hand, allowed for emerging themes to be inductively analysed.

The researcher adopted the two steps process recommended by Miles and Huberman (1994) to analyse the interview data. In step individual scripts were analysed in order to identify themes, while step two consisted of the analysis of all scripts to combine themes in order to identify the similarities and differences between them.

3.4.7.3.3.2 Data coding

With the qualitative data being text-based, coding is considered a fundamental activity in qualitative data analysis, as part of the process of data organisation and themes

identification (Maxwell and Miller 2008; Hilal and Alabri 2013). It is "*the process of analyzing qualitative text data by taking them apart to see what they yield before putting the data back together in a meaningful way*" (Creswell 2016, 156). "*In coding, data segments are labelled and grouped by category; they are then examined and compared, both within and between categories*" (Maxwell and Miller 2008, 465). Through these categorisation, thematic ideas are generated, enabling the researcher to examine and analyse the qualitative data in a structured way (Gibbs 2007).

Coding of the interview data was done using the qualitative data analysis software NVivo 11 (NVIVO 2016). "*Qualitative data analysis software is designed to carry out administrative tasks of organising the data more efficiently and should therefore be exploited to the full on this basis*" (Welsh 2002, 5). While NVivo provides the option of auto coding of texts into themes, a detailed review of the data, through manual coding, showed that chunks of texts were often missed and omitted from being grouped under themes because of the way the participants phrase their responses. As stated by Gurdial Singh and Jones (2007, 19), "*the software program is incapable of doing any reading and thinking for a researcher. Therefore, good qualitative analysis relies on good analytical work carefully done by a human researcher*". As a result, The NVivo auto coding option was not used in this study. Manual coding was used where all the texts were read manually and coded according to themes for a more thorough and complete categorisation of data. NVivo was mainly used as an easier and quicker tool to organise the manual data coding, as opposed to doing that using 'pen and paper'(Welsh 2002). "*Instead of spending time copying and manually cutting and pasting data*", NVivo allowed the researcher to "*do the equivalent of these processes 'on screen', freeing time for the analysis of data*" (McLafferty 2006, 35). Pre-identified themes, derived from the survey outcomes during the quantitative phase, as well as new emerging themes from the coding process, were created as nodes. Moreover, given the number of sub-characteristics associated with each of the main characteristics identified for the E-learning 3.0 model, child nodes were also created to represent those as sub-themes and to capture new emerging ones. Once themes were identified and nodes were created, the identification of relationships between nodes and themes became possible, providing more insight into the data being analysed. Additionally, throughout the manual coding of texts, the researcher recorded her thoughts and reflective comments in NVivo, via the use of memos and comments, linked to nodes, as opposed to writing those on paper (Welsh 2002). The

documentation of the researcher's thoughts proved essential during the write up of the interview analysis.

Details of the interview analysis and outcomes are provided in Chapter 5.

3.4.7.4 Documents

As discussed in section 3.4.7, documents are considered an important source of information for the case study approach (Yin 2009; Miles and Huberman 1994). It is "*often used in combination with other qualitative research methods as a means of triangulation*"(Bowen 2009, 28) and "*has served mostly as a complement to other research methods*" such as interviews in this study (Bowen 2009, 29). Yin (2009, 115) considers the "*the most important advantage presented by using multiple sources of evidence"* being *"the development of converging lines of inquiry, a process of triangulation and corroboration"*. Documents can take different forms including public records, administrative documents, institutional reports, website browsing and searchers and annual reports amongst others, with the additional information supplementing the data collected by the researcher from other sources (Miles and Huberman 1994; Saunders, Lewis and Thornhill 2009; Bowen 2009; Yin 2009). The use of documents has several advantages (Bowen 2009; Triad 3 2016), including

- Documents are easily managed and considered as practical resources for providing an effective and efficient means of gathering data.
- They are, in most cases, easily accessible (such as online) and are a reliable source of data.
- Documents cover a broad range of issues and information allowing the contextualisation of the research within the field of study.
- Documents are considered as "*stable*", "*unobtrusive*" and "*non-reactive*" data sources (Bowen 2009, 31), such that they can be "*read and reviewed multiple times and remain unchanged by the researcher's influence or research process*" (Triad 3 2016, 1).

Although, documents will not provide all the answers to the research questions as such, they are considered a valuable source of useful data, even in small amount and can significantly add to the richness of the data and strengthen findings (Bowen 2009). In this study, documents were mainly used to triangulate interview findings and have been incorporated as critical references in the discussion of the interview results in Chapter 5.

3.4.7.4.1 Documents used

The researcher consulted critical websites to gather documentation to support the interview findings, starting with the Tertiary Education Commission (TEC) website (Tertiary Education Commission Mauritius 2016a) as the main regulatory body for post-secondary education in Mauritius, to gather more information about the public and private tertiary institutions in the country. Participation reports from the TEC (Tertiary Education Commission 2014, 2016) were consulted to gather information on university rankings and participation rate, deemed particularly useful for the interview sample for this study to ensure an adequate representation of participants for the development of a holistic E-learning 3.0 model. The TEC websites also provided access to several reports including its annual reports, quality assurance reports and universities' audit reports. Tertiary institutions' websites were also consulted to access key documents such as their respective strategic plans and annual reports, where available. Given the predominance of public universities in the country (Tertiary Education Commission Mauritius 2016c), as well as the fact that Mauritius is a small island nation relying heavily on Government policies, strategies, initiatives and funding (Subrun and Subrun 2015), key data to support the interview findings was found in accessible public university documents and Government documents. A number of these publicly available documents such as national strategic plans, policies, guidelines and Governmental reports were analysed and used to corroborate interview findings in this study. An overview of the reports used are provided below:

- The National ICT Strategic Plan (NICTSP) 2007 – 2011 (National ICT Strategic Plan 2007) and The National Information and Communication Technology Strategic plan (NICTSP) 2011-2014: Towards I-Mauritius (Gillwald and Islam 2011), which provide the programme of action of the Mauritian Government to "*bring ICT sector to the forefront of the national economy and for Mauritius to be located as a globally recognised ICT hub*" (Gillwald and Islam 2011, 8).
- The Digital Mauritius 2030 strategic plan of the Ministry of Technology, Communication and Innovation, which examines the technological trends, opportunities and barriers in Mauritius to foster and develop innovative and effective strategies to support the continued digital transformation of the Mauritian economy as well as creating an enabling and sustainable environment "*in line with the Mauritius Vision 2030 that calls for an intelligent*

and smart Mauritius" (Ministry of Technology & Communication & Innovation 2018, 6).

- The Human Resource Development Council Sectoral Committee Report: Transforming Mauritius Into A Knowledge Hub, under the aegis of the Ministry of Education and Human Resources, which outlines the strategies that will equip Mauritius with the necessary skills and a knowledge-intensive base to move towards a knowledge economy (Human Resource Development Council 2006). The report discusses strategies on building the country's capacity to "*better integrate itself into the global economy, through the generation, acquisition and transmission of knowledge*" via "*considerable investment in education and training as well as in economic infrastructure*" (Human Resource Development Council 2006, 2) .
- Education and Human Resources Strategy Plan (EHRSP) 2008-2020 of the Ministry of Education, Culture and Human Resources "*formulated in line with the vision of providing a quality education for all and developing a Human Resource base to transform Mauritius into an intelligent nation state in the vanguard of global progress and innovation through the development of a culture of achievement and excellence*" (Ministry of Education and Culture and Human Resources 2009a, 12). The plan focuses on ways to bring out "*meaningful, process-oriented change*" within the Mauritian education system, including higher education, to create a culture of achievement (Ministry of Education and Culture and Human Resources 2009a, 13).
- The National Curriculum Framework (NCF), under the aegis of the Ministry of Education, Culture and Human Resources, which outlines the principles for curricular reform in Mauritius starting from secondary schools to set the base for post-secondary education (Ministry of Education and Culture and Human Resources 2009b).
- The National Broadband Policy 2012-2020 (NBP2012), on behalf of the Ministry of Information and Communication Technology, which outlines the Government strategic vision towards a 'broadband Intelligent Mauritius' in line with the National ICT Strategic Plan 2011-2014 (Ministry of Information and Communication Technology 2012).

- The Public Sector Investment Programme (PSIP) 2014-2018, which sets out the Mauritian Government funding plans for 2014-2018 including that for the education sector (Ministry of Finance and Economic Development 2014).
- The National Intellectual Property Development Plan For The Republic of Mauritius, which is a document to review relevant national policies, legislations, strategies and plans and examines the legal and administrative frameworks in regard to intellectual property rights in Mauritius with recommendations provided based on findings and stakeholders input (Mengistie and Hardowar 2017).
- Action Plan for the Tertiary Education Strategy Plan (TESP), Mauritius, which is a plan to monitor and evaluate the Tertiary Education Strategy Plan by an indepenent consultancy services to ensure the necessary measures and requirements are established for the implementation of the Tertiary Education Strategy Plan 2013-2025 (Van 't Rood et al. 2016).
- Tertiary Education Commission Strategic Plan 2007-2011, which sets out the strategic goals and measures of the TEC to empower post-secondary institutions towards the country's visions of becoming the knowledge hub and leading country for higher education in the region (Tertiary Education Commission 2007).
- Quality Audit Reports, which are prepared by the TEC, following the mandated audits carried out to monitor universities' activities based on their objectives, with recommendations made (Tertiary Education Commission 2012, 2017).
- Quality Assurance Report – Open University of Mauritius, which is prepared by the TEC after evaluating the institution's processes and performance in relations to national and international academic standards, with recommendations made (Tertiary Education Commission 2015).
- The University of Mauritius Strategic Plan 2015-2020, a key university guideline, which sets out its vision and key strategic directions (University of Mauritius 2015).

Findings from these documents were used to corroborate interview data. An overview of the document analysis is provided next, with details provided in Chapter 5.

3.4.7.4.2 Documents analysis

A deductive content analysis approach was used to analyse the content of the documents where the researcher meticulously went through the documents, multiple times, in order to find relevant materials to corroborate and strengthen the interview findings. This process substantiated several characteristics and associated sub-characteristics of the E-learning 3.0 model, including new themes inductively derived from the interviews. Chapter 5 provides details of the interview analysis and outcomes, with the relevant supporting data from documents, where appropriate.

The interview findings, with the supporting documentation from the universities' and Government' documents resulted in the final holistic E-learning 3.0 model.

3.4.8 Results write-up

As stated by Gurdial Singh and Jones (2007), the research analysis should culminate in communicating and presenting the results. The outcomes of the surveys' analysis (the quantitative phase of this study) are presented in Chapter 4. The surveys' results from the preliminary analysis are presented in both tabular and graphical forms while factor analysis results are presented in tabular forms with diagrams where appropriate. The revised holistic E-learning 3.0 model is also outlined. Chapter 5 presents the outcomes of the interviews' and documents' analysis (the qualitative phase of this study) and the final holistic E-learning 3.0 model. Results from the analysis of interview data are presented using tables and participants' comments, displayed in italics and in between quotes with the respective participants' codes within brackets, to clearly differentiate between the researcher's words and those of the participants (Whiteley 2002). All results in this study are discussed with support from relevant references to the literature with the interviews' results further validated with Government and university documents. For consistency and for the convenience of the readers, tables and diagrams presenting E-learning 3.0 characteristics and sub-characteristics are colour- coded the same way as for the literature review in Chapter 2.

3.4.9 Ethics approval

Throughout this study, the ethics policy of Curtin University Human Research Ethics Committee, was adhered to. The questionnaires for the students' and the lecturers' surveys as well as the interview questions were sent to the Curtin University Human Research Ethics Committee, for approval, which was subsequently received.

Participants' consent to be surveyed and interviewed were obtained via the consent clause on the information sheet in the survey questionnaires and via the consent form for the interviews, respectively. The purpose of the research was explained to participants and they were provided with clear statements highlighting their voluntary participation and the maintenance of their confidentiality. The contact details of the researcher, the supervisors and the Ethics Committee were provided to allow any participant to request additional information related to the study should they wish to do so.

3.4.10 Research process flowchart

The research process is shown in Figure 3.1. In Phase 1 (Chapter 2), a literature review on Semantic Web characteristics and E-learning critical success factors (CSFs) is conducted, resulting in an initial holistic E-learning 3.0 model. Building on that, the next phase (Chapter 4), is the quantitative phase in the form of surveys to students and lecturers from Mauritian higher education institutions. Survey data was collected and analysed, resulting in a revised holistic E-learning 3.0 model. Interviews with lecturers and administrative personnel of Mauritian higher education institutions made up the qualitative and third phase of this study (Chapter 5). Analysis of interview responses with additional reference support from Government and university documents resulted in the final holistic E-learning 3.0 model. The final phase of the research process (Chapter 6) concludes the research and discusses the research limitations and suggestions for future work.

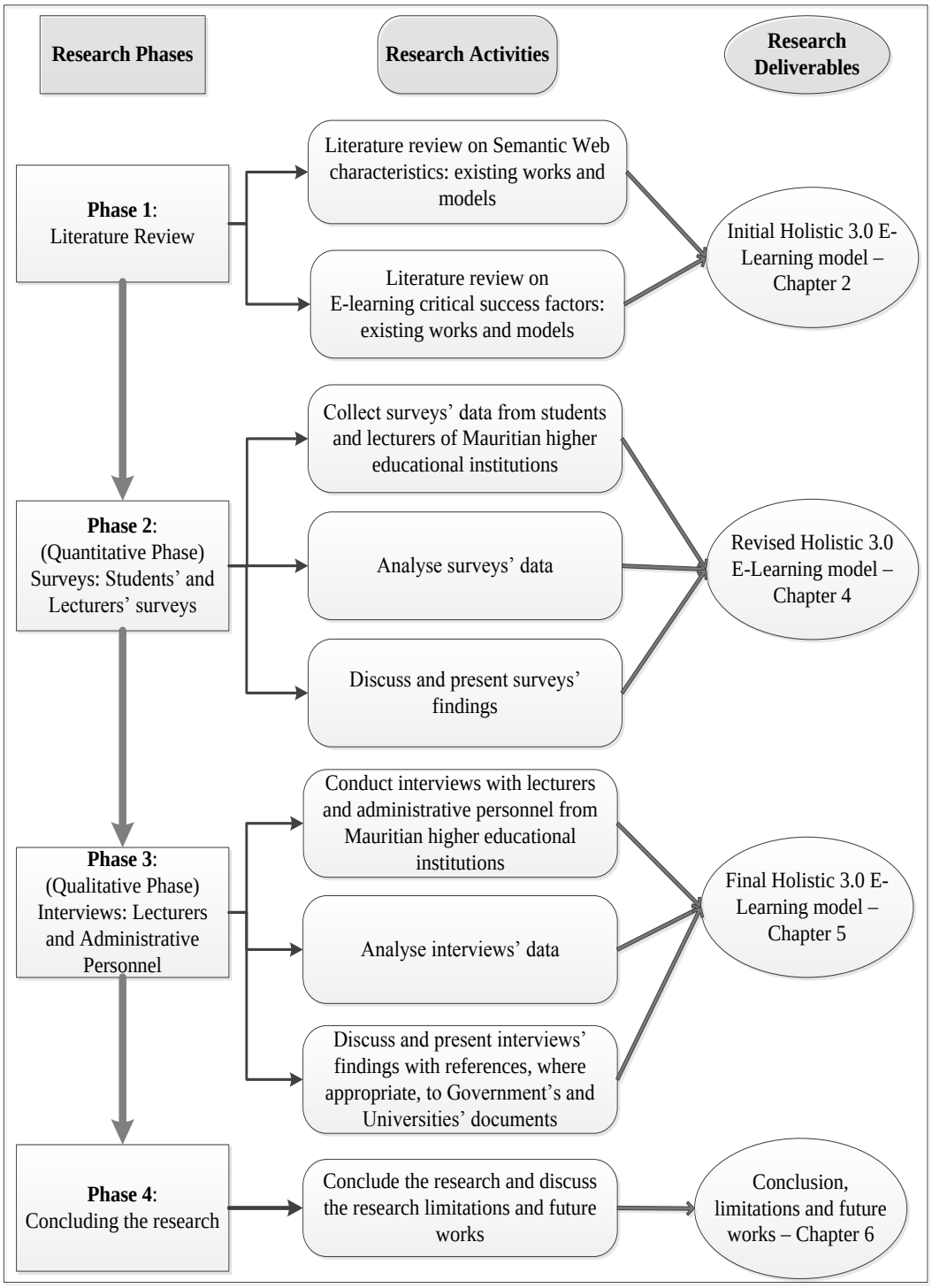


Figure 3.1: Research Process Flowchart

3.5 Chapter summary

This chapter explains the objectives and the significance of the research from theoretical and practical angles and formulates the research questions that will drive this study. The chapter then explains the research methodology adopted to answer the research questions. A comparison of the different IS philosophies is provided, leading the researcher to adopt the pragmatism philosophy as the main choice for this study, thus accommodating the need for paradigm plurality. Several research methods are then discussed based on an inductive approach to this study, given its exploratory nature, leading to the adoption of a mixed-methods approach consisting of a quantitative phase followed by a qualitative phase. The quantitative phase of this study consists of surveys distributed to Mauritian students and lecturers from tertiary institutions, while the case study approach, through interviews and documents analysis constitutes the qualitative phase. A preliminary analysis followed by factor analysis (exploratory) are conducted to analyse the survey data using SPSS, resulting in a revised holistic E-learning 3.0 model. Outcomes from the surveys are then used to design the interview questions. Semi-structured interviews are conducted with lecturers and administrative personnel from Mauritian tertiary institutions, with the interview responses manually coded using NVivo and analysed using content analysis. Mauritian university and Government documents are used to corroborate interview findings leading to the final holistic E-learning 3.0 model. Details on how the outcomes from the quantitative and qualitative phases are presented to the readers are then outlined before discussing the ethical considerations and presenting an overview of the research process in Figure 3.1.

The next chapter discusses the quantitative phase of this study, namely the surveys with students and lecturers from tertiary institutions in Mauritius.

CHAPTER 4: THE SURVEYS

4.1 Introduction

This chapter discusses the surveys conducted with students and lecturers from Mauritian higher education institutions to refine the initial holistic E-learning 3.0 model. The chapter explains how the surveys were designed and describes the target population. It outlines the process of setting up the surveys online and explains how the surveys were administered. The chapter reports on surveys' responses and analyses the demographic profiles of respondents. The techniques for data analysis are explained and the results of the analysis are presented. Changes made to the initial holistic E-learning 3.0 model following the survey outcomes are outlined. A revised holistic E-learning 3.0 model is presented at the end of the chapter.

4.2 Overview of the survey phase

The main aim of the survey phase of the research was to gather the perceptions of students and lecturers from the Mauritian higher education sector in regard to the initial holistic E-learning 3.0 model to ensure that the holistic E-learning 3.0 model is a comprehensive model which meet users' needs. Two survey questionnaires were designed, one for the students and one for the lecturers. The lecturers' survey also captured the perceptions of administrative personnel as discussed in section 3.4.6.1. The development of both survey questionnaires required a thorough understanding and accurate interpretation of the E-learning CSFs and the Semantic Web characteristics derived from the literature review. The survey questions were based on the characteristics identified in the initial holistic E-learning 3.0 model, taking into consideration the research questions of this study.

The survey phase of the research comprised the following steps:

- Design the hard copy of the questionnaires for the students' and lecturers' surveys.
- Review survey questions with the supervisors.
- Submit ethics approval form to the Ethics Committee of Curtin University.
- Design the online survey (*After approval has been granted from the Ethics Committee*).
- Distribute the surveys.

- Receive responses from students and lecturers from Mauritian higher education institutions.
- Analyse the survey responses.
- Revise the initial holistic E-learning 3.0 model.

Figure 4.1 below provides a summary of the survey phase of the research.

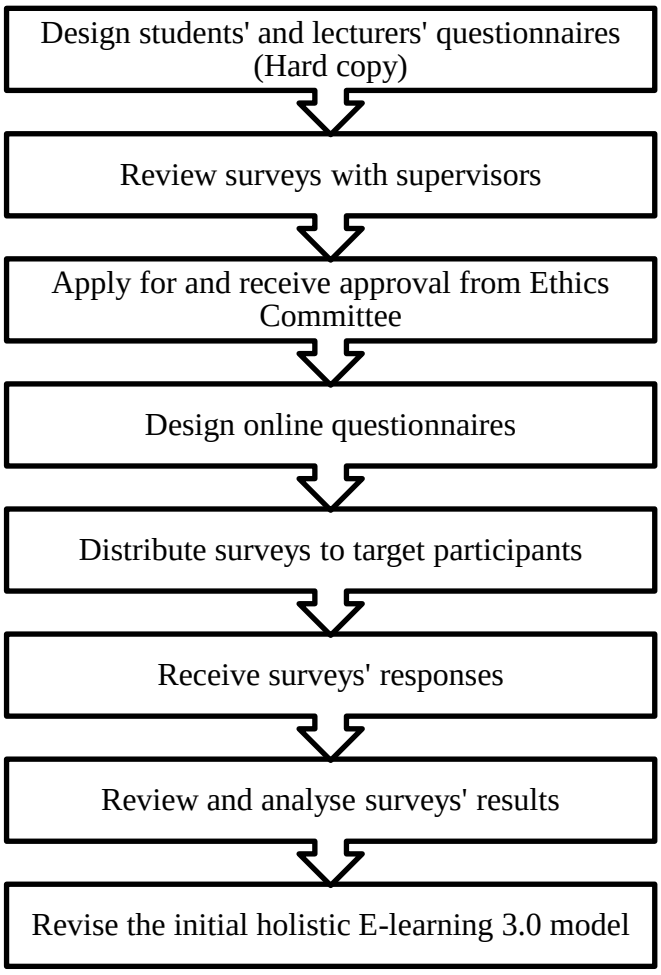


Figure 4.1: Summary of survey phase of the research

4.3 Target population

As discussed in section 3.4.6.1, the target population for this phase of the study are students and lecturers from the Mauritian public and private tertiary institutions. According to the Tertiary Education Commission (2014), over 40,000 students were enrolled in a Mauritian tertiary institution in 2013. The number of academic staff in public and private tertiary institutions in Mauritius varied with approximately 300 staff employed by the two largest universities in the country, namely the University of Mauritius and the University of Technology Mauritius (University of Mauritius 2014; University of Technology Mauritius 2014). Given the large number of students and

lecturers, they are the ideal survey participants, whose critical perceptions on E-learning 3.0 can be gathered in an economical way and hence, provide an extended and enhanced view of the research problem (Creswell 2007; Saunders, Lewis and Thornhill 2009). Additionally, as discussed in section 3.4.6.1, the lecturers' roles often cover activities such as course design and content creation, which the researcher initially considered as being distinct roles of the administrative personnel team. As a result, lecturers' participations in the survey would also provide their perceptions on critical aspects of the E-learning 3.0 model such as content creation, which were otherwise thought to be solely the domain of the administrative personnel.

4.4 Designing the students' and lecturers' surveys

Both surveys in this research were structured in a simple manner. It was estimated that participants would take an average of ten minutes to complete the survey questionnaire. Both surveys were divided into eight sections and the types of questions used were multiple choice questions and five-point likert scale questions. At the end of each section, participants were given the option to comment on the section via a free text box.

To ensure face validity, preliminary versions of the students' and lecturers' surveys were developed and presented to the supervisors of the study who are experienced academics from Curtin University and members of the researcher's thesis committee. The team systematically reviewed and evaluated the survey designs and questions and appropriate changes were made based on their recommendations. The questionnaires were then sent to the Curtin University Human Research Ethics Committee for approval, which was subsequently received. The final version of the questionnaires used in the students' and lecturers' surveys are shown in Appendix C and Appendix D respectively.

Both surveys started with an information statement (see Survey Consent in Appendix C and Appendix D) explaining the purpose of the study and objectives of the surveys and the expected time required to complete the survey. Other essential information on voluntary participation and confidentiality were provided as well as the surveys' approval number from the Curtin University Human Research Ethics Committee. Contact details of the researcher, the supervisors and the ethics Committee were provided to allow participant to request additional information related to the study or the surveys should they require to do so.

The eight sections of the students' and the lecturers' surveys as described next.

4.4.1 Questionnaire structure and items

Before formulating the survey questions, it was important to structure the questionnaires to ensure they covered all aspects of the initial holistic E-learning 3.0 model. As a result, while the first section of both surveys elicited the demographic information of respondents, in order to lay the foundation for content validity, both the students' and the lecturers' surveys consisted of a dedicated section for each of the seven characteristics and their associated sub-characteristics from the initial holistic E-learning 3.0 model. The questions for each specific characteristic section in both surveys were derived from the literature review based on the sources identified in this study as outlined in Appendix A and Appendix B. To further ensure content validity, each section ended with a free text box to allow participants to add any additional information not covered by the survey questions. Additionally, separate questionnaires were designed for the students and for the lecturers to provide a more customised list of questions for the two groups allowing survey items specifically related to each group to be included in a more structured manner. The eight sections of the surveys are explained below.

4.4.1.1 Background Information

The first section of both surveys, namely the 'Background Information', captured some general information about the participants including their age, gender and their university (whether public or private). Students, in their questionnaire, were also asked about their fields of study and the university programmes they were currently enrolled in. On the other hand, the lecturers were asked to specify their faculty, their highest education level and their preferred teaching mode. The questions were in the form of multiple choices with the option to choose a single answer. The section began with clear instructions directing participants to choose the answer that best represented their situations.

4.4.1.2 Questions on the characteristics/sub-characteristics from the initial holistic E-learning 3.0 model

Both surveys consisted of a dedicated section for each of the characteristics identified in the initial holistic E-learning 3.0 model. Each of the sections was titled according to its related characteristics from the initial holistic E-learning 3.0 model and consisted

of a series of statements related to that characteristic and its associated sub-characteristics. A brief explanation of each characteristic was also provided in the corresponding section. Participants were then clearly instructed to indicate their level of agreement with each of the statements within the section. The statements within each section sought to gather the opinions of students and lecturers on the related characteristics and associated sub-characteristics as identified from the initial holistic E-learning 3.0 model. It must be mentioned that the researcher, at times, refrained from using all the sub-characteristics' terminologies in their related statements, such as 'knowledge representation', 'ontologies', 'knowledge repositories' amongst others as, in many cases, this would have constituted a technical jargon, which might not have been understood by the students and the lecturers alike. The statements were instead formulated using simple-to-understand language while specifically asking participants about a characteristic and its associated sub-characteristics. The researcher also included inversely related statements, one after the other, in some sections such as 'Content Management' and 'Pedagogy', to check that participants understood the questions before answering them, as opposed to just randomly selecting an answer (Conway and Lance 2010).

At the end of each section, an open section in the form a comment text box was included to allow respondents to add any additional information not covered in the questionnaires, further ensuring content validity of the surveys.

A five-point Likert scale was used to capture the direction and strength of opinion of participants on each statement in the characteristics' sections (Garland 1991). The Likert scale (Likert 1932) is a popular instrument used to measure constructs such as opinions and attitudes where responses are easily quantifiable. It is widely used in market research and has been extensively tested in both the marketing and social science literature (Garland 1991). Lee and Soutar (2010) stated that the use of rating scales is the most common way of gathering data of quantitative nature. It is easier for the participants to respond to a degree of agreement, without the requirement to answer either 'yes' or 'no' (La Marca 2011). Responses are easy to code, including the neutral or undecided feelings of participants, thereby, making data analysis easier. As opposed to the often recommended seven-point Likert scale (Preston and Colman 2000; Finstad 2010), the five-point Likert scale was selected to minimise chances of respondents becoming frustrated by the volume of information in the questionnaires, particularly if pressed for time (Preston and Colman 2000).

For this study, the values for the Likert scale used were 'Strongly Agree', 'Agree', 'Neither Agree nor Disagree', 'Disagree', and 'Strongly Disagree' with a '1' indicating the participant's strong agreement with the statement and a '5' indicating the participant's strong disagreement with the statement, as per the original scoring system from Likert (1932) (Boone and Boone 2012; Friedman, Herskovitz and Pollack 1994).

4.5 Administering the surveys

As stated by (Hill 1998, 3), "*no doubt in e-surveys, obtaining informed consent to participate is not an easy task*". Given the large number of students and lecturers from the Mauritian tertiary institutions, as outlined in section 4.3 and their lack of willingness to participate in the surveys, as explained in section 3.4.6.2, the collection of survey data was outsourced to DCDM research, a renowned market and social research agency in Mauritius (DCDM Research 2015). Both surveys were administered using the 'Qualtrics' online survey tool (Qualtrics 2015) to ensure greater control by the researcher on the survey administration and on the participation rate, especially since the researcher is based in Australia and DCDM is based in Mauritius where participants' responses were to be gathered. The numerous benefits that Qualtrics brought to this study are elaborated in section 3.4.6.2.1.

DCDM Research assigned a project leader to work closely with the researcher to ensure as many surveys as possible were completed by the target population. The anonymous links generated by Qualtrics for each of the surveys were sent to the assigned project leader who in turn worked with his team at DCDM Research to distribute the link to students and lecturers in Mauritian public and private tertiary institutions.

Starting in May 2015, DCDM Research distributed 581 student survey questionnaires, of which 324 were completed. Out of these completed surveys, 300 were considered acceptable. For the lecturers' survey, 165 questionnaires were distributed, and 111 responses were obtained, out of which 105 were acceptable. DCDM research sent an initial email with the appropriate links to the surveys to the targeted population based on the list of contacts available on the agency's database. DCDM research also sent a follow up email, one week after the first email, as per the researcher's instructions, based on the recommendation made by Saunders, Lewis, and Thornhill (2009) as a means of increasing the response rate. Follow-ups are considered important as they

indicate the importance of the survey and respondents' participation and it limit the number of passive non-respondents, who may have somehow not received the survey, or may have forgotten about it, or misplaced it or may have had other commitments and hence did not get to attend to the survey (Cycyota and Harrison 2002; Rogelberg and Stanton 2007). After one month of the original email, another follow-up email was sent to students and lecturers, again encouraging them to participate if they have not done so already. Both surveys remained opened for a period of 3 months to allow maximum number of participants to be obtained. The whole process was challenging with the researcher monitoring the response rate on an almost daily basis and liaising constantly with DCDM Research to ensure that as many participants as possible were obtained.

Over the course of the three months, the response rate was monitored until 300 acceptable students survey responses (51.6%) and 105 acceptable lecturers survey responses (63.6%) were obtained. Following discussions with DCDM research, it became clear that the number of participants was highly unlikely to increase any further. Hence, with support from the literature review on adequate sampling size, the response rate was considered satisfactory. In fact, Cavana, Delahaye, and Sekaran (2001) stated that a reliable and valid sample for quantitative study should allow the generalization of findings from the sample to the population under investigation with a narrow margin of error. Although the rule for quantitative sampling remains that the greater the sample size, the more accurately the findings will reflect the population (Kumar 2011), it is argued that as the population increases, the sample size increases at a diminishing rate and remains relatively constant at slightly more than 380 cases (Krejcie and Morgan 1970). Martin (1986) also stated that the indefinite collection of data must be weighed up against time and it becomes more productive to move on at some point in time as additional results may add little to the final conclusions. It is further argued that sample size requires resources availability considerations in terms of time, space and effort as much as the statistical consideration (Roscoe 1969; Alreck 1995). Consequently, with 51.6% and 63.6% response rates for the students' and lecturers' surveys respectively, which is above the acceptable response rate according to Cavana, Delahaye, and Sekaran (2001) and Baruch and Holtom (2008), no more participants were sought.

4.6 Students' survey analysis

In this section, the researcher discusses the analysis of the data obtained from the 300 acceptable students survey questionnaires. The questionnaire consisted of 48 statements relating to the seven characteristics and associated sub-characteristics of the initial holistic E-learning 3.0 model. Appendix E provides the list of statements from the student survey questionnaire and the characteristics and sub-characteristics to which they relate.

A preliminary analysis of the students' survey data is conducted first using SPSS 22 followed by a factor analysis. The sub-sections below explain in detail the analysis of the students' survey data and the resulting outcomes.

4.6.1 Preliminary analysis of the students' survey

The preliminary analysis of the students' survey data consists of two parts. The first part discusses the demographics of the respondents and the second part discusses the results related to statements on the seven characteristics and associated sub-characteristics from the initial holistic E-learning 3.0 model, taking into consideration the research questions. The responses are analysed using SPSS version 22 and presented in both tabular and graphical forms for the convenience of the readers, with the tables providing the numerical values and the graphs indicating the proportion.

4.6.1.1 Demographic analysis of the students' survey

43.3 % of student participants were male and 56.7 % were female as outlined in Table 4.1 and Figure 4.2.

Table 4.1: Students' Survey – Gender of Participants (N=300)

Students' Gender	Number of Responses	Percentage Response
Male	130	43.3%
Female	170	56. 7%
Total (N)	300	100%

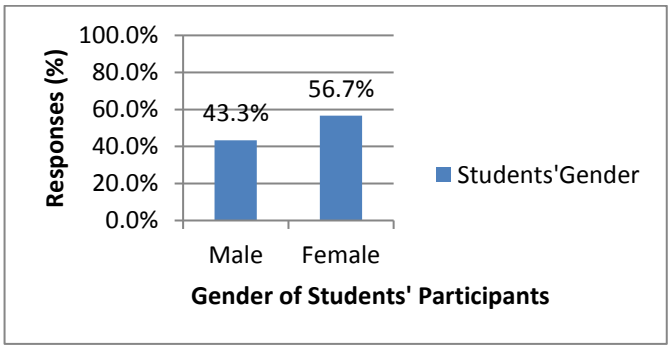


Figure 4.2: Students' Survey – Gender of Participants

In terms of age group, the majority of students who participated in the survey (96.7 %) were aged between 16-25 years as shown in Table 4.2 and Figure 4.3.

Table 4.2: Students' Survey – Age Group of Participants (N=300)

Students' Age Group	Number of Responses	Percentage Response
16-25	290	96.7%
26-35	10	3.3%
36-45	0	0.00%
46-50	0	0.00%
51 and above	0	0.00%
Total (N)	300	100%

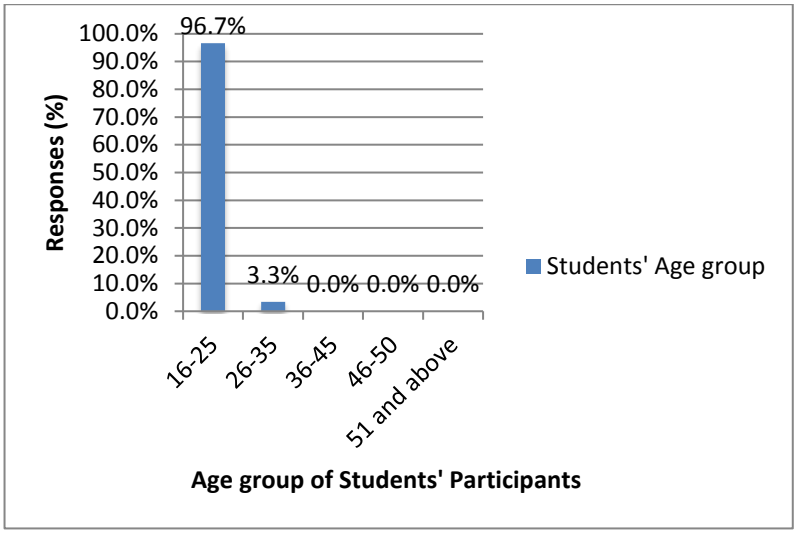


Figure 4.3: Students' Survey – Age Group of Participants

The percentages of student participants enrolled in different programs at the universities are shown in Table 4.3 and Figure 4.4. The highest percentage of 61.7% was obtained for enrolments in an undergraduate program, which also explains the large percentage of participants in the 16-25 ages' group as seen above. In fact, this is in line with the usual trend in Mauritius where most students wanting to pursue tertiary education do so as soon as they finish their secondary studies or soon after (Tertiary Education Commission 2016).

Table 4.3: Students' Survey – Programme Enrolment of Participants (N=300)

Programme Enrolled - Students	Number of Responses	Percentage Response
Foundation	7	2.3%
Undergraduate Certificate	22	7.3%
Undergraduate Diploma	66	22.0%
Undergraduate Degree/Bachelor Degree	185	61.7%
Postgraduate Diploma	12	4.0%
Postgraduate Degree/Masters	5	1.7%

PhD/Research	0	0.0%
Others	3	1.0%
Total (N)	300	100%

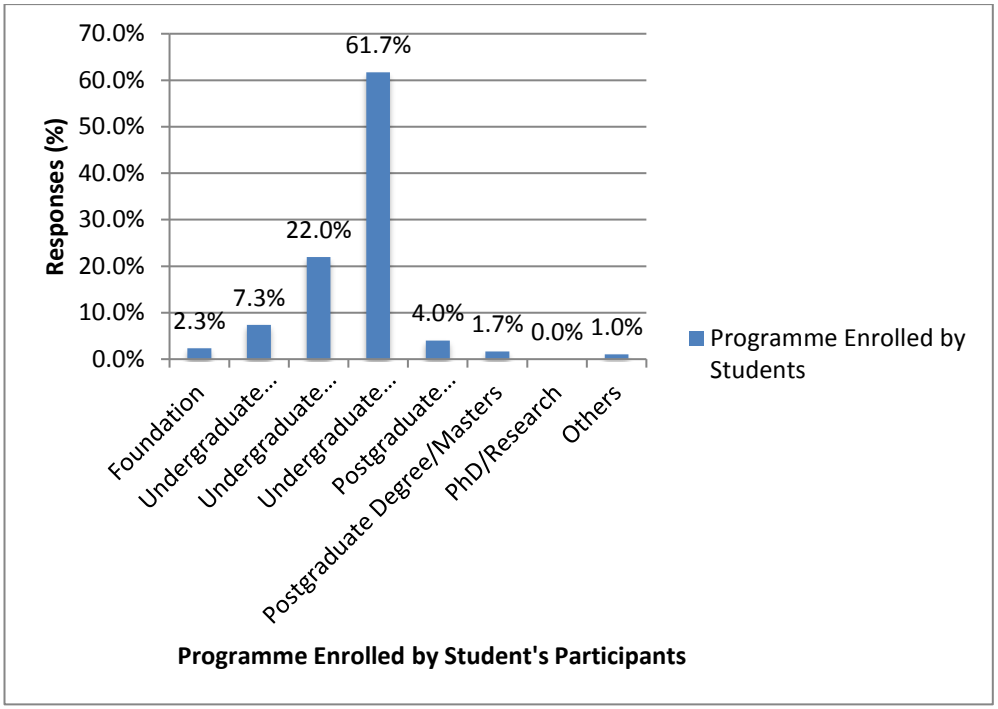


Figure 4.4: Students' Survey – Programme Enrolled by Participants

The number of student participants from public and private universities was relatively similar with 48.3% enrolled in public universities and 52.3 % in private universities. With public universities in Mauritius absorbing most of tertiary students in Mauritius (Tertiary Education Commission 2016), the figures, as shown in Table 4.4 and Figure 4.5, clearly denote that students at private universities were more willing to participate than those in public universities.

Table 4.4: Students' Survey – University Type of Participants (N=300)

Type of University	**Number of Responses**	**Percentage Response**
Public	145	48.3%
Private	157	52.3%
Total (N)	300	100%

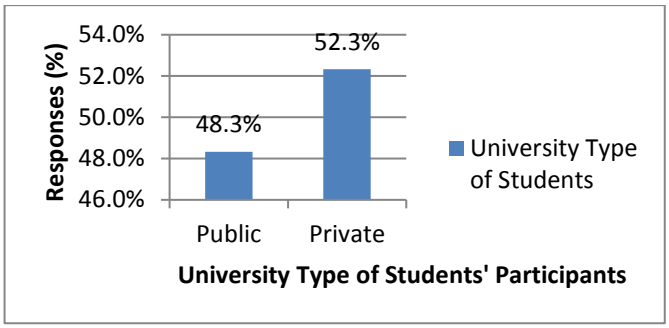


Figure 4.5: Students' Survey – University Type of Participants

In regard to participants' field of study, the percentages varied. The Tourism field had more student participants with 22.7% followed by the Law and Management field and Social Studies and Humanities field at 11.7 % each. Students enrolled in an Information Technology and Systems (IT/IS) related degree accounted for 10% of participants and an Engineering degree including Computer Science degree accounted for 6%. No participant was from the field of Agriculture. The participation of students from different faculties was considered critical to this study. It allowed the gathering of a wider range of opinions and perceptions on the different aspects of E-learning 3.0, not restricted to students enrolled in technology-specific courses such as computer engineering courses or the Information Technology and Systems field of study. Table 4.5 and Figure 4.6 show the number of participants and the percentage response in each field of study.

Table 4.5: Students' Survey – Field of Study of Participants (N=300)

Field of Study/Faculty	**Number of Responses**	**Percentage Response**
Agriculture	0	0.0%
Art & Design	22	7.3%
Business, Accounting & Finance	18	6.0%
Engineering	18	6.0%
Health	8	2.7%
Information Technology and Systems	30	10.0%
Law and Management	35	11.7%
Science	18	6.0%
Social Studies & Humanities	35	11.7%
Tourism	68	22.7%
Others	48	16.0%
Total (N)	300	100%

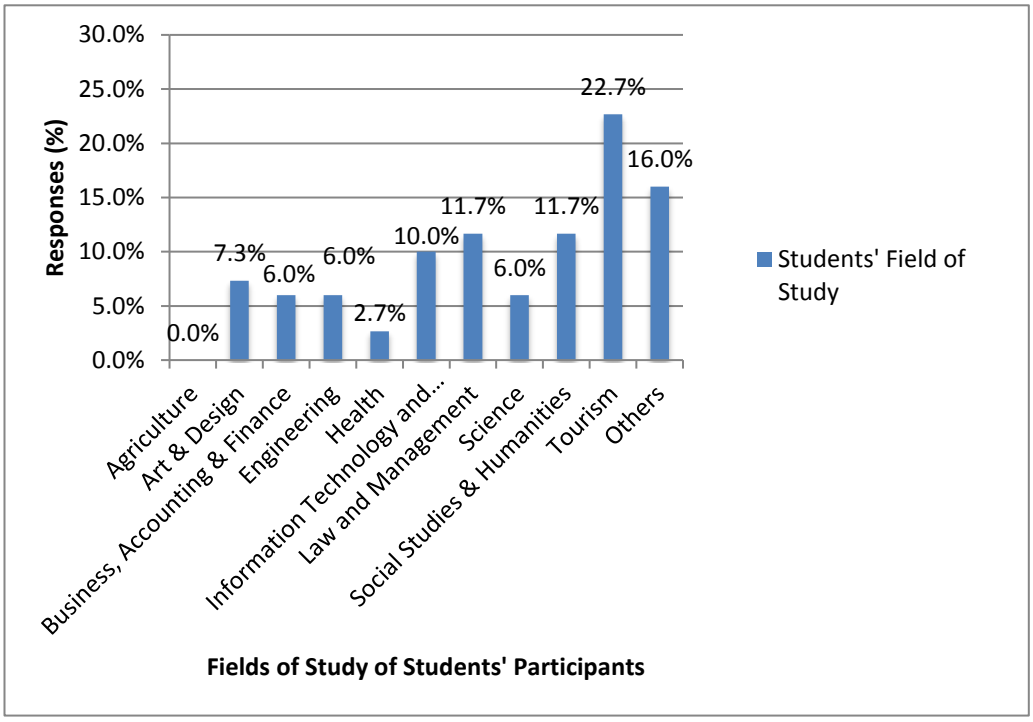


Figure 4.6: Students' Survey – Fields of Study of Participants

4.6.1.2 Characteristics analysis of the students' survey

Student participants' responses to the statements regarding the seven characteristics and associated sub-characteristics of the initial holistic E-learning 3.0 model are discussed below. Participants were asked to indicate their level of agreement with each statement with options ranging from 'Strongly Agree', 'Agree', 'Neither Agree nor Disagree', 'Disagree' to 'Strongly Disagree'. The researcher assigned a specific code to each of the level of agreement namely 1 for 'Strongly Agree', 2 for 'Agree', 3 for 'Neither Agree nor Disagree', 4 for 'Disagree', and 5 for 'Strongly Disagree' (Boone and Boone 2012; Friedman, Herskovitz and Pollack 1994). Descriptive statistics were computed to indicate how respondents answered the range of statements and to understand the key variables. In the next sub-sections, the research discusses the overall response to all the statements related to the initial holistic E-learning 3.0 model. This is followed by a detailed discussion of responses to statements related to each individual characteristic (and their associated sub-characteristics) namely 'Content Management', 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Web 3.0 System', 'Support' and 'Trust'.

4.6.1.2.1 Student participants' overall response to characteristics and sub-characteristics of the initial holistic E-learning 3.0 model

The average responses of student participants to the 48 statements related to the seven identified characteristics of the initial holistic E-learning 3.0 model, were between 1.07 and 3.86. 44 statements gathered a "Strongly agree" or "Agree" response while the remaining 4 statements registered neutral responses of "Neither agree nor disagree". As an initial observation, this result denotes that, overall, participating students favoured the proposed set of characteristics (and associated sub-characteristics) for a holistic E-learning 3.0 model. Appendix F provides descriptive statistics for participants responses to the lists of statements in the students' survey, in ascending order of mean value. A summary of the mean responses for each statement related to the seven characteristics identified in the initial E-learning 3.0 model are also outlined in Appendix H.

4.6.1.2.2 Student participants' responses by characteristics and sub-characteristics of the initial holistic E-learning 3.0 model

A detailed analysis of students' responses to the statements related to each characteristic (and their associated sub-characteristics) of the initial holistic E-learning 3.0 model, is provided below. The number of students responding to each of the statements under the categories of 'Strongly Agree' (SA), 'Agree' (A), 'Neither Agree nor Disagree' (NA/ND), 'Disagree' (D) and 'Strongly Disagree' (SD) are shown in tabular format while the respective percentages out of 300 participating students are shown in graphical format. Percentage response for the 'Strongly Agree' (SA) and 'Agree' (A) categories have been grouped together as shown in the graphs' legends as well as that for 'Disagree' (D) and 'Strongly Disagree' (A) categories.

4.6.1.2.2.1 Content Management

Responses of student participants to statements for the characteristic 'Content Management' and associated sub-characteristics 'Content creation', 'Content retrieval', 'Content reuse', 'Search' and 'Knowledge representation' are outlined in Table 4.6 and Figure 4.7 below.

Table 4.6: Students' Survey – Content Management Characteristic

Please indicate your level of agreement to each statement: **With respect to Content Management, in E-learning…**	**Number of Students**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Only lecturers can create learning materials	22	139	80	51	8	2.61
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)	3	47	130	117	3	3.23
Learning content should be easily accessible/retrievable	151	149	0	0	0	1.50
Learning content should be reusable	124	128	48	0	0	1.75
Learning content should match students' needs	166	129	5	0	0	1.46
Learning content should allow me to construct my own knowledge of the course	107	121	72	0	0	1.88
Learning content should be quick to search	150	150	0	0	0	1.50

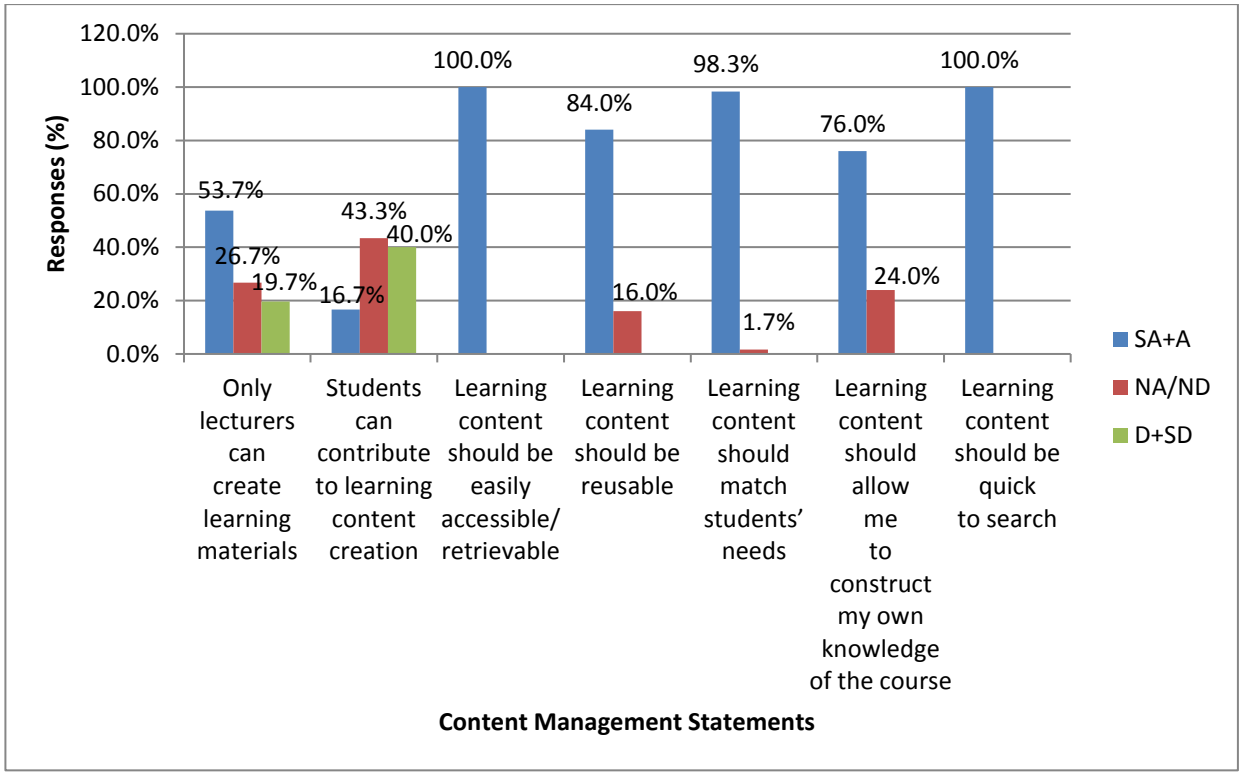


Figure 4.7: Students' Survey – Content Management Characteristic

Varied responses were obtained on the statement that only lecturers can create learning materials. 53.7 % strongly agreed/agreed with the statement, 26.7% preferred not to agree or disagree with the statement, while 19.7% disagreed/strongly disagreed with the statement. These results show mixed opinions about who should be responsible for content creation. The same response trend was recorded for the statement regarding students' contributions to learning content creation. Only 16.7 % strong agreed/agreed with the statement, while 43.3% and 40% had a neutral response and disagreed/strongly disagreed respectively. These results align with the fact that Mauritian students are used to being "*dependent learners*" in a traditional learning environment, with content created and delivered by lecturers as opposed to being "*independent learners"* who can "*contribute and influence the content and structure of learning programmes with the lecturer as a resource* (Vencatachellum and Munusami 2003, 2). The statements on content being easily accessible/retrievable and quick to search obtained 100% of agreement while the remaining three statements on content reuse, content meeting students' needs and content allowing students to construct their own knowledge of the course gathered high percentages of agreement with, nonetheless, a few neutral responses. One participant commented that "*it must be specific to what the student needs in order to avoid overload of notes*" in the comment section, supporting that content should match the students' needs. The neutral responses for the statements relating to content reuse (16%) and knowledge construction (24%) could possibly be indicating students' unfamiliarity with new concepts away from the traditional Mauritian learning environment. Consequently, the mixed results for some of the statements under 'Content Management' warrant the need for the researcher to explore this characteristic further to ensure its accurate representation in the E-learning 3.0 model.

4.6.1.2.2.2 Personalised Learning

Responses of student participants on the 'Personalised Learning' characteristic and associated sub-characteristics 'Student model' and 'Lecturer's characteristics' are shown in Table 4.7 and Figure 4.8.

Table 4.7: Students' Survey – Personalised Learning Characteristic

Please indicate your level of agreement to each statement: **With respect to Personalised Learning,**	**Number of students**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
My existing knowledge of the course should be taken into account	100	158	42	0	0	1.81
My learning style preferences should be taken into account	84	153	63	0	0	1.93
I should be allowed to select learning materials based on my learning style preferences	100	139	61	0	0	1.87
I should be able to receive different learning materials than my peers based on my learning profile (e.g. considering my existing knowledge and learning style preferences)	105	116	66	7	6	1.98
My educational goals should be met	147	152	1	0	0	1.51
Lecturers deliver courses based on students' needs	0	24	70	129	77	3.86
Lecturers are keen to facilitate students' learning	0	44	55	135	66	3.74
Lecturers have the skills and competence to support personalised learning	0	65	56	140	39	3.51

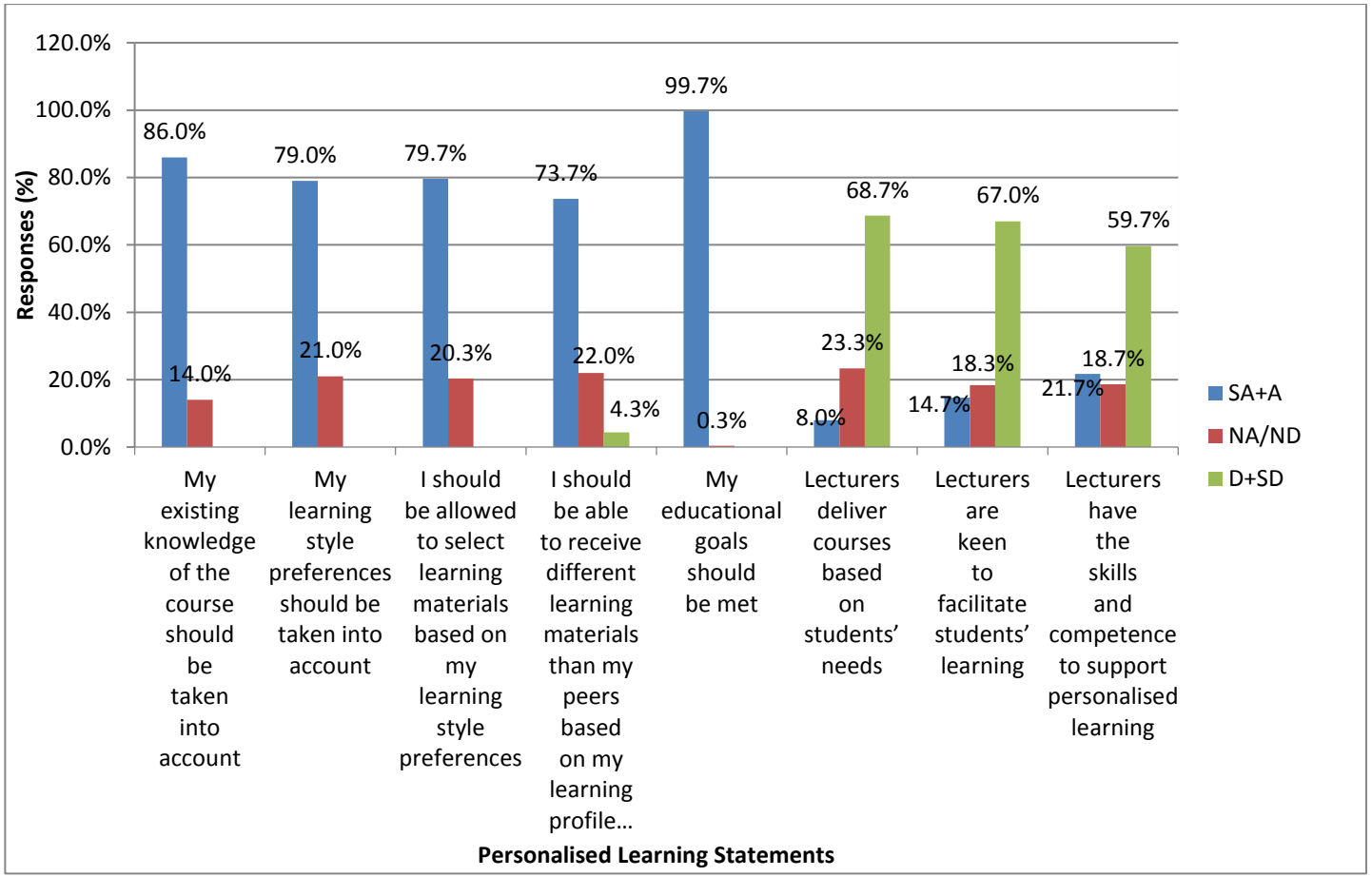


Figure 4.8: Students' Survey – Personalised Learning Characteristic

The first five statements relating to the 'Student model' sub-characteristics received high level of agreements with some students providing additional comments such as "*everyone should have their way of learning*" and "*Programme according to age and experience*". However, a small percentage of participants gave a neutral response while 4.3% disagreed/strongly disagreed with the statement on receiving learning materials that were different from those of their peers. These responses showed students' agreement that a personalised learning environment is welcomed, where their previous experiences, needs and goals, preferences and learning styles are taken into consideration for course delivery. Yet some students denoted that they were unsure and skeptical, possibly due to that fact that such an environment does not necessarily prevail in Mauritius (Allybokus 2015). Mixed responses were recorded for the statements pertaining to the sub-characteristic 'Lecturer's characteristics'. 68.7% disagreed/strongly disagreed that lecturers deliver courses based on students' needs, 23.3% neither agreed nor disagreed with the statement and only 8% agreed with the statement. Similarly, only 14.7% of respondents agreed that lecturers are keen to facilitate students' learning, 18.3% gave a neutral response and 67% disagreed/strongly disagreed with the statement. 59.7% of participants believed that lecturers did not have the skills and competence to support personalised learning, 18.7 % neither agreed nor disagreed with the statement and 21.7% agreed. The overall outcomes for the 'Personalised Learning' characteristic indicated a clear lack thereof within the learning environment, as perceived by the students, with the mixed responses providing grounds for further analysis.

4.6.1.2.2.3 Pedagogy

Participants' level of agreement with each of the statements for the 'Pedagogy' characteristic and associated sub-characteristics 'Syllabus', 'Course design and sequencing', 'Assessment and evaluation', 'Teaching strategies' and 'Context' are shown in Table 4.8 and Figure 4.9.

Table 4.8: Students' Survey – Pedagogy Characteristic

Please indicate your level of agreement to each statement: **With respect to Pedagogy, E-learning courses should…**	**Number of Students**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Have clear learning objectives for each lesson	144	133	23	0	0	1.60
Have clear organisation of lessons which is easy to follow	134	145	21	0	0	1.62
Have clear assessments instructions	161	116	23	0	0	1.54
Be delivered in a pre-determined way where I am a passive participant only	73	99	101	22	5	2.29
Allow me to be an active participant where I can construct and manage my own personal knowledge	23	97	70	110	0	2.89
Be delivered according to my learning profile (e.g. considering my existing knowledge and learning style preferences)	106	159	35	0	0	1.76
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet my needs	139	161	0	0	0	1.54

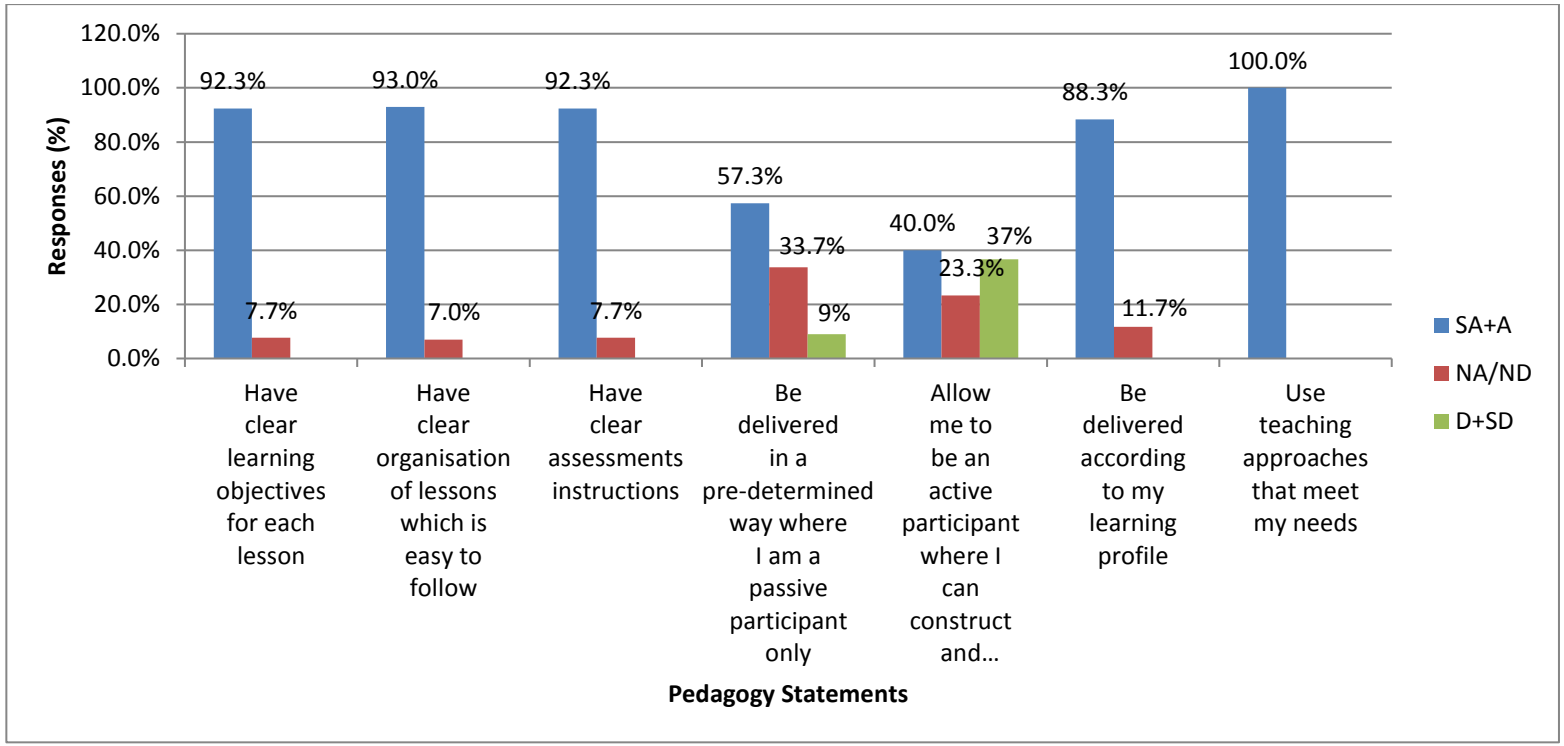


Figure 4.9: Students' Survey – Pedagogy Characteristic

The first three statements for the 'Pedagogy' characteristic, namely clear learning objectives for lessons, clear organisation of lessons which are easy to follow and clear assessment instructions, gathered positive responses of 92.3%, 93.0% and 92.3% respectively. 57.3% of student participants strongly agreed/agreed with the statement that E-learning courses should be delivered in a pre-determined way where students are passive participants, supporting the fact that Mauritian students are accustomed to a traditional learning environment, which is "*lecturer-directed"* with *"highly structured programmes*" (Vencatachellum and Munusami 2003, 2). However, the 33.7% neutral response and 9% disagreement with the statement seem to indicate a shift in students' perceptions of their role in their learning. This is further supported by results obtained from the next statement asking students if they want to be active participants in their learning and manage and construct their knowledge. 40% strongly agreed with this statement indicating their keenness to play a more collaborative role in their learning and supporting a shift in the role of instructors from "*givers of information*" to that of "*facilitating student learning*" (Gunness 2011, 10). Additionally, comments such as "*Practice adult learning principles*", "*learning should be delivered in a creative way*" also denote the willingness of some students to be active learners. With 57.3% of participants agreeing to the traditional teaching approach but at the same time 40% agreeing to the change in the students' roles in their learning (and hence the lecturer's role as well), there is clear indication that students, despite accepting the responsibility for their learning, are so used to the traditional teacher-centered learning environment that some are reluctant or even opposed to adopting learning practices that encourage autonomy and higher-order thinking (Jump and Jump 2006). Students' success in the Mauritian education system is more often than not determined by their performances in high-stake examinations where they are expected to reproduce a fixed body of knowledge (Toh et al. 2003; George and Lubben 2002; Allybokus 2015). As a result of this focus on examinations, students often prefer their learning to be led by teachers, as this teacher-centered delivery is seen as the best way to optimise examination results (Toh et al. 2003; Allybokus 2015). Based on these findings, the researcher believes that this aspect of the 'Pedagogy' characteristic needs to be further explored to ensure its accurate representation in the E-learning 3.0 model. Students were also asked whether E-learning courses should be delivered according to their learning profiles. 88.3% of participants agreed to the statement, while the remaining 11.7% neither agreed nor

disagreed with one student commenting that "*adapting to learning profiles of each student would be a lot of work*". Student participants agreed 100% that teaching approaches should meet students' needs, with one participant commenting that "*students should be given more attention*".

4.6.1.2.2.4 Collaboration

Participants' levels of agreement with each of the statements for the 'Collaboration' characteristic and associated sub-characteristics 'Interaction' and 'Sharing of resources' are shown in Table 4.9 and Figure 4.10.

Table 4.9: Students' Survey – Collaboration Characteristic

Please indicate your level of agreement to each statement: **With respect to Collaboration, in E-learning, it is important to…**	**Number of Students**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Have facilities for collaboration between peers	74	182	33	11	0	1.94
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)	133	167	0	0	0	1.56
Share resources with peers	40	191	56	13	0	2.14
Share resources with lecturers	82	199	19	0	0	1.79
Have group activities	88	171	41	0	0	1.84

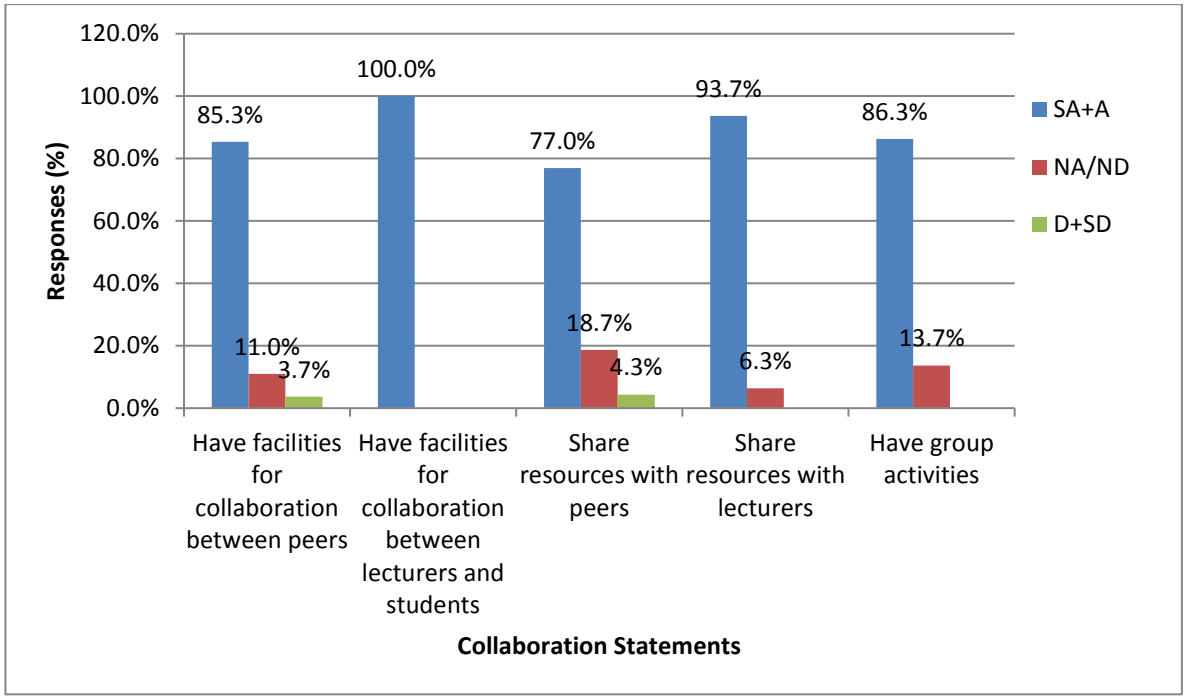


Figure 4.10: Students' Survey – Collaboration Characteristic

Most participants strongly agreed/agreed with 'Collaboration' as part of the E-learning 3.0 model. 85.3 % and 100% of participants were in favour of having facilities for collaboration between peers and between lecturers and students respectively. 77%, 93.7% and 86.3% of respondents believed that E-learning system should allow for the sharing of resources with peers and with lecturers and should support group activities. These outcomes were supported by several comments from participants such as "*Team working is crucial*", "*Collaboration within team is crucial*", "*Collaboration is important as it gives a preview of the working world*" and "*collaboration allows for better knowledge*". Collaboration and the sharing of resources with fellow students registered some neutral responses (11% and 4.3% respectively) as well as some disagreements (3.8% and 4.3% respectively). Similarly, 6.3% of participants and 13.7% neither agreed nor disagreed with the sharing of resources with lecturers and having group activities. While the overall outcomes for the 'Collaboration' characteristic indicate that participants largely agreed with the statements, some reluctance to collaborate with fellow students as well as to share resources with students and lecturers can be noted. As indicated by the comment from one participant that "*there must be some competition so that we can be more inspired and focused*", some students view collaboration as a barrier to competition. In fact, the literature shows that Mauritius does not have a "*knowledge sharing culture*" but instead has a deep-rooted education system, which encourage individualistic and competitive behaviours and mistrust mentalities as opposed to teamwork and collaboration (Veer Ramjeawon and Rowley 2017). Students do not see their peers as having much responsibility for their learning, but often consider their peers as competition and hence the reluctance to share and collaborate (Jump and Jump 2006). Consequently, this aspect of collaboration requires further exploration to ensure that 'Collaboration' is holistically represented in the E-learning 3.0 model.

4.6.1.2.2.5 Web 3.0 System

Responses to the characteristic 'Web 3.0 System' and its associated sub-characteristics 'Knowledge and other repositories', 'Ontologies', 'Usability', 'Accessibility' and 'ICT Infrastructure' are shown in Table 4.10 and Figure 4.11.

Table 4.10: Students' Survey – Web 3.0 System Characteristic

Please indicate your level of agreement to each statement: **With respect to Web 3.0 System, E-learning system should…**	**Number of Students**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Maintain effective records of information and resources	123	173	4	0	0	1.60
Support customised access to learning resources	131	166	3	0	0	1.57
Keep records of students' learning profiles	116	166	18	0	0	1.67
Support new technologies	259	37	4	0	0	1.15
Be easy to navigate	220	80	0	0	0	1.27
Have easy access to resources	193	107	0	0	0	1.36
Have effective IT infrastructure	279	21	0	0	0	1.07

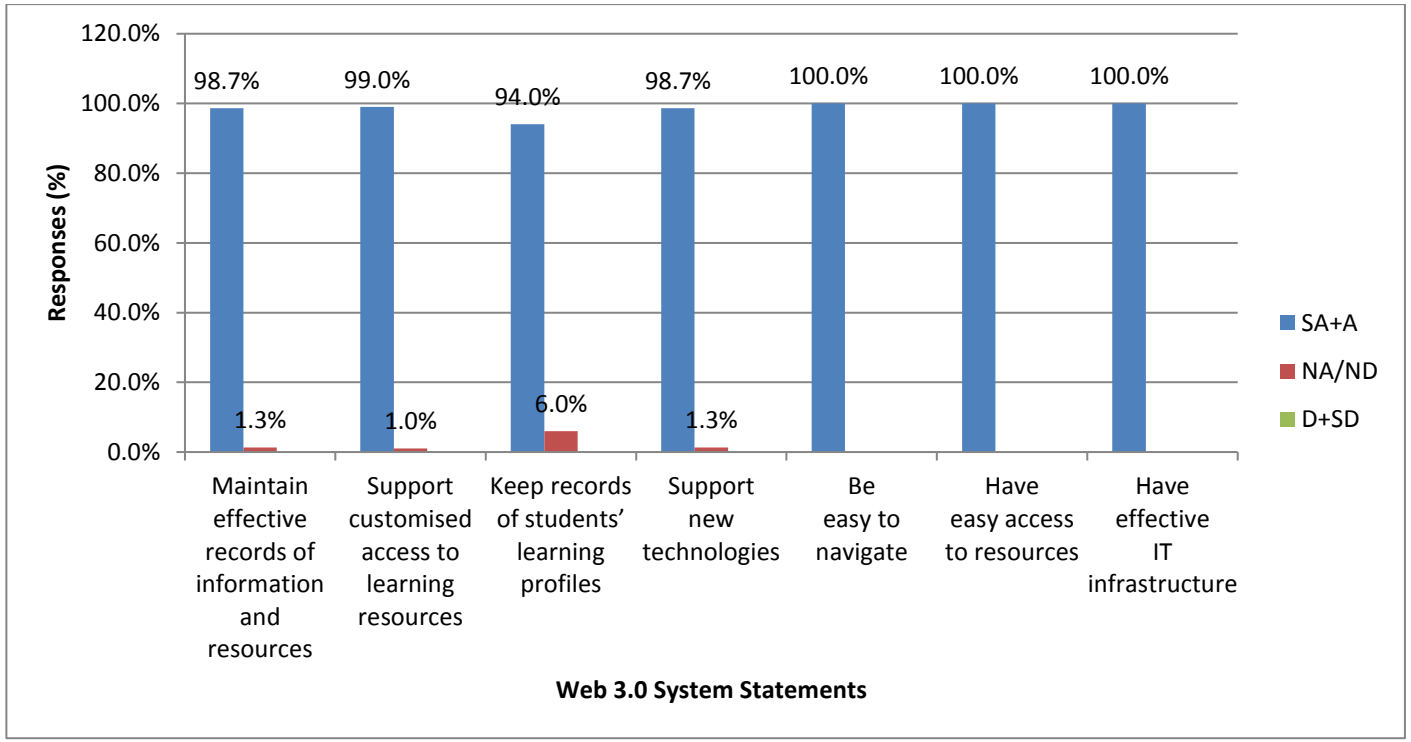


Figure 4.11: Students' Survey – Web 3.0 System Characteristic

The mean responses of students for the different statements on ‘Web 3.0 System’ denoted a high level of agreement with the statements on ‘Web 3.0 System’ with 100% agreement obtained for three of its statements and over 90% of agreement for the remaining ones. A small percentage of participants gave neutral responses to the statements related to the sub-characteristics ‘Knowledge and other repositories’ and ‘Ontologies’. While the statements were not formulated to contain these terms per se, they were intrinsically referring to the same. 6% of respondents neither agreed nor disagreed that the system should keep the students’ learning profiles, while around 1% of participants had neutral responses to statements on effective records and information maintenance, customised access to learning resources and the support for new technologies. Despite being a relatively small percentages of neutral responses compared to the overwhelmingly large percentage of agreements, these results, nonetheless, indicated that some participants were not certain about some aspects of ‘Web 3.0 System’, which could be explained by their lack of unfamiliarity with these concepts.

4.6.1.2.2.6 Support

Responses to the ‘Support’ characteristic and associated sub-characteristics ‘Instructional support’ and ‘Organisational support’ are provided in Table 4.11 and Figure 4.12.

Table 4.11: Students' Survey – Support Characteristic

Please indicate your level of agreement to each statement: **With respect to Support, in E-learning…**	**Number of Students**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Peer assistance is important to me	134	133	25	8	0	1.69
Lecturers' support is important (e.g. through students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles)	154	140	6	0	0	1.51
Ongoing feedback from lecturers about my learning performance is important	160	110	30	0	0	1.57
I should be able to provide feedback about my learning experience	145	131	24	0	0	1.60
Training to use the system is important	173	127	0	0	0	1.42
Effective and appropriate technology infrastructure is important	172	128	0	0	0	1.43
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	180	120	0	0	0	1.40

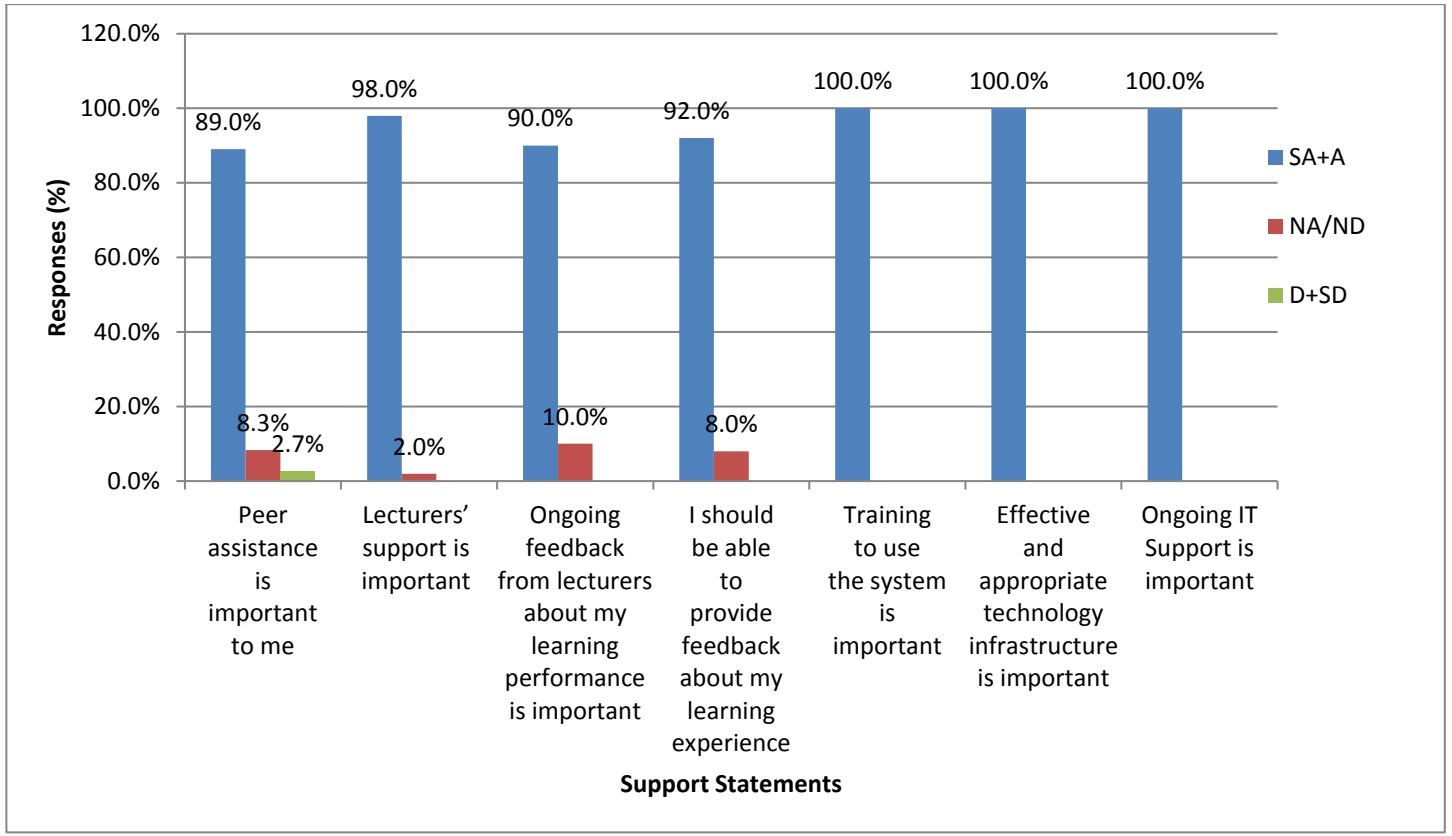


Figure 4.12: Students' Survey – Support Characteristic

The responses to the seven statements on the 'Support' characteristic showed a high level of agreement. A slightly lower percentage of agreement was captured for the statement related to peer assistance with 89% of participants agreeing that peer assistance is important to them, 8.3% neither agreeing nor disagreeing and 2.7 % disagreeing with the statement. These results aligned with results obtained for the 'Collaboration' characteristic, which as discussed, denoted an elusive resistance to collaboration, particularly between students, as collaboration is often seen by some students as a barrier to success due to the competitive nature of the Mauritian educational system and a lack of sharing culture (Veer Ramjeawon and Rowley 2017). A relatively small number of participants neither agreed nor disagreed with statements related to the receiving of feedback (10%) and the providing of feedback (8%) on their learning. 2% of respondents did not think that lecturers' support was important. Comments from participants seem to associate 'Support' with mostly technical support for the system, indicating a restricted view of the characteristic within the E-learning 3.0 model. One participant stated that "*ongoing 'IT" support to minimise the time wasting of people involved in the learning process is necessary*" and another one commented that *"'IT' support is important because they are the ones who help us find out the solutions to the system problems"*. Overall, the outcomes for the 'Support' characteristic showed that it was considered a key characteristic of the E-learning 3.0 model. However, the results also highlighted that students tend to associate support mostly with technical support and some participants expressed uncertainty and reluctance when it comes to supporting fellow students and sharing resources. To ensure a comprehensive representation of Support within the E-learning 3.0 model, further analysis is warranted.

4.6.1.2.2.7 Trust

Participants' level of agreement with the statements on the 'Trust' characteristic and its associated sub-characteristics 'Technology reliability and security', 'Trust between students' and 'Trust between students and lecturers' are outlined in Table 4.12 and Figure 4.13.

Table 4.12: Students' Survey – Trust Characteristic

Please indicate your level of agreement to each statement: **With respect to Trust, in E-learning…**	**Number of Students**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Interaction between lectures and students is important	144	149	7	0	0	1.54
I am comfortable using resources (such as links, presentations) shared by known peers	102	158	38	2	0	1.80
I am comfortable using resources (such as links, presentations) from peers even if they are not directly known to me	88	139	61	10	2	2.00
Continuous feedback to and from lecturers promotes trust between students and lecturers	151	149	0	0	0	1.50
The system should be reliable	191	109	0	0	0	1.36
The system should be secure	193	107	0	0	0	1.36
I am confident to learn in an E-learning environment	160	122	18	0	0	1.53

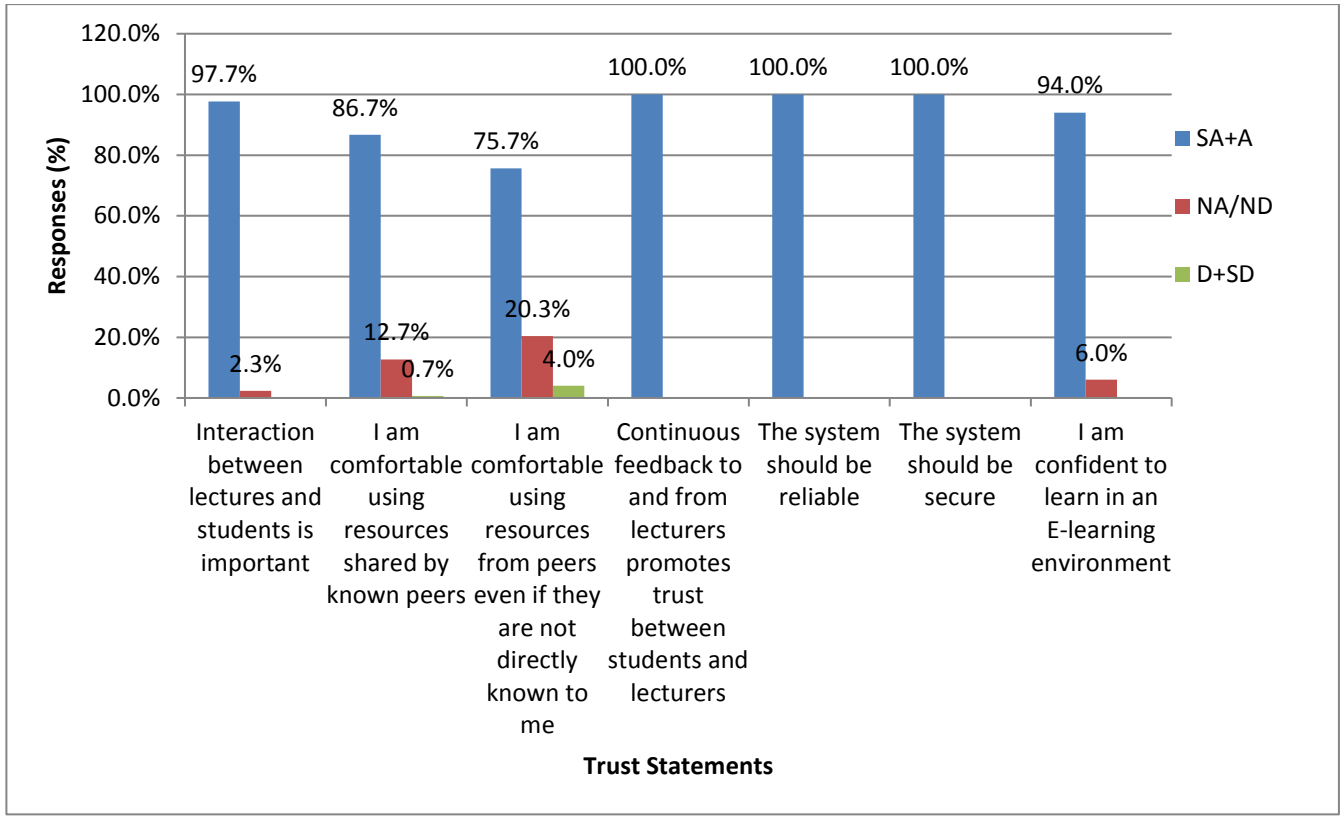


Figure 4.13: Students' Survey – Trust Characteristic

Participants were asked to respond to seven statements for the 'Trust' characteristic of the initial holistic E-learning 3.0 model. The students unanimously agreed with the statements on feedback to and from lecturers and the system being reliable and secure. Interaction between students and lecturers to promote trust and the sharing of resources with peers known and unknown to the students obtained 97.7%, 86.7% and 75.7% of agreement respectively. 0.7% of participants said they were not comfortable to use resources from their peers who are known to them, while 12.7% neither agreed nor disagreed with the statement. Similarly, 4% of participants said they were not comfortable to use resources from other students not known to them while 20.3% neither agreed nor disagreed with the statement. The mixed results for statements relating to the sharing of resources were once more recurrent, aligning with results obtained under the 'Collaboration' and 'Support' characteristics. To determine students' level of confidence to operate within an E-learning environment, the statement 'I am confident to learn in an E-learning environment' was included. 94% of respondents strongly agreed/agreed with the statement while 6% neither agreed nor disagreed. Despite the overall agreement with the statements related to 'Trust', with a mean response in the range of 1.36 to 2.00 denoting a strongly agree/agree opinion, respondents assigned more importance to trust in lecturers than in peers, particularly fellow students not known to them. This was further supported by some comments such as "*Trustworthy peers are very important*", "*The peers need to be trustworthy*" and "*Peers who we don't know are difficult to trust*". To ensure the proper representation of the 'Trust' characteristic in the E-learning 3.0 model, particularly with regard to trust between students, this aspect of trust needs to be further explored.

4.6.1.3 Summary of the preliminary analysis of the students' survey

Following the preliminary analysis of the students' survey, it can be noted that statements which challenged the traditional roles of students as well as those related to the sharing of resources were the ones which mostly registered varied responses. The survey outcomes also revealed unfamiliarity with certain concepts, mostly related to aspects of the Semantic Web such as reuse and knowledge representation. The outcomes for the characteristic 'Support' also indicated students' limited understanding of what 'Support' entailed. As a result of these mixed outcomes, which did not present an unequivocal list of characteristics and associated sub-characteristics,

another analysis method needs to be employed to confirm the components of the E-learning 3.0 model. This is discussed next.

4.6.2 Factor analysis

As discussed in Chapter 2 and outlined in Table 2.9, many E-learning CSFs in the literature are not captured in existing E-learning 3.0 model and the characteristics of the Semantic Web vary from model to model. This study is significant since it aims to provide a holistic representation of E-learning 3.0 model, in an effort to synthesize existing literature on Semantic Web characteristics and E-Learning CSFs.

The preliminary analysis of the students' survey revealed that there was a need to further analyse the characteristics and associated sub-characteristics of the initial holistic E-learning 3.0 model. Consequently, factor analysis was used to further analyse the outcomes from the students' survey. Factor analysis would assist in providing an improved list of characteristics/sub-characteristics for the E-learning 3.0 model, thereby reflecting a consistent interpretation of the survey data, unlike the original groupings.

Factor analysis is a data reduction technique, the general aim of which is to reduce a large number of variables in a smaller set of variables to establish underlying dimensions between measured variables and latent constructs to enable the formation and refinement of theory (Hair et al. 2010; Williams, Onsman and Brown 2010). Hair et al. (2010) also stated that factor analysis can perform data reduction by either identifying representative variables from a larger set of variables or by generating a totally new set of factors that partially or completely replace the original set of factors. According to Pallant (2010, 182), factor analysis is conducted in three steps: (Step 1) Assessment of the suitability of the data for factor analysis, (Step 2) Factor extraction and (Step 3) Factor rotation and interpretation, as shown in Figure 4.14. Each of these steps is explained below and applied to the students' survey outcomes. The results of the analysis are then discussed.

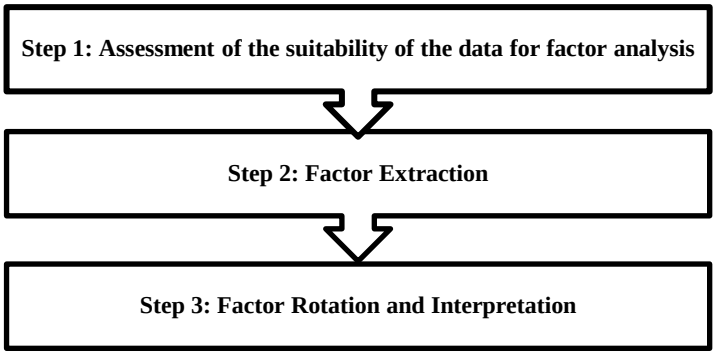


Figure 4.14: Factor Analysis Process
(adapted from Pallant (2010))

4.6.2.1 Assessment of data suitability for factor analysis

According to Pallant (2010), the first step in factor analysis (Step 1 of Figure 4.14) is to assess the data's suitability for factor analysis. This is done by considering the sample size and the strength of the relationship between variables as explained below.

4.6.2.1.1 Sample size

In terms of sample size for factor analysis, many researchers recommend large sample sizes although some researchers consider that a smaller sample size, 150 and less, is adequate enough as long as the factor loading is high (Hair et al. 2010; Pallant 2010). Factor loadings show the extent to which factor items (variables) relate to their respective factors (Saunders, Lewis and Thornhill 2009). Hair et al. (2010) provided guidelines for identifying significant factor loadings based on the sample size as shown in Table 4.13.

Table 4.13: Guidelines for sample size and corresponding factor loadings
(Hair et al. 2010)

Factor Loading	Sample size needed for significance
.30	350
.35	250
.40	200
.45	150
.50	120
.55	100
.60	85
.65	70
.70	60
.75	50

4.6.2.1.2 Strength of relationship between variables

To determine the strength of intercorrelations among items, also known as sample adequacy, Bartlett's test of Sphericity (Bartlett 1954) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser 1974) can be used (Pallant 2010). For

factor analysis to be considered appropriate, the Bartlett's test of Sphericity should be significant ($p < .05$ or less) and the KMO score should be .5 at a minimum (Tabachnick and Fidell 2007; Williams, Onsman and Brown 2010; Kaiser 1974).

4.6.2.2 Factor extraction

Once the data has been deemed suitable for factor analysis, the next step is factor extraction (Step 2 of Figure 4.14). The main aim of factor extraction is to determine "*the smallest number of factors that can be used to represent the interrelationships among the set of variables*" (Pallant 2010, 184). A number of techniques can be used to determine the number of factors to be retained as outlined below.

4.6.2.2.1 Techniques for factor extraction

According to (Pallant 2010) and (Hair et al. 2010), a number of techniques can be used to determine the number of factors to be extracted. These are:

- Kaiser's criterion (or eigenvalue rule) where factors with an eigenvalue of greater than one (>1) are retained. Eigen value of a factor represents the total variance it explains.
- The Scree test (Cattell 1966), where eigen values of factors are plotted on a graph, which is then inspected to find the point where the shape of the curve changes dramatically and becomes horizontal (inflexion point or a marked elbow). Factors above the inflexion point are retained as they explain most of the variance in the data set.
- Cumulative percentage of variance where the number of factors to be retained depends on how many factors meet a specified percentage of variance explained. According to Williams, Onsman, and Brown (2010), no fixed threshold exists as far as the percentage of variance is concerned, with some researchers agreeing that factors should be stopped when at least 95% of the variance is explained while others stating that the percentage of variance can be as low as 50-60%.

Osborne and Costello (2009, 135) pointed out that no single criterion should be used to determine the number of factors to be retained. They suggested a process that will allow multiple techniques to be used to ensure the "*cleanest*" factor structure is obtained as outlined below:

- Retain all factors under Kaiser's criterion, which is usually the default for most software including SPSS.

- Examine the Scree test to see if the number of factors to be retained is clear and is the same number of factors retained under Kaiser's criterion.
- If the number of factors to be retained is not clear from the scree plot and/or not matching the number of factors retained under Kaiser's criterion, run multiple factor analyses, manually setting the number of factors to be retained at the number of factors suggested by the Scree test if different from the number of factors retained under Kaiser's criterion, and then at a number above and below the number of factors suggested by Kaiser's criterion and the Scree test. To manually set the number of factors to be retained om SPSS, the 'Fixed number of factors' field under the 'Extraction' option must be set at the required number of factors. Figure 4.15 shows the option of manually setting up of the number of factors to be retained at 2 factors.
- Apply rotation (Step 3 of Figure 4.14, as explained in the next sub-section 4.6.2.3) to each of the number of factors to be retained and retain the number of factors with the "*cleanest*" factor structure.

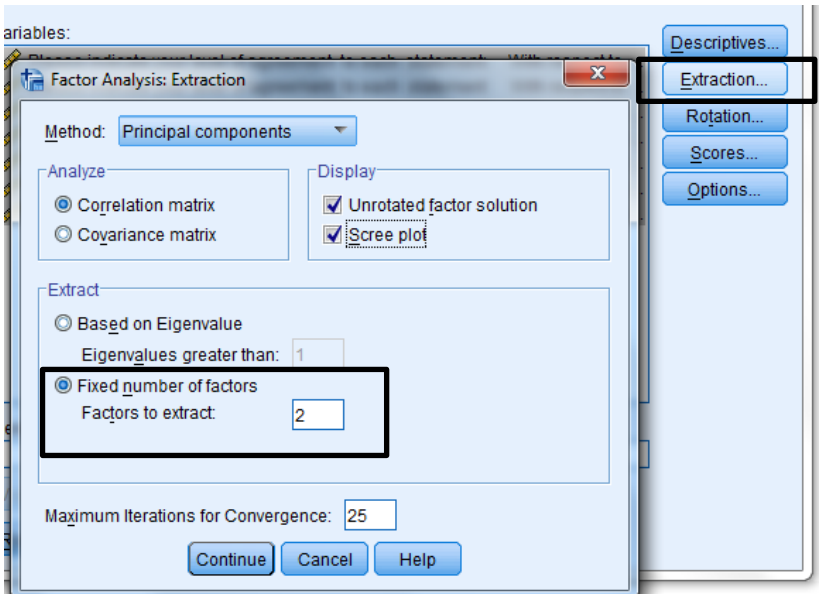


Figure 4.15: Manual set up of factors to be retained in SPSS

4.6.2.3 Factor rotation and interpretation

The third step in the factor analysis phase (Step 3 of Figure 4.14) is to carry out factor rotation and factor interpretation as explained below.

4.6.2.3.1 Factor rotation

The main purpose of factor rotation is to produce a more interpretable, simplified and theoretically more meaningful data structure (Williams, Onsman and Brown 2010). In

many cases, the rotation of factors improves the interpretation of the data structure by reducing some of the ambiguities that often accompany the initial unrotated factor solutions (Hair et al. 2010).

Rotation methods can be either orthogonal or oblique, each generating an uncorrelated and correlated factor solution respectively (Pallant 2010). For the purpose of this study, Varimax rotation method, a widely-used orthogonal method, was used to rotate the data since, according to many researchers, it produces more easily interpretable results (Osborne and Costello 2009). In fact, Varimax rotation is intended to minimise the number of variables by retaining the high loading variables for each factor (Pallant 2010; Alhija 2010).

Following the factor rotation, factor analysis needs to be carried out to generate factors and their associated factor loadings. For this study, SPSS 22.0 was used. Once factors are generated, the factor loading for each item needs to be analysed to determine whether items are within the acceptable cut-off points as factor items are not automatically retained. According to Comrey and Lee (1992, quoted in Distefano and Hess 2005, 227) factor loadings greater than .7 are considered excellent, .63 very good, .55 good, .45 fair and .32 poor. Additionally, to further ensure the relevance of each factor items, their communalities, which is the proportion of common variance present in factor items, can be reviewed with a minimum of 0.30 communality recommended for a factor item to be retained (Hair et al. 2010; Pallant 2010). MacCallum et al. (1999) recommended communalities in the range of 0.5 for sample sizes between 100 and 200.

The reliability of factor items also needs to be established by determining their internal consistency. The Cronbach alpha coefficient (Cronbach 1951) is a method widely used to assess reliability of a survey, whereby the alpha coefficient provides a good indication of whether the items in a scale are assessing the same construct. Moss et al. (1998) and Nunnally (1978) recommended 0.6 as the minimum Cronbach alpha value.

4.6.2.3.2 Factor interpretation

Once factor items have been confirmed based on their associated loadings, communalities and Cronbach alpha scores, the factors linked to the factor items need to be interpreted. The researcher needs to determine which variables (factor items) are attributable to which factor and then give a name or theme to the factors (Williams, Onsman and Brown 2010). According to Henson and Roberts (2006), at least two

variables must load on a factor for it to be given a meaningful interpretation. Hair et al. (2010) pointed out that variables with high loadings can be used to guide the naming of factors, although Henson and Roberts (2006, 396) also pointed out that "*the meaningfulness of latent factors is ultimately dependent on researcher definition*". The factor analysis for the students' survey is described next.

4.6.3 Factor analysis of the students' survey

Using the three-steps outlined by Pallant (2010) as shown in Figure 4.14, factor analysis is applied to the students' survey with the results discussed in this section. The three-hundred acceptable questionnaires for the students' survey is considered a "*comforting*" number for factor analysis as per Tabachnick and Fidell (2007, 613). The results of the Bartlett's test of sphericity and the KMO test of sampling adequacy for the students' survey are provided in Table 4.14.

Table 4.14: Students' Survey – KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.721
Bartlett's Test of Sphericity	Sig.	.000

Both tests met the minimum standard with the Bartlett's test being significant at .000 and the KMO score at .721 which is considered good (Hair et al. 2010). Bartlett's Test of Sphericity and the KMO test were also applied to the survey's outcomes for each of the seven characteristics of the initial holistic E-learning 3.0 model as shown in Table 4.15.

Table 4.15: Students' Survey – KMO and Bartlett's Test per characteristic

Characteristics of Initial Holistic E-learning 3.0 Model	**KMO Measure of Sampling Adequacy**	**Bartlett's Test of Sphericity**
Content Management	.590	.000
Personalised Learning	.751	.000
Pedagogy	.714	.000
Collaboration	.752	.000
Web 3.0 System	.577	.000
Support	.718	.000
Trust	.644	.000

The KMO scores for all the seven characteristics were above the minimum of .5, with values ranging from .590 to .752, denoting acceptable and good outcomes(Hair et al. 2010; Hutcheson and Sofroniou 1999). The Bartlett's test was significant at .000 for

all the seven characteristics. Based on these results, factor analysis was considered appropriate for the study of the students' survey.

To further proceed with the factor analysis, the researcher applied factor extraction (Step 2 – Figure 4.14) using the process outlined by Osborne and Costello (2009), as explained in section 4.6.2, followed by factor rotation and interpretation (Step 3 - Figure 4.14) for each of the characteristic in the initial holistic E-learning 3.0 model.

For the purposes of this study, once the factors had been rotated using Varimax rotation, the researcher retained factors with a minimum value of 0.55, following the guidelines of Hair et al. (2010) as shown in Table 4.13. While the sample size for the students' survey was 300, which would require factors with a minimum loading of 0.35 to be retained as per Table 4.13, 0.55 was set as the minimum factor loading to ensure consistency as the lecturer's survey required a minimum factor loadings of 0.55 as a result of the smaller sample size of 105.

In order to retain only those factors with a loading of 0.55 or more, the 'Absolute value below field' in SPSS under Options – Coefficient Display Format was set at 0.55. For ease of interpretation, the variables were also sorted by size and loadings below 0.55 were excluded by checking the 'Suppress small coefficients' checkbox. Figure 4.16 demonstrates the 'Coefficient Display Format' under SPSS with these settings.

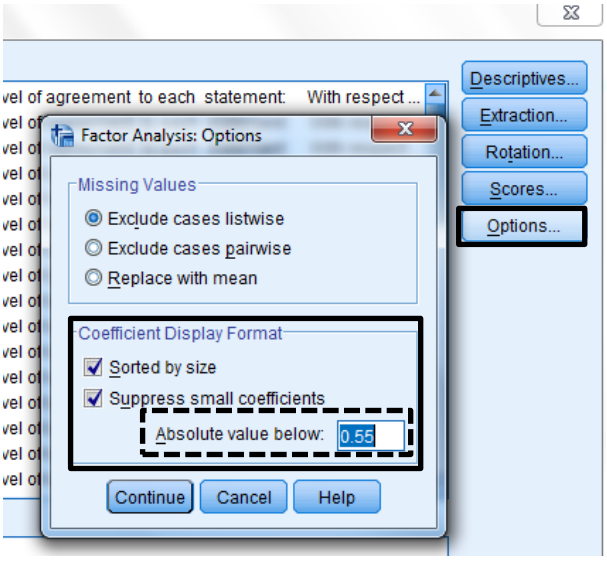


Figure 4.16: Settings under SPSS for displaying factor loadings at or above 0.55

The factor analysis results for each of the initial holistic E-learning 3.0 characteristics are discussed below ending with a table outlining the characteristics and sub-characteristics before (from the initial holistic E-learning 3.0 model) and after factor analysis. New factors emerging from the factor analysis as well as changes to the

original components of the initial holistic E-learning 3.0 model are shown in dark red. The results from the factor analysis have been colour-coded the same way as the characteristics of the initial holistic E-learning 3.0 from the literature review chapter (See Figure 2.30) enabling the readers to more easily recognise the characteristics being discussed.

4.6.3.1 Content Management

For the characteristic 'Content Management', three factors were retained under Kaiser's criterion with an eigenvalue greater than one. The Scree plot revealed a marked elbow after three components (blue arrow as shown in Table 4.16), confirming then number of factors to be retained at three. Factor 1 had three associated variables while factors 2 and 3 had two associated variables each, supporting the number of factors to be retained as per Henson and Roberts (2006). The factors captured 34.603%, 24.798% and 21.847% of the overall variance respectively, explaining a total of 81.248% of variance. The factor loadings for each factor items were in the range of .786 to .927, considered as excellent scores as per the guidelines outlined by Comrey and Lee (1992, quoted in Distefano and Hess 2005, 227). One variable had a negative loading merely indicating the direction of the correlation and did not affect the interpretation of the magnitude of the factor loading or the number of factors to be retained (Yong and Pearce 2013). All factor items had communalities above 0.5 and were therefore retained (MacCallum et al. 1999; Hair et al. 2010; Pallant 2010). The Cronbach alpha scores for the factor items associated with the extracted factors exceeded 0.7 (.823 for factor 1, .824 for factor 2 and .746 for factor 3), confirming the internal consistency of the factor items (DeVellis 2003; Pallant 2010). A summary of the factor analysis outcomes, including (1) the total variance explained table, (2) the rotated component matrix table, outlining the number of extracted factors , their associated factor items and corresponding loadings, (3) the Scree plot following the Scree test, (4) the KMO measure of sample adequacy score, (5) the Bartlett's Test of Sphericity score and (6) the Cronbach alpha score for internal consistency, is outlined in Table 4.16.

The researcher carefully examined the rotated component matrix, paying particular attention to the significant variables for each factor to ensure the accurate naming of each factor (factor labels). Table 4.17 summarises the improved extracted factors including the factor labels, the description, the sub-characteristics from the initial

holistic E-learning 3.0 model being considered and the variables for each factor with the associated loadings.

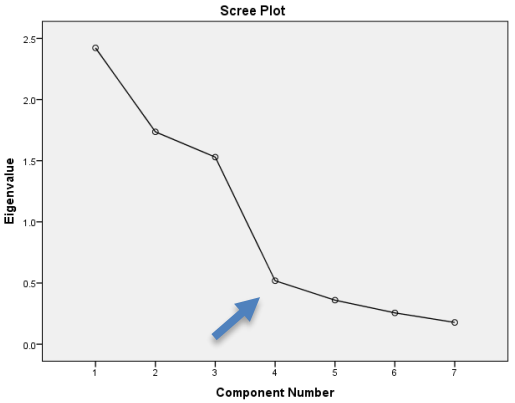
Table 4.16: Students' Survey – Summary of Factor Analysis – Content Management

CONTENT MANAGEMENT

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.422	34.603	34.603	2.422	**34.603**	34.603	2.327	33.248	33.248
2	1.736	24.798	59.401	1.736	**24.798**	59.401	1.719	24.555	57.803
3	1.529	21.847	81.248	1.529	**21.847**	81.248	1.641	23.445	**81.248**
4	.519	7.411	88.658						
5	.360	5.144	93.802						
6	.256	3.659	97.461						
7	.178	2.539	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix				Communalities
Variables for Content Management	**Component/ Factor Loadings**			
	1	**2**	**3**	
Learning content should be easily accessible/retrievable	.922			.851
Learning content should be quick to search	.917			.843
Learning content should be reusable	.786			.634
Only lecturers should create learning materials		-.927		.862
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)		.925		.860
Learning content should match allow me to construct my own knowledge of the course			.905	.821
Learning content should match students' needs			.896	.817
Cronbach α	.823	.824	.746	

KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity
.590	.000

Table 4.17: Students' Survey – Extracted Factors for Content Management

Factor Labels	Description of Factor Labels	Sub-characteristics for 'Content Management' from initial holistic E-learning 3.0 model	Variables for Content Management	Component/ Factor Loadings		
				1	2	3
Content accessibility and reuse	The three variables for factor 1 related to content being easily accessible and retrievable, quick to search and being reusable. Hence factor 1 was labelled as 'Content accessibility and reuse'.	• Content retrieval	Learning content should be easily accessible/retrievable	.922		
		• Search	Learning content should be quick to search	.917		
		• Content reuse	Learning content should be reusable	.786		
Content creation and content creation responsibility	Both factor items which loaded on factor 2 focussed on the creation of content as well as the contribution of lecturers and students with respect to content creation. The first variable loaded strongly on factor 2 with a loading of -.927, the negative sign indicating that factor 2 is related to lectures not being the only one to create learning materials, while the second variable had a factor loading of	• Content creation	Only lecturers should create learning materials		-.927	
		• Content creation	Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)		.925	

	.925. While these results established ‘Content creation’ as significant, who should be the responsible for content creation was another layer that emerged from the analysis. As a result, factor 2 was named ‘Content creation and content creation responsibility’.					
Knowledge representation	The two factor items which loaded on factor 3 were both linked to the sub-characteristic ‘Knowledge representation’, although the variables did not explicitly made use of the term ‘knowledge representation’ to keep the survey questions simple by avoiding the use of technical jargons to facilitate ease of understanding of participants. Factor 3 retained the name ‘Knowledge representation’ as a result.	• Knowledge representation	Learning content should match allow me to construct my own knowledge of the course			.905
		• Knowledge representation	Learning content should match students' needs			.896

Findings from the factor analysis for 'Content Management' revealed that the sub-characteristics 'Content retrieval', 'Search' and 'Content reuse' could be grouped together with the new factor/sub-characteristic named as 'Content accessibility and reuse'. Also emerging from the factor analysis is the new aspect of 'content creation responsibility' in addition to the originally identified sub-characteristic 'Content creation'. 'Content creation' was, therefore, renamed as 'Content creation and content creation responsibility'. The sub-characteristic 'Knowledge representation' was retained with no change. The characteristic 'Content Management' and its associated sub-characteristics from the initial holistic E-learning 3.0 model, prior to the factor analysis as well as the changes made following the factor analysis, are outlined in Table 4.18.

Table 4.18: Students' Survey – Content Management – Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Content Management	**Content Management**
Content creation	Content creation and content creation responsibility
Content retrieval	Content accessibility and reuse
Content reuse	
Search	
Knowledge representation	Knowledge representation

4.6.3.2 Personalised Learning

For the characteristic 'Personalised Learning', two factors were retained under Kaiser's criterion with an eigenvalue greater than one. The Scree test indicated a break after two components and a smaller one after five components (demonstrated by blue arrows Table 4.19**).** As a result, to confirm the number of factors to be retained, the number of factors to be extracted was set at three, four and five, using the process outlined by Osborne and Costello (2009) as discussed in section 4.6.2.2.1 and the rotated component matrix was then examined in all three cases to see the clarity of the data structures. From this exercise, it was clear that two factors were to be retained. The two factors accounted for 59.834% of the total variance explained, each contributing to 35.005% and 24.828% of the total variance respectively. The factor loadings ranged from 0.704 to 0.932, considered as excellent outcomes according to

Comrey and Lee (1992, quoted in Distefano and Hess 2005, 227). One factor item (highlighted in red in Table 4.19) was removed and not considered for factor labelling, as a result of its low communality of .193 (MacCallum et al. 1999; Hair et al. 2010; Pallant 2010). All other retained factor items achieved strong internal consistency with an alpha score of .887 and .711 (DeVellis 2003; Pallant 2010). The generated results following the factor analysis are outlined in Table 4.19. With particular attention to the variables and associated loadings for both factors, the researcher named the factors as shown in Table 4.20.

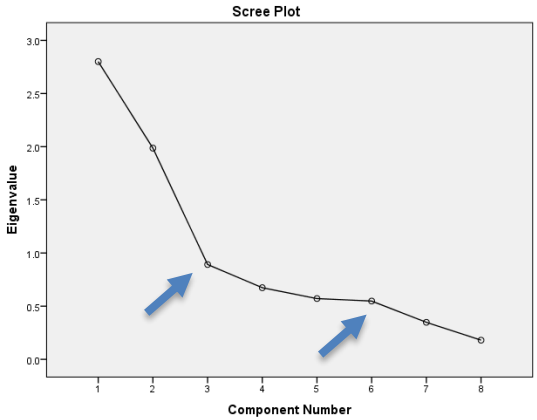
Table 4.19: Students' Survey – Summary of Factor Analysis – Personalised Learning

PERSONALISED LEARNING

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.800	35.005	35.005	2.800	**35.005**	35.005	2.500	31.244	31.244
2	1.986	24.828	59.834	1.986	**24.828**	59.834	2.287	28.590	**59.834**
3	.892	11.149	70.983						
4	.674	8.422	79.405						
5	.571	7.143	86.548						
6	.548	6.848	93.396						
7	.348	4.353	97.749						
8	.180	2.251	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix

Variables for Personalised Learning	Component/ Factor Loadings		Communalities
	1	2	
Lecturers are keen to facilitate students' learning	.932		.870
Lecturers deliver courses based on students' needs	.909		.833
Lecturers have the skills and competence to support personalised learning	.851		.736
My existing knowledge of the course should be taken into account		.761	.584
I should be allowed to select learning materials based on my learning style preferences		.727	.536
I should be able to receive different learning materials than my peers based on my learning profile (e.g. considering my existing knowledge and learning style preferences)		.717	.514
My learning style preferences should be taken into account		.704	.521

KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity
.751	.000

My educational goals should be met			.193	
Cronbach α	.887	.711		

Table 4.20: Students' Survey – Extracted Factors for Personalised Learning

Factor Labels	**Description of Factor Labels**	**Sub-characteristics for 'Personalised Learning' from initial holistic E-learning 3.0 model**	**Variables for Personalised Learning**	**Component/ Factor Loadings**	
				1	2
Lecturer's characteristics	Factor 1 revolved around the lecturer's attributes to facilitate personalised learning. The factor was labelled as 'Lecturer's characteristics', retaining the original naming from the initial holistic E-learning 3.0 model.	• Lecturer's characteristics	Lecturers are keen to facilitate students' learning	.932	
		• Lecturer's characteristics	Lecturers deliver courses based on students' needs	.909	
		• Lecturer's characteristics	Lecturers have the skills and competence to support personalised learning	.851	
Student model	The variables associated with factor 2 were about students' learning attributes to assist with personalised learning such as existing knowledge of the course, learning style preferences as well as	• Student model	My existing knowledge of the course should be taken into account		.761
		• Student model	I should be allowed to select learning materials based on my learning style preferences		.727

	customised learning materials based on the students' profiles. They were all related to the original sub-characteristic 'Student model', which was, therefore, retained as the labelling for factor 2.	• Student model	I should be able to receive different learning materials than my peers based on my learning profile (e.g. considering my existing knowledge and learning style preferences)		.717
		• Student model	My learning style preferences should be taken into account		.704

Factor analysis for the characteristic 'Personalised Learning' confirmed the two original sub-characteristics, namely 'Student model' and 'Lecturer's characteristics'. Therefore, no further changes were made, as outlined in Table 4.21.

Table 4.21: Students' Survey – Personalised Learning – Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Personalised Learning	**Personalised Learning**
Student model	Student model
Lecturer's characteristics	Lecturer's characteristics

4.6.3.3 Pedagogy

Two factors were retained under Kaiser's criterion with an eigenvalue greater than one. However, the Scree plot showed an inflexion after one component and another one after three components (indicated by blue arrows in Table 4.22). To confirm the number of factors to be retained, using the process outlined by Osborne and Costello (2009) as discussed in section 4.6.2.2.1, factor analysis was then conducted for three, four and five factors and rotated using Varimax rotation in order to determine the clearer data structure. Following this exercise, three factors were then retained; these accounted for a total of 72.427% of variance, with each factor contributing 37.709%, 21.111% and 13.606% of the total variance respectively. The factor loadings for all the factor items were above .7, thus considered excellent according to the guidelines provided by Comrey and Lee (1992, quoted in Distefano and Hess 2005, 227). Three variables loaded strongly on factor 1 and two variables loading strongly on factor 2 and 3 respectively, aligning with the guidelines given by Henson and Roberts (2006). All factor items with communalities above 0.6 were retained, meeting the minimum criterion set by MacCallum et al. (1999). The Cronbach alpha coefficients for all factor items demonstrated good internal consistency with score of .750, .652 and .658 respectively, exceeding the recommended minimum value of 0.6 and thus confirming internal consistency of the constructs and the reliability of the measurement model (Nunnally 1978; Malhotra 1993; Moss et al. 1998). Table 4.22 presents the results obtained from the factor analysis, followed by Table 4.23, which summarises the improved extracted factors after the researcher carefully examined the rotated component matrix, paying particular attention to the significant variables for each factor to ensure the accurate labelling of factors.

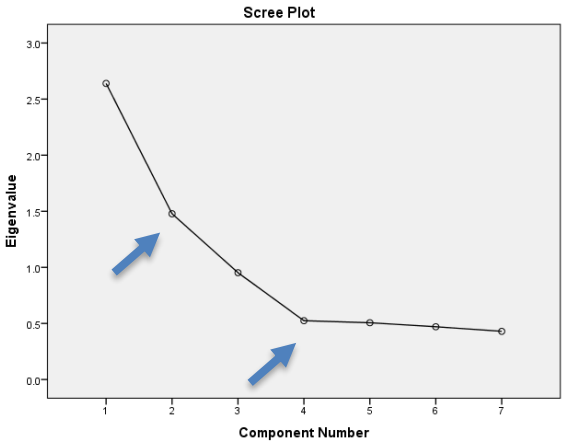
Table 4.22: Students' Survey – Summary of Factor Analysis – Pedagogy

PEDAGOGY

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.640	37.709	37.709	2.640	**37.709**	37.709	2.007	28.673	28.673
2	1.478	21.111	58.821	1.478	**21.111**	58.821	1.541	22.021	50.695
3	.952	13.606	72.427	.952	**13.606**	72.427	1.521	21.732	**72.427**
4	.524	7.489	79.915						
5	.506	7.230	87.146						
6	.470	6.719	93.865						
7	.429	6.135	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix				
Variables for Pedagogy	**Component/ Factor Loadings**			**Communalities**
	1	**2**	**3**	
Have clear organisation of lessons which is easy to follow	.833			.699
Have clear learning objectives for each lesson	.791			.657
Have clear assessments instructions	.781			.664
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet my needs		.848		.769
Be delivered according to my learning profile (e.g. considering my existing knowledge and learning style preferences)		.816		.750
Allow me to be an active participant where I can construct and manage my own personal knowledge			-.890	.793
Be delivered in a pre-determined way where I am a passive participant only			.809	.738
Cronbach α	.750	.652	.658	

KMO Measure of Sampling Adequacy	**Bartlett's Test of Sphericity**
.714	.000

Table 4.23: Students' Survey – Extracted Factors for Pedagogy

Factor Labels	Description of Factor Labels	Sub-characteristics of 'Pedagogy' from initial holistic E-learning 3.0 model	Variables for Pedagogy	Component/ Factor Loadings		
				1	2	3
Syllabus	Factor 1 represented 37.709% of the total variance explained and consisted of three variables, all related to the course content organisation, instructions and assessments. This factor was therefore labelled as 'Syllabus', in line with the initial holistic E-learning 3.0 model, as a syllabus provides clear assessment instructions, outline a clear organisation of lessons as well as provide clear lessons' learning objectives.	• Syllabus	Have clear organisation of lessons which is easy to follow	.833		
		• Syllabus	Have clear learning objectives for each lesson	.791		
		• Assessment and evaluation	Have clear assessments instructions	.781		
Student-centered teaching	The two factor items associated with factor 2 referred to teaching strategies and course delivery that	• Teaching strategies	Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet my needs		.848	

	focused on the students. As a result, the factor was named 'Student-centered teaching' which emphasises different types of teaching strategies with a focus on meeting students' needs and where the roles of instructors and students are changed to collaborators in the teaching and learning environment (Gunness 2011).	• Course design and sequencing • Teaching strategies • Context	Be delivered according to my learning profile (e.g. considering my existing knowledge and learning style preferences)		.816	
Student's and lecturer's roles in course delivery	The two variables for factor 3 questioned the type of course delivery that should be employed within the learning environment and the role of students (and lecturers by extension) in that process. As a result, factor 3 was labelled as 'Student's and lecturer's role in course delivery'.	• Course design and sequencing • Teaching strategies	Allow me to be an active participant where I can construct and manage my own personal knowledge			-.890
		• Course design and sequencing • Teaching strategies	Be delivered in a pre-determined way where I am a passive participant only			.809

The sub-characteristics for 'Pedagogy' from the initial holistic E-learning 3.0 model were grouped together in the factor analysis leading to new labels for some of them. The 'Syllabus' sub-characteristic was retained, but also included 'Assessment and evaluation'. New factors emerged including 'Student-centered teaching' and 'Student's and lecturer's roles in course delivery', replacing the original list of sub-characteristics namely 'Teaching strategies', 'Couse design and sequencing' and 'Context'. The resulting list, as compared to the original list of sub-characteristics for 'Pedagogy', is outlined in Table 4.24.

Table 4.24: Students' Survey – Pedagogy – Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Pedagogy	**Pedagogy**
Syllabus	Syllabus
Assessment and evaluation	
Course design and sequencing	Student-centered teaching
Teaching strategies	
Context	
Course design and sequencing	Student's and lecturer's roles in course delivery
Teaching strategies	

4.6.3.4 Collaboration

For the 'Collaboration' characteristic, with one factor extracted under the Kaiser's criterion, no rotation was possible. The Scree plot showed an inflexion after one component as well as a smaller one after two components, as shown by the blue arrow in Table 4.25, thereby, not providing a clear indication of the number of factors to be retained . Therefore, the number of factors to be retained was set at two and three, using the process outlined by Osborne and Costello (2009) as discussed in section 4.6.2.2.1. Following the identification of the clearer data structure, two factors were retained. They explained 75.227% of the total variance, with each factor contributing 56.695 % and 18.531% of the total variance respectively. The variables associated with the two extracted factors loaded strongly on the factors with a range of 0.757 to 0.876, categorised as excellent (Comrey and Lee 1992, quoted in Distefano and Hess 2005, 227). All variables were retained, with their communalities above .7, meeting the minimum criterion of 0.5 as outlined by MacCallum et al. (1999). Internal consistency of factor items was achieved with alpha scores of .725 and .651 (Nunnally 1978;

Malhotra 1993; Moss et al. 1998). A summary of the results from the factor analysis are shown in Table 4.25. The factors were then labelled after careful consideration of the variables and associated factors as shown in Table 4.26.

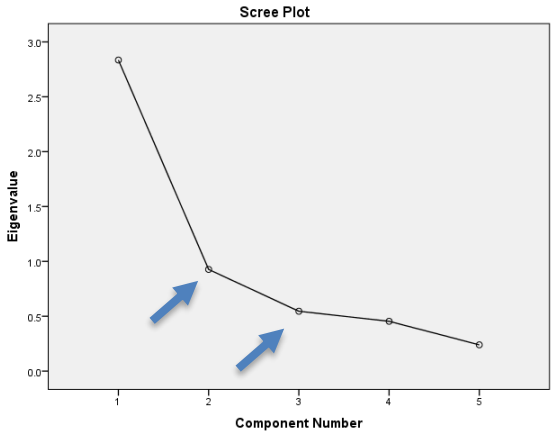
Table 4.25: Students' Survey – Summary of Factor Analysis – Collaboration

COLLABORATION

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.835	56.695	56.695	2.835	**56.695**	56.695	2.138	42.769	42.769
2	.927	18.531	75.227	.927	**18.531**	75.227	1.623	32.458	**75.227**
3	.545	10.910	86.136						
4	.454	9.078	95.215						
5	.239	4.785	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix

Variables for Collaboration	Component/ Factor Loadings		Communalities
	1	2	
Have facilities for collaboration between peers	.876		.829
Have group activities	.850		.728
Share resources with peers	.757		.744
Share resources with lecturers		.847	.752
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)		.817	.709
Cronbach α	.832	.651	

KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity
.752	.000

Table 4.26: Students' Survey – Extracted Factors for Collaboration

Factor Labels	Description of Factor Labels	Sub-characteristics of 'Collaboration' from initial holistic E-learning 3.0 model	Variables for Collaboration	Component/ Factor Loadings	
				1	2
Interaction and resource sharing between students	The three variables associated with factor 1 were related to interaction and the sharing of resources with peer students. As a result, factor 1 was labelled as 'Interaction and resource sharing between students'	• Interaction	Have facilities for collaboration between peers	.876	
		• Interaction	Have group activities	.850	
		• Sharing of resources	Share resources with peers	.757	
Interaction and resource sharing between students and lecturers	The two variables associated with factor 2 were related to interaction and the sharing of resources, but this time with lecturers. As a result, factor 2 was labelled as 'Interaction and resource sharing between students and lecturers	• Sharing of resources	Share resources with lecturers		.847
		• Interaction	Have facilities for collaboration between lecturers and students (e.g. using emails, skype)		.817

No new factors emerged from the factor analysis for the 'Collaboration' characteristic. However, the two factors extracted provided more information on the types of interaction and resource sharing, including with fellow students and with lecturers. The factors were renamed accordingly as shown in Table 4.27.

Table 4.27: Students' Survey – Collaboration – Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Collaboration	**Collaboration**
Sharing of resources	Interaction and resource sharing between students
Interaction	
Sharing of resources	Interaction and resource sharing between students and lecturers
Interaction	

4.6.3.5 Web 3.0 System

Under Kaiser's criterion, SPSS extracted three factors for the characteristic 'Web 3.0 System'. The Scree test showed a marked elbow after three components as well as a smaller one after five components (shown by blue arrows in Table 4.28). Therefore, to confirm the number of factors to be retained, using the process outlined by Osborne and Costello (2009) as discussed in section 4.6.2.2.1, the number of factors to be extracted was manually set at two and four and the results were analysed to find the clearer structure. Subsequently, three factors were retained, accounting for 81.822% of the total variance cumulatively, with each factor contributing 35.469%, 24.146% and 22.208% respectively. The factor loadings were in the range of .772 to .946, categorised as excellent as per the guidelines provided by Comrey and Lee (1992, quoted in Distefano and Hess 2005, 227). All factor items were retained as the communalities exceeded .50 as recommended by MacCallum et al. (1999). Strong internal consistency of factor items was achieved with the Cronbach alpha scores of .852, .884 and .704 (DeVellis 2003; Pallant 2010). Table 4.28 shows the factor analysis results with the total variance explained table, the rotated component matrix, the communalities for all retained factor items, the scree plot following the Scree test, the Cronbach alpha scores for factor items as well as KMO and Bartlett's Test of Sphericity scores. The factor labels with their descriptions, factor items with their corresponding loadings, and the related sub-characteristics from the initial holistic E-learning 3.0 model, are provided in Table 4.29.

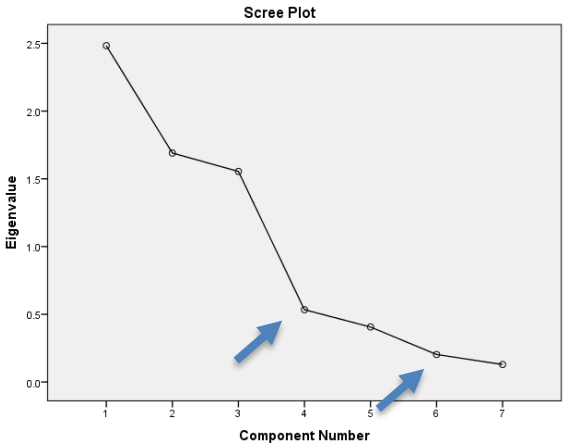
Table 4.28: Students' Survey – Summary of Factor Analysis – Web 3.0 System

WEB 3.0 SYSTEM

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.483	35.469	35.469	2.483	**35.469**	35.469	2.330	33.285	33.285
2	1.690	24.146	59.614	1.690	**24.146**	59.614	1.801	25.727	59.013
3	1.555	22.208	81.822	1.555	**22.208**	81.822	1.597	22.809	**81.822**
4	.534	7.627	89.449						
5	.406	5.802	95.251						
6	.203	2.902	98.153						
7	.129	1.847	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix				Communalities
Variables for Web 3.0 System	**Component/ Factor Loadings**			
	1	**2**	**3**	
Maintain effective records of information and resources	.945			.899
Keep records of students' learning profiles	.910			.828
Support customised access to learning resources	.772			.615
Have easy access to resources		.946		.899
Be easy to navigate		.941		.893
Have effective ICT infrastructure			.893	.798
Support new technologies			.890	.796
Cronbach α	.852	.884	.704	

KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity
.577	.000

Table 4.29: Students' Survey – Extracted Factors for Web 3.0 System

Factor Labels	Description of Factor Labels	Characteristic/Sub-characteristics of 'Web 3.0 System' from initial holistic E-learning 3.0 model	Variables for Web 3.0 System	Component/ Factor Loadings		
				1	2	3
Knowledge, ontologies and other repositories	While not explicitly making use of the terms Knowledge and other repositories or ontologies, being technical jargons associated with the Semantic Web, the three variables which loaded on factor 1 were all related to these specific sub-characteristics of 'Web 3.0 System'. As a result, both sub-characteristics were retained and combined and factor 1 was labelled as 'Knowledge, ontologies and other repositories'.	• Knowledge and other repositories	Maintain effective records of information and resources	.945		
		• Knowledge and other repositories • Ontologies	Keep records of students' learning profiles	.910		
		• Knowledge and other repositories • Ontologies	Support customised access to learning resources	.772		
	Statements on easy access to resources and easy navigation	• Accessibility	Have easy access to resources		.946	

Usability and accessibility	loaded strongly on factor 2. As a result, retaining the original sub-characteristics from the initial holistic E-learning 3.0 model, factor 2 was labelled as 'Usability and accessibility'.	• Usability	Be easy to navigate		.941	
ICT Infrastructure supporting new technologies	Factor 3 was all about effective ICT Infrastructure and technologies for supporting the Web 3.0 System. Factor 3 was labelled as 'ICT Infrastructure supporting new technologies'.	• ICT Infrastructure	Have effective ICT infrastructure			.893
		• Web 3.0 System	Support new technologies			.890

Factor analysis brought about few changes to the original sub-characteristics for 'Web 3.0 System'. The sub-characteristics 'Knowledge and other repositories' and 'Ontologies' were combined into one and named as 'Knowledge, ontologies and other repositories'. Similarly, the sub-characteristics 'Usability' and 'Accessibility were combined into 'Usability and accessibility'. The sub-characteristic 'ICT Infrastructure' changed to ICT Infrastructure supporting new technologies' to accurately reflect findings from the factor analysis. Both the initial list and the new list of factors are outlined in Table 4.30.

Table 4.30: Students' Survey – Web 3.0 System - Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Web 3.0 System	**Web 3.0 System**
Knowledge and other repositories	Knowledge, ontologies and other repositories
Ontologies	
Usability	Usability and accessibility
Accessibility	
ICT Infrastructure	ICT Infrastructure supporting new technologies

4.6.3.6 Support

Two factors were extracted for the 'Support' characteristic under Kaiser's criterion. The Scree test showed an inflexion at the third component, as shown by blue arrow in Table 4.31, confirming that two factors should be retained. The two extracted factors accounted for 48.040% and 29.607% of the total variance, with a cumulative percentage of 77.647%. Factor loadings were in the range of .713 to .956, considered excellent according to Comrey and Lee (1992, quoted in Distefano and Hess 2005, 227). All communalities for factor items which loaded on factor 1 and factor 2 exceeded 0.5, supporting the retention of all factor items and their reliability (MacCallum et al. 1999; Hair et al. 2010; Pallant 2010). The Cronbach alpha scores were .889 and .855 confirming strong internal consistency of the constructs (DeVellis 2003; Pallant 2010). A summary of the results is given in Table 4.31. The variables and their respective loadings on the extracted factors were carefully analysed before they were labelled. Details of factors and associated labelling, descriptions and variables are presented in Table 4.32.

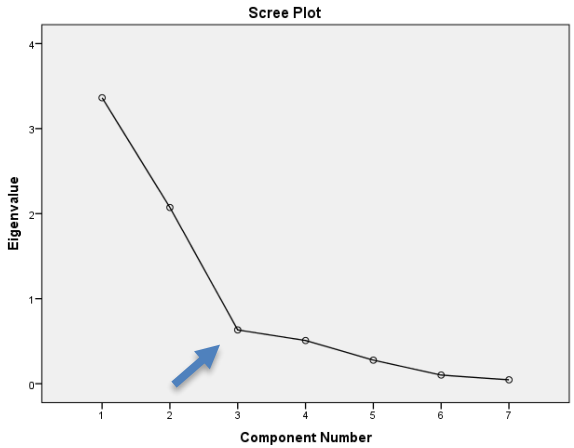
Table 4.31: Students' Survey – Summary of Factor Analysis – Support

SUPPORT

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.363	48.040	48.040	3.363	**48.040**	48.040	3.067	43.817	43.817
2	2.073	29.607	77.647	2.073	**29.607**	77.647	2.368	33.830	**77.647**
3	.633	9.037	86.684						
4	.508	7.256	93.940						
5	.277	3.959	97.898						
6	.102	1.451	99.349						
7	.046	.651	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix			
Variables for Support	**Component/ Factor Loadings**		**Communalities**
	1	**2**	
Ongoing feedback from lecturers about my learning performance is important	.937		.889
I should be able to provide feedback about my learning	.911		.847
Lecturers' support is important (e.g. through students' encouragements, provision of study materials, assessment and exams hints, use of different teaching	.880		.779
Peer assistance is important	.744		.558
Ongoing IT Support is important (e.g. help, FAQs, Help desk)		.956	.915
Training to use the system is important		.953	.912
Effective and appropriate technology infrastructure is important		.713	.535
Cronbach α	.889	.855	

KMO Measure of Sampling Adequacy	**Bartlett's Test of Sphericity**
.718	.000

Table 4.32: Students' Survey – Extracted Factors for Support

Factor Labels	Description of Factor Labels	Sub-characteristics of 'Support' from initial holistic E-learning 3.0 model	Variables for Support	Component/ Factor Loadings	
				1	2
Instructional support	Statements related to feedback, lecturers' support and peer assistance were the ones which loaded on factor 1 and was therefore named as 'Instructional support' in line with the original sub-characteristic from the initial holistic E-learning 3.0 model.	• Instructional support	Ongoing feedback from lecturers about my learning performance is important	.937	
		• Instructional support	I should be able to provide feedback about my learning	.911	
		• Instructional support	Lecturers' support is important (e.g. through students' encouragements, provision of study materials, assessment and exams hints, use of different teaching	.880	
		• Instructional support	Peer assistance is important	.744	
Organisational support	The three variables associated with factor 2 pertained to different types of support that the organisation must provide within the E-learning	• Organisational support	Ongoing IT Support is important (e.g. help, FAQs, Help desk)		.956
		• Organisational support	Training to use the system is important		.953

	environment. The factor was labelled as 'Organisational support' in line with the original sub-characteristic from the initial holistic E-learning 3.0 model.	• Organisational support	Effective and appropriate technology infrastructure is important		.713

Factor analysis confirmed both sub-characteristics of 'Support' namely 'Instructional support' and 'Organisational support'. They were, therefore, retained with no changes as shown in Table 4.33

Table 4.33: Students' Survey – Support – Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Support	**Support**
Instructional support	Instructional support
Organisational support	Organisational support

4.6.3.7 Trust

Three factors were extracted under Kaiser's criterion with eigenvalue greater than one. The Scree plot showed an inflection after the third component, as shown by the blue arrow in Table 4.34, confirming the number of factors to be extracted at three. The three factors explained a total variance of 85.033%, each contributing 41.029%, 26.064% and 17.939% of the total variance respectively. Factor loadings were in the range of .861 to .947, categorised as excellent as per the guidelines of Comrey and Lee (1992, quoted in Distefano and Hess 2005, 227). Communalities of factor items were high and therefore confirmed their retention, with alpha scores above 0.7 (.893, .871 and .763 for factor items which loaded on factor 1, factor 2 and factor 3 respectively), confirming strong internal consistency and reliability (DeVellis 2003; Pallant 2010). The results are outlined in Table 4.34. The factors were labelled after careful consideration of the variables and associated factors as shown in Table 4.35.

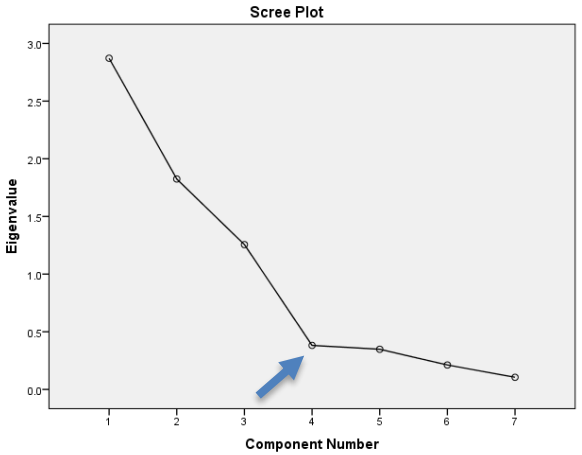
Table 4.34: Students' Survey – Summary of Factor Analysis – Trust

TRUST

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.872	41.029	41.029	2.872	**41.029**	41.029	2.529	36.128	36.128
2	1.825	26.064	67.094	1.825	**26.064**	67.094	1.772	25.313	61.441
3	1.256	17.939	85.033	1.256	**17.939**	85.033	1.651	23.592	**85.033**
4	.382	5.456	90.489						
5	.348	4.978	95.466						
6	.212	3.028	98.494						
7	.105	1.506	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix				Communalities
Variables for Trust	**Component/ Factor Loadings**			
	1	**2**	**3**	
The system should be reliable	.947			.915
The system should be secure	.924			.863
I am confident to learn in an E-learning environment	.861			.748
Interaction between lectures and students is important		.944		.901
Continuous feedback to and from lecturers promotes trust between students and lecturers		.911		.888
I am comfortable using resources (such as links, presentations) from peers even if they are not directly known to me			.901	.823
I am comfortable using resources (such as links, presentations) shared by known peers			.887	.814
Cronbach α	.893	.871	.763	

KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity
.644	.000

Table 4.35: Students' Survey – Extracted Factors for Trust

Factor Labels	**Description of Factor Labels**	**Sub-characteristics of 'Trust' from initial holistic E-learning 3.0 model**	**Variables for Trust**	**Component/ Factor Loadings**		
				1	2	3
System reliability and security	Factors items which loaded on factor 1 were all linked to the system being reliable and secure, and promoting confidence to learn in an E-learning environment. As a result, factor 1 was labelled as 'System reliability and security' instead of the original sub-characteristic 'Technology reliability and security'.	• Technology reliability and security	The system should be reliable	.947		
		• Technology reliability and security	The system should be secure	.924		
		• Technology reliability and security	I am confident to learn in an E-learning environment	.861		
Trust between students and lecturers	Factor 2 revolved around interaction and feedback between students and lecturers	• Trust between students and lecturers	Interaction between lectures and students is important		.944	

	to promote trust. The factor was labelled as 'Trust between students and lecturers' retaining the original naming from the initial holistic E-learning 3.0 model.	• Trust between students and lecturers	Continuous feedback to and from lecturers promotes trust between students and lecturers		.911	
Trust between students	Items which loaded on factor 3 were related to trust between students through the sharing of resources and therefore retained the original naming of 'Trust between students'.	• Trust between students	I am comfortable using resources (such as links, presentations) from peers even if they are not directly known to me			.901
		• Trust between students	I am comfortable using resources (such as links, presentations) shared by known peers			.887

Factor analysis for the 'Trust' characteristic retained all the sub-characteristics from the initial holistic E-learning 3.0 model. 'Technology reliability and security' was renamed as 'System reliability and security' to provide a more holistic view of that aspect of 'Trust'. 'Trust between students and lecturers' as well 'Trust between students' were retained as per the original naming from the initial holistic E-learning 3.0 model. The original sub-characteristics for 'Trust' and the resulting changes, following factor analysis, are outlined in Table 4.36.

Table 4.36: Students' Survey – Trust – Before and After Factor Analysis

Before Factor Analysis (as per Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Trust	**Trust**
Technology reliability and security	System reliability and security
Trust between students and lecturers	Trust between students and lecturers
Trust between students	Trust between students

The next section summarises all the factor analysis findings from the students' survey.

4.6.4 Summary of factor analysis for the students' survey

Following the factor analysis, the improved list of characteristics for the holistic E-learning 3.0 model, which reflects a consistent interpretation of the students' survey data, are summarised in Table 4.37. New factors as well renamed sub-characteristics, following the factor analysis, are in dark red. Characteristics and sub-characteristics retained the same colour code as used in the detailed factor analysis (see section 4.6.3) and in the literature review in Chapter 2. Additionally, Figure I:1 in Appendix I provides an overview of all the factor items for the students' survey and their associated characteristics and sub-characteristics. Factor items are underlined in different colours based on the loadings obtained following the factor analysis, as denoted by the legend of the diagram in Appendix I.

Table 4.37: Students' Survey – Factor Analysis Outcomes

Characteristics	Sub-Characteristics
Content Management	- Content creation and content creation responsibility - Content accessibility and reuse - Knowledge representation
Personalised Learning	- Student model - Lecturer's characteristics
Pedagogy	- Syllabus - Student-centered teaching - Student's and lecturer's roles in course delivery
Collaboration	- Interaction and resource sharing between students - Interaction and resource sharing between students and lecturers
Web 3.0 System	- Knowledge, ontologies and other repositories - Usability and accessibility - ICT Infrastructure supporting new technologies
Support	- Instructional support - Organisational support
Trust	- System reliability and security - Trust between students and lecturers - Trust between students

4.7 Lecturers' survey analysis

The researcher received 105 completed and acceptable surveys out of 165 surveys distributed. The questionnaire consisted of 51 statements relating to the seven characteristics and associated sub-characteristics of the initial holistic E-learning 3.0 model. Appendix E provides the list of statements from the lecturers' survey as well as the corresponding characteristics and sub-characteristics they relate to. A preliminary analysis followed a factor analysis were conducted on the collected data using SPSS version 22. Results of the analysis are provided below.

4.7.1 Preliminary analysis of the lecturers' survey

Similar to the students' survey, the preliminary analysis of the lecturers' survey outcomes consists of two parts. The first part discusses the demographics of the respondents and the second part discusses the results related to statements on the seven characteristics and associated sub-characteristics of the initial holistic E-learning 3.0 model, taking into consideration the research questions. The results are presented in

both tabular and graphical forms for the convenience of the readers with the tables providing the numerical values and the graphs showing the proportion.

4.7.1.1 Demographic analysis of the lecturer's survey

The number of male and female lecturer participants was nearly the same with 52 male responses (50.5%) and 53 (49.5%) female responses as shown in Table 4.38 and Figure 4.17.

Table 4.38: Lecturers' Survey – Gender of Participants (N=105)

Lecturers' Gender	Number of Responses	Percentage Response
Male	52	49.5%
Female	53	50.5%
Total (N)	105	100%

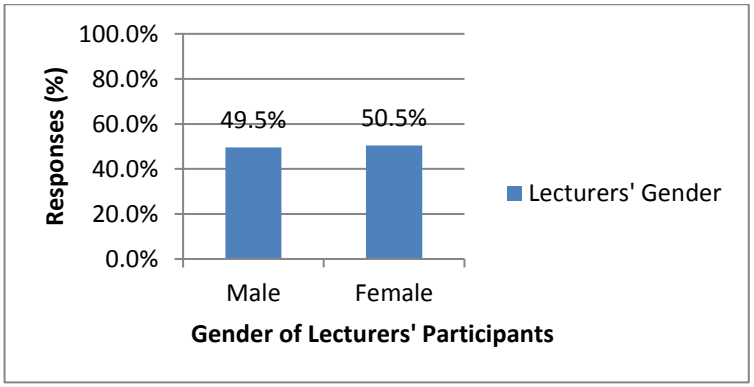


Figure 4.17: Lecturers' Survey – Gender of Participants

In terms of the age group of participants, the highest percentage of 41% belonged to the 46-50 age group. Details of participants' age groups are provided in Table 4.39 and Figure 4.18.

Table 4.39: Lecturers' Survey – Age Group of Participants (N=105)

Lecturers' Age Group	Number of Responses	Percentage Response
22-35	19	18.1%
36-45	29	27.6%
46-50	43	41.0%
51-55	11	10.5%
56-60	2	1.9%
61 and Above	1	1.0%
Total (N)	105	100%

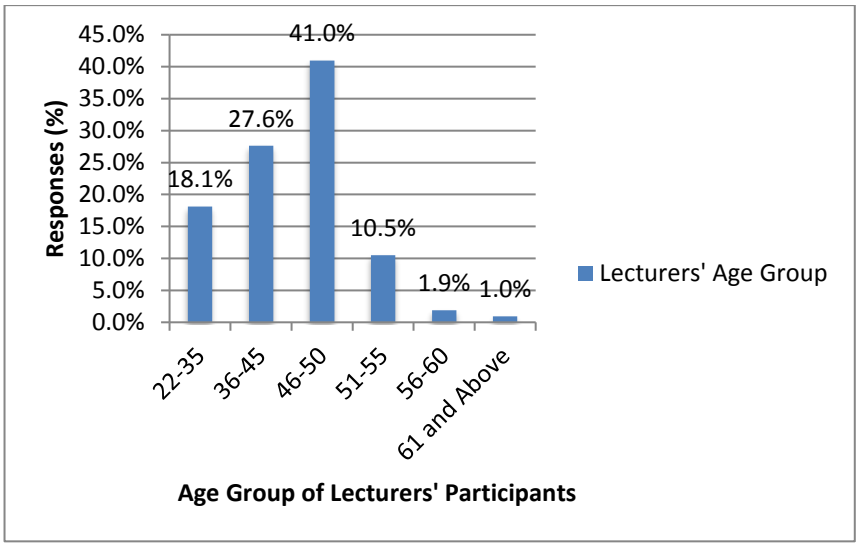


Figure 4.18: Lecturers' Survey – Age group of Participants

The Faculty of Law and Management had 26.7% of participation, followed by Tourism and Business, Accounting and Finance at 18.1 % and 16.2 % respectively. There were no respondents from the Faculty of Agriculture. The participation of lecturers from different faculties was considered critical to this study for a more realistic view on E-learning 3.0, not restricted to only those lecturers actively dealing with technologies as part of their courses. Details of lecturers' participation based on faculties are shown in Table 4.40 and Figure 4.19.

Table 4.40: Lecturers' Survey – Faculty of Participants (N=105)

Faculty	**Number of Responses**	**Percentage Response**
Agriculture	0	0.0%
Art & Design	11	10.5%
Business, Accounting & Finance	17	16.2%
Engineering	1	1.0%
Health	1	1.0%
Information Technology and Systems	9	8.6%
Law and Management	28	26.7%
Science	1	1.0%
Social Studies & Humanities	15	14.3%
Tourism	19	18.1%
Others	3	2.9%
Total (N)	105	100%

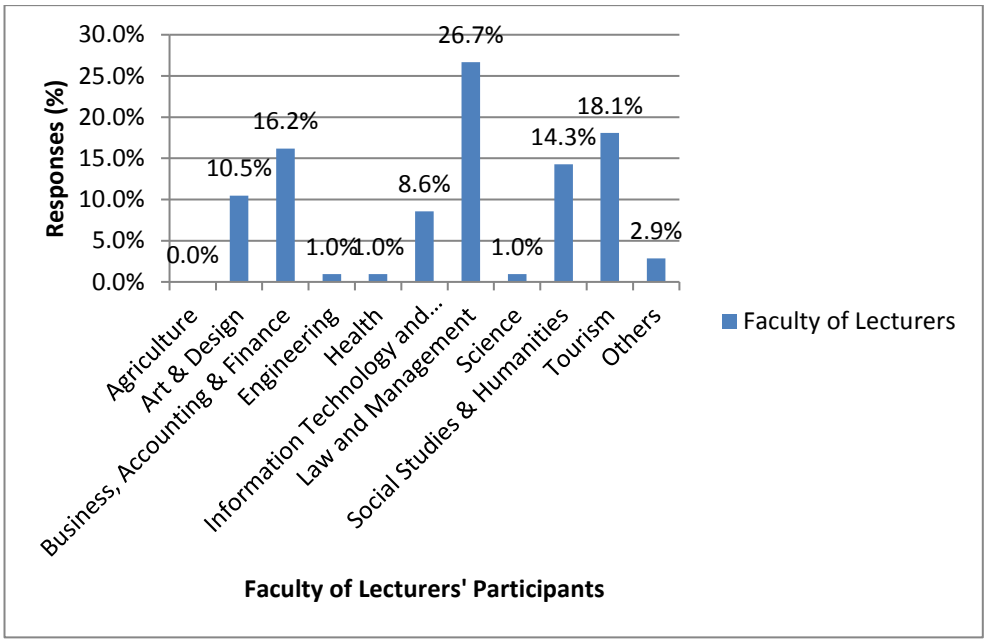


Figure 4.19: Lecturers' Survey – Faculty of Participants

In terms of their qualifications, 66.7% of lecturers had a Postgraduate degree and 15.2% had a PhD as shown in Table 4.41 and Figure 4.20.

Table 4.41: Lecturers' Survey – Qualifications of Participants (N=105)

Lecturers' Qualifications	**Number of Responses**	**Percentage Response**
Undergraduate Degree/Bachelor Degree	5	4.8%
Postgraduate Certificate	9	8.6%
Postgraduate Diploma	5	4.8%
Postgraduate Degree/Masters	70	66.7%
PhD/Research	16	15.2%
Others	0	0.0%
Total (N)	105	100%

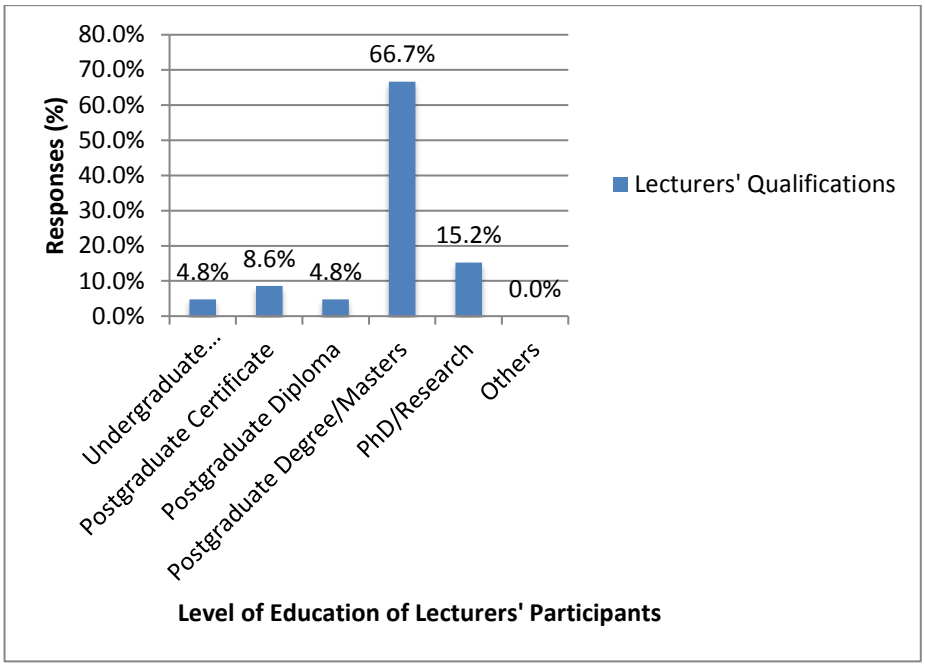


Figure 4.20: Lecturers' Survey – Qualifications of Participants

Of the participants, 53 lecturers (50.5%) were from public universities while 52 (49.5%) were from private universities, as shown in Table 4.42 and Figure 4.21. Similar to the findings from the students' survey, this participation level shows that, overall, private universities' lecturers were more keen to respond to the survey compared to public universities', although a greater number of lecturers are employed in public universities to cater for the higher number of enrolled students as compared to private universities (Tertiary Education Commission 2016).

Table 4.42: Lecturers' Survey – University Type of Participants (N=105)

Type of University	Number of Responses	Percentage Response
Public	53	50.5%
Private	52	49.5%
Total (N)	105	100%

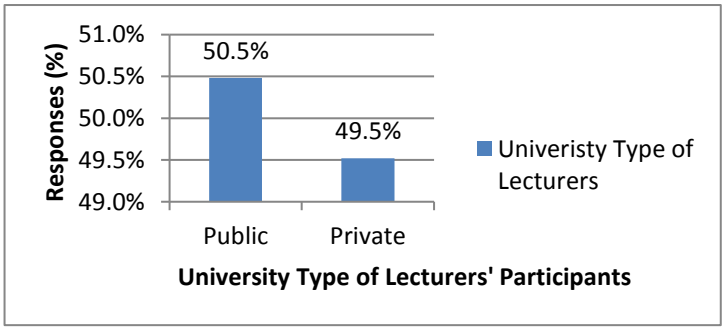


Figure 4.21: Lecturers' Survey – University Type of Participants

With classroom-based teaching being the most common approach in Mauritian universities, supplemented by the use of emails to send resources to students (Kasseeah

2012; Pudaruth et al. 2010; Tertiary Education Commission 2016), participants were also asked about the teaching mode they prefer. 49% of lecturers preferred a mix of face-to-face and online classes, 31% preferred only face-to-face classes and 20% preferred online classes, as shown in Table 4.43 and Figure 4.22.

Table 4.43: Lecturers' Survey – Mode of Teaching Preference of Participants (N=105)

Field of Study/Faculty	Number of Responses	Percentage Response
Face to Face Classes	33	31.0%
Online Classes	21	20.0%
Blended Classes (A mix of Face to Face and Online Classes)	51	49.0%
Total (N)	105	100%

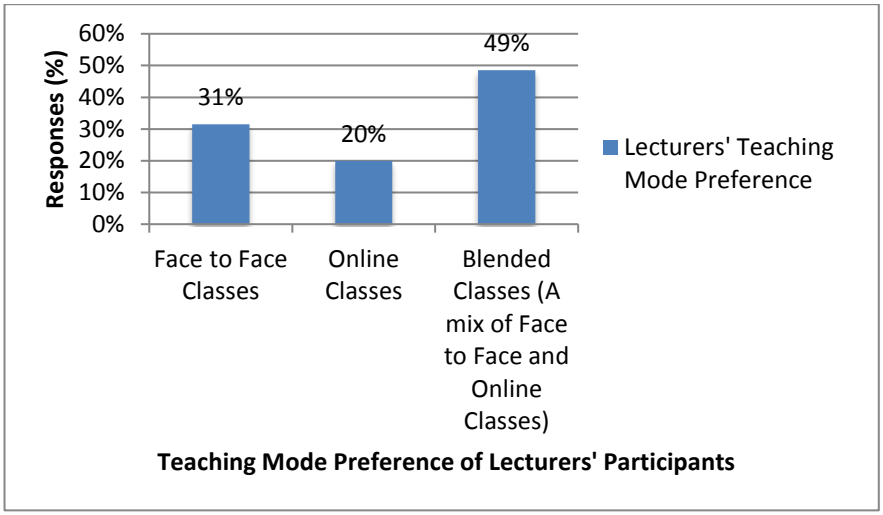


Figure 4.22: Lecturers' Survey – Teaching Mode Preference of Participants

4.7.1.2 Characteristics analysis of the lecturers' survey

The overall responses of lecturer participants on the characteristics of the initial holistic E-learning 3.0 model are discussed below, followed by their responses for each specific characteristic. Similar to the students' survey, lecturer participants were asked to indicate their level of agreement with the statements for the seven characteristics of the initial holistic E-learning 3.0 model, with options ranging from 'Strongly Agree', 'Agree', 'Neither Agree or Disagree', 'Disagree' to 'Strongly Disagree'. The researcher assigned a specific code to each of the level of agreement namely 1 for 'Strongly Agree', 2 for 'Agree', 3 for 'Neither Agree nor Disagree', 4 for 'Disagree' and 5 for 'Strongly Disagree', aligning with the scoring system used for the Students' survey preliminary analysis (Boone and Boone 2012; Friedman, Herskovitz and

Pollack 1994). Descriptive statistics were computed to indicate how the lecturers responded to the range of statements and to understand the key variables.

4.7.1.2.1 Lecturer participants' overall response on characteristics and sub-characteristics of the initial holistic E-learning 3.0 model

The average responses of lecturer participants to the 51 statements on the seven characteristics of the initial holistic E-learning 3.0 model were between 1.11 and 3.20. Three statements registered mean scores for the 'Neither Agree nor Disagree' category while the remaining 48 statements registered mean scores corresponding to the 'Agree'/'Strongly Agree' categories. As an initial observation, these results show that lecturers, in general, agreed with the characteristics of the initial holistic E-learning 3.0 model. Appendix G provides some descriptive statistics, including the minimum value, maximum value, mean, standard deviation and variance for the statements in the lecturers' survey, in ascending order of mean value. The mean responses for statements related to each characteristic of the initial holistic E-learning 3.0 are outlined in Appendix H.

4.7.1.2.2 Lecturer participants' responses by characteristics and sub-characteristics of the initial holistic E-learning 3.0 model

A detailed analysis of lecturer participants' responses on the statements related to the seven characteristics and associated sub-characteristics of the initial holistic E-learning 3.0 model is outlined below. The number of lecturers responding to each of the statements under the categories of 'Strongly Agree' (SA), 'Agree' (A), 'Neither Agree nor Disagree' (NA/ND), 'Disagree' (D) and 'Strongly Disagree' (SD) are shown in tabular format while the respective percentages out of 105 lecturer participants are shown in graphical format. Percentage response for the 'Strongly Agree' (SA) and 'Agree' (A) categories have been combined together as shown in the graphs' legends as well as that for 'Disagree' (D) and 'Strongly Disagree' (A) categories.

4.7.1.2.2.1 Content Management

The responses of lecturers to the statements related to the characteristic 'Content Management' and associated sub-characteristics 'Content creation', 'Content retrieval', 'Content reuse', 'Knowledge representation' and 'Search' are shown in Table 4.44 and Figure 4.23.

Table 4.44: Lecturer's Survey – Content Management Characteristic

Please indicate your level of agreement to each statement: **With respect to Content Management, in E-learning…**	**Number of lecturers**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Only lecturers can create learning materials	26	34	8	29	8	2.61
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)	2	30	28	45	0	3.10
Learning content should match the course requirements	90	15	0	0	0	1.14
Learning content should match students' needs	73	32	0	0	0	1.30
Learning content should be easily accessible/retrievable	93	12	0	0	0	1.11
Learning content should be reusable	62	43	0	0	0	1.41
Lecturers should be able to annotate learning content	0	60	43	2	0	2.45
Learning content annotations and descriptions (e.g. metadata) is important	0	33	58	14	0	2.82
Learning content should be flexible enough to allow students to construct their own knowledge of the course	3	60	33	9	0	2.46
Learning content should be searchable	62	43	0	0	0	1.41

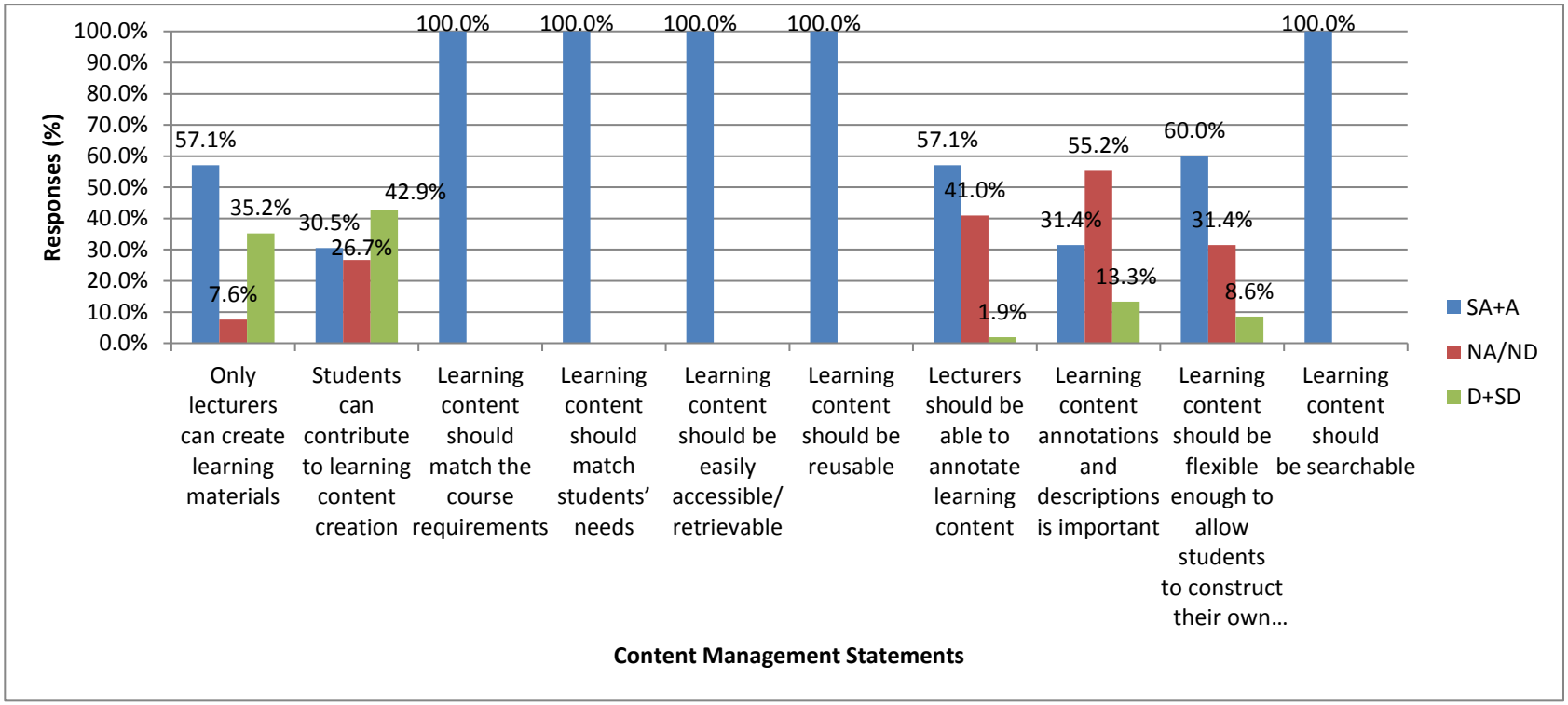


Figure 4.23: Lecturers' Survey – Content Management Characteristic

Five out of the ten statements on the characteristic 'Content Management' received 100% of agreement from respondents as shown in Figure 4.23. Comments from lecturers such as "*content should be regularly updated and should match the objective of the course to fulfil the needs of the industry"* and *"customability, flexibility and interoperability are important"* also supported these statements. The statement that only lecturers can create learning materials had varied responses with 57.1% strongly agreeing/agreeing, 7.6% neither agreeing nor disagreeing and 35.2% disagreeing/strongly disagreeing. Relatively similar results were obtained for the statement that students can contribute to learning content creation with 42.9% disagreeing/strongly disagreeing, 26.7% offering a neutral response and 30.5% strongly agreeing/agreeing with the statement. These results aligned with the current trend of responsibilities in terms of content creation in Mauritius. While lecturers are keen for students to participate in their learning, the core aspect of content creation is viewed as being dependent on lecturers only, which resonates with the strong teacher-centred learning environment that prevails in the country (Gunness 2011). Statements on learning content annotations also gathered mixed responses with relatively high percentages of neutral responses, underpinning the lack of familiarity with these aspects of content management. With findings similar to those of the students' survey, the need to further explore content creation and knowledge representation within content management is warranted to ensure the accurate representation of lecturers' perceptions in the E-learning 3.0 model.

4.7.1.2.2.2 Personalised Learning

Participants' level of agreement with each of the statements for the 'Personalised Learning' characteristic and associated sub-characteristics 'Student model' and 'Lecturer's characteristics' are shown in Table 4.45 and Figure 4.24

Table 4.45: Lecturers' Survey – Personalised Learning Characteristic

Please indicate your level of agreement to each statement: **With respect to Personalised Learning, in E-learning…**	**Number of lecturers**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Taking into account existing course knowledge of students is important	30	71	4	0	0	1.75
Taking into account students' learning style preferences is important	25	60	18	2	0	1.97
Learning content should meet students' educational goals	31	69	5	0	0	1.75
Students should be allowed to select learning materials that match their needs	4	69	21	11	0	2.37
Courses are delivered taking into consideration students' learning profiles (e.g. considering existing knowledge, learning style preferences etc)	0	21	42	42	0	3.20
I am keen to deliver courses based on students' individual needs	1	58	30	10	6	2.64
I have the skills and competence to support personalised learning	4	77	18	6	0	2.25

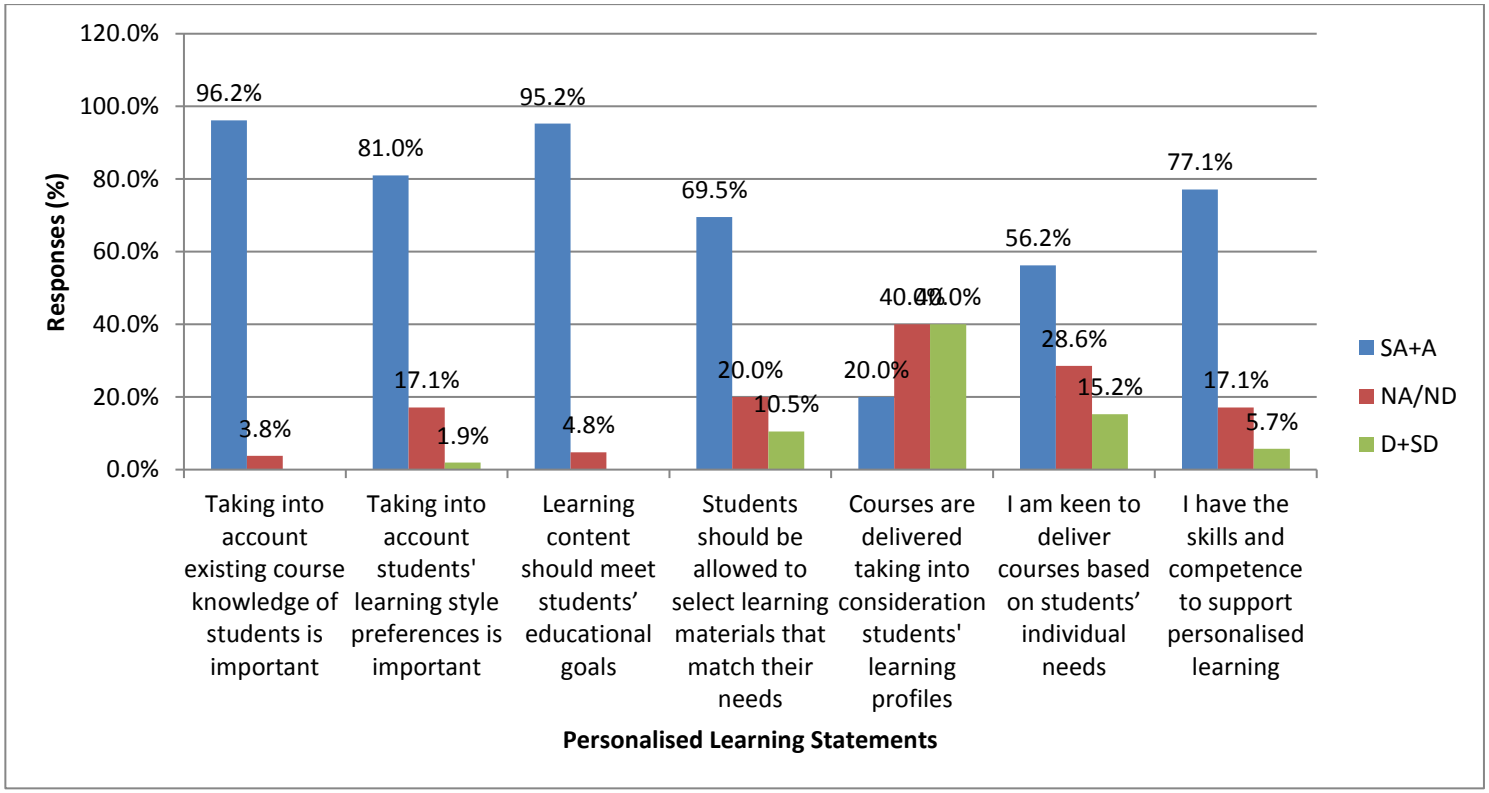


Figure 4.24: Lecturers' Survey – Personalised Learning Characteristic

Mixed responses were gathered in regard to all statements on 'Personalised Learning'. In terms of taking students' existing knowledge of the course into consideration, 96.2% strongly agreed/agreed while 3.8% neither agreed nor disagreed. 81.0% of agreement was recorded for the statement that students learning styles should be taken into account with two participants (1.9%) disagreeing and eighteen participants (17.1%) neither agreeing nor disagreeing. The slightly lower level of agreement registered for the second statement as compared to the first statement could be explained by the fact that, while students' existing knowledge is often acquired via pre-requisite courses, it is more difficult to take into consideration students' learning styles. 95.2% of lecturers were in favour of learning content meeting students' educational goals with the remaining 4.8% providing a neutral response. 69.5% of agreement were obtained for the statement that students should be allowed to select materials that match their needs, with 20% neither agreeing nor disagreeing with the statement and 10.5% disagreeing with the statement. The 30% of unconvinced/disagreed responses to that statement, once more, confirmed the deep rooted traditional system that prevails in Mauritius, where lecturers are used to providing the same learning materials to all students in a standard way, further supported by comments such as "*it is only fair that all students are provided with the same lecture notes and it is up to them to find out what is their best way to study these materials",* "*It is up to the student to study*" and "*It is the learners' willingness to learn the way they want. Trainers can only facilitate the learning process, not impose it*". Additionally, only 20% of participants agreed that courses are delivered taking into account students' learning profiles, with 40% neither agreeing nor disagreeing and disagreeing respectively. These results, again, confirmed the lack of personalisation within the Mauritian higher education system. 56.2% of participants said they were keen to deliver courses based on individual needs, while 77.1% believed they have the skills and competence needed to support a personalised learning environment. However, personalised learning is yet to become a familiar concept within the context of the Mauritian higher education system with 28.6% of participants unsure if they could delivery courses based on students' needs, 15.2% not supporting a customised course delivery, 17.1% unsure if they have the skills and competence to support personalised learning and 5.7% opining that they did not possess the requirements for supporting a personalised learning environment. To ensure its proper representation within the E-learning 3.0 model, further analysis needed to be conducted on this aspect.

4.7.1.2.2.3 Pedagogy

The opinions of lecturers regarding the statements for the characteristic ‘Pedagogy’ and associated sub-characteristics ‘Syllabus’, ‘Course design and sequencing’, ‘Assessment and evaluation’, ‘Teaching strategies’ and ‘Context’ are presented in Table 4.46 and Figure 4.25.

Table 4.46: Lecturers' Survey – Pedagogy Characteristic

Please indicate your level of agreement to each statement: **With respect to Pedagogy, E-learning courses should…**	**Number of lecturers**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Have clear learning objectives for each lesson	75	30	0	0	0	1.29
Have clear organisation of lessons which is easy to follow	72	33	0	0	0	1.31
Have clear assessments instructions	81	24	0	0	0	1.23
Align with the university's vision and mission	65	40	0	0	0	1.38
Be delivered in a pre-determined way where students are passive participants only	0	33	33	39	0	3.06
Allow students to be active participants where they can construct and manage their own personal knowledge	0	47	36	22	0	2.76
Be delivered according to students' learning profiles (e.g. considering students' existing knowledge and learning style preferences)	28	65	11	1	0	1.86
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet students' needs	44	61	0	0	0	1.58
Have learning content linked to a context	27	75	3	0	0	1.77

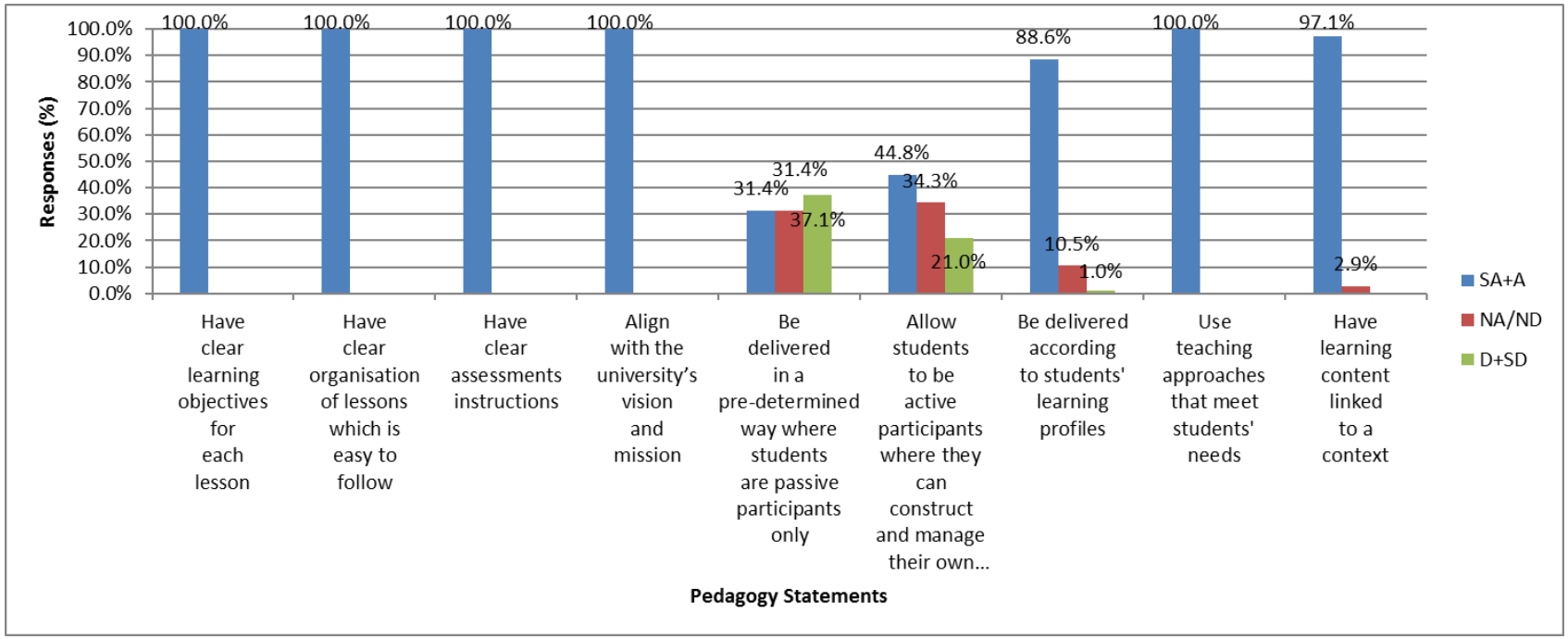


Figure 4.25: Lecturers' Survey – Pedagogy Characteristic

Five out of nine statements for the 'Pedagogy' characteristic received 100% agreement as shown in Figure 4.25. Most lecturers (97.1%) strongly agreed/agreed that content should be linked to a context with a relatively small percentage of 2.9% neither agreeing nor disagreeing with the statement. Opinions were divided for the two statements related to course delivery. 31.4% of participants agreed that delivery should be standard with students being passive participants, 37.1% disagreed with the statement, while 31.4% were neutral in their responses. On the other hand, 44.8% agreed that students should be actively involved in their knowledge construction, 34.3% neither agreed nor disagreed with the statement and 21% disagreed. These outcomes indicate that many lecturers cannot perceive that, for students to be active participants in their learning, a shift in the traditional role of the lecturer is crucial. In fact, the change in the role of the lecturer to that of a facilitator and collaborator in the students' learning journey to support them in being autonomous learners can be "*confusing*" and "*frowned upon*", especially in countries where the norm for learning is more about the "*the hierarchical transfer of skills*" "*from an authoritative power to students and technology users*" (Olaniran 2010, 23) and where the expectation is that the "k*nowledgeable are required to teach whatever needs to be learned*" (Olaniran and Agnello 2008, 76). Consequently, this aspect of 'Pedagogy' required further exploration. Additionally, aligning with the results obtained from the characteristic 'Personalised Learning', 88.6% of participants strongly agreed/agreed to course delivery being customised based on the students' learning profiles, with one participant disagreeing with the statement and eleven participants neither agreeing nor disagreeing. While having students as active participants in their learning, with content suited to match students' learning profile and teaching strategies adapted to meet students' needs are all statements supported by lecturers, the fact of the matter, as shown by the survey outcomes, is that many lecturers prefer to retain the traditional classroom delivery model with which they are familiar and comfortable, focussing on content coverage using the same didactic lecturing methods (Allybokus 2015). These outcomes confirm the need for further analysis of the 'Pedagogy' characteristic.

4.7.1.2.2.4 Collaboration

The level of agreements with the different statements for the 'Collaboration' characteristic and associated sub-characteristics 'Interaction' and 'Sharing of resources' is outlined in Table 4.47 and Figure 4.26.

Table 4.47: Lecturers' Survey – Collaboration Characteristic

Please indicate your level of agreement to each statement: **With respect to Collaboration, in E-learning, it is important to…**	**Number of lecturers**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)	49	56	0	0	0	1.53
Have facilities for collaboration between students and their peers	56	47	2	0	0	1.49
Have facilities for resource sharing between lecturers and students (e.g. through Wikis, blogs, discussion boards, etc)	56	49	0	0	0	1.47
Have facilities for resource sharing between students and their peers	55	47	3	0	0	1.50
Have group activities (e.g. through Google docs)	58	43	4	0	0	1.49

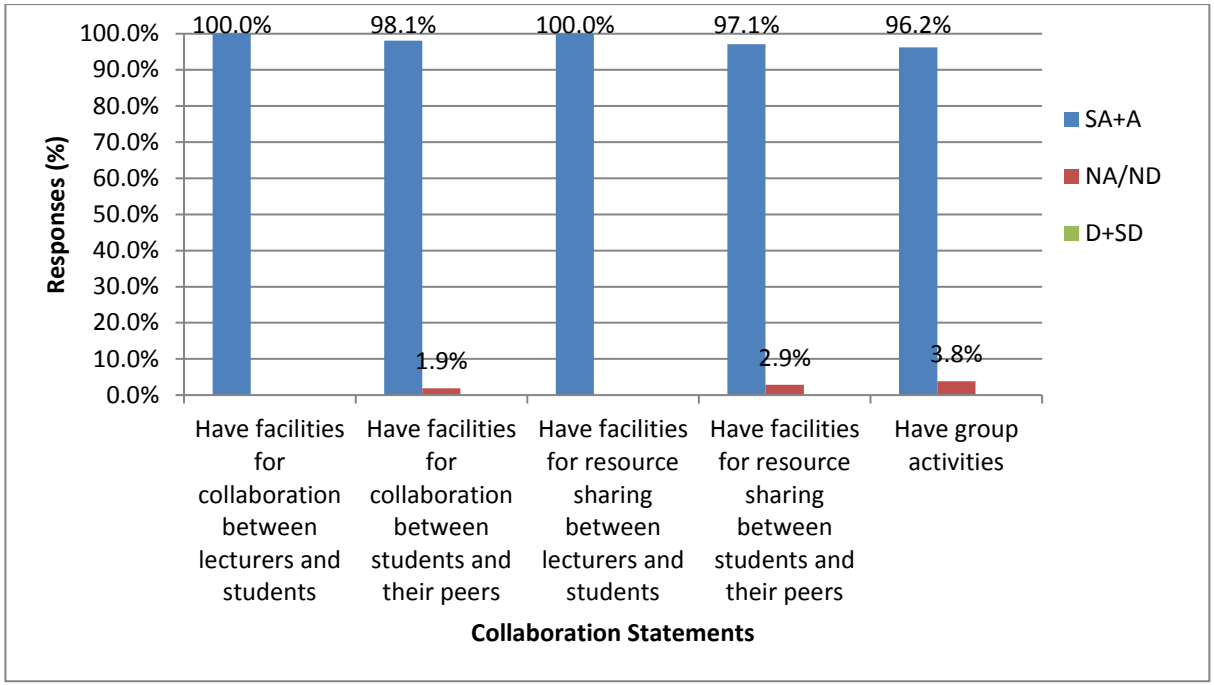


Figure 4.26: Lecturers' Survey – Collaboration Characteristic

The statements for the ‘Collaboration’ characteristic obtained a high level of agreement from participants with relatively few participants (two to four participants) providing a neutral response to statements on collaborative facilities and the sharing of resources between students and their peers. These few neutral responses could be an indication that some lecturers acknowledged that students may not necessarily want to collaborate and share resources with their peers. It is also noted that the subtle uneasiness to collaborate, as observed from the results of the students’ survey, was not salient in the lecturers’ survey outcomes. The importance of collaboration was further supported with comments from participants such as “*Learning is an on-going process. Knowledge sharing is the way to do it”*, “*Forums to ask questions should be available*” and “*interaction with lecturers and other students assist with learning*”.

4.7.1.2.2.5 Web 3.0 System

The responses of participated lecturers on the statements related to the characteristic ‘Web 3.0 System’ and associated sub-characteristics ‘Knowledge and other repositories’, ‘Ontologies’, ‘Usability’ ‘Accessibility’ and ‘ICT Infrastructure’ are outlined in Table 4.48 and Figure 4.27.

Table 4.48: Lecturers' Survey – Web 3.0 System Characteristic

Please indicate your level of agreement to each statement: **With respect to Web 3.0 System, E-learning system should…**	**Number of lecturers**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Support knowledge representation for customised access to learning materials	22	44	39	0	0	2.16
Maintain effective learning materials records	72	33	0	0	0	1.31
Keep track of students' learning profiles and patterns	56	49	0	0	0	2.47
Support new technologies	68	37	0	0	0	1.35
Be easy to navigate	71	34	0	0	0	1.32
Have easy access to resources	77	28	0	0	0	1.27
Have effective IT infrastructure	80	25	0	0	0	1.24

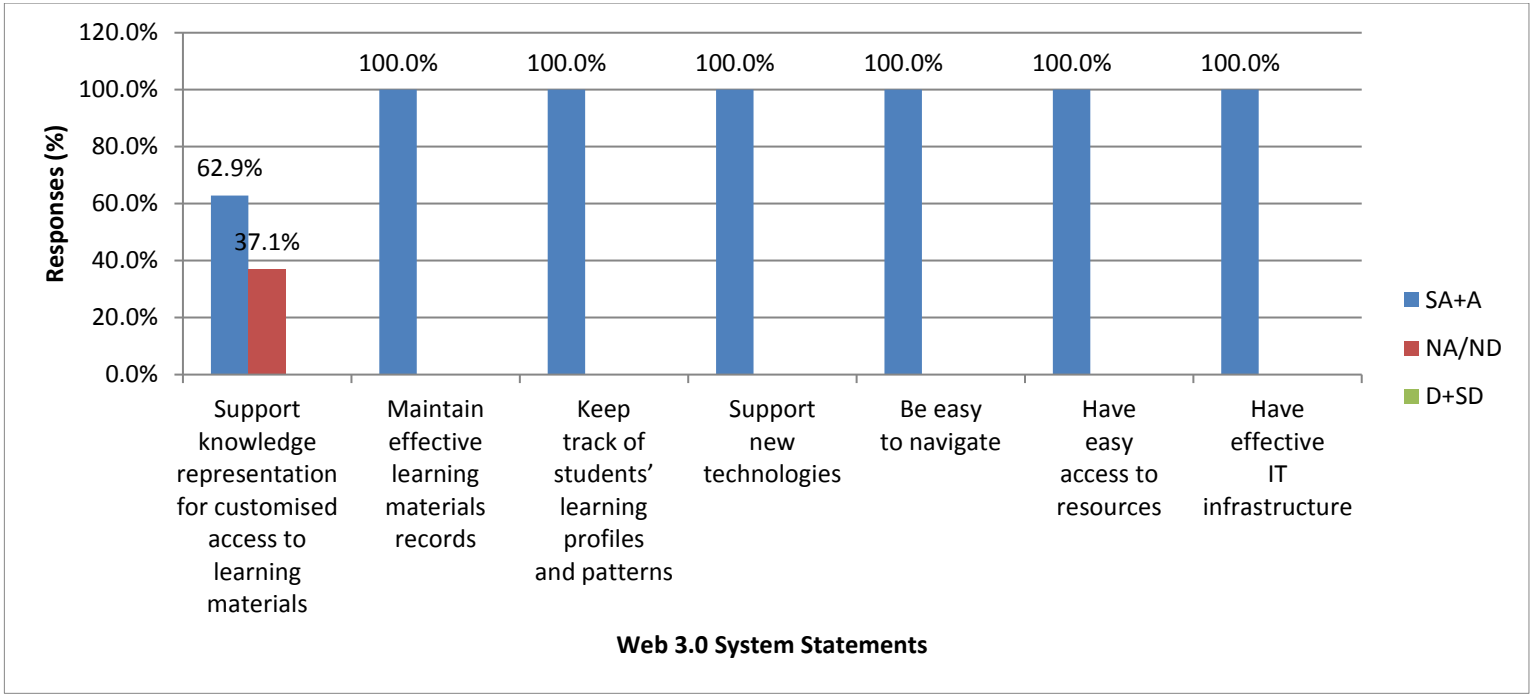


Figure 4.27: Lecturers' Survey – Web 3.0 System Characteristic

There was unanimous agreement on all the statements for ‘Web 3.0 System’ as seen in Table 4.48 and Figure 4.27 except for the statement on knowledge presentation, which drew mixed responses. 62.9% of participants strongly agreed/agreed that the system should support knowledge representation for customised access to learning materials, while 37.1% neither agreed nor disagreed. The mixed responses could be explained by participants’ unfamiliarity with the concept of knowledge representation, thus aligning with findings from the students’ survey. While the overall results for the statements on ‘Web 3.0 System’ were greatly positive, the mixed opinions on the key aspect of the Semantic Web, namely knowledge representation, warranted further analysis.

4.7.1.2.2.6 Support

The responses of lecturers on the statements related to the characteristic ‘Support’ and associated sub-characteristics ‘Instructional support’ and ‘Organisational support’ are shown in Table 4.49 and Figure 4.28.

Table 4.49: Lecturers' Survey – Support Characteristic

Please indicate your level of agreement to each statement: **With respect to Support, in E-learning…**	**Number of lecturers**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Students should assist their peers	24	65	12	4	0	1.96
Lecturers should support students (e.g. students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles)	62	43	0	0	0	1.41
Ongoing feedback to students about their learning performances is important	68	35	2	0	0	1.37
Ongoing feedback from students about their learning experience is important	61	42	2	0	0	1.44
Training to use the system is important	65	40	0	0	0	1.38
Effective and appropriate technology infrastructure is important	62	43	0	0	0	1.41
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	65	40	0	0	0	1.38

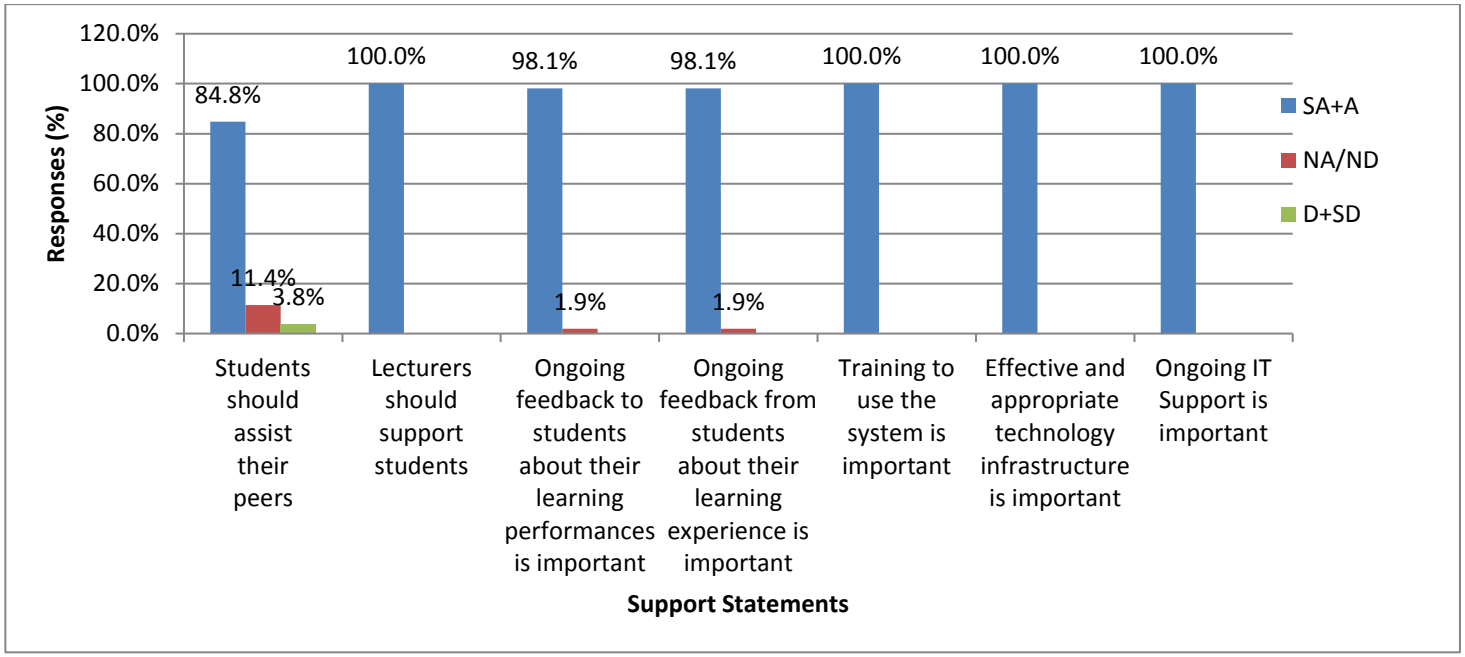


Figure 4.28: Lecturers' Survey – Support Characteristic

Support statements on training, effective infrastructure and IT support and support from lecturers received 100% agreement from participants. While 84.8% of participants strongly agreed/agreed that students should assist their peers, 11.4 % neither agreed nor disagreed and 3.8% disagreed with the statement, indicating participants' acknowledgement of the competitive nature of the education system in the country, which does not necessarily support students assisting their peers (Allybokus 2015). While the majority of participants strongly agreed/agreed (98.1%) that giving feedback to and receiving feedback from students on their learning were important, a relatively small number of participants (2 participants for each statement) had a neutral response which indicate that these participants did not see the benefit behind this type of instructional support, further demonstrating the nonchalance way of course delivery by some lecturers with a focus on knowledge transmission rather than knowledge construction and rote learning by students (Rughooputh 2003). Undoubtedly, as seen by the responses, 'Support' is considered important to the model. However, some comments from participants such as "*Support of management to lecturers is also important for them to perform in an optimal way*, "*The administration department which will provide the support, must work from everywhere, anywhere, at anytime, not at the usual 8am-4pm working hrs*", *"Management should also provide support by being more available to recommendations and make the necessarily changes to policies for a better education system"* suggest that there are other dimensions of 'Support' which could be included in the model, thereby dictating the need for further investigation and analysis.

4.7.1.2.2.7 Trust

The responses from lecturer participants on statements for the 'Trust' characteristic and associated sub-characteristics 'Technology reliability and security', 'Trust between students' and 'Trust between students and lecturers' are shown in Table 4.50 and Figure 4.29.

Table 4.50: Lecturers' Survey – Trust Characteristic

Please indicate your level of agreement to each statement: **With respect to Trust, in E-learning…**	**Number of lecturers**					**Mean Response**
	Strongly Agree (1)	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**	
Interaction between lectures and students is important	54	51	0	0	0	1.49
Interaction between students and their peers is important	56	46	3	0	0	1.50
Continuous feedback to and from students promotes trust between lecturers and students	61	41	3	0	0	1.45
The system should be reliable	76	29	0	0	0	1.28
The system should be secure	79	26	0	0	0	1.25
I am confident to teach in an E-learning environment	62	34	7	2	0	1.51

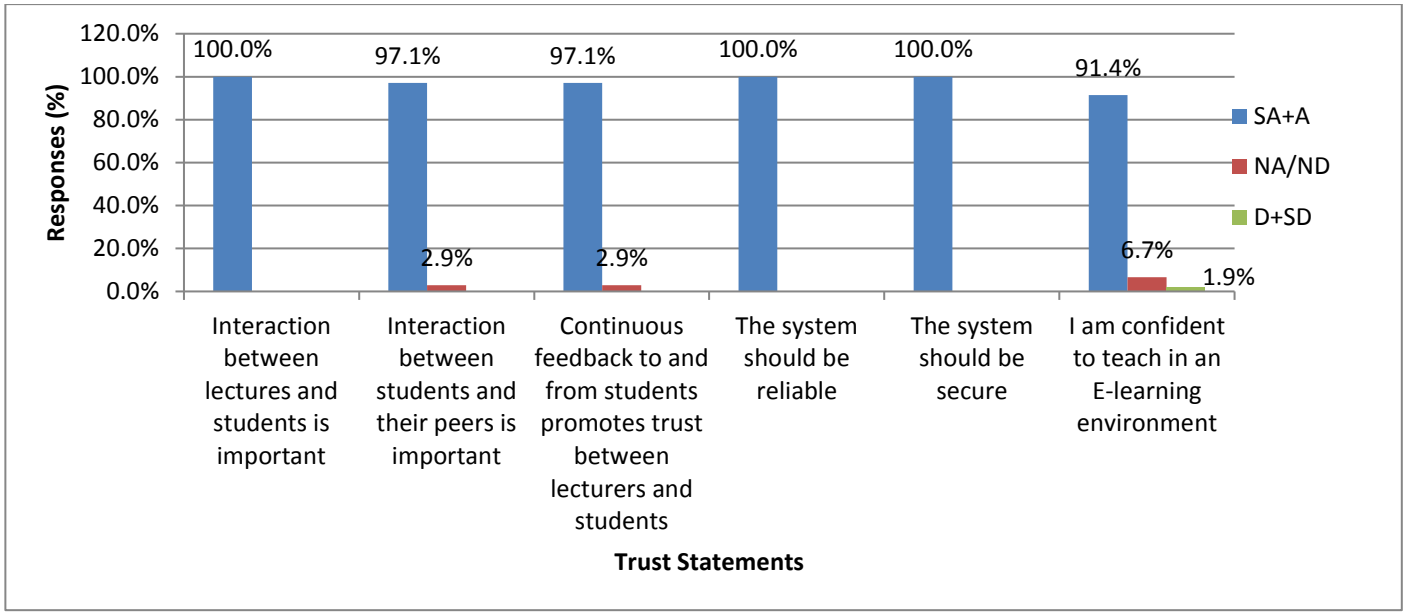


Figure 4.29: Lecturers' Survey – Trust Characteristic

Aligning with results for the 'Collaboration' characteristic, participants were unanimous that interaction between lecturers and students is important. Similar results were obtained regarding the importance of system reliability and security. One participant commented that "*Trust is vital for the success of the system*". 97.1% of participants strongly agreed/agreed that students should interact with their peers although, 2.9% neither agreed nor disagreed with that statement, reinforcing findings under the 'Collaboration' characteristic where some lecturers are not convinced of the importance of students' interaction but, instead value more lecturer-students interactions in a teacher-directed learning process (Allybokus 2015). Similarly, 97.1% of participants strongly agreed/agreed that feedback to and from students promotes trust, with the remaining 2.9% providing a neutral response, supporting findings under the 'Support' characteristic whereby the delivery of course content to complete the syllabus is seen as more critical by some as opposed to the actual understanding of it. To determine the level of confidence of lecturers to operate within an E-learning environment, the statement 'I am confident to teach in an E-learning environment' was included. 91.4% of lecturers responded as being confident, with only seven participants neither agreeing nor disagreeing and two participants disagreeing with the statement. One participant even commented "*I have targeted into an E-learning system before so I am happy to do that, if required*" indicating the readiness and willingness of some lecturers to operate within an E-learning environment. The large number of positive responses for the 'Trust' statements supports the significance of the characteristic in the E-learning 3.0 model.

4.7.1.3 Summary of the preliminary analysis of the lecturers' survey

The lecturers' survey registered varied responses for some statements, particularly on those related to the roles of students and lecturers within the learning environment, indicating that some lecturers preferred the traditional teacher-centred learning environment. The importance of collaboration between students and the importance of feedback also drew mixed responses, once again, highlighting the lack of a collaborative and sharing culture that dominates the Mauritian educational system, as well as the dominance of knowledge transfer and rote learning over knowledge construction (Veer Ramjeawon and Rowley 2017). A lack of familiarity was also noted on key Semantic Web aspects such as knowledge representation. Outcomes for the 'Support' characteristic indicated that other dimensions of 'Support' needed to be

considered. Taking these into account, to ensure an accurate representation of E-learning 3.0 from the lecturers' point of view, factor analysis was employed to further analyse the lecturer' survey data.

4.7.2 Factor analysis of the lecturers' survey

Findings from the preliminary analysis of the lecturers' survey revealed the need to further analyse the survey outcomes to ensure a consistent interpretation of these outcomes and to identify a distinct set of characteristics and sub-characteristics for the E-learning 3.0 model. Consequently, factor analysis, using SPSS version 22, was applied to the lecturers' survey data following the three steps outlined by Pallant (2010), as previously discussed in section 4.6.2 and shown in Figure 4.14.

In order to assess the suitability of the data from the lecturers' survey, the sample adequacy and the strength of intercorrelations among items in the survey were considered. With the number of lecturer participants being 105, the researcher followed the guidelines from Hair et al. (2010), as outlined in Table 4.13, to consider only those factors items with loadings above 0.55. In terms of the strength of intercorrelations among items, the Bartlett's test of Sphericity (Bartlett 1954) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser 1974) were used. As shown in Table 4.51 below, the KMO score was 0.518, which is above the minimum score of 0.5 (Tabachnick and Fidell 2007; Williams, Onsman and Brown 2010; Kaiser 1974) while the Bartlett's test was significant at .000.

Table 4.51: Lecturers' Survey – KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.518
Bartlett's Test of Sphericity	Sig.	.000

The KMO scores and the results of the Bartlett's test for each of the seven characteristics of the initial holistic E-learning 3.0 model are provided in Table 4.52. The KMO score were above the minimum of .5 and the Bartlett's test was significant at .000 for all the seven characteristics. Based on these results, factor analysis was considered appropriate for the Lecturers' survey.

Table 4.52: Lecturers' Survey – KMO and Bartlett's Test per characteristic

Characteristics of Initial E-learning 3.0 Model Proposed	KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity
Content Management	.608	.000
Personalised Learning	.702	.000
Pedagogy	.633	.000
Collaboration	.787	.000
Web 3.0 System	.528	.000
Support	.667	.000
Trust	.634	.000

To determine the number of factors to be retained, the process outlined by Osborne and Costello (2009), as discussed in section 4.6.2.2.1, was then applied to the lecturers' survey. Kaiser's criterion of eigen value greater than one was applied to the survey outcomes for each characteristic of the initial holistic E-learning 3.0 model, followed by an examination of the Scree test. Where required, the number of factors to be retained was then manually set, as shown in Figure 4.15, and the rotated component matrices were examined for the "*cleanest*" data structure (Osborne and Costello 2009, 135). Varimax rotation method was used to rotate the data as it produces more easily interpretable results (Osborne and Costello 2009) and it aligns with the rotation method used for the students' survey for consistency. Since only factor loadings above 0.55 were to be retained, based on the guidelines provided by Hair et al. (2010) for a sample size of 105 lecturers, as outlined in Table 4.13, factors with a loading below 0.55 were excluded from the rotated component matrix for ease of interpretation. Similar to the students' survey analysis, the variables were also sorted by size in descending order of factor loadings. Figure 4.16 in section 4.6.2 show the settings under SPSS to exclude factor loadings under 0.55 and to sort the variables by size.

Once the number of factors to be retained were determined, factors with at least two loaded variables were then given meaningful interpretation (Henson and Roberts 2006; Hair et al. 2010). Where the factor items loaded in the same way as the factor analysis of the students' survey, similar factor labelling was applied, to maintain consistency between both surveys. The communalities for each factor items were also considered to determine which factor items were to be retained, with a minimum of .5 set as the guidelines as per MacCallum et al. (1999). The researcher also checked the Total Variance Explained tables for each characteristic of the initial holistic E-learning 3.0

model to ensure that the cumulative percentage of variance for the extracted factors was at least 50% (Williams, Onsman and Brown 2010).

For consistency and for the convenience of readers, the results of the factor analysis have been colour-coded the same way as for the students' survey results and the characteristics of the initial holistic E-learning 3.0 model (Figure 2.30). This will assist the readers to easily discern the characteristics and associated sub-characteristics being discussed. The factor analysis results for each of the characteristics of the initial holistic E-learning 3.0 are discussed below, ending with a table outlining the characteristics and sub-characteristics before (from the initial holistic E-learning 3.0 model) and after the factor analysis. New factors emerging from the factor analysis as well as changes to the original components of the initial holistic E-learning 3.0 model are shown in dark red.

4.7.2.1 Content Management

Four factors were extracted under Kaiser's criterion with an eigenvalue greater than one. The Scree test showed an elbow at the fourth and fifth component (as shown by the blue arrows in Table 4.53). While, the number of factors to be retained seemed more likely to be four due to the similarity between Kaiser's criterion and the tendency of the scree plot, given the two inflexion points on the Scree plot, the number of factors to be retained was manually set at three and five for confirmation using the process outlined by Osborne and Costello (2009) as discussed in section 4.6.2.2.1. The rotated component matrices were then examined in all cases to determine the cleaner data structure. From this exercise, four factors were retained, explaining 73.102% of the variance, with each factor contributing 27.615%, 19.246%, 13.693% and 12.548% of the total variance respectively. The factor loadings were in the range of .786 to .922, representing excellent outcomes according to Comrey and Lee (1992, quoted in Distefano and Hess 2005, 227). All factor items were retained with their respective communalities above the minimum requirements of 0.5 as outlined by MacCallum et al. (1999). Factor reliability was demonstrated with Cronbach alpha scores of .749, .651, .808 and .745 for factor items which loaded on factors one to four respectively (Nunnally 1978; Malhotra 1993; Moss et al. 1998). The results of the factor analysis are summarised in Table 4.53. The observable variables associated with each factor were examined carefully, following which the factors were named. Table 4.54 shows the resulting factor labels and their descriptions, the sub-characteristics from the initial

holistic E-learning 3.0 model as well as the corresponding variables and their respective loadings.

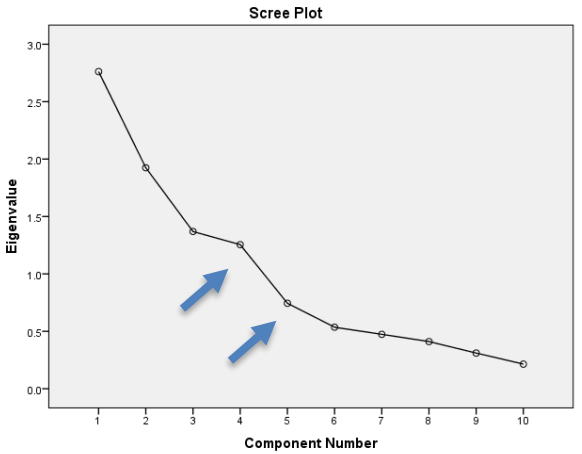
Table 4.53: Lecturers' Survey – Summary of Factor Analysis – Content Management

CONTENT MANAGEMENT

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.762	27.615	27.615	2.762	**27.615**	27.615	2.048	20.481	20.481
2	1.925	19.246	46.861	1.925	**19.246**	46.861	1.825	18.252	38.733
3	1.369	13.693	60.554	1.369	**13.693**	60.554	1.803	18.027	56.760
4	1.255	12.548	73.102	1.255	**12.548**	73.102	1.634	16.342	**73.102**
5	.744	7.444	80.546						
6	.536	5.357	85.903						
7	.474	4.737	90.640						
8	.411	4.107	94.747						
9	.311	3.109	97.856						
10	.214	2.144	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix					Communalities
Variables for Content Management	Component/ Factor Loadings				
	1	2	3	4	
Learning content annotations and descriptions (e.g. metadata) is important	.853				.737
Learning content should be flexible enough to allow students to construct their own knowledge of the course	.806				.662
Lecturers should be able to annotate learning content	.786				.618
Learning content should be searchable		.818			.694
Learning content should be reusable		.803			.657
Learning content should be easily accessible/retrievable		.635			.551

KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity
.608	.000

Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)			-.922		.858
Only lecturers can create learning materials			.895		.865
Learning content should match the course requirements				.919	.854
Learning content should match students' needs				.851	.815
Cronbach α	.749	.651	.808	.745	

Table 4.54: Lecturers' Survey – Extracted Factors for Content Management

Factor Labels	Description of Factor Labels	Sub-characteristics of 'Content Management' from initial holistic E-learning 3.0 model	Variables for Content Management	Component/ Factor Loadings			
				1	2	3	4
Knowledge representation	The three factor items which loaded on factor 1 were statements associated with the sub-characteristic 'Knowledge representation', although the variables did not explicitly made use of the term 'knowledge representation' to keep the survey simple by avoiding technical jargons for ease of understanding by participants. As a result, factor 1 retained the name 'Knowledge representation'.	• Knowledge representation	Learning content annotations and descriptions (e.g. metadata) is important	.853			
		• Knowledge representation	Learning content should be flexible enough to allow students to construct their own knowledge of the course	.806			
		• Knowledge representation	Lecturers should be able to annotate learning content	.786			
	The variables which loaded on factor 2 were related to content	• Search	Learning content should be searchable		.818		

Content accessibility and reuse	being searchable, reusable and easily accessible. As a result, factor 2 was labelled as 'Content accessibility and reuse', aligning with the students' survey findings, with accessibility capturing the search and retrievable aspects of learning content.	• Content reuse	Learning content should be reusable		.803		
		• Content retrieval	Learning content should be easily accessible /retrievable		.635		
Content creation and content creation responsibility	The two factor items which loaded on factor 3 had as main focus the creation of content as well as the contribution of lecturers and students with respect to content creation. The first variable loaded strongly on factor 3 with a loading of -.922, the negative sign indicating that factor 3 is related to students not being able to contribute to learning content creation, while the second variable had a factor loading of .895. While these results established 'Content creation' as significant, who should be the responsible for content creation was another	• Content creation	Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)			-.922	
		• Content creation	Only lecturers can create learning materials			.895	

	layer that emerged from the analysis. As a result, factor 3 was named ‘Content creation and content creation responsibility’, in line with findings from the students’ survey.						
Content meeting courses’ and students’ needs	The factor items which loaded on factor 4 were both related to learning content meeting the course requirements as well as the students’ needs. Hence, factor 4 was labelled as ‘Content meeting courses’ and students’ needs’	• Content creation • Knowledge representation	Learning content should match the course requirements				.919
		• Knowledge representation • Content retrieval • Search	Learning content should match students’ needs				.851

Following the factor analysis, new factors emerged for the characteristic 'Content Management' while some sub-characteristics from the initial holistic E-learning 3.0 model were renamed based on the groupings of factor items. 'Content retrieval', 'Content reuse' and 'search' sub-characteristics from the initial holistic E-learning 3.0 model were grouped together into a new factor labelled as 'Content accessibility and reuse, aligning with findings from the students' survey (see 4.6.3.1). Similarly, content creation responsibility, as another aspect of content creation, emerged from the analysis while a new factor 'Content meeting courses' and students' needs' also emerged as factor 4. 'Knowledge representation' was retained as the labelling for factor 1 as per the original sub-characteristic from the initial holistic E-learning 3.0 model. The characteristic 'Content Management' and its associated sub-characteristics from the initial holistic E-learning 3.0 model, prior to the factor analysis as well as the changes made following the factor analysis, are outlined in Table 4.55.

Table 4.55: Lecturers' Survey – Content Management - Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Content Management	**Content Management**
Content creation	Content creation and content creation responsibility
Content retrieval	Content accessibility and reuse
Content reuse	
Search	
Knowledge representation	Knowledge representation
Content creation	Content meeting courses' and students' needs
Content retrieval	
Search	
Knowledge representation	

4.7.2.2 Personalised Learning

Two factors were extracted under Kaiser's criterion with an eigenvalue greater than one for the characteristic 'Personalised Learning'. The Scree test showed an inflexion after the second component, although a slight bend can be seen at the sixth component. To confirm the number of factors to be retained, using the process outlined by Osborne and Costello (2009) as discussed in section 4.6.2.2.1, the number of factors to be extracted was then manually set at three and four and five. Two factors were then retained after careful examination of the Rotated Component Matrices as they

provided the cleanest factor structure (Osborne and Costello 2009, 135). The two factors extracted accounted for 67.012% of the total variance, each contributing 39.865% and 27.147% of the total variance respectively. All items had excellent factor loadings of above .7, except for one with a factor loading of .640, categorised as a 'very good' outcome (Comrey and Lee 1992, quoted in Distefano and Hess (2005, 227). However, that item, as shown in red in Table 4.56, was removed due to its low communality, not meeting the minimum requires of 0.5 as per MacCallum et al. (1999). Retained factor items demonstrated strong internal consistency with Cronbach alpha scores of .867 and .706 for factors 1 and 2 respectively (DeVellis 2003; Pallant 2010). Table 4.56 shows a summary of the factor analysis results while Table 4.57 outlines the factor labels and descriptions, the related sub-characteristics from the initial holistic E-learning 3.0 model and the variables with their associated loadings.

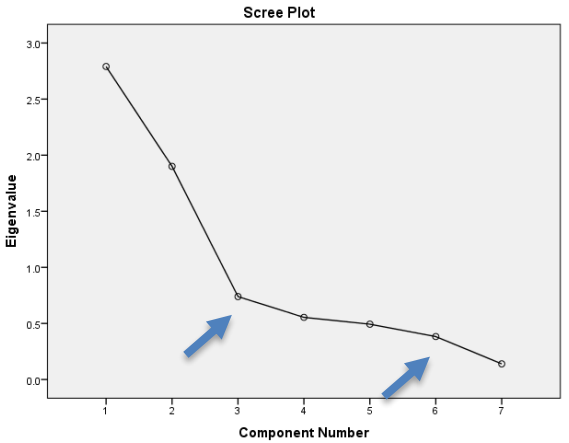
Table 4.56: Lecturers' Survey – Summary of Factor Analysis – Personalised Learning

PERSONALISED LEARNING

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.791	39.865	39.865	2.791	**39.865**	39.865	2.770	39.577	39.577
2	1.900	27.147	67.012	1.900	**27.147**	67.012	1.920	27.436	**67.012**
3	.739	10.564	77.576						
4	.554	7.917	85.493						
5	.493	7.044	92.537						
6	.383	5.468	98.005						
7	.140	1.995	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix			
Variables for Personalised Learning	**Component/ Factor Loadings**		**Communalities**
	1	**2**	
Students should be allowed to select learning materials that match their needs	.935		.874
I have the skills and competence to support personalised learning	.871		.760
I am keen to deliver courses based on students' individual needs	.829		.688
Courses are delivered taking into consideration students' learning profiles (e.g. considering existing knowledge, learning style preferences etc)	.640		.421
Taking into account students' learning style preferences is important		.813	.662
Learning content should meet students' educational goals		.796	.638
Taking into account existing course knowledge of students is important		.782	.648
Cronbach α	.867	.706	

KMO Measure of Sampling Adequacy	**Bartlett's Test of Sphericity**
.702	.000

Table 4.57: Lecturers' Survey – Extracted Factors for Personalised Learning

Factor Labels	Description of Factor Labels	Sub-characteristics of 'Personalised Learning' from initial holistic E-learning 3.0 model	Variables for Personalised Learning	Component/ Factor Loadings	
				1	2
Lecturer's characteristics	Statements related to the sub-characteristic 'Lecturer's characteristics', including the attitudes, skills and competence of lecturers in supporting personalised learning, were all grouped together for factor 1. Hence, factor 1 retained the same naming.	• Lecturer's characteristics	Students should be allowed to select learning materials that match their needs	.935	
		• Lecturer's characteristics	I have the skills and competence to support personalised learning	.871	
		• Lecturer's characteristics	I am keen to deliver courses based on students' individual needs	.829	
Student model	The variables associated with factor 2 were related to the student learning profile including existing course knowledge, the learning styles and the educational goals. As a result, factor 2 was named 'Student model' in line with the students' survey findings and the original naming from the initial holistic E-learning 3.0 model.	• Student model	Taking into account students' learning style preferences is important		.813
		• Student model	Learning content should meet students' educational goals		.796
		• Student model	Taking into account existing course knowledge of students is important		.782

Both sub-characteristics from the initial holistic E-learning 3.0 model were retained for "Personalised Learning', following the factor analysis, as outlined in Table 4.58 below.

Table 4.58: Lecturers' Survey – Personalised Learning - Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Personalised Learning	**Personalised Learning**
Student model	Student model
Lecturer's characteristics	Lecturer's characteristics

4.7.2.3 Pedagogy

Under the 'Pedagogy' characteristic, three factors were retained under Kaiser's criterion with an eigenvalue greater than one. The Scree test also showed an inflection after three components, confirming the number of factors to be retained at three, which also provided a clean factor structure (Osborne and Costello 2009). These three factors explained 63.320% of the total variance, with each factor contributing 26.921%, 19.015% and 17.384% of the total variance. Factor loadings were all above 0.7 and categorised as 'excellent', except for one factor item scoring .671 and therefore categorised as 'very good' (Comrey and Lee 1992, quoted in Distefano and Hess (2005, 227). Communalities for all factor items were above the minimum required 0.5, establishing reliability of factors (MacCallum et al. 1999). Factor items also demonstrated internal consistency with alpha scores of .712, .675, .708 for factors 1 to 3 respectively (Nunnally 1978; Malhotra 1993; Moss et al. 1998). Table 4.59 summarises the results from the factor analysis while Table 4.60 presents the factor labels and descriptions as well as the related sub-characteristics from the initial holistic E-learning 3.0 model and the variables with their associated loadings.

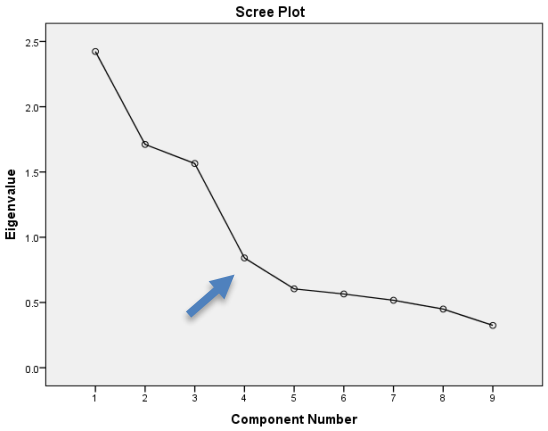
Table 4.59: Lecturers' Survey – Summary of Factor Analysis – Pedagogy

PEDAGOGY

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.423	26.921	26.921	2.423	**26.921**	26.921	2.167	24.083	24.083
2	1.711	19.015	45.936	1.711	**19.015**	45.936	1.863	20.703	44.786
3	1.565	17.384	63.320	1.565	**17.384**	63.320	1.668	18.534	**63.320**
4	.841	9.346	72.666						
5	.604	6.715	79.381						
6	.565	6.278	85.659						
7	.517	5.743	91.402						
8	.449	4.994	96.396						
9	.324	3.604	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix				Communalities
Variables for Pedagogy	**Component/ Factor Loadings**			
	1	**2**	**3**	
Have clear organisation of lessons which is easy to follow	.809			.661
Align with the university's vision and mission	.716			.567
Have clear learning objectives for each lesson	.713			.512
Have clear assessments instructions	.671			.531
Be delivered according to students' learning profiles (e.g. considering students' existing knowledge and learning style preferences)		.822		.685
Have learning content linked to a context		.776		.626
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet students' needs		.726		.549

KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity
.633	.000

Allow students to be active participants where they can construct and manage their own personal knowledge			.905	.822
Be delivered in a pre-determined way where students are passive participants only			-.855	.746
Cronbach α	.712	.675	.708	

Table 4.60: Lecturers' Survey – Extracted Factors for Pedagogy

Factor Labels	**Description of Factor Labels**	**Sub-characteristics of 'Pedagogy' from initial holistic E-learning 3.0 model**	**Variables for Pedagogy**	**Component/ Factor Loadings**		
				1	2	3
Syllabus	Factor 1 retained the naming 'Syllabus' from the initial holistic E-learning 3.0 model, which included clear organisation of the lessons, the university's vision and mission, clear objectives of lessons as well as clear assessment instructions.	• Syllabus	Have clear organisation of lessons which is easy to follow	.809		
		• Syllabus	Align with the university's vision and mission	.716		
		• Syllabus	Have clear learning objectives for each lesson	.713		
		• Assessment and evaluation	Have clear assessments instructions	.671		
Student-centered teaching	All the 3 variables associated with factor 2 were related to having a student centered environment where courses are delivered based on the	• Course design and sequencing • Teaching strategies • Context	Be delivered according to students' learning profiles (e.g. considering students' existing knowledge and learning style preferences)		.822	

	students' learning profiles, learning content are linked to contexts, and where customised teaching approaches are adopted to meet students' needs. Hence, factor 2 was labelled as 'Student-centered teaching', which is also in line with the students' survey findings to maintain consistency.	• Course design and sequencing • Context	Have learning content linked to a context		.776	
		• Teaching strategies	Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet students' needs		.726	
Student's and lecturer's roles in course delivery	The two variables for factor 3 questioned the type of course delivery that should be employed within the learning environment and the role that students and lecturers should adopt in that process. As a result, factor 3 was labelled as 'Student's and lecturer's role in course delivery', also aligning with findings from the students' survey.	• Course design and sequencing • Teaching strategies	Allow students to be active participants where they can construct and manage their own personal knowledge			.905
		• Course design and sequencing • Teaching strategies	Be delivered in a pre-determined way where students are passive participants only			-.855

Findings for the 'Pedagogy' characteristic under the lecturers' survey, following factor analysis, align with the findings obtained from the students' survey, particularly for factor 2 and factor 3 as explained in Table 4.60 above. 'Syllabus' was retained as the naming of factor 1, but also included 'Assessment and evaluation'. Factor 2 and factor 3 were named as 'Student-centered teaching' and 'Student's and lecturer's roles in course delivery' respectively, in line with the variables which loaded onto the factors and to maintain consistency with the students' survey results. Table 4.61 below shows the 'Pedagogy' characteristic before and after factor analysis.

Table 4.61: Lecturers' Survey – Pedagogy – Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Pedagogy	**Pedagogy**
Syllabus	Syllabus
Assessment and evaluation	
Course design and sequencing	Student-centered teaching
Teaching strategies	
Context	
Course design and sequencing	Student's and lecturer's roles in course delivery
Teaching strategies	

4.7.2.4 Collaboration

Under Kaiser's criterion, two factors were extracted. However, the Scree plot showed an inflexion after the first component and another smaller one at the third component. Therefore, in order to confirm the number of factors to be retained, the number of factors to be extracted was manually set at three and four, according to the process outlined by Osborne and Costello (2009) as discussed in section 4.6.2.2.1. Following careful analysis of the Rotated Component Matrices for two, three and four rotated factors, two factors were retained, which provided the cleaner factor structure. Three variables were associated with factor 1 and two variables were associated with factor 2 respectively (Osborne and Costello 2009; Henson and Roberts 2006). The two factors accounted for 67.985 % of the total variance cumulatively, each contributing 53.059% and 14.926% of the total variance. Factor loadings were in the range of .587 to .858, categorised as good to excellent as per Comrey and Lee (1992, quoted in Distefano and Hess 2005, 227). Communalities of all factor items were above the minimum 0.5 guideline as per MacCallum et al. (1999), with strong internal

demonstrated by Cronbach alpha scores of .704 and .660 for factor 1 and factor 2 respectively. The results are shown in Table 4.62. After careful consideration of the Rotated Component Matrix, the factors were labelled as shown in Table 4.63, which also provide a description of the factor labels, the related sub-characteristics from the initial holistic E-learning 3.0 model and the variables associated with each factor with their respective loadings.

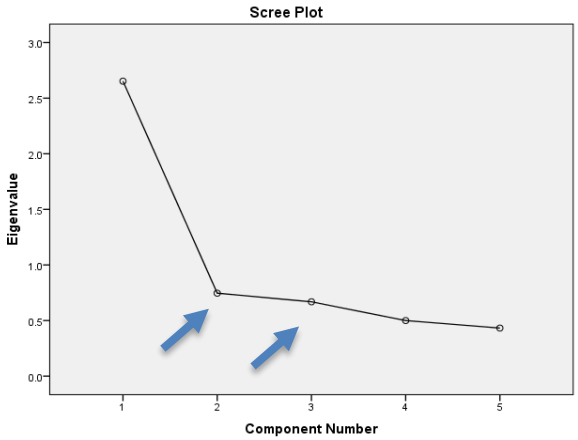
Table 4.62: Lecturers' Survey – Summary of Factor Analysis – Collaboration

COLLABORATION

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.653	53.059	53.059	2.653	**53.059**	53.059	1.812	36.236	36.236
2	.746	14.926	67.985	.746	**14.926**	67.985	1.587	31.749	**67.985**
3	.668	13.369	81.355						
4	.500	9.996	91.351						
5	.432	8.649	100.000						

Extraction Method: Principal Component Analysis.



KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity
.787	.000

Rotated Component Matrix

Variables for Collaboration	Component/ Factor Loadings		Communalities
	1	2	
Have facilities for resource sharing between students and their peers	.858		.508
Have group activities (e.g. through Google docs)	.776		.649
Have facilities for collaboration between students and their peers	.587		.767
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)		.863	.773
Have facilities for resource sharing between lecturers and students (e.g. through Wikis, blogs, discussion boards, etc)		.776	.702
Cronbach α	.704	.660	

Table 4.63: Lecturers' Survey – Extracted Factors for Collaboration

Factor Labels	Description of Factor Labels	Sub-characteristics of 'Collaboration' from initial holistic E-learning 3.0 model	Variables for Collaboration	Component/ Factor Loadings	
				1	2
Interaction and resource sharing between students	The three variables which loaded on factor 1 were about the availability of facilities for resource sharing and for collaboration between students and their peers. The factor was labelled as 'Interaction and resource sharing between students'	• Sharing of resources	Have facilities for resource sharing between students and their peers	.858	
		• Interaction	Have group activities (e.g. through Google docs)	.776	
		• Interaction	Have facilities for collaboration between students and their peers	.587	
Interaction and resource sharing between students and lecturers	The two variables associated with factor 2 were related to interaction and the sharing of resources between students and lecturers. As a result, factor 2 was labelled as 'Interaction and resource sharing between students and lecturers'.	• Interaction	Have facilities for collaboration between lecturers and students (e.g. using emails, skype)		.863
		• Sharing of resources	Have facilities for resource sharing between lecturers and students (e.g. through Wikis, blogs, discussion boards, etc)		.776

Similar to the findings from the students' survey, no new factors emerged for the 'Collaboration' characteristic. However, the two factors provided more information about the types of interaction and resource sharing, including with fellow students and with lecturers, as shown in Table 4.64.

Table 4.64: Lecturers' Survey – Collaboration – Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Collaboration	**Collaboration**
Sharing of resources Interaction	Interaction and resource sharing between students
Interaction Sharing of resources	Interaction and resource sharing between students and lecturers

4.7.2.5 Web 3.0 System

For the characteristic 'Web 3.0 System', three factors were extracted under Kaiser's criterion with an eigenvalue greater than one. The Scree plot did not confirm the number of factors to be retained and showed an inflexion after the first and the fourth components. Therefore, to confirm the number of factors to be retained, factor analysis was conducted by manually setting the factors to be extracted at two and four and comparing the rotated component matrices for two, three and four extracted factors, using the process outlined by Osborne and Costello (2009). Following this exercise, three factors were retained as they provided the cleanest data structure (Osborne and Costello 2009). They explained 72.162% of the total variance, each contributing 28.715%, 26.084% and 17.363% of the total variance respectively. All factor loadings were high (>.8), categorised as excellent, except for one item, which obtained a factor loading of .643 and was therefore categorised as 'very good' (Comrey and Lee 1992, quoted in Distefano and Hess (2005, 227)). Communalities of factor items were above .5 as per the guidelines of MacCallum et al. (1999), except for one item (shown in red in Table 4.65), which was not considered in labelling factors. All retained factor items achieved strong internal consistency with Cronbach alpha scores of .708, .760 and .707 for factors 1 to 3 respectively. Results of the factor analysis are summarised in Table 4.65, while Table 4.66 shows the factor labels and their descriptions, the related sub-characteristics from the initial holistic model and the corresponding variables and associated loadings for each of the extracted factors.

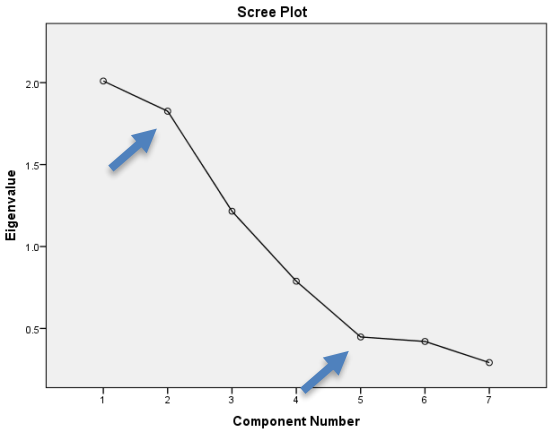
Table 4.65: Lecturers' Survey – Summary of Factor Analysis – Web 3.0 System

WEB 3.0 SYSTEM

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.010	28.715	28.715	2.010	**28.715**	28.715	1.790	25.569	25.569
2	1.826	26.084	54.798	1.826	**26.084**	54.798	1.660	23.721	49.290
3	1.215	17.363	72.162	1.215	**17.363**	72.162	1.601	22.871	**72.162**
4	.788	11.261	83.422						
5	.448	6.400	89.822						
6	.421	6.010	95.831						
7	.292	4.169	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix				Communalities
Variables for Web 3.0 System	**Component/ Factor Loadings**			
	1	**2**	**3**	
Be easy to navigate	.851			.744
Have easy access to resources	.801			.645
Maintain effective learning materials records	.643			.447
Support new technologies (e.g. Semantic Web, the use of ontologies)		.894		.818
Have effective IT infrastructure		.885		.787
Support knowledge representation for customised access to learning materials			.906	.821
Keep track of students' learning profiles and patterns			.858	.790
Cronbach α	.708	.760	.707	

KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity
.528	.000

Table 4.66: Lecturers' Survey – Extracted Factors for Web 3.0 System

Factor Labels	Description of Factor Labels	Characteristic and Sub-characteristics of 'Web 3.0 System' from initial holistic E-learning 3.0 model	Variables for Web 3.0 System	Component/ Factor Loadings		
				1	2	3
Usability and accessibility	Easy navigation and easy access to resources were statements which loaded strongly on factor 1. As a result, retaining the original sub-characteristics from the initial holistic E-learning 3.0 model as well as maintaining consistency with the findings from the students' survey, factor 1 was labelled as 'Usability and accessibility'.	• Usability	Be easy to navigate	.851		
		• Accessibility	Have easy access to resources	.801		
ICT Infrastructure supporting new technologies	Support for new technologies and having an effective ICT infrastructure were the statements which loaded on factor 2. Therefore, factor 2, was labelled as 'ICT Infrastructure supporting new technologies'.	• Web 3.0 System	Support new technologies (e.g. Semantic Web, the use of ontologies)		.894	
		• ICT Infrastructure	Have effective IT infrastructure		.885	

Knowledge, ontologies and other repositories	The two items which loaded strongly on factor 3, were both related to the sub-characteristics ‘Knowledge and other repositories’ and ‘Ontologies’. As a result, both sub-characteristics were retained, but combined into one factor label namely ‘Knowledge’, ontologies and other repositories’ for factor 3.	• Knowledge and other repositories • Ontologies	Support knowledge representation for customised access to learning materials			.906
		• Knowledge and other repositories • Ontologies	Keep track of students' learning profiles and patterns			.858

Findings for the 'Web 3.0 System' characteristic in the lecturers' survey, following factor analysis, align with the findings obtained from the students' survey. The sub-characteristic 'Usability' and 'Accessibility' were combined into 'Usability and accessibility', while 'Knowledge and other repositories' and 'Ontologies' were combined into 'Knowledge, ontologies and other repositories'. The sub-characteristic 'ICT Infrastructure' captured support for new technologies and was changed into 'ICT infrastructure supporting new technologies'. The original list of sub-characteristics for 'Web 3.0 System' as well as the improved list are presented in Table 4.67.

Table 4.67: Lecturers' Survey – Web 3.0 System – Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Web 3.0 System	**Web 3.0 system**
Knowledge and other repositories	Knowledge, ontologies and other repositories
Ontologies	
Usability	Usability and accessibility
Accessibility	
ICT Infrastructure	ICT Infrastructure supporting new technologies

4.7.2.6 Support

For the 'Support' characteristic, three factors were extracted under Kaiser's criterion with an eigenvalue greater than one. The Scree test showed a small inflexion after the first component, and another one after the third component. To confirm the number of factors to be retained, the number of factors to be extracted was then manually set at two and four, based on the process outlined by Osborne and Costello (2009) as discussed in section 4.6.2.2.1. Following the comparison of the Rotated Component Matrices for two, three and four extracted factors, two factors were retained as they provided the cleanest factor structure (Osborne and Costello 2009). The two factors explained 58.451 % of the total variance cumulatively with factor 1 contributing 36.294% and factor 2 contributing 22.157% of the total variance respectively. Factor loadings were above the minimum requirement of 0.55 as outlined by Hair et al. (2010), except for one item (shown in red in Table 4.68), which also had low communalities of less than the required .5 as per the guidelines of MacCallum et al. (1999) and was, therefore, not considered for factor labelling. All retained items had factor loadings of above 0.7, categorised as excellent by Comrey and Lee (1992,

quoted in Distefano and Hess 2005, 227). Strong internal consistency was demonstrated with Cronbach alpha scores of .775 and .724 for factor 1 and factor 2 respectively (DeVellis 2003; Pallant 2010). Table 4.68 outlines a summary of the factor analysis results. Details of the factor labels and their descriptions, the related sub-characteristics from the initial holistic E-learning 3.0 model and the factor items and their loadings are shown in Table 4.69.

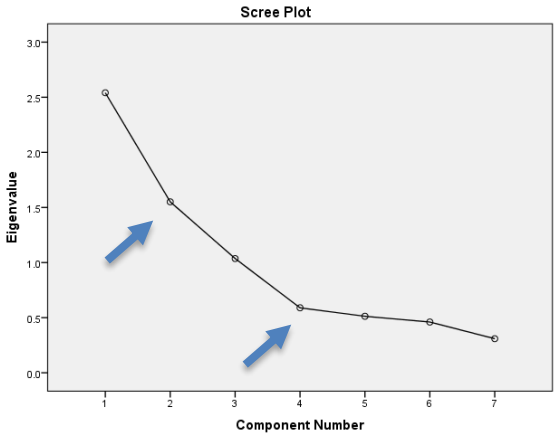
Table 4.68: Lecturers' Survey – Summary of Factor Analysis – Support

SUPPORT

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.541	36.294	36.294	2.541	**36.294**	36.294	2.080	29.713	29.713
2	1.551	22.157	58.451	1.551	**22.157**	58.451	2.012	28.738	**58.451**
3	1.036	14.807	73.258						
4	.590	8.422	81.680						
5	.513	7.323	89.004						
6	.461	6.579	95.583						
7	.309	4.417	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix			
Variables for Support	**Component/ Factor Loadings**		**Communalities**
	1	**2**	
Training to use the system is important	.872		.762
Effective and appropriate technology infrastructure is important	.859		.751
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	.735		566
Lecturers should support students (e.g. students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles		.819	.670
Ongoing feedback from students about their learning experience is important		.770	.619
Ongoing feedback to students about their learning performances is important		.758	.587
Students should assist their peers		.364	.136
Cronbach α	.775	.724	

KMO Measure of Sampling Adequacy	**Bartlett's Test of Sphericity**
.667	.000

Table 4.69: Lecturers' Survey – Extracted Factors for Support

Factor Labels	Description of Factor Labels	Sub-characteristics of 'Support' from initial holistic E-learning 3.0 model	Variables for Support	Component/ Factor Loadings	
				1	2
Organisational Support	All the three statements for the sub-characteristic 'Organisational support' loaded on factor 1 and therefore, factor 1 retained the same labelling.	• Organisational support	Training to use the system is important	.872	
		• Organisational support	Effective and appropriate technology infrastructure is important	.859	
		• Organisational support	Ongoing IT Support is important (e.g. help, FAQs, Help desk)	.735	
Instructional support	Just like 'Organisational support', 'Instructional support' was the key theme which loaded on factor 2 and therefore it was named accordingly.	• Instructional support	Lecturers should support students (e.g. students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles		.819
		• Instructional support	Ongoing feedback from students about their learning experience is important		.770
		• Instructional support	Ongoing feedback to students about their learning performances is important		.758

The sub-characteristics ‘Organisational support’ and ‘Institutional support’ from the initial holistic E-learning 3.0 model under the ‘Support’ characteristic were both confirmed by the factor analysis. They were both retained with no changes made as shown in Table 4.70.

Table 4.70: Lecturers’ Survey – Support – Before and After Factor Analysis

Before Factor Analysis (as per the Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Support	**Support**
Organisational support	Organisational support
Instructional support	Instructional support

4.7.2.7 Trust

For the ‘Trust’ characteristic, two factors were extracted under Kaiser’s criterion with an eigenvalue greater than one. The Scree plot showed an inflexion after the second component, aligning with Kaiser’s criterion, although a smaller inflexion could be seen at the fifth component. To ensure the correct number of factors to be retained, factor analysis was conducted at two and three, four and five factors, following which, two factors were retained as they provided a cleaner factor structure (Osborne and Costello 2009). These two factors cumulatively explained 64.190% of the total variance, each contributing 37.975% and 26.215% of the total variance respectively. All factor items’ loadings were high, ranging from .7 to .907, thereby categorised as ‘excellent’ (Comrey and Lee 1992, quoted in Distefano and Hess (2005, 227)). Communalities of factor items also met the minimum 0.5 guideline as per MacCallum et al. (1999), leading to all items being retained and confirming factor reliability. Strong internal consistency was demonstrated with Cronbach alpha scores of .703 and .775 for factor 1 and 2 respectively (DeVellis 2003; Pallant 2010). A summary of the results is provided in Table 4.71. Factor labels and their descriptions as well as the related sub-characteristics from the initial holistic E-learning 3.0 model and the factor items with their respective loadings are outlined in Table 4.72.

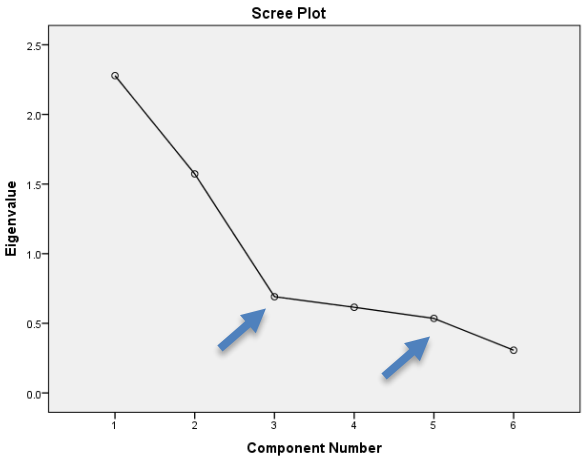
Table 4.71: Lecturers' Survey – Summary of Factor Analysis – Trust

TRUST

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.279	37.975	37.975	2.279	**37.975**	37.975	2.187	36.447	36.447
2	1.573	26.215	64.190	1.573	**26.215**	64.190	1.665	27.744	**64.190**
3	.691	11.519	75.709						
4	.615	10.255	85.964						
5	.535	8.920	94.885						
6	.307	5.115	100.000						

Extraction Method: Principal Component Analysis.



Rotated Component Matrix			
Variables for Trust	**Component/ Factor Loadings**		**Communalities**
	1	**2**	
Continuous feedback to and from students promotes trust between lecturers and students	.768		.608
Interaction between students and their peers is important	.744		.556
Interaction between lectures and students is important	.704		.525
I am confident to teach in an E-learning environment	.700		.500
The system should be secure		.907	.831
The system should be reliable		.885	.832
Cronbach α	.703	.775	

KMO Measure of Sampling Adequacy	**Bartlett's Test of Sphericity**
.634	.000

Table 4.72: Lecturers' Survey – Extracted Factors for Trust

Factor Labels	Description of Factor Labels	Sub-characteristics of 'Trust' from initial holistic E-learning 3.0 model	Variables	Component/ Factor Loadings	
				1	2
Trust between students and lecturers and between students	Variables which loaded on factor 1 were related to trust between students and lecturers as well trust between students to promote confidence in the E-learning environment. Factor 1 was, consequently, labelled as 'Trust between students and lecturers and between students'	• Trust between students and lecturers	Continuous feedback to and from students promotes trust between lecturers and students	.768	
		• Trust between students	Interaction between students and their peers is important	.744	
		• Trust between students and lecturers	Interaction between lectures and students is important	.704	
		• Technology reliability and security	I am confident to teach in an E-learning environment	.700	
Trust between students and lecturers and Trust between students'	Factor 2 was about system security and reliability to foster an environment of trust and was labelled as 'System reliability and security'.	• Technology reliability and security	The system should be secure		.907
		• Technology reliability and security	The system should be reliable		.885

The resulting factors for the 'Trust' characteristics align with the sub-characteristics from the initial holistic E-learning 3.0 model as shown in Table 4.73. Technology reliability was renamed as 'System reliability and security' while 'Trust between students' and 'Trust between students and lecturers' were combined into one factor.

Table 4.73: Lecturers' Survey – Trust – Before and After Factor Analysis

Before Factor Analysis (as per Initial Holistic E-learning 3.0 Model)	**After Factor Analysis**
Trust	**Trust**
Technology reliability and security	System reliability and security
Trust between students	Trust between students and lecturers and between students
Trust between students and lecturers	

The next section summarises all the factor analysis findings from the lecturers' survey.

4.7.3 Summary of factor analysis for the lecturers' survey

The resulting characteristics and sub-characteristics of the lecturers' survey data, following the factor analysis, are outlined in Table 4.74, colour-coded the same way as the detailed factor analysis and as in the literature review chapter (Chapter 2). New factors derived from the factor analysis as well as the renaming of some sub-characteristics, following the grouping of factor items, are in dark red. Additionally, Appendix J provides an overview of all the factor items for the lecturers' survey and their associated characteristics and sub-characteristics. Factor items are underlined in different colours based on the loadings obtained following the factor analysis, as denoted by the legend of the diagram.

Table 4.74: Lecturers' Survey – Factor Analysis Outcomes

Characteristics	**Sub-Characteristics**
Content Management	- Content creation and content creation responsibility - Content accessibility and reuse - Knowledge representation - Content meeting courses' and students' needs
Personalised Learning	- Student model - Lecturer's characteristics
Pedagogy	- Syllabus - Student-centered teaching - Student's and lecturer's roles in course delivery

Collaboration	- Interaction and resource sharing between students - Interaction and resource sharing between students and lecturers
Web 3.0 System	- Usability and accessibility - ICT Infrastructure supporting new technologies - Knowledge, ontologies and other repositories
Support	- Organisational support - Instructional support
Trust	- System reliability and security - Trust between students and lecturers and between students

4.8 Findings from the students' and lecturers' surveys - combined

Following the mixed results from the preliminary analysis of the students' and lecturers' surveys, as discussed in sections 4.6.1 and 4.7.1 respectively, factor analysis was applied to the outcomes of both surveys to assist in extracting an improved set of factors, which reflected a more consistent interpretation of the data from the original groupings. The outcomes obtained from the factor analysis of the students' and lecturers' surveys, as discussed in sections 4.6.3 and 4.7.2, resulted in an improved list of components to represent E-learning 3.0 model.

The characteristics and associated sub-characteristics from the initial holistic E-learning 3.0 model from the literature review in Chapter 2, as well as the resulting changes, following factor analysis of the students' and lecturers' survey, are presented in Table 4.75, maintaining the same colour coding used for denoting the characteristics and sub-characteristics as per the literature review and factor analysis findings. Given the similarities to the findings from the students' and lecturers' surveys, a combined list of factors from the factor analysis outcomes obtained for both surveys, are also outlined in the last column of Table 4.75. This combined list, subsequently, made up the revised holistic E-learning 3.0 model, derived from the surveys' findings, capturing the perceptions of both students and lecturers from Mauritian higher education institutions, in line with the research objectives and questions. The revised holistic E-learning 3.0 model is presented in the next section.

Table 4.75: Summary of Factor Analysis Outcomes from the Students' and Lecturers' Surveys

Characteristics	Sub-Characteristics from Initial Holistic E-learning 3.0 Model	Factor Analysis Outcomes		
		Factors from Students' Survey	Factors from Lecturers' Survey	Combined Factors from Students' and Lecturers' Surveys
Content Management	• Content creation • Content retrieval • Content reuse • Search • Knowledge representation	• Content creation and content creation responsibility • Content accessibility and reuse • Knowledge representation	• Content creation and content creation responsibility • Content accessibility and reuse • Knowledge representation • Content meeting courses' and students' needs	• Content creation and content creation responsibility • Content accessibility and reuse • Knowledge representation • Content meeting courses' and students' needs
Personalised Learning	• Student model • Lecturer's characteristics	• Student model • Lecturer's characteristics	• Student model • Lecturer's characteristics	• Student model • Lecturer's characteristics
Pedagogy	• Syllabus • Course design and sequencing • Assessment and evaluation • Teaching Strategies • Context	• Syllabus • Student-centered teaching • Student's and Lecturer's roles in course delivery	• Syllabus • Student-centered teaching • Student's and lecturer's roles in course delivery	• Syllabus • Student-centered teaching • Student's and lecturer's roles in course delivery

Collaboration	• Interaction • Sharing of resources	• Interaction and resource sharing between students • Interaction and resource sharing between students and lecturers	• Interaction and resource sharing between students • Interaction and resource sharing between students and lecturers	• Interaction and resource sharing between students • Interaction and resource sharing between students and lecturers
Web 3.0 System	• Knowledge and other repositories • Ontologies • Usability • Accessibility • ICT Infrastructure	• Knowledge, ontologies and other repositories • Usability and accessibility • ICT Infrastructure supporting new technologies	• Usability and accessibility • ICT Infrastructure supporting new technologies • Knowledge, ontologies and other repositories	• Knowledge, ontologies and other repositories • Usability and accessibility • ICT Infrastructure supporting new technologies
Support	• Instructional Support • Organisational Support	• Instructional support • Organisational support	• Organisational Support • Instructional support	• Instructional Support • Organisational Support
Trust	• Technology reliability and security • Trust between students • Trust between students and lecturers	• System reliability and security • Trust between students and lecturers • Trust between students	• System reliability and security • Trust between students and lecturers and between students	• System reliability and security • Trust between students and lecturers • Trust between students

4.9 The Revised Holistic E-learning 3.0 Model

Based on the findings from the analysis of the students' and lecturers' survey, the initial holistic E-learning 3.0 model has been revised accordingly. The revised holistic E-learning 3.0 model maintained the seven main characteristics from the initial holistic E-learning 3.0 model namely 'Content Management', 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Web 3.0 System', 'Support' and 'Trust'. Changes were made to some of the associated sub-characteristics as discussed in sections 4.6 and 4.7. Some of them were merged, while others were renamed. New sub-characteristics also emerged following the factor analysis of the students' and lecturers' survey data. The revised holistic E-learning 3.0 model is presented in Figure 4.30. Changes resulting from the analysis of the students' and the lecturers' surveys are in dark red font. The characteristics and associated characteristics of the revised holistic E-learning 3.0 model are now ready to be discussed.

4.9.1 Content Management

Kanaksabee, Odit, and Ramdoyal (2011, 111) pointed out that, "*the answer to succeed in E-learning is high quality educational content*". 'Content Management', as discussed in Section 2.11.1, is a key characteristic of the E-learning 3.0 model and refers to the creation, provision and maintenance of learning materials, which support the needs of learners and instructors, as well as support and enhance the teaching and learning process and learning goals of students. Following the analysis of the students' and lecturers' surveys, its associated sub-characteristics consist of 'Content creation and content creation responsibility', 'Content accessibility and reuse', 'Knowledge representation' and 'Content meeting courses' and students' needs' as explained below.

- **Content creation and content creation responsibility**

The importance of the creation and provision of learning materials has been pointed out by Oliver (2001, 227) stating that "*critical to the success of online delivery strategies within higher education institutions is the prevalence of materials and resources to support the learning settings*". However, the findings from the surveys' analysis revealed mixed perceptions from students and lecturers regarding the responsibility for content creation. Therefore, the sub-characteristic 'Content creation responsibility' in the E-learning 3.0 model seeks to emphasise the need for a change in perceptions, away from the traditional role of lecturers as the main content

providers, to a more collegial and collaborative partnership between lecturers and students. In fact, within the E-learning 3.0 model, the lecturers no longer play the "*intermediate role between the learner and the learning material*" and "*no longer control the delivery of material*" but rather are collaborators of content with students being given the opportunity to "*combine learning material in courses on their own*" (Stojanovic, Staab and Studer 2001, 25). This affirms the criticality of 'Content creation and content creation responsibility' as part of the holistic E-learning 3.0 model.

- **Content accessibility and reuse**

Ndume, Tilya, and Twaakyondo (2008) pointed out that a key factor in the acceptance and usage of E-learning technologies in institutions in developing countries is the availability and accessibility of educational resources. 'Content accessibility and reuse', as another critical aspect of 'Content Management', is the requirement for learning materials to be accessible, easily located, understandable, relevant, meaningful and organised in a logical way to facilitate reuse (Buzzetto-More and Pinhey 2006). Through the semantic annotations of learning material, supported by ontological knowledge, content can be combined into useful, contextually appropriate learning materials that are well-designed and suitable for reuse (Snae and Brueckner 2007).

- **Knowledge representation**

With the Semantic Web providing the opportunity to improve the metadata associated with learning materials, through the linkage with ontologies, the potential for developing a learner centered environment whereby learners can create and manage their own learning content, share their content with others and contribute to the content created by others is made possible (Karunasena, Deng and Zhang 2012). Consequently, 'Knowledge representation', a critical aspect of the Semantic Web, as seen in sections 2.6.1 and 2.11, is another fundamental component of 'Content Management' in the E-learning 3.0 model. It allows learning materials to be annotated and described, via metadata, for more flexibility in course building, thereby supporting other components of 'Content Management' including easy access to learning resources, reuse of learning resources and content customised to meet the needs of the students and the course.

- **Content meeting courses' and students' needs**

'Content meeting courses' and students' needs' allows customised content to be delivered to students based on their needs as well as that of the course requirements. This is made possible through key considerations to learning resources management including the capturing, eliciting, organising and retrieving of learning resources as well as the identification of characteristics describing these resources to support customised delivery and reusability (Sridharan, Deng and Corbitt 2008; Nonaka and Toyama 2003).

4.9.2 Personalised Learning

Researchers have argued that one of the main problems with E-learning environments is their lack of personalisation (Santally and Senteni 2005). In fact, the establishment of a unique learning experience based on preferences and needs is seen to be essential to successful online learners. Personalisation, as explained in section 2.11.2, allows for learners to "*make their own decisions to meet their own needs at their own pace and in accordance with their own existing knowledge and learning goals*" within the E-learning environment (Lin and Hsieh 2001, 382). Its key components within the E-learning 3.0 model, namely 'Student model' and 'Lecturer's characteristics' are discussed below.

- **Student model**

Central to this, is the 'Student model', considered as a critical component in a personalised E-learning environment (Duran and Amandi 2011). Rokou, Rokou, and Rokos (2004) stated that for personalised learning to take place, it is crucial to define the student learning profile which outlines the students' learning styles, knowledge and skills and specifies the learning goals, both those related specifically to the course and the general goals, in terms of the skills to be acquired. Stojanovic, Staab, and Studer (2001) pointed out that customised learning content, as a means of supporting students' personalised learning can only be initiated by the student model. Within the E-learning 3.0 environment, the student model is used to enhance semantic-based retrieval of learning materials, thus allowing for the best individual results as opposed to an E-learning environment offering all learners the same content, irrespective of the differences in their learning demands and learning roles (Pah et al. 2007). It is important to note that personalised learning can also take place within a collaborative E-learning environment. As pointed out by Duran and Amandi (2011, 144), because

each student is different, offering personalised assistance to students in collaborative learning environments is critical since the "*effectiveness of collaborative learning depends on the quality of interactions that take place among group members*" which in turn depends on "*the different collaborative skills students have*". Therefore, the student model should not only capture the individual learning goals of students, but also their collaborative attributes and preferences to support them in their individual and collaborative learning processes.

- **Lecturer's characteristics**

As seen in the literature review (see section 2.8.2), multiple researches showed 'Lecturer's characteristics' as a critical factor for the success of E-learning with Selim (2007b, 343) going as far as stating that it is the "*main key to successful e-learning based courses in higher education institutions*". Lecturer's characteristics include the lecturer's attitude towards the delivery of E-learning courses, the E-learning skills literacy as well as the level of technology competency and attitudes and mindsets towards students within the E-learning environment (Webster and Hackley 1997; Selim 2007b; Volery and Lord 2000). As pointed out by Zhao, McConnell, and Jiang (2009), the instructor's conception and perceived usefulness of E-learning have a direct impact on learning outcomes. Instructors with positive attitudes towards the E-learning environment, supporting the students and promoting the technology, are required for E-learning success and are likely to achieve a more positive learning outcome.

4.9.3 Pedagogy

'Pedagogy', as discussed in section 2.11.3, are the methodologies, strategies and techniques adopted for good teaching and learning practices which allow learners to acquire the relevant knowledge and develop particular skills that meet their needs (Rokou, Rokou and Rokos 2004; Govindasamy 2001). Following the surveys' analysis, its sub-characteristics comprises of the 'Syllabus', 'Student centered teaching' and 'Student's and lecturer's roles in course delivery'. These are explained below.

- **Syllabus**

'Syllabus' includes clear and measurable objectives and outcomes of the course, appropriate contents that relate to the course's objectives as well as activities and assessments sequenced in a way that facilitate learning (Buzzetto-More and Pinhey

2006). Brophy (2000) stated that the course design, curricula and learning materials are critical considerations for effective learning performance. In fact, the clarity of the syllabus and course structure are key factors to be considered before students can take control of their own learning as self-directed learners, critical to the E-learning 3.0 environment (Hung et al. 2010). However, for students to be self-directed learners, where they can take initiatives to understand their learning needs and goals, are able to access the appropriate learning materials and implement the appropriate learning strategies to assist in their learning process and are able to self-evaluate their learning progress, a 'Student centered teaching' approach is required (Paxton 2003; Hung et al. 2010).

- **Student centered teaching**

As stated by Demidova et al. (2007), effective pedagogical strategies, coupled with the right technologies and appropriate and adequate learning materials facilitate a student-centered approach to teaching and learning. Student centered teaching is "*increasingly being encouraged in higher education*" where the focus is no longer on lecturers having full control of course content delivery, but rather on fostering a learning environment where students are encouraged to be active participants in their knowledge construction (Gunness 2011, 10). From a pedagogical perspective, the Semantic Web is seen as an "*enabling technology allowing students to determine the learning agenda and be in control of their own learning*" (Moreale and Vargas-Vera 2004, 114). Through metadata, enriched with ontological knowledge, students can undertake semantic querying of learning materials within the E-learning 3.0 environment, allowing them to interact with content that meet their specific needs at their own pace. Furthermore, lecturers, as facilitators, can employ multiple teaching strategies to cater for the needs of all types of students rather than being the sole authority responsible for content delivery.

- **Student's and lecturer's roles in course delivery**

The student-centered teaching approach in the E-learning 3.0 model entails a change in the role of students and lecturers within the E-learning environment, requiring students to be given control over the sequence of their learning materials, allowing them to make decisions about their learning and being accountable for the outcomes of those decisions (Hung et al. 2010). However, students may find it challenging to become autonomous learners, responsible for their knowledge construction, rather than just being focused on knowledge absorption, while lecturers may find it equally

difficult to embrace a collaborator role in knowledge transmission and construction as opposed to having total control of content delivery, as shown in the surveys' findings. This holds particularly true in countries where the tradition is to teach in a more didactic manner (Eastmond 2000; Sehrt 2004; Evans 2005). Mauritius is no exception with an education system which is highly teacher-centered and where students expect to be spoon-fed as discussed in section 2.12.3. Therefore, it is crucial to stress the importance of changing the traditional roles of students and lecturers with respect to course delivery. Hence, 'Student's and lecturer's roles in course delivery' is also another fundamental component for the 'Pedagogy characteristic'.

4.9.4 Collaboration

As previously discussed in the literature review (see section 2.11.4), collaboration between lecturers and students and between students is essential to improve performance as well as student satisfaction when it comes to E-learning based courses (Driver 2002; Selim 2003; Fulford and Zhang 1993; Hayes 1990; Vrasidas and McIsaac 1999; Moore and Kearsley 2011). The outcomes of the surveys' analysis identified two sub-characteristics for 'Collaboration'' namely 'Interaction and resource sharing between students' and 'Interaction and resource sharing between students and lecturers', as explained below.

- **Interaction and resource sharing between students and Interaction and resource sharing between students and lecturers**

Duran and Amandi (2011, 146) pointed out that "*interaction among peers is a significant factor in collaborative learning*". Anderson (2003) stressed the need for interaction between student-teacher, student-student and student-content in order for meaningful learning within an E-learning environment to take place. However, Kasseeah (2012) pointed out that E-learning in higher education has been subject to persistent criticisms because it often fails to facilitate interaction among students and between students and instructors. Findings from the students' and lecturers' surveys analysis indicated reluctance from both the students and the lecturers regarding the collaboration amongst students. Mauritian education system is an elitist system that encourages a highly individualistic and competitive mentality, which hinders collaboration, particularly among students (Allybokus 2015). In fact, the lack of knowledge-sharing culture is "*deep rooted*" in the Mauritian education system (Veer Ramjeawon and Rowley 2017, 373). Collaboration, particular among students, is

often viewed as a barrier to personal success and many students collaborate either when they are forced to do so within the education settings, as part of the course requirements, or because they see some personal benefits in the interaction or knowledge sharing (Allybokus 2015). Nonetheless, the survey outcomes showed high level of support for collaboration in the E-learning 3.0 model. With Mauritian educational policies aiming to promote a more inclusive, integrated and holistic approach to education, supporting team work and knowledge sharing (Allybokus 2015), collaboration remains a critical component of the E-learning 3.0 model.

4.9.5 Web 3.0 System

In an attempt to position Mauritius as a leader in higher education in the region, the move towards a knowledge-based society that can facilitate the creation, sharing and transfer of knowledge, is seen as inevitable (Veer Ramjeawon and Rowley 2017). To assist with this endeavor, a structure for developing a shared knowledge base is considered critical (Allybokus 2015). The E-learning 3.0 model is an attempt to provide a framework, to assist in such a move, with its characteristics 'Web 3.0 System' providing critical components to facilitate knowledge sharing and reuse. Findings from the surveys retained all sub-characteristics for 'Web 3.0 System' from the initial model, with some sub-characteristics being grouped together as shown in Sections 4.6.3.5 and 4.7.2.5. The resulting components of 'Web 3.0 System' namely 'Knowledge, ontologies and other repositories', 'Usability and accessibility' and 'ICT Infrastructure supporting new technologies' are discussed below.

- **Knowledge, ontologies and other repositories**

'Knowledge, ontologies and other repositories' constitute all the databases required for the Web 3.0 system to work effectively. As discussed in Section 2.11.5, it includes the maintenance and management of records including those pertaining to students, learning resources and their associated descriptions, in the form of metadata, ontologies and their linkage to learning resources through metadata descriptions, inference rules to provide customised and efficient access to learning content as well as other repositories required for the effective operation of the Web 3.0 system.

- **Usability and accessibility**

'Usability and accessibility' refers to having a well-designed, user friendly and consistent interface as well as ease of access to required programs, content and technology by all users within the E-learning environment (Cheawjindakarn,

Suwannatthachote and Theeraroungchaisri 2012; McPherson and Baptista Nunes 2006a).

- **ICT Infrastructure supporting new technologies**

The 'ICT infrastructure' sub characteristic from the initial model was added the component 'supporting new technologies' following the factor analysis. This support for new technologies is essential, particularly in developing countries to emphasise the need to embrace new technologies, such as the Semantic Web, within the model and to demonstrate that the system needs to be as flexible and adaptable as possible to support changes and evolve in the short run and long run (Santally and Senteni 2005; Bhuasiri et al. 2012).

4.9.6 Support

Both 'Instructional support' and 'Organisational support' were retained as key sub-characteristics for 'Support' in the E-learning 3.0 model, following the surveys' analysis. In fact, the literature reveals that the quality of support received significantly influences students' and instructors' satisfaction within the E-learning environment (Cheawjindakarn, Suwannatthachote and Theeraroungchaisri 2012; Selim 2007a; Bhuasiri et al. 2012). E-learning acceptance in developing countries is, perforce, dependent on the type of support provided (Lee 2008).

- **Instructional support**

As stated by Andersson and Grönlund (2009), a critical challenge within the E-learning environment that needs to be considered by developing countries, where teacher-centered instructions prevail, is the provision of necessary support to students and staff. Different from the traditional classroom environment where instructional support is provided face-to-face, the E-learning environment requires that students are given the necessary assistance to facilitate knowledge construction through encouragement from their instructors, through the use of different teaching styles, through assessments to ensure understanding of course contents and through the provision of feedback to students on their learning progress and from students on their learning experience.

- **Organisational support**

Organisational support is also considered critical for E-learning success (Karunasena, Deng and Zhang 2012). Pah et al. (2007) stated that students and instructors need support from their institution to be able to use E-learning offerings. The higher education institutions are responsible for supporting students' E-learning experiences

by providing the required technical support, ensuring the standardisation of E-learning experiences across courses, providing the required infrastructure and effectively maintaining students' sensitive information (Wagner, Hassanein and Head 2008). Moreover, lecturers should be offered the required training including those related to instructional design as well as technology, be provided with the necessary technical support, be given incentives to use E-learning technologies and be provided with the required resources to assist them in enforcing standardisation across E-learning courses (Wagner, Hassanein and Head 2008). It is also argued that instructors show more motivation and commitment when organisational support is provided, in terms of technical support, training, and the clear commitments from management (Andersson and Grönlund 2009).

4.9.7 Trust

Trust is another essential factor to consider in E-learning as it reduces the level of uncertainty, ensures effective commitments and promotes collaboration and instructor-learner relationships to maximise learning (Kramer 1999; Luhmann 2000; Wooten and McCroskey 1996; Ghosh, Whipple and Bryan 2001; Casaló, Flavián and Guinalíu 2008). As stated by, Beckett, Rowland-Campbell, and Strahl (2011, 213 213), "*matters of trust relate to both the technology and the people supporting it*". Aligning with this, the associated sub-characteristics for 'Trust' following the surveys' analysis remain centered on technology and the people, namely the students and the lecturers and include 'System reliability and security', 'Trust between students' and 'Trust between students and lecturers'. These are explained below.

- **System reliability and security**

In developing countries, the use of new technologies, including those for E-learning, can lead to uncertainty and trust is believed to be "*one of the fundamentals for the necessary mechanisms of uncertainty reduction*" (von Kortzfleisch and Winand 2000, 3). This holds particularly true in the context of the Semantic Web, with trust considered as "*a central component of the Semantic Web vision*" as "*humans will not be the only consumers of information*", with computer agents finding resources and information on behalf of users, thereby requiring them to "*automatically make trust judgments to choose a service or information source while performing a task*" (Artz and Gil 2007, 58). Consequently, in the online environment, users of the online system, including learners and instructors, need to feel supported by the online system through

which the courses are being accessed and delivered (Baggio 2011). This trust in the system evolves into organisational trust to enhance the learning process and assist in providing a positive experience (Baggio 2011). Consequently, trusting the system to act reliably and securely is vital for ensuring success of the E-learning system (Grandison and Sloman 2000).

- **Trust between students**

The building and maintaining of students' trust in an online environment is critical to the success and future of E-learning (Wang 2014). This include trust between fellow students as well as trust between the students and lecturers. 'Trust between students' is essential for the establishment of a safe learning environment for learners and to pave the way for communication and collaboration within the E-learning environment (Jones, Dirckinck-Holmfeld and Lindström 2006). With Mauritian students being used to a highly competitive education system where collaboration with other students is often dreaded, having students trusting each other in the E-learning environment is critical to be able to establish a friendly environment of sharing and interaction. Such an environment will facilitate the effective management of intellectual conflicts and divergent views and ideas into productive discussions and outcomes, through open and friendly communication (Rourke 2000; Kirschner and van Bruggen 2004; Jameson et al. 2006; De Hoyos 2004).

- **Trust between students and lecturers**

Trust is also considered a "*requisite component*" of the instructor-learner relationship if maximal learning is to occur (Wooten and McCroskey 1996, quoted in Wang 2014, 346). The online environment "*presents more uncertainty, risk and expectations*" where students, who are familiar with the traditional classroom environment, can find themselves "*uncertain about how to proceed and what to expect*" (Coppola, Hiltz and Rotter 2004, 95). Consequently, the lecturers are considered as the most important party in establishing trust in such an environment, with the critical and challenging role of developing and maintaining trust between students and between themselves and the students in order to have a productive learning environment (Coppola, Hiltz and Rotter 2004). Trust between the students and lecturers determines students' commitment to their learning and is the first step in reducing the level of uncertainty that students could be experiencing in the E-learning environment (Kramer 1999; Luhmann 2000) and, as such, is a crucial component of the E-learning 3.0 model.

4.9.8 The revised holistic E-learning 3.0 model

The revised holistic E-learning 3.0 model, as shown in Figure 4.30, captures the perceptions of students and lecturers from the Mauritian higher education institutions on the E-learning 3.0 model, in line with the research objectives and questions (see section 3.2). To further validate the model, it will be used in the preparation of the interviews with lecturers and administrative staff of higher education institutions in Mauritius, as part of the qualitative phase of this study. The revised holistic E-learning 3.0 model is, therefore, the foundation for the qualitative phase of this study, which will be discussed in Chapter 5.

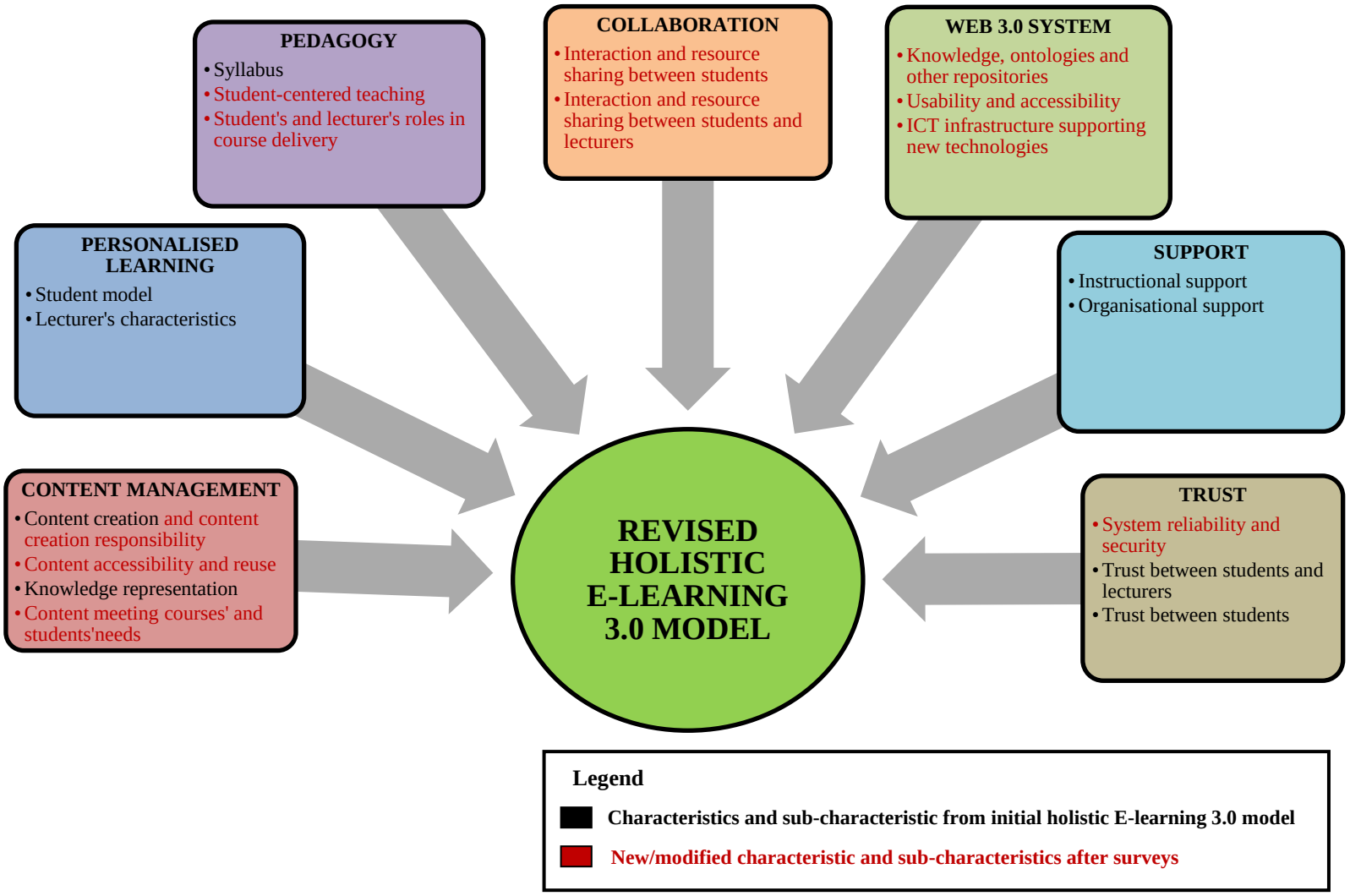


Figure 4.30: Revised Holistic E-learning 3.0 Model

4.10 Chapter summary

This chapter discusses the students' and lecturers' surveys conducted with 300 students and 105 lecturers in public and private universities in Mauritius to refine the initial holistic E-learning 3.0 model. The surveys' designs were discussed, as well as the target population and how the surveys were distributed to participants. The data was collected through Web-based survey using Qualtrics software and was analysed using SPSS.

Outcomes from the students' survey were analysed first, followed by the outcomes of the lecturers' survey. Each survey analysis consisted of a preliminary analysis of the demographic profile of respondents as well discussions on the participants' responses to statements relating to characteristics and associated sub-characteristics of the initial holistic E-learning 3.0 model. Mixed results were recorded for some aspects of the E-learning 3.0 model, more specifically related to statements challenging the roles of students and lecturers were challenged and where new concepts, such as those related to the Semantic Web, were queried. Consequently, factor analysis techniques were then applied to the surveys' outcomes in order to identify groups of inter-related factors to produce a new set of robust characteristic sub-characteristics associated with the main characteristics for the E-learning 3.0 model. Results of the factor analysis for each survey were presented, after the preliminary analysis section, explaining the reasonings behind the retention of factors and their associated factor items. Factors from the students' survey and those from the lecturers' survey were then combined to produce a revised holistic E-learning 3.0 model, capturing the perceptions of students and lecturers from the Mauritian higher education institutions, in line with the research objectives and questions of this study. The chapter ends with a detailed description of the revised model.

The next chapter discusses the interviews, as part of the qualitative phase of this study, with findings corroborated throughout with documents from Mauritian universities and the Government of Mauritius.

CHAPTER 5: THE INTERVIEWS AND DOCUMENTS

5.1 Introduction

This chapter describes the qualitative phase of this research, namely interviews with lecturers and administrative personnel of private and public universities in Mauritius and analysis of publicly available documents from the Mauritian Government and related agencies as well as universities. The aim of the interviews is to evaluate the revised holistic E-learning 3.0 model (Figure 4.30), as outlined in the previous chapter. Then findings from documents explored are used to corroborate findings from the interviews. This chapter explains the interview process including the selection of interviewees as well as the preparation and conduct of the interviews. It then describes the analysis of the interview data and presents the outcomes, corroborated with findings from documents analysis. At the end of this chapter, the final holistic E-learning 3.0 model is presented.

5.2 Overview of the interview phase

One of the most common qualitative data collection methods is the interview (Lincoln and Guba 1985; Maykut and Morehouse 2002). As outlined in Chapter 3 section 3.4.7.3.2.3, semi-structured interviews with lecturers and administrative personnel were adopted in this study to evaluate the seven characteristics and associated sub-characteristics in the revised holistic E-learning 3.0 model, obtained from the survey phase and to ascertain whether these components provided an adequate and realistic representation of a holistic E-learning 3.0 model. The interview phase of the research consisted of the following steps:

- Establish objectives of the interview phase in line with the research objectives and questions.
- Recruit participants from lecturers and administrative personnel of the Mauritian higher education institutions.
- Design the interviews for lecturers and administrative personnel of the Mauritian higher education institutions.
- Conduct the interviews with lecturers and administrative personnel of the Mauritian higher education institutions.
- Analyse interviewees' responses using thematic coding.

- Discuss interviews findings, corroborated with findings from documents analysis.
- Modify the revised holistic E-learning 3.0 model based on interview findings.
- Present the final holistic E-learning 3.0 model.

Figure 5.1 below provides an overview of the interview phase, discussed in detail in the next sections.

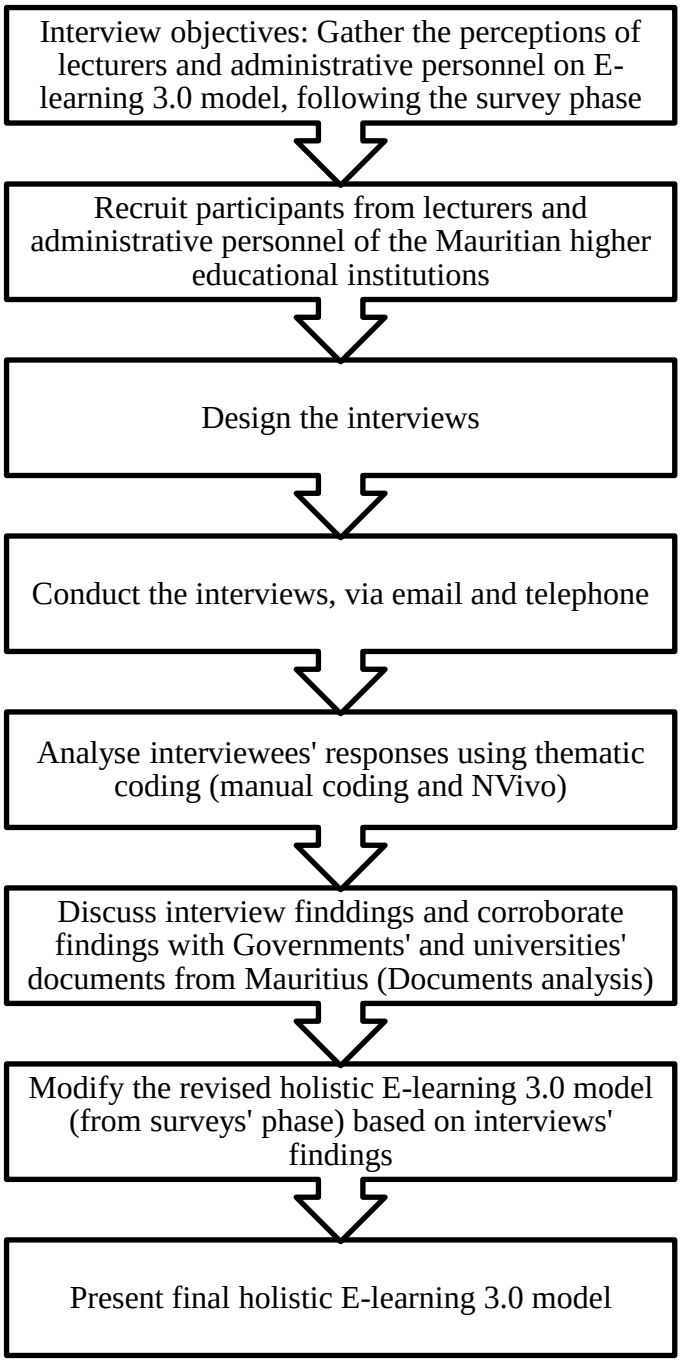


Figure 5.1: Overview of interview phase

5.3 Interview participants

Participants for the interviews are the lecturers and administrative personnel from the Mauritian higher education institutions. Lecturers, in this study are members of the teaching staff at the tertiary institutions while administrative personnel are staff who are engaged in course development, particularly online course development, including educational technologists, instructional designers and staff within the office of teaching and learning across institutions. Five higher educational institutions were selected as main candidates for this phase of the study, as explained in section 3.4.7.1. The websites for these five institutions were checked to gather contact details on interview participants as explained in the next sub-sections below.

5.3.1 Lecturer participants

To recruit lecturers for the interviews, the researcher contacted individual lecturers via their emails as listed on the institutions' websites. The lecturers were sent an invitation letter via email (see Appendix K) inviting them to participate in the interview. Where a list of lecturers was not available, an email was sent to the institutions 'Contact us' email address or, if available, to the 'academic affairs' or similar departments' email addresses, seeking the institution's cooperation to forward the invitation to their academic teams to participate in the interview. The invitation letter clearly stated the return email addresses of the researcher so that interested participants can express their interests to participate in the interview. It also provided participants with the different interview mode options (via telephone, Skype or email) they could choose from, as discussed in Chapter 3 section 3.4.7.3.2.

A total of sixty invitation letters were sent out in October 2016. The researcher waited two weeks for responses. Twenty-two lecturers responded positively to the invitation. Only one response was received from one of the general 'Contact us' email addresses, informing the researcher that the invitation would be forwarded to academic staff, following which, three lecturers from that institution contacted the researcher to express their willingness to participate in the interview. After two weeks, the researcher sent a reminder email to the non-respondents reminding and encouraging them to participate in the study, as recommended by Opdenakker (2006), to try and increase the response rate. Seven more lecturers responded positively. The researcher sent a final reminder, after another two weeks, encouraging the non-respondents to participate in the interview. Unfortunately, no further responses were received

confirming that follow-ups to not always increase the response rate at the organisational level (Baruch and Holtom 2008). In total, thirty two lecturers were interested to participate in the study. However, only twenty lecturers proceeded with the interview. Table 5.1 shows the three rounds of contacts made and the respective number of invitation letters sent, the number of positive responses received and the number of actual participants in the interviews. The number of lecturers who participated in the interview was less than those who originally expressed interest in the study. All of the participants preferred the email interview option.

Table 5.1: Rounds of contacts to gather lecturer participants

Round	No. of potential participants contacted (via email)	Invitation letters sent (via email)	Reminder letters sent (via email)	Positive responses received	No. of actual participants
1	60	9th Oct 2016	-	25	16
2	38		25th Oct 2016	7	4
3	31		9th Nov 2016	0	0

5.3.2 Administrative personnel participants

To allow for a comprehensive perspective on the development of the holistic E-learning 3.0 model and in line with the research objectives and questions of this study (see section 3.2.1), the next step was to recruit administrative personnel participants. As discussed in section 3.4.7.1, the researcher consulted the universities' websites to obtain contact details for any departments related to 'Teaching and Learning' or similar departments related to course design, particularly online courses, as well as any staff with roles such as educational technologies, instructional designers and online course designers. This proved quite challenging because most of the universities' websites did not have any such departments listed. Only one university had an 'Office of Learning and Teaching', contributing to the design of learning programmes, including digital environment support and initiatives, with a dedicated email address as the contact detail. Similarly, only one other university had a list of educational technologists, who are experts in developing online courses using e-learning authoring tools, and their email addresses. Consequently, these the institutions were chosen as case participants for this phase.

Aligning with finding following the challenges faced when lecturer participants were being recruited for the survey phase (see section 3.4.6.1) and based on the information displayed on different universities' websites, it became evident that course content creation and course design were often part of the lecturer's role and responsibilities and not carried out by a separate team, per se, within the universities (Open University of Mauritius 2016b; UTS 2016; Tertiary Education Commission 2015; Open University of Mauritius 2016a). Consequently, the lecturers' interviews would also capture their opinions and perceptions on various aspects of the research model, such as course design and content creation, which the researcher initially thought could be gathered only and exclusively from the administrative personnel team.

The researcher sent invitation letters (see Appendix K) to the available administrative personnel's contact details in October 2016. The only 'Office of Learning and Teaching' for which an email address was available, responded by providing the email addresses of three of the institution's staff, who were responsible for course designs, including online courses. In total, eleven invitation letters were sent to individual email addresses, of which seven responded positively. After a lapse of one week, a reminder letter was sent to the four non-respondents to increase the response rate, with no response received. The researcher made a last attempt to contact the non-respondents after one more week, with no success. Table 5.2 shows the three rounds of contacts made to the administrative personnel and the respective number of invitation letters sent, the number of positive responses received and the number of actual participants in the interviews. All the participants preferred the email interview option, except one, who opted for a telephone interview.

Table 5.2: Rounds of contacts to gather administrative personnel participants

Round	No. of potential participants contacted (via email)	Invitation letters sent (via email)	Reminder letters sent (via email)	Positive responses received	No. of actual participants
1	11	17th Oct 2016	-	7	7
2	4		25th Oct 2016	0	0
3	4		1st Nov 2016	0	0

5.3.3 Total number of lecturers and administrative personnel participants

Following the process outlined above to gather lecturer and administrative personal participants for the interview phase, twenty lecturers and seven administrative personnel proceeded with the interviews. The total of twenty-seven participants were considered adequate for this phase since the focus is on the quality of information gathered rather than quantity, the aim of which is to "*provide rich insights in order to understand social phenomena rather than statistical information*" (Bowling 2002, 380). Teddlie and Yu (2007) stated that thirty cases or less is usually sufficient for this kind of study, while Green (2009) pointed out that little new information normally emerges after twenty or so people have been interviewed. Besides, responses from the participants started to be repetitive with no new findings, confirming saturation has been achieved whereby "*no new or relevant data seem to emerge regarding a category*" as stated by Thomson (2011, 47). Table 5.3 provides a brief description of the interviewees including their chosen method of interview. In order to maintain the anonymity of participants, codes were used to identify them (Saunders, Lewis and Thornhill 2009). Participants coded as Participant_L1 until Participant_L20 represent the twenty participating lecturers with the 'L' in the coding standing for Lecturer, while participants coded as Participant_A1 to Participant_A7 represent the seven participating administrative personnel where the 'A' in the coding stands for Administrative Personnel.

Table 5.3: Description of Interviewees

Participants	Description	Gender	University Type (Public/Private)	Chosen Interview Method
Lecturers				
Participant_L1	Participant_L1 is a male lecturer in a Public University. He is aged between 22-35 years and holds a Master degree. He has no experience in teaching online classes but uses Moodle to post notes for students.	Male	Public	Email
Participant_L2	Participant_L2 is a female lecturer in a Private University. She is aged between 36-45 years and holds a PhD. She is an experienced academic in teaching online classes and using online platforms such as Blackboard.	Female	Private	Email
Participant_L3	Participant_L3 is a female lecturer in a Private University. She is aged between 22-35 years and holds a Master degree. She does not have experience in teaching online classes but has used blackboard and wikispaces to post notes.	Female	Private	Email
Participant_L4	Participant_L4 is a female lecturer in a Public University. She is aged between 22-35 years and holds a Master degree. She uses Moodle and Google Docs to interact with students.	Female	Public	Email
Participant_L5	Participant_L5 is a male lecturer in a Public University. He is aged between 61 years and above and holds a Master degree. He does not have experience in teaching online or in using online tools.	Male	Public	Email
Participant_L6	Participant_L6 is a male lecturer in a Public University. He is aged between 36-45 and holds a PhD. He uses Moodle to post lecture notes, which students can access prior to classes. He is ready and keen to teach online classes if this option becomes available.	Male	Public	Email

Participant_L7	Participant_L7 is a male lecturer in a Public University. He is aged between 36-45 years and holds a Master degree. He uses Moodle for notes' upload and is ready to move online for theory-based classes but is sceptical that E-learning will work for practical classes.	Male	Public	Email
Participant_L8	Participant_L8 is a male lecturer in a Public University. He is aged between 51-55 years and holds a PhD. He does not have experience teaching online classes.	Male	Public	Email
Participant_L9	Participant_L9 is a female lecturer in a Public University. She is aged between 22-35 and holds a Master degree. She uses online platforms to interact with students and is confident to teach online.	Female	Public	Email
Participant_L10	Participant_L10 is a female lecturer in a Public University. She is aged between 36-45 years and holds a PhD. She is familiar with Moodle but currently does not have any form of E-learning happening in her classes.	Female	Public	Email
Participant_L11	Participant_L11 is a male lecturer in a Public University. He is aged between 36-45 years and holds a PhD. He is an expert in teaching online and all his classes are fully online and based on self-instructional materials. He has over ten years of online teaching experience. He currently uses Moodle as the main E-learning platform.	Male	Public	Email
Participant_L12	Participant_L12 is a female lecturer in a Public University. She is aged between 46-50 years and holds a Master degree. She is an experienced online academic with over 10 years of experience teaching online classes.	Female	Public	Email
Participant_L13	Participant_L13 is a female lecturer in a Public University. She is aged between 36-45 years and holds a Master degree. She does not have experience teaching online classes but uses CMS for notes' upload, for	Female	Public	Email

	submission of students' assignments and for discussion forums.			
Participant_L14	Participant_L14 is a male lecturer in a Public University. He is aged between 51-55 years and holds a PhD. He is confident to teach online but not keen to do so as he believes it is difficult to convey the message of the lecture without eye contact and in a virtual environment. He currently posts course materials online.	Male	Public	Email
Participant_L15	Participant_L15 is a female lecturer in a Public University. She is aged between 22-35 years and holds a PhD. She does not have any online classes but would like the opportunity. She currently monitors students' work progress via emails.	Female	Public	Email
Participant_L16	Participant_L16 is a female lecturer in a Public University. She is aged between 22-35 years and holds a PhD. She does not have experience in teaching online classes and has only used Blackboard to share class materials, to make announcements and for submission of assignments and marking.	Female	Public	Email
Participant_L17	Participant_L17 is a female lecturer in a Public University. She is aged between 36-45 years and holds a Master degree. She uses Moodle to post notes for her students.	Female	Public	Email
Participant_L18	Participant_L18 is a female lecturer in a Public University. She is aged between 36-45 years and holds a PhD. She is experienced in the delivery of online classes and uses Moodle as the main platform.	Female	Public	Email
Participant_L19	Participant_L19 is a female lecturer in a Private University. She is aged between 36-45 years and holds a Master degree. She is ready to undertake online classes if the opportunity is made available. She currently posts notes online and assignments are submitted online.	Female	Private	Email

Participant_L20	Participant_L20 is a female lecturer in a Private University. She is aged between 22-35 years and holds a Master Degree. She has some experience with online classes where videos are posted and students interact using discussions forums. She currently uses Moodle for posting reading materials, links and videos, to monitor students' progress and to create discussion threads.	Female	Private	Email
Administrative Personnel				
Participant_A1	Participant_A1 is male and is the head of research in a Private University. He is actively engaged in empowering instructors through programs to build their appropriate skills and tools to undertake research as well as adopt new pedagogical strategies for innovative learning and teaching.	Male	Private	Email
Participant_A2	Participant_A2 is female in a Public University and is an educational technologist with years of experience in instructional design, course manual development and the management of professional development programs and lifelong learning. She is currently working on the development of several online courses.	Female	Public	Email
Participant_A3	Participant_A3 is a female educational technologist in a Public University whose main duties consist of overseeing the pedagogical design of self-instructional materials for online modules.	Female	Public	Telephone
Participant_A4	Participant_A4 is a female educational technologist in a Public University. She is involved in research work in the field of educational technology and currently works on developing online courses using authoring tools, designs and develops training materials on specialised e-learning authoring tools, experiments with new technologies and their possible applications in teaching	Female	Public	Email

	and learning and assists in managing E-learning platforms at the University.			
Participant_A5	Participant_A5 is a female educational technologist in a Public University. Her main responsibilities comprise pedagogical designs and the development of online materials as well as project management of online programmes.	Female	Public	Email
Participant_A6	Participant_A6 is male and is the head of the office of learning and teaching in a Private University. He is actively engaged in providing strategic leadership about learning and teaching innovation, assisting in the design of learning programmes and learning spaces and supporting academic staff's professional development including new practices for teaching and learning to support instructors' empowerment.	Male	Private	Email
Participant_A7	Participant_A7 is a male educational technologist in a Private University and is actively involved in online course designs and materials preparation as well as assisting academic staff to use online platforms where needed.	Male	Private	Email

5.4 Interview questions design

Prior to conducting the interviews, interview questions were designed. The questions were based on findings from the students' and lecturers' surveys and the revised holistic E-learning 3.0 model and formulated based on the surveys' questionnaires' items and the literature review.

As discussed in sections 4.6 and 4.7 of Chapter 4, the surveys' results showed the need for further clarification on different aspects of the E-learning 3.0 model. Mixed results were gathered from both surveys on the issue of content creation and a high level of unfamiliarity was recorded for content management aspects such as annotation and knowledge representation. A lack of personalisation to support customised course delivery was noted. Mixed responses were also obtained in regard to encouraging autonomous students and promoting a collaborative culture, with the findings indicating the lack of a sharing culture between students. Critical aspects of 'Web 3.0 System' including knowledge repositories as well as ontologies showed high level of unfamiliarity. Support was somewhat perceived as technical support only while trust between students were not perceived as significant compared to trust in the system and between students and lecturers. Consequently, based on the surveys' results and aligned with findings from the literature review, the researcher devised the questions shown in Table 5.4, to gather more information, understanding and clarity on these findings in the next phase of the study, namely the interviews with lecturers and administrative personnel from Mauritian higher education institutions. Some of the questions explicitly address one aspect of the surveys' findings and the revised E-learning 3.0 model, while others relate to multiple aspects of the surveys' findings and the revised E-learning 3.0 model. Table 5.4 lists the interview questions, their corresponding sources from the literature, which the researcher used or was inspired by to formulate the questions (based on the surveys' findings) and the questions' aims in terms of what they seek to clarify and achieve in the interview phase.

Table 5.4: Interview questions based on surveys' results

Interview questions to lecturers/administrative personnel	Sources	Aim(s) of question(s)
• Who create learning materials for your classes?	Stojanovic, Staab, and Studer (2001)	These questions intend to gather clarity on the aspect of content creation responsibility as the students' and lecturers' surveys showed mixed reactions to content creation responsibility, with the core aspect of content creation viewed as being dependent on lecturers only (see sections 4.6.1.2.2.1 and 4.7.1.2.2.1). At the same time, the question on reuse will provide more information on this aspect for 'Content Management'.
• Do you often reuse learning materials from your previous courses or from other colleagues/ institutions? Please give details. / Does reuse of learning materials from previous courses or from other institutions occur? Please give details	Stojanovic, Staab, and Studer (2001), Snae and Brueckner (2007), Karunasena, Deng, and Zhang (2012)	
• Do you or your department do learning materials annotations? (Yes/No) o Answering Yes → Do you consider annotating learning materials an extra burden? o Answering No → Who does learning materials annotations for your course(s)?	Moreale and Vargas-Vera (2004), Devedzic (2004), Snae and Brueckner (2007)	Following the high percentage of neutral response gathered on learning materials annotations, denoting unfamiliarity with the concept as well as knowledge representation, this question seeks to clarify these aspects of content management (see section 4.7.1.2.2.1)
• Do you use authoring tools for your class materials? / Are authoring tools used for course materials? Please give details.	Devedzic (2004)	Responses from both surveys showed unfamiliarity with Semantic Web concepts including knowledge representation from 'Content Management', knowledge repositories, and ontologies for 'Web 3.0 System' (see

• How would you rate the importance of metadata of learning materials? (Highly important, Important, Neutral, I do not see its importance, I have not dealt with metadata before)	Govindasamy (2001), Stojanovic, Staab, and Studer (2001), Pah et al. (2007)	sections 4.6.1.2.2.1, 4.6.1.2.2.5, 4.7.1.2.2.1 and 4.7.1.2.2.5). With these concepts central to the E-learning 3.0 model, these questions aim to further gauge the understanding of these concepts from interview participants.
• What is the proportion of digital materials used for courses?	Pah et al. (2007), Gunness (2011)	
• Do you often reuse learning materials from your previous courses or from other colleagues/ institutions? Please give details. / Does reuse of learning materials from previous courses or from other institutions occur? Please give details	Stojanovic, Staab, and Studer (2001), Snae and Brueckner (2007), Karunasena, Deng, and Zhang (2012)	
• Have you heard about the Semantic Web? (Yes/No) o Answering Yes→ Where do you see Mauritius with respect to the Semantic Web?	Gunness (2011)	
• Have you heard about ontologies? (Yes/No) o Answering Yes→ Do you think that the Mauritian higher	Gunness (2011)	

education sector will use or promote the usage of ontologies?		
• Do you think understanding students' prior experience and knowledge and their learning styles and preferences are essential at the time of teaching delivery/course design? Please give details.	Stojanovic, Staab, and Studer (2001), Rokou, Rokou, and Rokos (2004), Santally and Senteni (2005)	The surveys' results showed a lack of personalisation for course delivery with mixed responses obtained for the delivery of courses based on students' learning profiles (see sections 4.6.1.2.2.2, 4.7.1.2.2.2 and 4.7.1.2.2.3). This question seeks to gather more understanding on this aspect, allowing for more information to be gathered, from interview participants' point of views, on having a student model to support personalised learning.
• How comfortable and confident are you to teach online classes? Please give details.	Masoumi (2006)	These questions intend to gather further clarity on the lecturer's characteristic under 'Personalised Learning' with the lecturers' survey showing mixed responses in terms of lecturers having the skills to support a personalised learning environment (see section 4.7.1.2.2.2). The questions, at the same time, aim to gauge the readiness of lecturers for E-learning overall.
• Is there any form of E-learning happening already in your classes? Please give details.	Rowe and Rafferty (2013)	
• Do you use any E-learning system/platforms for your classes such as Blackboard, WebCT, Moodle etc? Please give details.	Selim (2007b)	
• What do you think are the barriers for Mauritian lecturers to be E-learning ready?	Oliver (2001), Rowe and Rafferty (2013)	
• Do you think Mauritian students can collaborate to their learning or rather they can only succeed if they are spoon fed by their lecturers? Please give details.	Jump and Jump (2006), Rowe and Rafferty (2013)	This question intends to get a deeper understanding from interview participants in terms of students' participation in their learning and how the student's role is perceived following the mixed reaction obtained from both surveys on students adopting more autonomy as well as

		a more collaborative role in their learning (see sections 4.6.1.2.2.3 and 4.7.1.2.2.3)
• Are you ready as a lecturer to change your role from an active instructor to a collaborator in learning?	Hung et al. (2010), Rowe and Rafferty (2013)	Following the mixed results obtained from the lecturers' survey to the change of the role of lecturers as a collaborator in students' learning, this question intends to gather further clarity on this aspect of the 'Pedagogy' characteristic (see section 4.7.1.2.2.3)
• Do your students use learning tools such as discussion board, chat rooms, wiki, blog etc? Please give details.	Karunasena, Deng, and Zhang (2012), Rubens, Kaplan, and Okamoto (2011)	Reluctance to collaborate and share resources on behalf of participating students were noted from the survey outcomes (see section 4.7.1.2.2.4). These questions seek to further understand this aspect of 'Collaboration' from the interview participants.
• What is your perception on the culture of sharing and collaboration in Mauritian universities?	Kasseeah (2012), Allybokus (2015)	
• What do you think are the barriers to make Mauritius E-learning ready?	Vencatachellum and Munusami (2003), Schweisfurth (2011), Gunness (2011)	The students' survey showed a limited view of support from participants, mostly centered around technical support, while the lecturers' survey showed other aspects of support that were considered important from participants (see sections 4.6.1.2.2.6 and 4.7.1.2.2.6). These questions aim to gather the opinions of interview participants on their perceived E-learning barriers which will assist the researcher to understand the types of support required for the E-learning 3.0 model. At the same time, these questions can provide more information on E-learning barriers, in general, assisting the researcher to ensure all perceive critical E-learning aspects are considered and adequately represented in the holistic E-learning 3.0 model.
• What do you think are the barriers for Mauritian lecturers to be E-learning ready?	Vencatachellum and Munusami (2003), Gunness (2011), Rowe and Rafferty (2013)	
• What do you think are the barriers for Mauritian students to be E-learning ready?	Gunness (2011), Rowe and Rafferty (2013)	

• What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome?	Kasseeah (2012)	In line with the identification of E-learning barriers from interview participants, these 2 additional questions aim to gather opinions of interview participants on their perceived E-learning benefits and gauge their views on whether E-learning will work or not in a small state island like Mauritius to further assist the researcher in ensuring all perceived critical aspects of E-learning are captured in the holistic E-learning 3.0 model.
• Do you think E-learning works or will work in Mauritius? Please give details.	Gunness (2011)	
• How would you rate the importance of students' course evaluation? Please provide details.	Benigno and Trentin (2000)	The surveys showed that many students and lecturers had a preference for didactic delivery of course content by lecturers and rote learning by students with feedback to and from students not considered important at times (see section 4.7.1.2.2.6 and 4.7.1.2.2.7). These questions seek to further understand how much students' feedback and by extension, the overall course evaluation, are deemed important and taken into consideration.
• Do you think that course evaluation feedback is genuinely taken into consideration for future course planning and delivery? Please provide details.		
• How important do you think trust in the system security and reliability, trust between students and lecturers and trust between students are in the E-learning environment?	Baggio (2011), Wang (2014)	Results from the students' and lecturers' surveys showed that more importance is assigned to trust in the system and between students and lecturers than trust between students (see sections 4.6.1.2.2.7 and 4.7.1.2.2.7). This question seeks to provide more clarity on the 'Trust' aspect as perceived by interview participants.

The questions were intended to obtain the opinion and perceptions of lecturers and administrative personnel in order to ascertain whether the characteristics and associated sub-characteristics of the revised E-learning 3.0 model adequately represented a holistic E-learning 3.0 model or needed further modification. To increase the validity and reliability of the interview results, as suggested by Rowley (2012), the interview questions were validated with the research supervisors and some colleagues to check for any ambiguity or vagueness. The questions were then submitted to the Curtin University Human Research Ethics Committee for approval, which after due processing, was obtained.

As explained in section 3.4.7.3.2.2, for the email interviews, the questions were placed on 'Qualtrics' software. Both the lecturer's and the administrative personnel's interview questions were divided into five sections. The questions were similar for both group of participants, with some additional questions included for the lecturer's interview, mainly related to online teaching. The next two sub-sections below (sections 5.4.1 and 5.4.2) outline the structure of the lecturer's and the administrative personnel's interviews.

5.4.1 Lecturer interview questions

The lecturer's interview questions (see Appendix L) were divided into five sections as follows:

- The 'Your role' section identified the role of the participant, either as lecturer or administrative personnel, which then determined the questions that were subsequently presented to the interviewees via Qualtrics.
- The 'Background Information' section with five questions, in the form of multiple choices, with the option to choose a single answer, captured the general demographic data of participating lecturers. These included the gender, the age group, their university type (public or private), their faculty/department and their highest education level.
- Eight questions were formulated in the 'E-learning and You' section, which aimed to capture the lecturers' perceptions of E-learning in Mauritius and within their respective institutions as well as their perceived roles within an E-learning environment. Questions were related to several characteristics and sub-characteristics of the revised E-learning 3.0 model including 'Content Management', 'Pedagogy', 'Support' and 'Trust'.

- Students perceived role and contributions within the E-learning environment from the lecturers' perspectives were captured in the section 'E-learning and Students'. The section contained eight questions related to different aspects of the revised E-learning 3.0 model including 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Support' and 'Trust'.
- The section 'E-learning and Learning Materials', which consisted of eleven questions, aimed at providing more clarity around the characteristics 'Content Management' and 'Web 3.0 Systems'. It consisted of a combination of multiple-choice questions, with the option of a single answer as well as open-ended questions, some of which depended on participants' responses to the previous multiple-choice questions.

5.4.2 Administrative personnel interview questions

The administrative personnel's questions were similar to those of the lecturers', omitting those questions related specifically to lecturers such as their views on teaching online. The questions (see Appendix M) were also divided into five sections as follows:

- The 'Your role' section identified the role of the participant, either as lecturer or administrative personnel, which then determined the questions that were subsequently presented to the interviewees via Qualtrics.
- The 'Background Information' section, with two multiple-choice questions, with the option to choose a single answer, captured the type of university (public or private) the administrative personnel are associated with and the faculty/department they belong to.
- The 'Barriers to E-learning' section, with five questions, aimed at capturing the perceptions of administrative personnel on general E-learning issues including their perceived E-learning barriers from lecturers and students, from within the institution, and from within the country, thereby providing more insight on the characteristics and sub-characteristics of the revised E-learning 3.0 model.
- Similar to the lecturers' questions, the 'E-Learning and Students' section, with seven questions, aimed at gathering the perceptions of administrative personnel on different aspects of the E-learning 3.0 model relating to students such as their perceived roles and contribution in an E-learning environment. Questions

in this section aimed at gathering more insight on the characteristics 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Support' and 'Trust'.

- With similar questions to those for the lecturer's interview, the 'E-Learning and Learning Materials' section with ten questions, aimed at obtaining more insight on the characteristics 'Content Management' and 'Web 3.0 System' and their associated sub-characteristics, from the administrative personnel's perspectives. It consisted of a combination of multiple-choice questions, with single-answer options as well as open-ended questions, some of which depended on participants' responses to previous multiple-choice questions. This section was considered critical for administrative personnel as the participants included educational technologists and course designers, believed to be able to provide relevant and meaningful insights on different aspects of 'Content Management' and 'Web 3.0 Systems' including course creation responsibility and representation as well as Semantic Web and ontologies in the Mauritian context.

With the interview questions designed, the next step, as discussed next, was to contact the participants to undertake the interviews.

5.5 Conducting the interviews

All participants were contacted, via email, using their respective email addresses they used to respond to the emailed invitation letters. Each email included the Interview Consent Form (see Appendix N) and the Participant Information Statement (see Appendix O). The Participant Information Statement also included a confidentiality clause, reassuring the interviewees about the anonymity of their participation, as well as their organisations and the privacy of the data being gathered (Healey and Rawlinson 1993). Participants were requested to read and sign the consent form, thereby agreeing to participate in the interview.

All the participants who opted for an email interview were also sent the Qualtrics link to the interview questions. They were requested to advise the researcher once they had completed the interview questions to allow the researcher to keep track of participants' responses from Qualtrics for analysis purposes and for follow-ups, where needed. All subsequent follow-ups to clarify and finalise responses from participants were done via emails. The email interviews, including follow-ups, took around two weeks on average, with some participants taking longer to respond than others. No transcription

was required since the responses were already in text format. Responses from participants were downloaded and updated, where needed, based on follow-ups.

On the other hand, the email sent to the administrative personnel interviewee, who chose the telephone interview, also contained the interview questions to allow her to be better prepare for the telephone interview and to reduce interviewer and response biases as discussed in section 3.4.7.3.2.2. She was also requested, in the email, to advise the researcher on the most convenient date and time that she would prefer the telephone interview to be conducted. Once the telephone interview's date and time were finalised, it was conducted and lasted for around forty-five minutes. The researcher printed the questions, prior to the telephone interview and then manually recorded the participant's responses on the printed question list during the interview. A full transcript, in the same format as the email interviews, was produced immediately after the telephone interview to ensure that participant's responses were captured in their entirety.

5.6 Data Preparation

Prior to the analysis of the interview data, it is important for the data to be in a written text format (Zhang and Wildemuth 2009). Participants' responses obtained via Qualtrics were readily available in text format, requiring no transcription. However, where available, additional information was added to the responses based on follow-ups obtained, to ensure that no data was omitted. The telephone interview transcription was done in the same format as the email interviews to facilitate analysis. To distinguish between the interviewee(s) and the interviewer, and to maintain the anonymity of each interviewee, codes were used to identify participants as mentioned in Section 5.3.3 and Table 5.3 (Saunders, Lewis and Thornhill 2009). For example, Participant_L1 represents the first lecturer who responded to the interview questions while Participant_A1 represents the first administrative personnel who responded to the interview questions. Each transcript also contained the job title of the participant (lecturer or administrative personnel), the interview questions and the corresponding responses. Each transcript was saved in a distinct file with the file clearly labelled using the interviewee code to facilitate access and preserve confidentiality. For e.g., Participant_L1.docx and Participant_A1.docx were the file names used for the interview responses from the first lecturer and from the first administrative personnel respectively. The interview responses to all questions, except the demographic

questions were also collated in one file, labelled as InterviewResponsesByQuestions.docx, to have all responses per question in one spot. The file was organised using tables to capture questions and matching responses with each participant's code clearly shown next to each response. The file generated a 38-page document as shown in Appendix P.

5.7 Data Coding and Analysis

As discussed in Chapter 3, section 3.4.7.3.3, content analysis was conducted to systematically analyse the interview results, allowing the researcher to make valid inferences from the collected interview responses to validate the revised E-learning 3.0 model (Bengtsson 2016).

The researcher adopted the two-step process recommended by Miles and Huberman (1994) to analyse the interview data. Step one consisted of the analysis of each individual script using a systematic content analysis approach as outlined by Tesch (1990); in step two, all the scripts were analysed to identify similarities and differences between them.

In step one, although no transcriptions were required for the email interviews as they were already in written format, the researcher made some formatting changes to the scripts to ensure all responses were in a consistent and standard format for ease of analysis. The telephone interview transcript was also produced (as discussed in section 5.6), in the same format as the email interviews, for consistency. Individual themes were then used as the units of analysis in order to look for the expression of an idea, thereby assigning a code to "text chunk of any size, as long as that chunk represents a single theme or issue of relevance" (Zhang and Wildemuth 2009, 320). Coding was done through NVivo, as outlined in section 3.4.7.3.3 of chapter 3, mainly as a tool for speeding up the "*clerical tasks associated with data handling, which in turn frees the researcher to think and to 'discover theory creatively and intuitively'*" (Moir 1998, quoted in McLafferty 2006, 35).

During the deductive content analysis phase, the researcher closely analysed each interview script to look for pre-defined themes, as identified in the literature review and surveys and coded the data accordingly. Codes were assigned to the pre-defined themes based on the meaning of the data, divided into sentences and segments "*that make sense when taken out of context*" (McLafferty 2006, 35). Once the set of pre-defined themes was identified from each script, the researcher eliminated overlaps

where chunks of data from the interview scripts were coded into more than one theme (Creswell 2008). To inductively analyse the scripts, the researcher constantly scrutinised the data from each script, paying particular attention to the repetition of certain concepts and captured new emerging themes, as discussed in section 3.4.7.3.3. Throughout this process, for validation purposes, the researcher revisited the interview scrips many times to compare the results with the set of characteristics and sub-characteristics derived during the survey phase.

In step two, all the scripts were analysed to identify similarities and differences between them. Similar themes were combined under the same name and organised into codes to create a holistic approach to the key findings.

Throughout the coding process, the researcher captured and updated her thoughts via memos, linked to themes, which were later used in the write-up of the interview results. The researcher also prepared a word document capturing responses of interviewees according to themes as shown in Appendix Q. The file was labelled as InterviewResponsesByCharacteristics.docx and was organised in the same format as the InterviewResponsesByQuestions.docx file (Appendix P), with participants' code and their corresponding responses grouped by interview questions using tables. The InterviewResponsesByCharacteristics.docx file was created for the convenience of readers to have one document where they can view and read all interview responses by themes, as the interview analysis only refers to some comments.

5.8 Validity and Reliability

Patton (2002) stated that validity and reliability are the two factors which any qualitative researcher should be concerned about when designing a study, analysing the results and assessing the quality of the study. Consequently, for validity and reliability purposes, the following were adopted by the researcher:

- For content validity, the interview questions were based on findings from the literature review and surveys' outcomes and were further checked by a panel of experts including the research supervisor and academics at Curtin University, as discussed in section 5.4 (Yin 2009; Rowley 2012). The questions were submitted for approval to the Curtin University Human Research Ethics Committee and were approved.
- The open-ended questions from the interviews encouraged participants to express their thoughts, experiences and opinions in as much detail as possible.

The open-ended questions were designed to encourage strong and in-depth discussions that can lead to new concepts (Dearnley 2005). The collection of data were rich in details and analysis, further supporting the validity of the study (Hussey and Hussey 1997).

- All participants had access to the interview questions prior to answering them, allowing them to be better prepared, thereby adding to the validity and reliability of the data (Saunders, Lewis and Thornhill 2009)
- Thorough and continuous reviews of the data being analysed, with back and forth checking of themes to compare meanings, were undertaken. Saturation was achieved as most of the themes identified were mentioned and confirmed by more than one participant (Thomson 2011).
- Participants' comments, in the thesis, were clearly identified using italics and interspersed with quotations with the participant's code clearly shown in brackets. This further assisted in achieving rigour since the readers are able to distinguish the respondents' words from those of the researcher (Whiteley 2002).
- Analysis of documents from Mauritian universities and the Government were used to triangulate interview findings, thereby enhancing the interview data reliability (Yin 2009).

5.9 Interview results and documents' findings

The interview results are presented next. The interviewees' responses are analysed and results are corroborated with findings from documents explored, as outlined in section 3.4.7.4. The background information provided by participants is analysed first, followed by a detailed analysis of participants' responses on the questions pertaining to the characteristics and associated sub-characteristics of the revised E-learning 3.0 model, as outlined in section 5.4. For each characteristic and their associated sub-characteristics, the interview results are discussed first followed by additional findings from the documents analysis.

5.9.1 Background Information

The information collected from lecturers and administrative personnel interviewees under the background information section showed that thirteen of the twenty participating lecturers (65%) and four of the seven participating administrative

personnel (57%) were female. This was considered quite a balanced response in terms of capturing the opinions and perceptions of lecturers and administrative personnel based on genders. Sixteen of the twenty lecturer interviewees were from public tertiary institutions (80%) with the remaining four (20%) being from private institutions. This showed the predominance of public universities in Mauritius, which absorb most of tertiary educational enrolments and hence have a larger number of staff (Tertiary Education Commission 2016). Administrative Personnel's participation was relatively the same from the public and private tertiary institutions, despite the predominance of public institutions in Mauritius, with four participants out of seven being from public institutions (57%). This indicated the difficulties and challenges faced by the researcher to recruit administrative personnel participants, with an overlap of roles and responsibilities with that of lecturers as outlined in section 5.3. All interviewees had a Master degree or a PhD in their respective field.

5.9.2 E-learning 3.0 characteristics

The rest of the interview questions, namely questions from sections three, four and five of the lecturers' and administrative personnel's interviews (see Appendix L and Appendix M for the interviews' questions) were intended to capture the opinions and perspective of participants on the identified E-learning 3.0 characteristics that emerged from the quantitative phase of this study as outlined in sections 5.4.1 and 5.4.2.

The interview analysis for each of the revised holistic E-learning 3.0 characteristics are discussed below, ending with a table outlining the characteristics and sub-characteristics before the interviews (from the revised holistic E-learning 3.0 model as per Figure 4.30) and after the interviews. The first row of each table identifies the characteristic being discussed and is colour-coded similar to the literature review and the surveys chapters. New emerging characteristics and sub-characteristics from the interview analysis, as well as any change to the naming of characteristics and sub-characteristics from the revised holistic E-learning 3.0 model are shown in dark red.

5.9.2.1 Content Management

Following the survey phase, 'Content Management' from the revised holistic E-learning 3.0 model, as discussed in section 4.9.1, consisted of the sub-characteristics 'Content creation and content creation responsibility', 'Content accessibility and reuse', 'Knowledge representation' and 'Content meeting courses' and students'

needs'. Findings from the interviews and documents analysis for the 'Content Management' characteristic and associated sub-characteristics are discussed below.

- **Content creation and content creation responsibility**
  - ***Interview Findings***

In the 'E-learning and Learning Materials' section of the interview (see Appendix L for the lecturers' interview questions), lecturers were asked who created learning materials for their courses, with a multiple choice option of three answers: themselves, the university or 'other', which they were requested to specify. Eighteen of the twenty lecturers stated that they created their own learning materials with the remaining two stating that the university provided the learning materials. This high percentage of self-creation of course content confirms that most of the tertiary institutions in Mauritius do not have a specific department catering for content creation, but rather the lecturers are given full control over the content they provide to the students. This further explains the mixed results obtained from the surveys with regard to the aspect of content creation responsibility, as discussed in sections 4.6.1.2.2.1 and 4.7.1.2.2.1, which seem to be considered, across institutions in Mauritius, as being part of the lecturers' work responsibilities. Additionally, many lecturers and administrative personnel found that one of the barriers for lecturers and for Mauritius to be E-learning ready is the lack of content providers, including educational technologists and instructional designers, as well as lecturers' lack of skills to produce content appropriate for E-learning. Some of the comments from the interviews are provided below:

> *"Lecturers need to be trained to prepare interactive content using appropriate tools." (Participant_L1)*

> *"Expertise of content experts, instructional designers are a must as key to the E-learning environment is the availability of useful content that meet students' needs." (Participant_A2)*

> *"Lecturers are not expert at creating content that is ideal for an E-learning environment. These need to be done by expert such as*

educational technologists working in collaboration with lecturers." (Participant_A5)

Similarly, many lecturers and administrative personnel agreed that E-learning will work in Mauritius "*provided the materials are well created in an interactive way" (Participant_L4)* and there is the *"availability of relevant content to match the course within the E-learning environment" (Participant_A1)*. Others stated that *"E-learning will work to some extent, but more has to be done at both the producer (content & platform provider) and the consumer (learners) ends." (Participant_L14).* The need to have materials relevant to the E-learning environment is often stressed as pointed out by Participant_A7 who said that "*More needs to be done to have the materials ready for lecturers to be able to deliver. This is a big mis-conception in Mauritius where E-learning is the downloading of notes and course materials from an online portal. The materials and the delivery need to be interactive and support students to learn by themselves."*

While the importance of content creation is clear from the participants' expressed opinions, the interview responses affirm the need to have a more collaborative approach to content creation, with the responsibility being shared between lecturers and content provision experts such as educational technologists and instructional designers.

- ***Documents' Findings***

This view to have a more collaborative approach to content creation is supported by the Tertiary Education Commission (TEC) in Mauritius, which recognised that subject experts are contributing to the learning content of courses but made the pertinent remark that for online learning, "*all contents have to be instructionally designed, so that these can be used as effective learning guide by students to manage their own learning process*" (Tertiary Education Commission 2015, 13). In its quality assurance report to the Open University of Mauritius, the TEC recommended the appointment of "*key staff such as subject experts, instructional designers, and technologists to strengthen the mounting, development and production of ODL* [Open and Distance Learning] *materials"* and to "*contribute significantly to the development and use of materials that goes beyond provision of content*" (Tertiary Education Commission 2015, 13).

Based on these findings, the sub-characteristic 'Content creation and content creation responsibility' was renamed 'Collaborative content creation'.

- **Content accessibility and reuse**
  - ***Interview Findings***

Interviewees viewed content accessibility as a major advantage of E-learning in Mauritius as opposed to the delivery of content in face-to-face classes. Some of the comments from lecturers were as follows:

> *"With E-learning, student can access course materials from anywhere and anytime giving them more flexibility in their learning." (Participant_L6)*

> *"Nowadays students attention time in classroom is very short, it's becoming harder for lecturers to firstly retain the interest of the students and secondly to transfer maximum of content or know how in a traditional mode of lecture of 2 to 3 hours. Students are more at ease with discrete knowledge that they can go through at anytime from anywhere." (Participant_L14)*

> *"Student can access course materials in a more interactive way allowing them to absorb the course concepts better and at their own pace and in their own time. This is not always possible in face to face classes with large student numbers." (Participant_L20)*

In regard to content reuse, participants were asked about the portion of digital materials they used for their courses. Thirteen of the twenty lecturers and three of the seven administrative personnel stated that all their materials were digital, with the rest stating that half of their materials were digital. The question which then arose was whether the lecturers and administrative personnel were creating course materials from scratch or reusing available resources from previous courses, other colleagues and/or institutions. Interestingly, most lecturers and all administrative personnel seemed to consider that content reuse is the reuse of their own materials across semesters, with modifications made to reflect the current courses, with only few considering the

options of reusing other available materials from other institutions or colleagues. These findings aligned with previous responses regarding content creation, which as discussed above, was carried out mostly by the lectures themselves. In fact, only one lecturer mentioned the sharing of resources with other colleagues delivering the same course(s) so that all students have a standard set of materials. Similarly, only two other lecturers mentioned the use of materials from another institution and the use of Open Educational Resources (OERs) respectively. In fact, previous researches, as reported in the literature, show that while lecturers are keen to reuse existing materials and use OER materials, they are less willing to share their own content, reuse other's content and collaboratively create content (Petrides and Jimes 2006; Santally 2011). To promote the novel concept of OER to lecturers to encourage collaboration of content and reuse across institutions, the University of Mauritius organised two workshops for academics and educators of higher education institutions in Mauritius on the novel concept of OER (Santally 2011). Observations from the seminars showed that most academics and content developers preferred to use their own content as it "*takes more time to understand other's content that to create one's own content*" (Santally 2011, 8). Some were also sceptical about reusing the content of others for fear of a lack of authenticity and integrity (Santally 2011). Additionally, reusing content from other colleagues and other institutions also implied being involved in similar activities and practices of sharing one's own content, something that Mauritian lecturers are not too keen on doing (Allybokus 2015; Veer Ramjeawon and Rowley 2017). Nonetheless, both the lecturers and administrative personnel regularly reused their own content. Some of the comments on content reuse are given below.

> *"Yes, lecture notes prepared for previous years are updated and reused. Moreover, we very often share modules between colleagues where we share our lecture notes and give the same lecture notes all students." (Participant_L6)*

> *"I re-use learning materials from previous courses whenever there are changes in syllabus. But when there is a new module to prepare then I use lecture notes from universities that is considered as reference in the field for example material from Carnegie Mellon university. (Participant_L7)*

"Yes, but I only reuse materials for my own course." (Participant_A3)

"I do no re-use the material from other institution. I prefer to create my own pedagogical course content keeping my students in focus." (Participant_A4)

- ***Documents' Findings***

Access remains a key focus on the agenda of the Mauritian Government. So much so, it is part of the vision of the *Digital Mauritius* plan being "*A highly inter-connected society with access to the knowledge required for an Innovation-driven culture*" (Ministry of Technology & Communication & Innovation 2018, 13). In line with fostering "*the spirit of collaboration*" within and amongst institutions as well as to promote coherence and eliminate redundancy and duplication of efforts, maximising reuse is highlighted as a key tool towards such endeavours in the National ICT Strategic Plan (National ICT Strategic Plan 2007, 101).

With content accessibility highly regarded as a key advantage in E-learning and reuse as a recurrent activity, as seen from the interviewees' responses, the sub-characteristic 'Content accessibility and reuse' was retained for the final holistic E-learning 3.0 model.

- **Knowledge representation**
  - ***Interview findings***

Questions on participants' use of authoring tools as well as their perceived importance of metadata and learning content annotation were intrinsically referring to the sub-characteristic 'Knowledge representation'. Eight lecturers out of twenty lecturers and three out of seven administrative personnel stated that they use authoring tools for content design with only three lecturers providing appropriate examples of the kind of tools they employ for content creation and design. This is in line with previous comments made by participants that more needs to be done to assist them to create interactive learning materials, thereby, confirming that Mauritius is still in the early stage of content development suitable for E-learning and more needs to be done to

support this aspect of content management. Some of the comments regarding the use of authoring tools are outlined below:

> *"Given my current responsibilities it the educational technologists that do this for me with tools like Articulate or XERTE or exe depending on the nature of resources to be designed." (Participant_L11)*

> *"Yes. Flash /Articulate, Ispring with PPT are some of the authoring tools I use." (Participant_L12)*

> *"mostly word processing, online video links, spreadsheet, presentation and pdf are used to course materials." (Participant_A6)*

Participants were given a 'Yes/No' question on whether learning materials for their courses were annotated. A 'Yes' response led participants to another question namely whether they consider annotation as an extra burden; a 'No' response led to participants being asked who or which department is responsible for annotation for their courses. This set of questions had, overwhelmingly, poor responses, with most participants (lecturers and administrative personnel) responding with a 'no' denoting that learning materials annotations were "*not done*" (Participant_L6). Only 2 lecturers responded as follows:

> *"Yes. It makes reading more interesting for the students. I personally quite like it when there are annotations in the text i am reading/video i am watching." (Participant_L17)*

> *"Yes. It is time-consuming but learning becomes easier." (Participant_L19)*

Similarly, in regard to the importance of metadata, participants were asked to choose among the options of 'Highly important', 'Important', 'Neutral', 'I do not see its

importance' and 'I have not dealt with metadata before'. Most participants either responded as 'Neutral 'or 'I have not dealt with metadata before'.

- ***Document' findings***

None of the analysed documents provided specific information on knowledge representation and the importance of metadata towards digitising content. Yet, the focus of many of the documents analysed remain centered "*the transformation of Mauritius into a regional knowledge hub and centre of higher learning*" (National ICT Strategic Plan 2007, 4; Gillwald and Islam 2011; Ministry of Technology & Communication & Innovation 2018; Human Resource Development Council 2006), although knowledge representation is central to the idea of knowledge hub.

The responses from the interviews on the sub-characteristic 'Knowledge representation' showed that participating lecturers and administrative personnel in Mauritius are unfamiliar with the concept of knowledge representation, aligning with the findings from the surveys (see Sections 4.6.1.2.2.1 and 4.7.1.2.2.1). None of the documents analysed covered this aspect of E-learning either. While knowledge representation is a key aspect of the Semantic Web and hence the E-learning 3.0 model, it is yet to be fully understood. Hence, to ensure that it's importance is highlighted, it is retained as a sub-characteristic. Moreover, to be more explicit about what knowledge representation entails and to facilitate its understanding, more information was added to the sub- characteristic 'Knowledge representation' namely 'Knowledge representation through annotations and metadata'. Additionally, to highlight the lack of familiarity with the concept and to demonstrate that more attention needs to be given to this aspect of E-learning 3.0, the sub-characteristic was renamed 'towards understanding and applying knowledge representation through annotations and metadata'.

- **Content meeting courses' and students' need**
  - ***Interview findings***

Most of the responses related to the course content meeting the course needs as well as the students' needs were linked with 'Content accessibility and reuse', as shown by some of the comments below. As a result, this sub-characteristic was merged with the sub-characteristic 'Content accessibility and reuse', thereby becoming 'Content accessibility and reuse relevant to courses' and students' needs'. The phrase 'relevant

to courses' and students' needs' were used as opposed to 'meeting courses' and students' needs' to align with the interviews' responses.

> *"yes, but these are modified and updated depending on the requirements perceived through interaction with students and depending on the course needs." (Participant_L5)*

> *"…They are updated though to ensure that we cover the course syllabus." (Participant_L9)*

> *"I often reuse learning materials if they are still relevant to the course requirements." (Participant_L10)*

> *"Through an e-learning platform, students can access a variety of educational materials that can better meet their needs at their own pace." (Participant_L12)*

> *"I reuse learning materials I prepared but always update every semester according to market trends and new research findings so that students are provided with the most relevant information and the course is kept current." (Participant_L15)*

- ***Documents' findings***

Ensuring relevance of content to meet the courses and students' needs has been identified as a key feature to "*develop a cutting edge*" over competitors and to ensure high quality provision of education in the country (Human Resource Development Council 2006, 13). As stated in the Education and Human Resources Strategy Plan 2008-2020 (Ministry of Education and Culture and Human Resources 2009a, 12), relevance *"pre-supposes that there must be a broad-based, flexible and responsive curriculum that both motivates students to stay in learning and at the same time challenges the most able*". For higher education institutions, it also implies being more responsive to the needs of the labour market by mounting programmes that "*are relevant to the needs of learners, the country and the region*", in line with the vision of positioning of the country as the knowledge hub of the region (Ministry of Education and Culture and Human Resources 2009a, 128).

- **Additional findings under 'Content Management characteristic**
  - **Intellectual property rights**

➢ ***Interview Findings***

Emerging from some of the interview responses was the lack of willingness by some lecturers to post content online for fear of others copying their work in disregard of copyright issues. Two lecturers found the lack of intellectual property rights a major concern for Mauritian lecturers to be E-learning ready as shown below:

> *"Copyright issues. Intellectual property rights are not enforced. How do you protect your materials as lots of people just copy the work of others without bothering about intellectual property rights." (Participant_L7)*

> *"I don't want to spend the time creating online appropriate content for my students and others just copy my work. There need to be better regulations surrounding content ownership and sharing." (Participant_L8)*

As discussed in section 2.8.1, Papp (2000, 104) considered intellectual property as "*one of the first hurdles that must be overcome*" in E-learning, where lecturers need to be provided with "*a certain level of security with respect to their intellectual capital*" to overcome their concerns and reluctance to place their content online to be accessed by anyone. Copyright and intellectual property concerns as well as rules and regulation around them, if not addressed, can lead to poor content, thereby affecting the quality of courses and programs (Papp 2000; Andersson and Grönlund 2009). This aspect of considering intellectual property rights and having better regulations to support content ownership and sharing to facilitate the creation of online content was noted in the literature review and captured under the characteristic 'Content Management' as shown in Appendix B. However, it was not separately shown in the model and was incorporated as part of 'Content creation'. Additionally, the Mauritian Government wants to ensure that the universities in the country, particularly the public ones, become leading international universities of excellence and intellectual creativity and acknowledges that universities have a major role to play in the creation of intellectual capital (Cloete, Bailey and Pillay 2011).

- ***Documents' Findings***

In its National ICT Strategic Plan 2007-2011 and more recently, in its Digital Mauritius 2030 report, the Mauritian Government considered the protection of intellectual property rights as "*an integral part of an enabling legal and regulatory framework*" (Ministry of Technology & Communication & Innovation 2018, 35) for the uptake of ICT in the country and for supporting "*adequate locally generated and relevant content*" (National ICT Strategic Plan 2007, 35). During one of its audits of the University of Mauritius, the TEC pointed out that Intellectual Property rules were unclear to many academics due to a lack of awareness and recommended that necessary processes be put in place to remediate the issue (Tertiary Education Commission 2012). Subsequently, a number of initiatives were undertaken. These included the development of an institutional intellectual property policy through the establishment of the Knowledge Transfer Office at the University of Mauritius (UOM Knowledge Transfer Office 2016). Also, a workshop on intellectual property to address concerns and queries of academics regarding intellectual property issues and to better equip them with the proper tools and educate them on intellectual property considerations for content creation and dissemination, were organised (UOM Knowledge Transfer Office 2016). However, concerns have been raised by numerous stakeholders about the inadequacy of staff equipped to deal with intellectual property related issues and to provide guidance and information on matters pertaining to issues such as the disclosure, protection and ownership of educational resources and research materials (Mengistie and Hardowar 2017).

Taking the interviewees and governmental bodies' concerns into account and considering the fact that intellectual property rights was mentioned in the literature as an E-learning CSF, the researcher included this aspect in the final E-learning 3.0 model as a separate and explicitly stated sub-characteristic of 'Content Management'. Consequently, 'Intellectual property rights and regulations considerations' was added to 'Content Management'.

Following the above analysis, the researcher confirmed the importance of 'Content Management' as a characteristic for the E-learning 3.0 model. Table 5.5 shows the characteristic 'Content Management' and its associated sub-characteristics before and after the interviews and documents' analysis, while Appendix Q provides all the

responses from lecturers' and administrative personnel's interviews related to 'Content Management'.

Table 5.5: Content Management - Before and After Interviews and Documents Analysis

Before Interviews (as per Revised holistic E-learning 3.0 Model)	**After Interviews/ Documents Analysis**
Content Management	**Content Management**
Content creation and content creation responsibility	Collaborative content creation
Content accessibility and reuse	Content accessibility and reuse relevant to courses' and students' needs
Content meeting courses' and students' needs	
Knowledge representation	Towards understanding and applying knowledge representation through annotations and metadata
New findings	
	Intellectual property rights and regulations considerations

5.9.2.2 Personalised Learning

The characteristic 'Personalised Learning' after the survey findings, as discussed in Section 4.9.2, consisted of the sub-characteristics 'Student model' and 'Lecturer's characteristics'. Findings from the interviews and documents analysis related to this characteristic and its associated sub-characteristics are discussed below.

'Personalised Learning' was central to many of the interviewees' responses, where E-learning was seen as being key to support customised delivery, which otherwise was difficult to accommodate due to large class sizes in the traditional classrooms. In fact, the Mauritian education system, all the way to its higher educational levels, is deeply rooted in the "*traditional teaching paradigm where students' learning is part of the reproduction and perpetuation process of existing knowledge"* from the instructors and where "*individualised programs to meet the different needs of learners are not promoted"* (Allybokus 2015, 36). Moreover, all students are given the same content at the same time with explicit instructions from the lecturers, with no consideration of individual needs (Daniels, Kalkman and McCombs 2001). Responses to statements such as "What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome? and 'Do you think E-learning works or will work in Mauritius', highlighted the need to cater for mixed ability students, which is seen

by participants as being achievable through E-learning, as shown by some of the comments below:

> *"Varied/mixed ability students – difficult to deliver lecturers that suit all students, pace of learning is different for each student and an E-learning environment can cater for that better as compared to face to face classes." (Participant_L6)*

> *"Interaction and personalisation. Because class sizes are big and matching the pace of large group is also challenging." (Participant_L9)*

> *"Face to face classes depend on the teaching style of the lecturer - it is teacher centered. e-Learning is learner centered - promotes autonomy of the student and gets a student to maturity quicker." (Participant_L11)*

> *"students learn at different pace and have different learning styles and this cannot be accommodated in F2F classrooms whereas E-learning can support that." (Participant_L16)*

The sub-characteristics of this critical component of the E-learning 3.0 model are discussed below.

- **Student model**
  - ***Interview findings***

With regard to the sub-characteristic 'Student model', participants were asked their opinions on whether an understanding of students' prior knowledge and experience as well as their learning styles and preferences is essential for course delivery. Eleven of the twenty lecturer interviewees six of the seven administrative personnel interviewees agreed with the statement. However, many of them also pointed out that understanding students' learning styles and preferences would be ideal but not something currently happening in face-to-face classes. In fact, only three lecturers, agreed that students' prior knowledge and experience as well as their learning styles and preferences are

essential for course delivery with one participant further emphasising that such an understanding is only important '*to some extent*'. Some of these comments are presented below.

> *"Yes, it is important to understand the students prior experience and learning style and preferences so as you better customised the learning materials to the need and level of the students. However, it is very rare to have a homogenous class and students have different prior experience." (Participant_L6)*

> *"Yes, it is important as we need to know what students already know before so as to provide them with better learning experience and cater for content that meet their needs." (Participant_L12)*

> *"Yes, it is important as once we are aware of prior experience and knowledge and learning preferences to some extent, we can plan our teaching in a better way to meet students 'needs. As a lecturer, we need to understand the different levels of knowledge for our students to make them achieve the goals set by the module. It is also important to know prior knowledge to align students in terms of knowledge dispensed and acquired." (Participant_L19)*

> *"Yes, E-learning supports more personalised delivery where it is easier to meet the needs of different learners based on their knowledge and learning style. This is much harder in face to face classes where the delivery is via standard lectures for all learners." (Participant_A7)*

In general, lecturers were of the opinion that class sizes were too big and that if they had to personalise delivery based on students' learning styles and preferences, they would never be able to get through their workload. In fact, as pointed out by Vavrus (2009), instructors find that controlling the learning in overcrowded classes is the only practical way of getting through the course. One administrative personnel interviewee also pointed out that learning styles and preferences were not usually taken into

consideration. However, many participants agreed that E-learning could undoubtedly assist with a more personalised approach to course delivery, compared to the traditional delivery style. Some of the responses capturing participants' reservations about taking into consideration students' learning styles and course delivery preferences are given below:

> *"Yes, it helps to plan what needs to be covered in the limited time we have in our face to face delivery. However, delivery of the course will be standard to all students and not based on their learning style or preferences." (Participant_L5)*

> *"Ideally, we want to be able to cater course delivery to meet different students' learning style and preferences. However, in an E-learning setting that might be possible with different teaching approaches, but within a face to face class, this is impossible due to the large number of students and we need to finish our syllabus content" (Participant_L6)*

> *"Yes, but maybe understanding students' prior knowledge. E-learning can make this easier but it will take time as in Mauritius we are used to one way of teaching for all students and learning styles preferences are never considered." (Participant_L13).*

> *"It helps in cases where students have different backgrounds and knowledge, but this can be taken care of by having a basic introductory course. With their learning styles, this is something that cannot be accommodated in the large face to face classes that we have. It might something left to E-learning maybe, although this will be take time as lectures are mostly used to one style of delivery." (Participant_L17).*

> *'Yes, although prior knowledge is usually captured through pre-requisites, learning styles and preferences is much harder and is usually not taken into consideration." (Participant_A5).*

Four of the twenty lecturer participants, while not disagreeing that understanding student prior knowledge and experience as well as learning styles and preferences are important for personalised learning, believed that this depended on the nature of the course being offered and that prior knowledge and experience of students could be taken care of "*by having a basic introductory course*" (Participant_L17). One administrative personnel interviewee also stated that courses have minimum entry requirements and, therefore, an understanding of students' prior knowledge and experience "*might be useful but not crucial*" (Participant_A1). Some of these comments are shown below:

> *"It will depend on the nature of the course being delivered. If it is a third year module which is a continuity of a second year module then yes." (Participant_L11)*

> *"It depends. If it is an advanced course, then some kind of pre-assessment might be necessary for the students to determine if they are ready for this course or whether they need to take the introductory version prior to taking the advanced course. on the other hand, students can always look up concepts they do not understand as they go along." (Participant_L16)*

> *"It helps in cases where students have different backgrounds and knowledge, but this can be taken care of by having a basic introductory course." (Participant_L17)*

> *"It might be useful but not crucial as all courses have a minimum entry requirement." (Participant_A1)*

However, two lecturers disagreed and responded with the following:

> *"No, but that won't help as even if everyone has different knowledge and experience, we need to teach the same way whether some students have already got the knowledge or not and whether they have different learning preference." (Participant_L1)*

> *"Not that much because we have specific set of lessons to cover in class and finishing the syllabus is the essential part whether the student has prior knowledge and experience or not. Learning style is not considered. We give lectures and students make notes." (Participant_L8)*

It is evident from the responses received that having a student model, where students' prior knowledge and experience as well as learning styles and preferences are considered, is not common practice within the Mauritian higher education's settings. However, as stated by Koch and Wirsing (2001), without knowledge about the learners, a system would act in the same manner for all of them. Based on findings from the literature, it is argued that, while students, particularly high achievers, would still learn even if their learning experiences and preferences were not taken into account, low and average achievers can perform significantly better in an environment where their learning attributes are taken into account (Santally and Senteni 2006; Dunn et al. 1995).

The importance of offering a personalised learning experience to students within the E-learning environment cannot be overlooked (Volery and Lord 2000; Soong et al. 2001; Oliver 2001; McPherson and Baptista Nunes 2007a; Selim 2007a; Fresen 2007; Musa and Othman 2012; Bucos, Dragulescu and Veltan 2010; Šimić, Gašević and Devedžić 2004). The E-learning system "*needs to be compelling to students it targets, offering the student a resource that is seen to be appealing, valuable and productive to their goals and aspirations*" (Selim 2007b, 160). For this to be possible, as pointed out by Santally and Senteni (2006), the student model, which allows the students to declare their interests, preferences and educational goals, is an important part of the system as it will contain the necessary individual attributes of the learner to allow for a more personalised learning experience. The model can be gradually built as the student interacts with the learning system, while inputs from the lecturers can assist with updating the student model based on their interactions with students (Brusilovsky and Peylo 2003; Santally and Senteni 2006).

- ***Documents' findings***

The Mauritian Government recognises the need to move from a "*one size-fits-all*" culture to one valuing "*individual learning achievements"*(Human Resource Development Council 2006, 31). In line with national strategies for transforming

Mauritius into a knowledge hub and centre for higher learning, the Mauritian Government proposed a number of recommendations and took a number of initiatives to support more personalised learning with proposals to review the curricula, across educational levels, to consider and adapt to the specific needs, levels and life experiences of the learners (Ministry of Education and Culture and Human Resources 2009b; National ICT Strategic Plan 2007). Such endeavours further confirm the importance of 'Personalised Learning' and the 'student model' for a holistic representation of E-learning 3.0 within the Mauritian context.

Taking all these into consideration and given the criticality of the student model within the E-learning 3.0 model, as discussed in the literature review chapter (see section 2.11.2), this sub-characteristic is retained as part of the 'Personalised Learning' characteristic. However, taking into account the responses from interviewees, 'Student model' is renamed 'Towards the student model (Prior knowledge and experiences, Educational goals, Learning styles and preferences). The addition of the term 'towards' seeks to explicitly indicate that Mauritian higher education institutions are yet to really consider a student model to achieve personalised learning, while at the same time, shows the need to make such a move to capture students' learning profiles within the E-learning system, as a critical component for personalised learning, as discussed in section 4.9.2. Furthermore, emphasising the different components that the student model needs to consider and capture for individual learners reinforces the need for a holistic consideration of the student model, not just courses' pre-requisites, as mentioned by some of the participants, for successful E-learning (Sridharan, Deng and Corbitt 2010).

- **Lecturer's Characteristics**
  - ***Interview findings***

On the other hand, while the lecturer's characteristics, including their attitudes and mindsets towards E-learning and students, their technology competency and their E-learning skills literacy, as discussed in section 4.9.2, are seen as critical for E-learning success, these same components are seen as major barriers for Mauritian lecturers to be E-learning ready, from interviewees point of views, as shown below:

"Mindset – resistance to change (I have always done it in a certain way, why should I change?" (Participant_L2)

"Readiness to change to a new way of teaching. The mindset I'd say." (Participant_L9)

"It's just that they are comfortable with the current system and they don't want to change. They are not aware of the personal benefits that adoption of e-learning could bring to them. They don't want to adopt things that others are better at them in doing." (Participant_L11)

"Resistance to change the way they work (lecturers)." (Participant_A1)

"Mauritian lecturers have to get over the traditional teaching techniques. One of the biggest barriers is that the teachers do not want to experience new things in their learning way." (Participant_A4)

However, it is important to note that, fifteen of the twenty lecturers who were interviewed, have used or currently use some kind of E-learning platforms (mostly Moodle, though few mentioned Blackboard) to "*share class materials, for announcements/discussions and for students to submit assignments." (Participant_L16).* At the same time, 50% of lecturers stated that they were confident and comfortable about teaching within an E-learning environment, as long as the necessary support is provided to them, particularly through training, as shown in some of the comments below:

"I believe I will be able to but will need some type of coaching/mentoring from an academic who has carried out online classes before." (Participant_L3)

> *"I have already had training sessions on how to work with Moodle. However, more training will be required to be able to start teaching online." Participant_L10*

> *"I am quite comfortable and confident to teach online classes since as a lecturer, I have the assistance of some people who are specialized in setting up platforms for E-learning to take place. Our job becomes easier in this sense, since any technical problems are dealt by the experts." (Participant_L20)*

The responses above indicate that lecturers and administrative personnel are enthusiastic about online learning. However, as pointed out by Oliver (2001), there are a number of barriers which limit the move toward E-learning or the adoption of new teaching and learning technologies, including psychological barriers, teachers' alternative underlying pedagogical beliefs that often preclude ICT, difficulties in changing teachers' deep-rooted mental structures on the art of teaching and the difficulty for teachers of keeping up with the pace of ICT developments, all very much in line with comments from interviewees.

- ***Documents' findings***

The Government of Mauritius recognises that the quality of education is "*largely a function of the teaching quality and personal qualities and motivation of the teachers*" (Ministry of Education and Culture and Human Resources 2009a, 42). The need to empower instructors with the required knowledge, values, skills and attitudes is seen as a critical aspect towards education reform in the country, as clearly stated in its Education and Human Resources Strategy 2008-2020 (Ministry of Education and Culture and Human Resources 2009a).

Based on these findings, the sub-characteristic 'Lecturer's characteristics' was retained, but with more explicit information added to it on the different aspects and attributes that the 'lecturer's characteristics' was referring to, within the context of the E-learning 3.0 model. Thus, the sub-characteristic was renamed 'Lecturer's characteristics (Mindset, Technology competence, E-learning skills literacy)', with the three main aspects of the lecturer's characteristics, namely, mindset, technology competence and E-learning skills literacy, detailed out, following responses from the

interviews and findings from the literature review and the surveys (see Sections 2.11.2 and 4.9.2) (Webster and Hackley 1997; Selim 2007b; Volery and Lord 2000).

Given the opportunities that E-learning can bring to facilitate more personalised learning, the numerous benefits associated with personalised learning and the criticality of the student model as well as the lecturers' characteristics, as shown by the literature review and findings from the surveys and the interviews, both sub-characteristics were retained. However, as explained above, they were renamed to more pertinently capture the perceptions of interviewees and to more accurately reflect the current educational landscape in Mauritius. Table 5.6 shows the 'Personalised Learning' characteristic and associated sub-characteristics before and after the interviews and documents' analysis. Appendix Q provides all the responses from the interviews of lecturers and administrative personnel related to 'Personalised Learning'.

Table 5.6: Personalised Learning – Before and After Interviews and Documents' Analysis

Before Interviews (as per Revised Holistic E-learning 3.0 Model)	**After Interviews/ Documents Analysis**
Personalised Learning	**Personalised Learning**
Student model	Towards the student model (Prior knowledge and experiences, Educational goals, Learning styles and preferences)
Lecturer's characteristics	Lecturer's characteristics (Mindset, Technology competence, E-learning skills literacy)

5.9.2.3 Pedagogy

The educational system in Mauritius, similar to that of many developing countries, is "*teacher-centred, syllabus-driven, textbook-centred and examination-oriented*" (Allybokus 2015, 31). However, the Mauritian Government, in its quest to make Mauritius the digital hub of the region, aspires to improve the Mauritian education system with a "*focus on critical thinking, problem solving, data literacy and working collaboratively*" and where flexibility of learning in terms of time and location is better supported (Ministry of Technology & Communication & Innovation 2018, 6). It promises to undertake interventions in the educational system to bring a gradual change towards a system which is "*realistic*" and which is "*commensurate with the*

requirements of emerging and future economic challenges" (Rughooputh 2003, 2). Therefore, E-learning and the aspect of 'Pedagogy' in E-learning remain, undisputedly, essential in the way forward towards making Mauritius a knowledge society. 'Pedagogy', as discussed in section 4.9.3, consisted of the sub-characteristics 'Syllabus', 'Student centered teaching' and 'Student's and lecturer's roles in course delivery, following the surveys' analysis. Findings from the interviews and documents explored on this essential aspect of the E-learning 3.0 model, are discussed below.

- **Syllabus**
  - ***Interview findings***

Interview responses from both lecturers and administrative personnel showed participants' concerns about the current structure of the Mauritian curriculum which is considered as "*bulky"*, "*does not cater for E-learning"* and is "*exams-focused only" (Participant_L19).* Many participants see the lack of a structured curriculum to support E-learning as one of the major barriers to the adoption of E-learning in Mauritius and considers that E-learning will work if this is reviewed as indicated in some of the comments below:

> *"the courses are not designed to suit E-learning." (Participant_L2)*

> *"The focus is on finishing a bulky syllabus rather than providing an interesting learning experience for students. Lecturers have to ensure all content are covered before exams. Too many students and no time to think about adapting content to E-learning" (Participant_L4)*

> *"the bulky curriculum does not cater for E-learning." (Participant_L19)*

> *"the curriculum needs to be adapted to meet the needs of E-learning. The current courses are not structured to suit E-learning. It is more for face to face delivery." (Participant_L4)*

These comments confirm the need for a structured syllabus that supports E-learning and includes course content and deliverables, course design and course delivery. As pointed out by Rughooputh (2003, 10), the syllabus should be "*diverse enough to cater for various individual differences*" where the materials used and the methodologies employed are adapted to meet their needs.

- ***Documents' findings***

The Government of Mauritius has promised a review of the educational curricula so that they are meaningful to the learner and place "*more emphasis on information investigation, communication and social skills*", with learning content adjusted to "*real life context*" and support "*greater diversity of methods for student assessment*", where "*instructional methods that stimulate active learning*" are promoted and applied, with "*focus on individual interests and needs*" and "*team work among students*", where "*higher responsibility among students for their own learning*" are encouraged and where instructors work together collaboratively (National ICT Strategic Plan 2007, 73; Gillwald and Islam 2011). The National Curriculum Framework (Ministry of Education and Culture and Human Resources 2009b, 14) emphasised the need for a "*holistic*" curriculum which "*provides for the overall, wholesome development of the individual in his/her physical, social, emotional, intellectual, aesthetic and moral dimensions*". Even the University of Mauritius, has as key actions, in its strategic plans 2015-2020, to *"Develop programmes that support innovative, inter-disciplinary and diverse curricula"* (University of Mauritius 2015, 5).

Given the importance of a structured syllabus which is suitable for E-learning, as per the comments from interviewees and in line with the Mauritian Government initiatives of reviewing the curricula, the sub- characteristic 'Syllabus' was retained but renamed 'Curricula supporting E-learning', to emphasise the need for an appropriate E-learning syllabus, as seen from the interviewees' comments and to align with the term 'curricula' as used by the Mauritian Government.

- **Student-centered teaching**
  - ***Interview findings***

Interviewees' responses showed that eighteen of the twenty lecturers were ready to take on a more collaborative approach in their delivery whereby students can take more responsibility for their learning and the lecturers can act more as facilitators. Two of

those eighteen lecturers also pointed out that they are already doing this within their teaching environment. Some of the comments from interviewees are shown below:

> *"Fully ready* [to take on a more collaborator role in course delivery]. *Our learners are changing. The instructor is no more the prime source of information. Digital natives now have access to a wealth of information via the Internet and it would seem that they better through collaboration on social media platforms. As an instructor, I need to adapt to this preference for learning." (Participant_L2)*

> *"I am already trying to be more collaborative in my teaching. Yes, it is high time we shift towards a 21st century teaching where learning goals are more challenging and appropriate to build the career of our students." (Participant_L19)*

> *"I am ready for the change* [to take on a more collaborator role in course delivery] *because I believe that change is truly the word of this century. The 21st century learners are independent enough to navigate through the course on their own. hence, I would say that the change is a two-way process: it involves both lecturers and students." (Participant_L20)*

A study conducted by Gunness (2011, 13) also showed that academics in Mauritius are steadily being "*less resistant to new methodologies*" and can "*see the benefits of inculcating learner-centred approaches both in their teaching and learning practices*". However, many lecturers pointed out there is still a lot to be done to make teaching and learning more collaborative, which requires time, support and a change in the mindset of lecturers and students as shown by some of the comments below.

> *"the students need to be the focus rather than the syllabus. However, students will need time to adjust because they will be expected to take more control of their progress and studies. It might be a challenge for some." (Participant_L4)*

> *"it could be hard because everyone is used to the traditional class model and students and lecturers will need support to adapt to new ways of teaching and learning." (Participant_L12)*
>
> *"Yes, but overtime with a change in mindset." (Participant_L13)*
>
> *"Yes, this is the future of education. But this is a gradual change. Elements of e-classrooms should be incorporated gradually into existing classroom environments, creating some sort of mixed environments, where the best of both methods can be fully tapped." (Participant_L16)*

Nonetheless, some interviewees remained sceptical towards adoption a student centered teaching approach with one lecturer participant (Participant_L1) stating that "*time is limited*" and he "*would rather continue with the current teaching methods*" he has been using, while another one (Participant_14) found this approach to be "*more meaningful for highly mature students like MPhil/PhD students*". As a matter of fact, most lecturers in Mauritius "*enjoy complete autonomy in the selection of their teaching method*" with teacher-centered teaching methods generally employed, even after having learnt about the benefits of student-centered teaching in their professional training courses (Allybokus 2015, 4). Expecting lecturers to adopt a student-centred teaching environment instantly when they have not been exposed to such pedagogical methods has been argued to be unrealistic (Brodie, Lelliott and Davis 2002; O'Sullivan 2004). The Diffusion of Innovation theory showed that past experiences have a direct effect on the adoption of new innovative practices (Rogers 2003). Guskey (2002, 386-387) also pointed out that it is important to recognise that such a change can be a difficult process as the lecturers will not just "*easily alter or discard the practices they have developed*", "*even when presented with evidence from the most carefully designed experimental studies*" as change can be threatening and carries a certain amount of uncertainty and anxiety.

- ***Documents' findings***

It is important to note that while Government policies in Mauritius do not mandate any particular teaching strategies, the Government is encouraging a move from "*a knowledge transmission model towards a knowledge construction model*", where

instructors change from being "*only a knowledge provider to becoming equally a guide in the teaching learning process*" (Allybokus 2015, 18). Planned reforms, as outlined in national strategy plans, propose a "*paradigmatic shift that does away with the very causes of current systemic dysfunctions and lays down the basis for innovative practices which will respond to the exigencies of the current local and global contexts*" (Ministry of Education and Culture and Human Resources 2009b, 14). Similarly, the Mauritian action plan report for the tertiary education strategy stressed the importance of pedagogical trainings to promote a "*facilitative and supportive*", learner centered competence and problem based teaching approach, away from the traditional "*authoritarian*" teaching method (Van 't Rood et al. 2016, 23). The main university in the country, the University of Mauritius, is committed, in its strategic plans, to make the move towards student-centered teaching and adopt innovative teaching practices to create an environment which promotes active learning and engagement, paving the way for others to follow (University of Mauritius 2015).

However, as shown by the interviews' comments, such a move can be "*hard" (Participant L_12) and "…will take time as most lecturers and students are familiar with the traditional lecture style and may take time to adapt." (Participant_L3)*. The Mauritian Government acknowledges that such change necessitates a gradual introduction and implementation in a manner "*that does not make the main actors insecure or resistant*" but, instead, considers and builds on "*existing structures*" to "*enlist their full participation*" (Ministry of Education and Culture and Human Resources 2009b, 16).

With the high percentage of positive responses for a more collaborative teaching and learning approach, the sub-characteristic 'Student-centered teaching' was retained but renamed 'Towards student-centered teaching' to capture the need for a gradual move towards it in line with comments from interviewees and the country's proposed reforms and initiatives to improve the education system.

It is also important to note that, the "*change in mindset" (Participant_L13),* as commented on by participants, was a recurrent theme across both the interviews from Mauritian lecturers and administrative personnel. Soong et al. (2001) argued that the mindset of both the student and the instructor play a critical role in how they behave within the learning environment. They (Soong et al. 2001, 106) stated that if learning

is perceived as "*knowledge absorption*" rather than "*knowledge construction*", then participation and contribution levels will to be much lower as a result of that perception. This aspect of mindset has also been considered as part of the lecturer's characteristics for 'Personalised learning' as discussed above in section 5.9.2.2. However, because of its recurrence in the interview responses, not just related to the 'Pedagogy' or the 'Personalised Learning' characteristics but extended to other critical components of the E-learning 3.0 model, this theme emerging from the interviews was considered and discussed separately in section 5.9.2.8: Additional findings below.

- **Student's and lecturer's roles in course delivery**
  - ***Interview findings***

Two lecturers were quite sceptical about having lecturers' and students' roles changed to a more collaborative approach with comments such as *"some students can succeed. Most will not"* (Participant_L1) and *"Students are used to spoon feeding and lecturers just want to deliver their lessons for the day and move on. This will be challenging for Mauritius because there is no visible incentive to change the way things are done"* (Participant_9). However, most lecturers and all administrative personnel agreed that students can adopt a more collaborative role in their learning rather than being spoon fed. However, they also unanimously agreed that this shift, while being the way forward, is challenging and requires guidance, both to lecturers and students. Some of the comments are presented below:

> *"I strongly think that collaboration can work if guided. Already a lot of collaboration is already happening via social media. What is lacking there is a structure. For e.g. instead of an unstructured discussion on a topic, students could be given a case study to discuss on or an ethical dilemma to reflect on or simply a problem to solve via social media. The level of discussion which often follows is quite amazing. The lecturer only intervenes for advice and direction." (Participant_L2)*

> *"Mauritian students have been spoon fed since an early age and I strongly believe that at university level, this should not be the case. Independent learning should be encouraged. Mauritian students*

studying abroad collaborate to their learning, and so there is no reason why students in Mauritius should be spoon fed." (Participant_L10)

"I think the students if given the opportunity through active projects, working on collaborative projects, problem-based activities they can become more autonomous. The lecturer should be there to facilitate. I also think that the pedagogical approaches should evolve and technology should be integrated whereby students are given the opportunities to learn through technologies." (Participant_L12)

"spoon feeding should be banned practice. the lecturer should be skilled enough to put content which stimulates the minds of the students. the e-learning platform will be simply a tool to do it faster." (Participant_A6)

Given that the Mauritian education system is "*immersed in a culture*" where "*performance in examination*" has precedence (Allybokus 2015, 141), students prefer to be spoon fed by the lecturers to maximise their chances of success in their examinations while the lecturers equally prefer such teaching approaches due to the pressure of "*finishing a bulky syllabus" (Participant_L4)*, particularly when the student's performance is at stake (Toh et al. 2003). One of the participants (Participant_L20) even stated that "*the idea of spoon feeding will result into students' success is a myth that teachers and lecturers themselves have created"*. Researches showed that instructors are often influenced by their own experiences as students and tend to adopt approaches similar to those they themselves experienced as students, irrespective of their subsequent professional teacher-training (Nespor 1987; Trumbull and Slack 1991; Pajares 1992; Goddard and Foster 2001). Additionally, the change in roles may be viewed by some lecturers as a threat to their authority and professional status of being the main ones controlling the class and, consequently, may prefer to adhere to the traditional roles of students receiving knowledge and lecturers, as the sole authority, delivering it (O'Sullivan 2004; Dyer et al. 2004; Ajaheb 2011; Santally and Senteni 2005). Moreover, operating in an online environment has an effect on the

learning culture of students, the teaching culture of the lecturers and the educational conceptions with which they are familiar (Santally and Senteni 2005).

- ***Documents' findings***

However, emphasis on students to develop greater autonomy in their learning by being at the centre of the learning process continues to be reiterated across all proposed educational reforms in the country (Ministry of Education and Culture and Human Resources 2009b). As outlined under the sub-characteristic 'Student-centered teaching', both the Government and tertiary institutions in the country are committed to promote an environment of active learning and engagement with the learners "*at the centre of the learning process, constructing meaning, understanding reality and developing greater autonomy in learning*" (Ministry of Education and Culture and Human Resources 2009b, 14; Van 't Rood et al. 2016; University of Mauritius 2015). A change in the role of instructors from "*authoritarian to facilitative and supportive*", with a focus on problem-based learning and independent analytical and critical thinking from learners are significantly emphasised in the Action Plan for the Tertiary Education Strategy Plan (Van 't Rood et al. 2016, 23).

Consequently, given the importance of the sub-characteristic 'Student's and lecturer's roles in course delivery' within the holistic E-learning 3.0 model, it is retained as part of 'Pedagogy'. However, it is renamed 'Guided shift in student's and lecturer's roles in course delivery', in line with the interviews' responses, to acknowledge that while this change in roles could be challenging in the Mauritian context, with guidance and support, this shift is possible.

- **Additional findings under 'Pedagogy' characteristic**
  - **Evaluation and feedback**
- ***Interview findings***

While the 'Assessment and evaluation' sub-characteristic was included in the sub-characteristic 'Syllabus' following the factor analysis in Sections 4.6.3.3 and 4.7.2.3, during the interviews, both lecturers and administrative personnel stressed the need for prompt evaluation and feedback as a critical aspect to support the change in teaching and learning within the E-learning environment. They all agreed that course evaluation is important if not highly important, as shown in some of the interview responses below.

"They can collaborate to their learning provided they are guided properly at the start. Or evaluation is done at different stages." (Participant_A4)

"Both students and lecturers can be collaborators if delivery is well structured with clear milestones and deliverables etc. That is after each topic, there are MCQs to test students' understanding of the topics they read about and a small assessment is conducted after each topic with feedback about things they need to improve." (Participant_L7)

"Yes, if they are supported properly and provided with timely feedback." (Participant_A7)

Prompt evaluation, both formative and summative, is part of the learning process. Formative assessments allow students to track their learning progress, which when coupled with the necessary corrective activities, help students to improve both their learning and their confidence, particularly critical when new technologies and teaching and learning practices are employed (Bloom, Madaus and Hastings 1981). Additionally, they offer lecturers specific feedback on the effectiveness of their teaching and learning practices as they provide "*direct evidence of the results of their efforts and illustrate precisely the improvements made in students' learning*" (Guskey 2002, 387). Positive results from such feedback can result in a sustained adoption of new technologies and teaching and learning practices, as they play an important role in boosting the confidence of the lecturers, resulting in a change in attitude and beliefs (Guskey 2002).

However, as pointed out by Pryor and Lubisi (2002), the nature of evaluation and assessment, has been one which resisted going beyond summative examinations. Evaluation and feedback within the Mauritian educational context has been that of showing what is deficient with the students' learning and progress rather than acknowledging what has been achieved in terms of skills and competencies, as good grades are often considered as the only measure of success as opposed to understanding for learning (Allybokus 2015).

Equally important is the evaluation of the actual E-learning courses other than the assessment and evaluation of students' performances in the courses, which is often overlooked (Benigno and Trentin 2000). The interview responses showed that four of the twenty lecturer interviewees did not believe that feedback on course evaluation are genuinely taken into consideration while seven of them and two administrative personnel interviewees were undecided whether feedback on courses were being taken into account. But, as stated by Goodyear (1999), evaluation and persistent improvement are critical to the success of E-learning programmes. If the use of new practices is to be sustained, individuals involved need to receive regular feedback on their efforts.

- ***Documents' findings***

The TEC, in its quality assurance report for the Open University of Mauritius, pointed out that the curriculum is mostly based on "*an accumulation of knowledge with less focus on assessment of higher level skills and interpretation*" (Tertiary Education Commission 2015, 11). As a means of ensuring the highest quality of teaching and learning environments in tertiary institutions, the Education and Human Resources Strategy Plan 2008-2020 proposed regular Student Assessment Surveys "*so that the aspirations of students in terms of educational and extracurricular facilities as well as quality delivery of programmes are met"(Ministry of Education and Culture and Human Resources 2009a, 115)*. The TEC continues to stress the importance of continuous monitoring of programmes to ensure the highest quality courses are delivered to students (Tertiary Education Commission 2015). It made a series of recommendations to universities to move away from the "*very traditional*" assignment methods relying "*heavily on an unseen examination and coursework*" to different modes of assignments that can demonstrate students' achievements including their skills (Tertiary Education Commission 2015, 12). The TEC went further by recommending an "*overarching assessment strategy that takes account of the type of students, the mode of delivery, DL and blended learning approaches, the importance of feedback and feed forward for effective learning and progression of students*" (Tertiary Education Commission 2015, 12). Similarly, it recommended that the University of Mauritius establish an internal research function that would foster and oversee "*the development of appropriate institutional systems for benchmarking, student and employer surveys, and impact studies*" (Tertiary Education Commission 2012, 25)

Therefore, given the importance of evaluation and feedback from the very beginning in the literature review, all the way to the interview responses and documents' findings, this aspect of 'Pedagogy' is retained and included as a sub-characteristic of its own to highlight its importance. The sub-characteristic was also renamed 'Evaluation of student's and course's performances and feedback' to reflect findings from the interviews and at the same time to align with the literature review.

- **Blended delivery**

➢ ***Interview findings***

Findings from the interviews also revealed the need to adopt a blended delivery approach to support the gradual move towards E-learning and embracing new technologies such as E-learning 3.0 in the Mauritian higher education sector. Essentially, the comments indicated that the move towards E-learning should be gradual to overcome the challenges associated with changing the traditional ways of designing and delivery courses. Some of these comments are given below:

> *"I think Mauritius still require a blend of both e-learning platforms and face to face contact. E-learning requires a culture of self-reflection which has not yet been adopted by Mauritians. It also requires more self-discipline which could be an issue for younger students." (Participant_L2)*

> *"I believe students themselves will be comfortable, only if they have some form of face to face contact as well with their lecturers." (Participant_L3)*

> *"For students to be active online learners, it is up to us the lecturers to be creative, proactive and innovate in our classroom. I think the Mauritian students today have easier access to technology and are rather computer proficient. We should tap on the potential of technologies to make the learning environment more conducive. It does not mean that there should not be face to face session. I think the flipped classroom model would be beneficial whereby the classroom time is devoted to discussion, hands on activities instead*

> *of the teacher lecturing and the students copying notes." (Participant_L12)*

> *"The shift from F2F to online classes should be gradual. From F2F, instructors should incorporate some elements of e-learning such that in the future, more and more e-learning components would gradual pave the way to a class which is entirely conducted online." (Participant_L16)*

Studies conducted at the University of Mauritius showed that *"a blended approach to online learning can be viewed as an effective transitional phase on the continuum from traditional classroom courses to fully online programmes"* (Vencatachellum and Munusami 2003, 8). In such an environment, courses can be delivered using both face-to-face and online learning platforms, with E-learning elements gradually replacing classroom time with less face to face teaching and more online learning (Bates 2001; Kasseeah 2012). As a result, challenges for students and lecturers, including adapting to new teaching and learning approaches, new ways of interacting and IT skills and capabilities required for the online environment, can be overcome or become more manageable. While E-learning offers a number of opportunities for students to be autonomous learners, where they can process course content based on their individual preferences, anytime, anywhere (Paechter and Maier 2010), unfamiliarity with such an environment can result in "*surface learning*" (Huon et al. 2007, 26; Paechter and Maier 2010). On the other hand, lecturers, particularly those not conversant with the use of new technologies as well as new teaching approaches, are prone to show resistance to a fully online learning environment, as noted by *Participant_A6* who stated that "*old fashioned lecturers will be reluctant to embrace the e-learning as there will be resistance to change*". A gradual change provides the "*grounding area*", allowing lecturers to design, develop and deliver effective mixed programmes while progressing towards a complete E-learning environment (Esyin 2008, 345). This aligns with findings from the lecturers' survey where 49% of lecturers preferred a blended delivery approach as shown in Section 4.7.1.1. With the inherent culture of traditional classroom delivery for the majority of students and lectures in the Mauritian higher education environment, the blended approach to online learning is seen as the ideal starting point (Vencatachellum and Munusami 2003).

- ***Documents' findings***

The blended delivery approach is supported by the Mauritian Government as seen by the Open University of Mauritius initiative where a blended mode delivery approach has been adopted to meet the needs of the different learners with contact classes deemed "*necessary to enhance the learning experience*" of learners (Tertiary Education Commission 2015, 4). This approach is further emphasised in the 'Digital Mauritius 2030' report (Ministry of Technology & Communication & Innovation 2018) which talks about harnessing the power and scalability of blended online courses to facilitate the move towards a knowledge society.

Consequently, based on these findings, 'Towards full online delivery via blended delivery' is added as another sub-characteristic of 'Pedagogy'.

Following the above analysis, the researcher confirmed the importance of 'Pedagogy' as a characteristic for the holistic E-learning 3.0 model, with all sub-characteristics from the surveys' analysis retained but renamed and with two new emerging sub-characteristics as shown in Table 5.7. Appendix Q provides all the responses from lecturers and administrative personnel interviewees related to 'Pedagogy'.

Table 5.7: Pedagogy – Before and After Interviews and Documents' Analysis

Before Interviews (as per Revised Holistic E-learning 3.0 Model)	**After Interviews/ Documents Analysis**
Pedagogy	**Pedagogy**
Syllabus	Curricula supporting E-learning
Student centered teaching	Towards student-centered teaching
Student's and lecturer's roles in course delivery	Guided shift in student's and lecturer's roles in course delivery
New Findings	
	Evaluation of student's and course's performances and feedback
	Towards full online delivery via blended delivery

5.9.2.4 Collaboration

The interviews revealed that collaboration is seen as a major advantage that E-learning can bring to higher education in Mauritius, with 50% of participating interviewees

believing that the lack of interaction is a major issue in face-to-face classes that E-learning. This is indicated by some of the comments below:

> *"High number of students in the classroom and limited interaction possible." (Participant_L6)*

> *"Usually during the face to face classes, especially with big cohorts, it is not always possible to get responses from students." (Participant_L12)*

> *"Face to face classes with the students of university does not give the same outcome which an e-learning session can. There are a number of students who still have the fear to talk in front of the class. For example, if a question is asked to a group of students in a face to face session, hardly some will answer to it, whereas if the same question to same group of students in an e-learning session and almost all the students will share their views." (Participant_A4)*

> *"More collaborative learning culture is encouraged by e-learning." (Participant_A5)*

These comments support 'Collaboration' as a critical aspect of the E-learning 3.0 model. The analysis of the responses for its sub-characteristics, following the survey phase, namely 'Interaction and resource sharing between students' and 'Interaction and resource sharing between students and lecturers' are discussed below, corroborated with documents findings.

- **Interaction and resource sharing between students**
  - ***Interview findings***

Many interviewees agreed that students enjoy interacting with each other, particularly on social media and on online platforms. Participant_L16 and Participant_A3 pointed out respectively that, "*the more they* [students] *interact with each other online, the more confident they seem to get"* and "*They* [students] *are quite active on the chats, forums etc and seem to enjoy the experience of online platform during these*

interactions". In fact, 70% of lecturers stated that their students use collaborative learning tools such as discussions forums, chat rooms, wikis, which seem to be initiatives taken by students themselves rather than being a course requirement except for four lecturers who explicitly mentioned that these are an integral part of their courses. Participant_L9 pointed out that "*Some* [students] *do have their own blogs and aim at sharing their experiences as well. This encourages others to participate if they feel they are benefiting from the experience".* Similarly, Participant_L8 stated that *"Yes, they* [Students] *do interact a lot by themselves and this helps build a better conducive atmosphere for learning. Gradually the trend is changing and a more collaborative environment is seen between students because of things like social media which is great for their learning.*". More comments are shown below:

> *"As mentioned before, I strongly think that collaboration can work if guided as students already collaborate a lot via social media." (Participant_L2)*

> *"They are quite active on the chats, forums etc. and seem to enjoy the experience of online platform during these interactions." (Participant_A3)*

However, a degree of reluctance among students to collaborate is noted by some lecturers and administrative personnel as shown in the below comments. One participant even stated that students "*work together either because they have to as part of the course requirements or because they can benefit being part of a team for good grades*" (Participant_L5).

> *"If given the choice, students will obviously prefer the easy way out. However, if they believe it is the only method available, they will surely make the effort. There are some who are very selfish with their studies because of the very competitive nature of Mauritian education and the focus of getting the best grades for exams. They will need to be provided with no choice but collaborate for them do to that. Unless they are confident that interaction will assist them with their studies, they won't do it." (Participant_L3)*

> *"They can definitely collaborate, but there is reluctance to do so because they like to be spoon fed and also because of the competitive nature of many students who see collaboration as a way of others performing as good as them." (Participant_L18)*

> *"Some of them do participate in discussion forums to share their ideas and opinions. But many do not because there is not much a culture of sharing in Mauritius because the education system is too focussed on exams and getting better results than your fellow classmates." (Participant_L20)*

> *"Many students do not like to share their knowledge with others as the system is very competitive." (Participant_A5)*

Previous studies (Aurelie Bechina Arntzen, Worasinchai and Ribiere 2009; Fullwood, Rowley and Delbridge 2013; Cheng, Ho and Lau 2009; Goh and Sandhu 2013) showed that higher education institutions, particularly in developing countries, lack a knowledge-sharing culture, due to the highly competitive nature of the education system, which hinders collaboration and promotes an individualistic culture. The Mauritian higher education sector is no different. Collaboration, not just between students, but also amongst academics, is more often than not seen as a threat to success (Veer Ramjeawon and Rowley 2017). Nonetheless, many interviewees also agreed that "*given the opportunity to collaborate, students do so quite well. It is just a matter of giving them the chance to do so. Mauritian students are quite adaptable."* (Participant_L12) and "*given proper guidance, a culture of sharing and collaboration can be fostered*." (Participant_L19).

- ***Documents' findings***

The lack of collaboration between students was attributed to the mindset of students and education stakeholders as well as the absence of a conducive environment to promote collaborative learning within Mauritian institutions. The Education and Human Resources Strategy Plan 2008-2020 highlighted that the necessity of collaborative learning is often not seen by parents, particularly those with a "*result-minded*" ethos (Ministry of Education and Culture and Human Resources 2009a, 74).

This mentality is further reinforced by the "*lack of motivation*" from educators and "*absence of conditions to the inclusion of innovative pedagogical practices*" to support collaborative learning (Ministry of Education and Culture and Human Resources 2009a, 74). An improved educational curricula, as discussed in section 5.9.2.3, is seen as the solution to address this concern where team work among students as well as instructors are encouraged (National ICT Strategic Plan 2007, 73; Gillwald and Islam 2011).

Given the importance of interaction and resource sharing as shown throughout this study, from the literature review and all the way to the interviewees' responses and documents explored, this sub-characteristic is retained for the final model.

- **Interaction and resource sharing between students and lecturers**
  - ***Interview findings***

As discussed in the 'Pedagogy' section (see Section 5.9.2.3), over 80% of participating lecturers and administrative personnel supported the idea of a collaborative role between students and lecturers, with the majority of them considering the idea of spoon-feeding by the lecturers as something that *"should be banned practice" (Participant_A6).* Those holding reservations towards collaborative teaching and learning pointed that "*first of all there is a need to shift from an exam based mindset*" *(Participant_L11)* and that *"it should be possible. But it is not easy" (Particiant_L17)* and *"Some students can succeed. Most will not" (Participant_L1)*. Because of the spoon-feeding culture that exists in Mauritius, which is considered a *"a big issue" (Participant_L15)* in the country, participants repeatedly stated that collaboration between students and lecturers will work provided they are *"given the proper support and guidance"* (Participant_L20). Some of the comments are outlined below:

> *"I strongly think that collaboration can work if guided." (Participant_L2)*

> *"They can collaborate to their learning provided they are guided properly." (Participant_L4)*

- ***Documents' findings***

The development of interactive learning and fostering student engagement are key benchmarks set out in the Action Plan for the Tertiary Education Strategy Plan (Van 't Rood et al. 2016). Developing autonomous learners through planned education reforms and pedagogical trainings to encourage collaborative teaching and learning are seen as part of the solution to move away from the 'spoon-feeding' culture prevalent in the country (National ICT Strategic Plan 2007, 73; Gillwald and Islam 2011; Ministry of Education and Culture and Human Resources 2009a). As discussed in section 5.9.2.3, educators are encouraged to take on the role of facilitators and collaborators in the students' learning process, although Government policies do not impose such change per se, as seen from the documents analysed.

Following these findings, which stressed the importance for lecturers to be collaborators in their students' learning, the sub-characteristic "Interaction and resource sharing between students and lecturers" was retained.

- **Additional findings under 'Collaboration' characteristic**
  - **Interaction and sharing between lecturers**
- ***Interview findings***

Interviewees also pointed out that there is a lack of interaction, sharing and collaboration, in general, among lecturers, as shown by some of the comments below:

> *"Many lecturers do not put in the effort to create appropriate materials for their courses and just enjoy using the work of others. As a result, there is reluctance to collaborate at times because of this. Sharing and collaboration is often used by those who see personal benefits in it." (Participant_L7)*

> *"… Even lecturers should be encouraged to collaborate with each other for their content and for the best pedagogical approach. Not just students." (Participant_A6)*

> *"Lecturers themselves do not like to collaborate with their colleagues because they themselves were not used to teamwork as*

> *students. So they do not necessarily encourage collaboration among students as they themselves often do not perceive its usefulness." (Participant_L20)*

Previous studies also showed that many academics at the university level "*consider knowledge as power and prone to knowledge hoarding*" (Veer Ramjeawon and Rowley 2017, 375). Sharing is seen as a threat by some where they are potentially giving away "*a source of power and expertise to others*" (Hislop 2009, quoted in Fuller, Vician and Brown 2006, 124). In fact, as stated by Allybokus (2015, 18), in Mauritius, "*there is no structure for developing a shared knowledge base about teaching*" among academics in Mauritius, where lectures often operate in "*isolation*", gaining their "*expertise in their practice through trial and error*" with no avenues for tapping into collective experiences and expertise. There is reluctance to collaborate, even at the content level, for fear of others taking advantage of such collaboration, due to a lack of enforcement of intellectual property rights, as discussed under the 'Content' characteristic (see Section 5.9.2.1).

Undoubtedly, an environment where lecturers collaborate with each other and complement each other's skills and knowledge sets, produces effective educational environments and is considered critical for E-learning success (McPherson and Baptista Nunes 2007b). Facilitated communities of practice that encourage lecturers to share their use of E-learning with each other should be made common practice, with willing lecturers given the necessary support and incentives to become mentors and technology champions to coach their colleagues (King and Boyatt 2015; Covington, Petherbridge and Warren 2005). Additionally, with the novel concept of Open Educational Resources (OERs) gaining momentum, and the reported benefits associated with such initiatives such higher educational institutions gaining numerous rewards in terms of enhanced reputation and exposure to the development of innovative ways to produce E-learning materials (Bossu, Brown and Bull 2012; Wiley and Gurrell 2009), the sharing and collaboration of content is coming at the forefront. As seen in Section 5.9.2.1, creating awareness about OER have begun in Mauritius through workshops organised by the University of Mauritius to academics and higher education content providers (Santally 2011; Gunness 2011). While still a novel concept in Mauritius, the implications of OER and how it can raise the profile of the Mauritian higher education sector and its contributors will benefit the country immensely towards achieve its vision of being the centre of excellence for and the

gateway to higher education in the region. Therefore, the need for lecturers to start collaborating among themselves becomes even more pressing as such collaboration is deemed critical as a stepping stone towards more innovative and rapidly growing concept such as OER that entails the free use and reuse of content by others (Bossu, Brown and Bull 2012). Through the different projects from the CILL of using and adapting available OERs such as from the Open University of the UK (Santally 2011), lecturers in Mauritius can already visualise how content sharing and collaboration can enable them to leverage high quality work contributed by the international community to benefit them and the students.

- ***Documents' findings***

The "*less than positive academic culture*" with a lack of teaching and knowledge sharing among academics was a main concern expressed by the TEC in its Quality Report for the University of Mauritius (Tertiary Education Commission 2012, 55). It recommended "*serious attention*" to be given to improving the internal academic climate to enable more willing, open and inclusive communication (Tertiary Education Commission 2012, 55). Similarly, in its quality assurance report to the Open University of Mauritius, the TEC recommended that appropriate considerations be given to effective collaboration among different units to help achieve the university's strategic objectives (Tertiary Education Commission 2015).

Given the importance associated with the need for lecturers to collaborate and the concerns being expressed for the current lack of such initiatives, 'Interaction and sharing of resources between lecturers' was added as a new sub-characteristic of 'Collaboration'.

Consequently, based on findings from the interviews, corroborated with findings from documents, the sub-characteristics 'Interaction and resource sharing between students' and 'Interaction and resource sharing between students and lecturers' were retained. The findings also revealed the emergence of new sub-characteristic 'Interaction and resource sharing between lecturers' to emphasise the current lack of and the importance of such an attribute for a holistic representation of 'Collaboration' within the E-learning 3.0 model. The resulting sub-characteristics of 'Collaboration' are shown in Table 5.8. Appendix Q provides all the responses from lecturers and administrative personnel interviewees related to 'Collaboration'.

It is also important to note that, the "*culture of spoon-feeding" (Participant_L10)*, as commented on by participants, was a recurrent theme emerging from the interviews with Mauritian lecturers and administrative personnel. However, because of its recurrence in the interviews' responses and not just related to the 'Collaboration' characteristic, this emerging theme is considered and discussed separately in section 5.9.2.8: Additional findings are shown below.

Table 5.8: Collaboration – Before and After Interviews and Documents' Analysis

Before Interviews (as per Revised Holistic E-learning 3.0 Model)	**After Interviews/ Documents Analysis**
Collaboration	**Collaboration**
Interaction and resource sharing between students	Interaction and resource sharing between students
Interaction and resource sharing between students and lecturers	Interaction and resource sharing between students and lecturers
New findings	
	Interaction and resource sharing between lecturers

5.9.2.5 Web 3.0 System

Central to the holistic E-learning 3.0 model is the characteristic 'Web 3.0 System'. However, findings from the surveys of Mauritian students and lecturers of the higher education sector (as discussed in Chapter 4) indicated a high level of unfamiliarity with this critical aspect of the holistic E-learning 3.0 model, particularly with Semantic Web concepts such as knowledge representation, knowledge repositories and ontologies. With the Mauritian Government's aim of positioning the country as the knowledge hub of the region, embracing emerging technologies to remain at the cutting edge globally is at the forefront of the agenda (Ministry of Technology & Communication & Innovation 2018; Gillwald and Islam 2011). Knowledge management is central to this endeavour with the Semantic Web seen as the emerging technology that will support knowledge creation and knowledge sharing. To further validate and gather perceptions of lecturers and administrative personnel on this crucial aspect of the E-learning 3.0 model, a set of questions was based on this aspect (as explained in section 5.4). The resulting findings for the 'Web 3.0 System' characteristic and associated sub-characteristics 'Knowledge, ontologies and other repositories', 'Usability and

accessibility' and 'ICT infrastructure supporting new technologies', following the interviews and documents' analysis, are discussed below.

- **Knowledge, ontologies and other repositories**
  - ***Interview findings***

Sixty-five percent of lecturer participants and fifty-seven percent of administrative personnel participants had heard about the Semantic Web. Interestingly, the overwhelming responses of participants in terms of where they see Mauritius with respect to the Semantic Web seem to revolve around the fact that this concept is still a new one and Mauritius still needs to work on sorting out the basic aspects of E-learning first. One participant (Participant_L14) also pointed out the lack of "*intra sharing of data*" in the Mauritian context, which may be an obstacle in the path of the Semantic Web usage in the country. Some of the responses are outlined below:

> *"This is a new concept. Mauritius will first need to understand E-learning properly before moving towards semantic web." (Participant_L1)*

> *"As mentioned earlier local data production is poor, so intra sharing of data as it happens in a semantic web is not relevant, there were some projects in the past like School IT Project with data centres for storage and dissemination of knowledge for secondary schools. Probably if there are similar projects including the industrial sectors, then the need for semantic web will be felt." (Participant_L14)*

> *"I know people who are doing research on semantic web and i have also given assignment to my students on semantic web - but maybe in Mauritius it will be mostly people in IT who know what it is and its importance - as for Mauritius i honestly don't know. This is still too new a concept and we are still struggling with getting E-learning to where it should be." (Partiicpant_L17)*

> *"E-learning needs to be applied properly first in Mauritius." (Participant_A1)*
> *"It will take time because we are still trying to understand how to deal with online platforms." (Participant_A3)*

Similarly, the interviewees' responses regarding their familiarity with the concept of ontologies and its use within E-learning in Mauritius showed that participants believed that more needs to be done to understand the basics of E-learning before Mauritius can begin to entertain such new concepts. As commented Participant_L2, this "*will take time as we are still working with understanding E-learning*" *(Participant_L2).* Similarly, the lack of sharing culture that prevails within the Mauritian context was pointed out as a barrier to the adoption of the Semantic Web and the use of ontologies, as commented by Participant_L14, who stated that the *"Use of semantic web or OWL may find a way when the country moves towards a knowledge base and digital economy. The only option I foresee this happening is in the context of an African regional effort to produce and share data and information. However, E-learning is still in its infancy in the country and this will take time. There is also a lack of sharing culture in the country which unless sorted, we cannot progress towards semantic web or think about the use of ontologies"*. Therefore, the overwhelming perceptions from participants remained that ontologies were too new a concept for Mauritius. Some additional comments on ontologies are shown below.

> *"It is too new a concept and as far as I am aware, we are not doing anything in this direction." (Participant_L10)*

> *"not anytime soon. It is a new thing and we still need to understand basic E-learning first." (Participant_L13)*

> *"Some research work at tertiary level has been done on the on the usage of ontologies but it is not a term that is commonly heard of. it will definitely be in the interest of Mauritian higher education to use ontologies for more structured, efficient and effective knowledge management systems." (Participant_A5)*

These findings align with the surveys' results where unfamiliarity with the Semantic Web concepts prevailed. But as discussed under the 'Content management' and 'Collaboration' characteristics (see sections 5.9.2.1 and 5.9.2.4), the creation, reuse and sharing of content are increasingly becoming the vanguard of success indicators of higher education institutions with the Semantic Web through ontologies having a critical role in facilitating the reuse and sharing of digital content. The use of ontologies to facilitate the discovery of digital content are now being extended to OERs with the Semantic Web technologies considered an appealing opportunity to allow for a sustained discovery and use of this rapidly growing data repository (Piedra, Chicaiza, López, Tovar, et al. 2010; Piedra, Chicaiza, López, Martínez, et al. 2010). Given the vital and ongoing need to make learning content accessible, easily located, understandable, relevant, meaningful and organised in a logical way to facilitate reuse and sharing (Buzzetto-More and Pinhey 2006), there is no denying the importance of the knowledge repositories and ontologies for a holistic representation of E-learning 3.0.

- ***Documents' findings***

Similar to the sub-characteristic 'Knowledge representation' (see section 5.9.2.1), no specific information on knowledge, ontologies and other repositories could be gleaned from the analysed documents. Findings from the explored documents regarding the move to online learning tend to focus on the infrastructure and the pedagogical implications as opposed to content and knowledge representation, aligning with findings from the interviews. Nonetheless, the analysed documents showed that the Government of Mauritius is keen on supporting and promoting collaboration between Mauritian universities and other regional and international knowledge institutions (Van 't Rood et al. 2016; Gillwald and Islam 2011; National ICT Strategic Plan 2007; Ministry of Education and Culture and Human Resources 2009a). Such collaborations are critical to promote the "*intra sharing of data*" to "*progress towards E-learning 3.0*" and "*the use of ontologies*" as commented by Participant_14.

Responses from the interviews on the sub-characteristic 'Knowledge representation' showed that participating lecturers and administrative personnel in Mauritius are unfamiliar with the concept of knowledge representation, aligning with the findings from the surveys (see Sections 4.6.1.2.2.1 and 4.7.1.2.2.1) and documents explored. However, given the importance of this sub-characteristic for the E-learning 3.0 model,

as seen in this study, it is retained but renamed, in line with comments from the interviews, as 'Understanding and working towards knowledge, ontologies and other repositories' so as to emphasise the need to first understand the Semantic Web concepts and then to work towards building the knowledge base to support the Semantic Web technologies.

Additionally, interviewees repeatedly pointed out the need to understand and establish the basics of E-learning first in Mauritius, as an initial step towards Web 3.0 as well the need to develop a culture of sharing before ontologies can be fully understood and implemented. As discussed in this study, E-learning is still in its infancy in Mauritius and more work needs to be done to turn online platforms into engaging and interactive learning environments supporting customised access to materials and fostering an environment of contribution and sharing through knowledge construction and understanding. In fact, proper understanding of E-learning and the culture of sharing have been mentioned repeatedly by interviewees, not just in the context of 'Web 3.0 System'. As a result, these two aspects are further discussed in Section 5.9.2.8: Additional findings below.

- **Usability and accessibility**
  - ***Interview findings***

Interviewees referred to usability and accessibility as key features required for E-learning to work in Mauritius and to boost the confidence of both students and lecturers within such an environment. However, usability and accessibility were also seen as current barriers to E-learning in the country. Some of the comments from interviewees are shown below:

> *"The E-learning platform must be easy to use for easy acceptance." (Participant_L4)*

> *"If universities dare to put adequate, easy to use system which supports ease of access to customised resources and encourage to change the mindset, E-learning will work." (Participant_L5)*

> *"If all logistics are available, the system is easy to use and the software allows for easy and efficient creation/update of contents*

and access to learning materials, then I would be comfortable and confident. Lecturers and students will eventually have to be confident that online is the way forward." (Participant_L13)

"we do not have access to the right online campus. The online portal must have the necessary features to support an online learning environment, which is user friendly and at the same time provide us with the necessary resources as and when needed." (Participant_L18)

- ***Documents' findings***

No specific information on usability and accessibility were mentioned in the analysed documents. However, making the E-learning environment as conducive as possible to promote effective and autonomous learning remains a major aim of the Government towards achieving the knowledge society status (Gillwald and Islam 2011; Ministry of Technology & Communication & Innovation 2018) and usability and accessibility features of the E-learning environment are central towards this achievement.

Given the importance of usability and accessibility from the beginning of the study as seen by the literature review (see Chapter 2: section 2.11.5, Appendix A and Appendix B) and the surveys' findings (see Chapter 4: Sections 4.6.1.2.2.5, 4.6.3.5, 4.7.1.2.2.5, 4.7.2.5 and 4.9.5), comments from the interviewees, backed by documents' findings further confirmed the importance of this sub-characteristic within the holistic E-learning 3.0 model. Therefore, 'Usability and accessibility' was retained as part of 'Web 3.0 System' with no change.

- **ICT supporting new technologies**
  - ***Interview findings***

Technology is considered as one of the factors to effectively adapt a technological innovation (Rogers 2003). The lack of the required ICT infrastructure, both the software and hardware components, to support new technologies can significantly hinders the adoption of emerging and innovative trends. In fact, the lack of ICT infrastructure with high internet prices and low bandwidth in Mauritius were barriers to E-learning put forward by most of the participating lecturers (90%) and administrative personnel (50%). Some of the comments were:

"Lack of infrastructure" (Participant_L5)

"The necessary infrastructure needs to be put in place." (Participant_L6)

"Barriers could include the IT infrastructure/bandwidth etc" (Participant_L12)

"The budget because Mauritius is still a developing country. It will take time in order to set all the necessary infrastructure…"(Participant_L19)

The Government has promised to continue to strive to make Internet access as "*a basic citizens' right*" and to provide "*high infrastructure facilities and services along with a robust and reliable telecommunications network*" (Oolun, Ramgolam and Dorasami 2012, 163). Initiatives such as increased investments in the ICT sector, such as the US$50 million put towards e-government and e-education initiatives) and the deployment of fibre-to-the-home infrastructure with a proposed minimum of 10Mb/s download access to every household, are all part of the plan to propel the ICT sector in the country with Mauritius being the "*first country in the sub Saharan Africa to have nationwide fibre-to-the-home technology deployment*" (Oolun, Ramgolam and Dorasami 2012, 163).

- ***Documents' findings***

The Government of Mauritius has also recognised the high cost of Internet and constrained bandwidth issues in the country in its National ICT Strategic plan 2011-2014, stating that "*The dramatic cost reductions in cable provisioning associated with developments in data transmission technologies have not been witnessed in Mauritius to the extent they have elsewhere in the world, largely as a result of the absence of competition in this area*" (Gillwald and Islam 2011, 9). The recent National Broadband Policy 2012-2020 (Ministry of Information and Communication Technology 2012), coupled with the latest National ICT Strategic Plan 2011-2014, towards i-Mauritius (Gillwald and Islam 2011), continue to be used as blueprints for the country's efforts for a commensurate ICT infrastructure to support its steady positioning as the regional ICT hub. The Public Sector Investment Programme 2014-2018 showed that the

Government is investing around 1.2 billion Mauritian rupees in the digitisation of education (Ministry of Finance and Economic Development 2014).

Consequently, the sub characteristic 'ICT Infrastructure supporting new technologies' was retained for the E-learning 3.0 model with no change.

Findings of the interviews and documents led to the retention of 'Web 3.0 System' and all its sub-characteristics as shown in Table 5.9. Appendix Q provides all participants' responses to the questions related to the 'Web 3.0 System' characteristic.

Table 5.9: Web 3.0 System – Before and After Interviews and Documents' Analysis

Before Interviews (as per Revised Holistic E-learning 3.0 Model)	**After Interviews/ Documents Analysis**
Web 3.0 System	**Web 3.0 System**
Knowledge, ontologies and other repositories	Understanding and working towards knowledge, ontologies and other repositories
Usability and accessibility	Usability and accessibility
ICT infrastructure supporting new technologies	ICT infrastructure supporting new technologies

5.9.2.6 Support

Throughout the interviews, all the lecturers and administrative personnel mentioned 'Support' as an essential aspect for Mauritius to move towards E-learning, confirming the criticality of this characteristic as part of the holistic E-learning 3.0 model. The 'Support' characteristic consisted of 'Instructional support' and 'Organisational support', following the surveys' findings, as discussed in Section 4.9.6. Both aspects are discussed below in relation to the interviews' responses and documents' findings.

- **Instructional support**
  - ***Interview findings***

The interviewees' responses took instructional support beyond providing the necessary pedagogical support to students in their learning to include other critical considerations such as fostering a learner centered environment, having well-designed courses with structured curricula, using multiple teaching styles, having learning materials that meet the students' learning needs and goals and providing relevant forms of assessment and

feedback (Brophy 2000). While participants agreed that E-learning will work in Mauritius as long as "*necessary support and feedback are provided to the students in terms of their learning. (Participant_L6),* many also mentioned the need to assist lecturers and administrative personnel with course designs and content preparation as a key consideration for successful online learning as shown by some of the comments below:

> *"Lecturers need to be trained to prepare interactive content using appropriate tools" (Participant_L1)*
>
> *"training of lecturers to produce materials suitable for E-learning.*" *(Participant_L4)*
>
> *"Lack of training and expertise. The bulky curriculum does not cater for E-learning. As product of traditional schools, 'lecturers cannot get out from traditional teachings. They will need to be trained on how to create and adapt content to E-learning." (Participant_L19)*
>
> *"considering the new educational landscape that favours the use of ICT in education, I would say that with proper guidance, feedback, and resources, E-learning can definitely work." (Participant_L20)*

- ***Documents' findings***

A major goal of the TEC, under its strategic plan, is the promotion and improvement of academics training to ensure highest standards of delivery that meet international norms (Tertiary Education Commission 2007). This goal has prompted a number of initiatives across universities in Mauritius. For instance, the University of Mauritius mandated the post-graduate certificate in teaching and learning course for all academic staff with the Educational Technologies module delivered fully online to better prepare the lecturers for online course delivery and the use of technology-enhanced teaching strategies (Gunness 2011). Similarly, under the recommendations of the TEC, the Open University of Mauritius is required to ensure that all its staff have certified training in ODL (Open and Distance Learning) and higher education pedagogy (Tertiary Education Commission 2015) while the University of Technology needs to deploy the appropriate learning technologies to support its teaching and learning practices (Tertiary Education Commission 2017).

In fact, professional development is considered "*a central component*" for innovation and improvement in education as seen in Guskey's model of change (Guskey 2002, 381). Research shows that institutions that had successfully diffused E-learning had professional development as a major focus (Nichols 2008). Such support to staff members is considered essential to build awareness about the strengths, potentials, and strategies of embracing new technologies, critical to the adoption of innovative practices as pointed out by Rogers (1995). Through professional development, lecturers' concerns and misconceptions are addressed, thereby boosting their confidence and trust in undertaking new innovative practices. This can further translate into more collaborative practices and open communication between colleagues, currently significantly lacking within higher education institutions in Mauritius as seen by this study's findings. Professional development support to staff also needs to be ongoing for continuing educational improvement and for a sustained use of innovative practices (McLaughlin and Marsh 1990; Guskey 2002).

Hence, 'Instructional support' was retained for the final model but renamed 'Instructional support to students (Pedagogical, Feedback, Content meeting needs) and lecturers (Content preparation, Course designs, Ongoing professional development) to elaborate more on the different aspects of instructional support for considerations to better reflect the views of interviewees, universities' efforts and the TEC's recommendations.

- **Organisational support**
  - ***Interview findings***

The need for adequate ICT infrastructure and training were key elements of support that participants expected from their organisations, with 30% of lecturers and administrative personnel perceiving these as essential for E-learning to work in Mauritius. Some of these responses are given below.

> *"Yes, if the required platform is put in place and necessary support are provided to the students." (Participant_L6)*

> *"E-learning can eventually work with proper training of instructors to help prepare them to become effective online instructors." (Participant_L16)*

> *"It can work but the main issue is technology and price. Internet bandwidth is too low to allow full and proper use of E-learning facilities. Moreover, the price may be prohibitive for some people." (Participant_A1)*

Similarly, over ninety percent of participants commented that the main barrier for them and students to be E-learning ready is the lack of training and the lack of infrastructure as shown by some of the comments below.

> *"Lack of training and maybe insufficient exposure. Infrastructure could also be an issue in some institutions." (Participant_L2)*

> *"knowledge of necessary platforms is a limiting factor. Lecturers should be trained to use the platforms." (Participant_L6)*

> *"Mauritian Lecturers would need to be trained to use the platform and also get training in e-tutoring. They are perhaps not well acquainted to technologies. They prefer may be to meet students for 1-2 hours in a lecture instead of having to respond online." (Participant_L12)*

> *"Lack of training for lecturers. Fear of the unknown. Fear of technology." (Participant_A1)*

> *"Cost related to online learning including Internet costs and equipment costs." (Participant_A4)*

These findings align with the literature review (see Chapter 2), where the need for technology support in terms of reliable IT infrastructure and access to training, technical advice and expertise, are critical components for E-learning success (Oliver

2001; Selim 2007a; Soong et al. 2001). Oliver (2001, 227) further suggested that the infrastructure needs to be tied up with the professional development of staff "*so that decisions are led by pedagogical and educational considerations rather than the technology itself*".

It is also important to note that twenty-five percent of participants commented on the need for better leadership at the organisational level and better support at the governmental level as critical support aspects and considered the lack of these as current barriers to E-learning in Mauritius. As shown in the comments below, participants mentioned the lack of a competent regulatory framework, unavailability of a proper regulatory body for E-learning, lack of financial incentives and rewards and policy issues, as some of the key issues at both the organisational level and governmental level for Mauritius to progress towards E-learning, and by extension E-learning 3.0.

> *"absence of an e-learning framework at the regulatory body for higher education. The institution and government bodies need to work together to establish a proper regulatory body to support E-learning and provide the necessary support at all levels (policies, infrastructure, training, financial investments, recruitment of E-learning experts and educational technologies). Otherwise, we won't progress in this direction at the pace we need to." (Participant_L14)*

> *"The main barriers are training, financial incentives and recognition. As mentioned earlier the absence of an ODL framework at the level of the higher education authority engenders a mess and contributions towards elearning is not yet a KPI in academic staff career path." (Participant_L14)*

> *"the administration itself work with people having the improper qualifications, therefore they act as barriers to Innovative system." (Participant_L15)*

> *"Political. Prices are dependent on government policies." (Participant_A1)*

> *"I believe more important than all for e-learning to succeed is a very good well explained policies for both students, admins, and tutors." (Participant_A6)*

Previous studies showed that the organisation has the power to facilitate or inhibit the success of E-learning courses, particularly at the executive level, based on the decisions they make and views they hold about learning models and strategies, course philosophies and pedagogical approaches (McPherson and Baptista Nunes 2006b). Comments such as "*Poor leadership at organisational level as they understand practically nothing at top management level. Poorly competent regulatory authority." (Participant_L11)"* captured the frustration felt by some participants with regard to what they perceived as poor decision making at the management level within their institutions and hence, a major barrier to E-learning. Similarly, other comments such as *"I have mainly been involved in face to face teaching up to now. The necessary initiatives to use the existing online platform were not provided. Contact hours given was significantly reduced in the online mode therefore we have to conduct more lectures." (Participant_L6),* aligns with findings from the studies conducted that "*unless incentives are provided to encourage instructors to use e-learning technology, resistance to additional workload is likely to occur*" (Wagner, Hassanein and Head 2008, 29). In fact, a study conducted at the University of Mauritius showed that there is little incentive and support within higher education institutions for academics to experiment with "*innovative IT-enhanced forms of teaching and to excel in producing and sharing educational material*" (Gunness 2011, 5).

Veer Ramjeawon and Rowley (2017, 376) pointed out that higher education institutions in Mauritius require "*visionary leadership*" where organisations are capable of introducing policies and promoting the right climate to facilitate innovation and the implementation of new emerging technologies in the country. Clear leadership and high-quality support creates a conducive environment where staff feel comfortable to adopt new innovative practices, and the absence of these can result in lower rates of adoption (King and Boyatt 2015). Political backing and support from policy makers also play a critical role in E-learning adoption as well as its enhancement (Andersson

and Grönlund 2009). The higher education in Mauritius, being predominantly dominated by public universities (as discussed in section 2.12.4), is highly dependent on Governmental policies and funding. In fact, the general standard of education in the country largely depends upon the Government as most of the policies and educational investments are introduced and implemented by them (Subrun and Subrun 2015).

- ***Documents' findings***

Findings from the documents explored showed that the Mauritian Government is stimulating investments in infrastructure and education, including E-learning, as major policy considerations towards its quest to be a regional ICT hub (Gillwald and Islam 2011). It is also endeavouring to provide the necessary support to realise that vision through the initiation of "*appropriate legal, institutional and infrastructural changes*" as well as the implementation of "*effective monitoring and evaluation mechanisms*" (National ICT Strategic Plan 2007, 6). Such initiatives promise a more conducive environment for E-learning and supporting technologies including a move towards the Semantic Web. Furthermore, with the TEC being responsible for implementing an overarching regulatory framework within the country for higher education, there is great hope that the country will progress towards quality E-learning supporting new technologies (Patten 2017). While the ideal scenario will be for the TEC to have a dedicated E-learning division responsible for planning, developing and promoting E-learning in the country in line with Governmental strategies and policies, it, nonetheless, endeavours to achieve its strategic goal of establishing good governance in the higher education sector and assisting tertiary institutions to develop performance indicators, which they annually need to report on including such aspects as teaching quality, financial health, staff strength and space and infrastructure (Tertiary Education Commission 2007).

Based on the interview responses and aligning with documents' findings, the sub-characteristic 'Organisational support' was changed to 'Organisational and Governmental support (Technical support and training, ICT Infrastructure, Incentives and recognition, Policies, Regulatory framework, E-learning regulatory body, Financial investments) to explicitly indicate the different aspects of support expected from both the educational institutions and the Government, as perceived by interviewees. Table 5.10 shows the 'Support' characteristic and associated sub-characteristics before and after the interviews and documents' analysis while

Appendix Q provides all the responses from lecturers and administrative personnel related to 'Support'.

Table 5.10: Support – Before and After Interviews and Documents' Analysis

Before Interviews (as per Revised Holistic E-learning 3.0 Model)	**After Interviews/ Documents' Analysis**
Support	**Support**
Instructional support	Instructional support to students (Pedagogical, Feedback, Content meeting needs) and lecturers (Content preparation, Course designs, Ongoing professional development)
Organisational support	Organisational and Governmental support (Technical support and training, ICT Infrastructure, Incentives and recognition, Policies, E-learning Regulatory body and framework, Financial investments)

5.9.2.7 Trust

The characteristic 'Trust', following the survey findings as discussed in section 4.9.7, consisted of the sub-characteristics 'System reliability and security', 'Trust between students and lecturers' and 'Trust between students'. There were unanimous agreement from both the lecturer and administrative personnel participants on the importance of trust within the E-learning environment, with some participants even stating that "*A trustworthy system supporting the needs of the students and the lecturers is the only way to get E-learning acceptance at the university level" (Participant_L7) ,"Mauritians are not too familiar with E-learning and trust in the system and collaboration with each other is needed to facilitate this transition" (Participant_L2)* and *"Trust in the system and in its users are pre-requisites for E-learning success."(Participant_L19).* More responses from interviewees on the different aspects of 'Trust', corroborated with findings from the documents explored, are discussed below.

- **System reliability and security**
  - ***Interview findings***

When asked about how confident and comfortable they were to teach within an E-learning environment, fifty percent of participated lecturers were certain that they were ready, with the recurring comment that a reliable system meeting the teaching and learning goals was a determining factor for confidence in E-learning and its adoption. Participant_A7 also pointed out, in response to the barriers for Mauritian students to be E-learning ready, that "*Students might need time to adjust as they are too used to classroom environments. They will need to trust that the online learning environment is meeting their educational needs as face to face classes are.".* Similarly, participants unanimously agreed on the importance of the system's reliability and security to foster trust within the E-learning environment with some participants viewing this aspect of trust as "*absolutely critical*" *(Participant_L14).* Additional comments from interviewees on the importance of 'System reliability and security' are shown below.

> *"I will be happy to teach online classes as this may allow me to save time for more research. We need to have a system in place that allows us to meet our teaching goals and at the same time allow students to get the best of the class. The online platform must be reliable and both lecturers and students should feel that they are getting the best out of the it as they would in face to face." (Participant_L6)*

> *"I am a recognised expert in elearning internationally. I have been teaching all my classes practically online since 2007. We need to have the confidence that the system will work. This is what is lacking in Mauritius. We are often scared and not willing to try something different and out of our comfort zone. We want to stick to how we have always 'done things'." (Participant_L11)*

> *"Very important. Everyone using the system, not just lecturers and students should be able to trust it. It should have all the required functions to support proper learning, just like the classrooms." (Participant_L12)*

"Very important. The system must be very reliable. Otherwise, lecturers and students will complain." (Participant_A1)

- ***Documents' findings***

The National ICT Strategic Plan (National ICT Strategic Plan 2007, 6) emphasised the importance of "*a culture of security and trust*" that needs to be fostered when it comes to new technologies and ICT. In fact, the report considered security and trust as critical components towards the Mauritian success to become the knowledge hub of the region, further reaffirming the importance of 'Trust' within the holistic E-learning 3.0 model.

Consequently, the sub-characteristic 'System reliability and security' was retained for the final model.

- **Trust between students and lecturers**
  - ***Interview findings***

Online instructors have the challenge of building and sustaining students' trust in E-learning (Wang 2014). Agreeably, as stated by Participant_L17, "*Lecturers need to support their students to build that trust*." 'Trust between students and lecturers', through interaction and the provision of feedback, was seen as crucial to promoting confidence in the E-learning environment, as shown by some of the comments below:

"Students must trust their lecturers in the E-learning environment as it is different from the classroom settings. There should be regular communication to ensure that this trust is maintained." (Participant_L11)

"I am pretty comfortable and confident as it is more than 10 years than I am in the field. I myself did my masters in Educational Technologies fully online and I now apply the skills developed in my professional practice. The key is to communicate clearly with your class and provide timely feedback." (Participant_L12)

"I will need to make sure I communicate with my students regularly to ensure that they are comfortable with their online classes.

Feedback will be key especially at the beginning." (Participant_L17)

"The lecturers need to be supportive for students to feel comfortable in the E-learning environment. Then they can collaborate more." (Participant_A7)

- ***Documents' findings***

The Digital Mauritius 2030 report advocated more "*open, transparent, innovative, participatory and trustworthy*" learning environment are among the main principles for improving the educational system in the country (Ministry of Technology & Communication & Innovation 2018, 34). However, on the other hand, The TEC in its audit reports also raised concerns of the ineffectiveness of the student feedback system in higher education institutions, which is often plagued with a "*lack of clear, accurate and transparent*" information, thereby setting the "*scene for mistrust*"(Tertiary Education Commission 2012, 44; 2008).

Based on the findings of the interviews and the documents explored which emphasised the significance of this sub-characteristic, it was retained for the final model.

- **Trust between students**
  - ***Interview findings***

Similar to the interviews' findings for the 'Collaboration' characteristic (see section 5.9.2.4), participants acknowledged the reluctance that some students may have to trust each other due to the competitive nature of the Mauritian education system.

"Students trusting each other can be a bit hard because of the competitive nature of the system. However, if the system is secure and reliable and the lecturers support their students, then that should be enough." (Participant_L5)

"Very Important. Students may not trust each other straight away due to the competitive nature of the Mauritian system. But with online discussions and forums, they can collaborate more and the trust can be gradually built." (Participant_L18)

Nonetheless, participants also acknowledged the importance of students trusting each other for success in the E-learning environment as shown by some of the comments below:

> *"Trust between students needs to be there for collaboration and teamwork. Otherwise, not all team members will benefit from the teamwork the same way." (Participant_L13)*

> *"The E-learning environment requires students to be autonomous learners. For this to happen, the system needs to be able to support students' needs and at the same time, the lecturers need to be able to facilitate students' learning. The E-learning environment can be daunting for newcomers and trust each other through collaboration and discussion can assist with the journey." (Participant_L14)*

> *"We as lecturers need to ensure we get our students to trust the system and the learning environment, otherwise it won't work. Mauritian students are familiar with face to face classes and will need that trust to build the confidence in E-learning. Trust between students can be cultivated through online discussions and forums etc." (Participant_L20)*

- ***Documents' findings***

While trust between students are not mentioned per se in the analysed documents, the competition that characterises the education system in Mauritius is heavily criticised across numerous reports (Ministry of Education and Culture and Human Resources 2009a; Tertiary Education Commission 2012, 2008), which as previously stated is setting "*scene for mistrust*" (Tertiary Education Commission 2012, 44).

Given the importance assigned to the trust between students by participants, despite the acknowledge that there is a lack of such trust within the Mauritian education system, this sub-characteristic was retained.

- **Additional findings under 'Trust' characteristic**
  - **Trust between lecturers**

➢ ***Interview findings***

Some participants, as shown below, raised concerns regarding a lack of trust between lecturers.

> *"Staff should also be trustworthy, but there is no fair play." (Participant_7)*

> *"The lecturers should also lead by example and collaborate with other colleagues to foster this atmosphere of trust." (Participant_L20)*

> *"Lecturers should learn to collaborate and trust each other instead of competing with each other." (Participant_A6)*

Mason and Lefrere (2003) pointed out that trust is the determining factor and primary enabler for consensus building, consultation, collaboration, organisational transformation and knowledge sharing. It is the critical element required to allow for effective collaboration within any organisation, and a lack of it is detrimental in establishing collegial participation (Jameson et al. 2006). Researches have shown that the stronger the trust between colleagues, the more willing they are to exchange information and share knowledge (Kimmerle, Cress and Hesse 2007; Blair, Maddock and Poulsen). Trust relationships are considered critical to effective communication (Dodgson 1993). In fact, trust facilitates collaboration and collaboration builds trust. But as seen from findings from this study (see sections 5.9.2.1 and 5.9.2.4), higher education institutions are exposed to a lack of collaboration among lecturers, who are used to work in isolation (Allybokus 2015).

➢ ***Documents' findings***

Concerns have been expressed by the TEC over this "*silo mentality*" which prevails across universities in Mauritius, causing mistrust (Tertiary Education Commission 2012, 44) This mistrust is often linked to the ingrained culture of competition that prevails in the Mauritian educational environment, which, often carries on into the working environment and translates into a lack of knowledge sharing attitude between lecturers. This, in turn, accentuates the mistrust and collegial participation even

further. In one of its audit report, the TEC pointed out the "*noticeable low level of trust among academics*", explaining why peer review of lecturers were not being used as a tool to improve teaching and knowledge sharing within and across institutions (Tertiary Education Commission 2012, 55) Addressing these concerns, the TEC has recommended open and inclusive communication to foster an environment of trust across the board (Tertiary Education Commission 2012). Trust between lecturers promote an environment of sharing, critical towards the vision of the Semantic Web and central to optimise the benefits behind E-learning ,as discussed in sections 2.6.1 and 2.8.1.

Taking these into consideration and to highlight the importance of trust in facilitating a culture of sharing between colleagues, 'Trust between lecturers' was, therefore, added as another sub-characteristic of 'Trust'.

Findings from the interviews and documents analysis confirmed the criticality of trust for a holistic representation of E-learning 3.0 within the Mauritian higher education sector. Consequently, as shown in Table 5.11, the 'Trust' characteristic and associated sub-characteristics were all retained for the final model with the addition of new sub-characteristic 'Trust between lecturers' highlighting the upmost importance of this aspect of trust for an effective E-learning environment and for the E-learning 3.0 model. Appendix Q provides all the responses from lecturers and administrative personnel interviewees related to 'Trust.

Table 5.11: Trust – Before and After Interviews and Documents' Analysis

Before Interviews (as per Revised Holistic E-learning 3.0 Model)	**After Interviews/ Documents' Analysis**
Trust	**Trust**
System reliability and security	System reliability and security
Trust between students and lecturers	Trust between students and lecturers
Trust between students	Trust between students
New findings	
	Trust between lecturers

5.9.2.8 Additional findings

Throughout the analysis of the interview responses from lecturers and administrative personnel, there was recurrent mention of the need for a shift in mindset and culture as a steppingstone towards E-learning in Mauritius. In fact, more than 50% of

participants commented on the need for a shift in mindset and culture in Mauritius as a requirement to progress effectively towards E-learning. As discussed under the 'Personalised Learning' and 'Pedagogy' characteristics (see sections 5.9.2.2 and 5.9.2.3), this shift was seen as critical to allow for personalised learning and a more collaborative teaching and learning environment as well as to support student centered teaching. Numerous comments also suggested the need for Mauritius to move from a spoon-feeding and exams-oriented culture to one which promotes sharing and collaboration as well as autonomous learning, as discussed under the 'Collaboration' characteristic (see Section 5.9.2.4). Similarly, the need to have a proper understanding of E-learning itself, by a range of stakeholders, was pointed out by many participants as a pre-requisite before they can see the country moving towards E-learning 3.0, as discussed under the characteristic 'Web 3.0 System' (see Section 5.9.2.5). Some of these comments are shown below.

With respect to whether e-learning works or will work in Mauritius, some participants commented as follows:

> *"Currently, E-learning is not working in Mauritius as there is no one who is really using it in the way it is meant to be used." (Participant_L1)*

> *"E-learning requires a culture of self-reflection which has not yet been adopted by Mauritians. It also requires more self-discipline which could be an issue for younger students." (Participant_L2)*

> *"It will not work for quite a few students since they will have to do independent learning - which requires more maturity and ability to manage one's time - not always easy for some students." (Participant_L17)*

> *"There is no true e-learning in Mauritius…." (Participant_L18)*

Similarly, some of the comments related to the barriers preventing Mauritius and Mauritian lecturers from becoming ready for E-learning were as follows:

"A change in mindset and culture from students who rely on spoon feeding and exams." (Participant_L11)

"The misconceptions that people normally associate with e-learning can be a barrier to e-learning in Mauritius, for instance, that students need to be tech savvy, that online learning doesn't have any kind of support and interaction with the instructor, that online learning isn't taken seriously since there is no defined schedule and learners can study at any time." (Participant_L16)

"Mauritians still hold the belief that education entails whiteboard, chairs, table. People's current mindset can be a barrier." (Participant_L20)

"cultural barriers and attitude (need to move from spoon-feeding to autonomy)" (Participant_A2)

"The mindset of the people is the biggest barrier to make Mauritius E-learning ready." (Participant_A4)

"lecturers need to understand that their role is not diminished with e-learning. On the contrary, their role is redefined and enhanced: they have not only to teach/, but also guide, coach and engage learners to facilitate their learning process." (Participant_A5)

In terms of how comfortable Mauritian students are or will be with E-learning and as collaborators in their learning, similar comments reflecting a need for a shift in mindset and culture were recorded as shown below:

"Mauritian students have been spoon fed since an early age and I strongly believe that at university level, this should not be the case. Independent learning should be encouraged. Mauritian students studying abroad collaborate to their learning, and so there is no

reason why students in Mauritius should be spoon fed." (Participant_L10)

"Spoon feeding is a big issue in Mauritius. Even at tertiary education level students do not want to do the effort especially at undergraduate level." (Participant_L15)

"Cultural. Change in the way they are used to learn and be assessed." (Participant_A1)

"Students might need time to adjust as they are too used to classroom environments. (Participant_A7)"

After careful consideration of all the comments related to this need for a mindset and cultural shift and taking into account the frequent occurrence of these comments in the interviewees' responses, the researcher included this aspect as one of the critical characteristics for the holistic E-learning 3.0 model to accurately reflect the Mauritian context better. It was named, accordingly, as 'Mindset and cultural shift'. In fact, "*culture has always played a significant role in shaping educational policies and guiding learning and teaching practices*" in the Mauritian education system and mindset has always played the critical role of facilitating or hindering new practices (Santally 2011, 8). Documents' analysis also showed that the Mauritian Government recognised the need for a change in mindset and culture within the education system. In fact, the Education and Human Resources Strategy Plan 2008-2020 highlighted such a change as a key area of consideration to promote quality education in the country, in line with the aim of transforming Mauritius into "*an intelligent nation state in the vanguard of global progress and innovation"* (Human Resource Development Council 2006, 11). The 'Mindset and cultural shift' characteristic denotes the importance that participants attributed to this aspect during the interviews and is also considered critical to allow for the move towards E-learning 3.0. Its associated sub-characteristics were determined based on the groupings of comments from the interviews and are discussed below.

- **From spoon-feeding towards autonomous learning**
  - ***Interview findings***

The first sub characteristic of 'Mindset and cultural shift' shows the need for shift from the culture of spoon feeding to allow students to be more autonomous learners. Autonomous learning promotes independent learners capable of contributing to their own learning and who can influence their learning structure (Vencatachellum and Munusami 2003). It relates to "*the degree of control the learner has over the preparation, execution and evaluation of his or her learning*" (Garrison 2003, quoted in Kerr, Rynearson and Kerr 2006, 101) and often requires the learner to demonstrate high order thinking skills as well as problem-solving capabilities (Liaw, Huang and Chen 2007). At a minimum, it demands learners being in control of their learning time and processes (Liaw, Huang and Chen 2007). Mauritian students, even at the higher education level, are not used to such independence in their learning, as shown by comments from participants such as *"The Mauritian education system does not prepare students to be sufficiently independent and reflective."(Participant_L2)* and *"For some, online learning might be a challenge and can find it hard to manage their learning on their own."(Participant_A5).* Students are "*overly dependent on guidance*" in their learning from the lecturers and there is high expectation of spoon-feeding as the norm for how teaching should be carried out (Devlin 2002, 126). Students, in such a context, have an "*essentially quantitative view of knowledge*" and see learning as "*an accumulation and memorisation of facts and procedures*" and as a result, expect to receive some of this knowledge from their instructors first before taking responsibility for remembering it (Devlin 2002, 135). Consequently, moving towards a culture of autonomous learning, where students can understand and establish their own learning needs and goals as well as employ the necessary strategies and resources to facilitate and evaluate their learning, can be hard for many Mauritian students. This shift away from the culture of spoon-feeding can be equally hard for many lecturers who very often see the teaching and learning process as imposing knowledge on students, who in turn respond by knowledge absorption through memorisation (Ajaheb 2011). However, the E-learning environment signifies autonomous learning, such that this shift from spoon-feeding to autonomous learning is deemed critical towards effective E-learning. However, it also needs to be gradual to allow both students and lecturers to adapt. The blended delivery approach, discussed

under the 'Pedagogy' characteristic (see section 5.9.2.3), is often seen as the interim solution to support such transition (Vencatachellum and Munusami 2003).

- ***Documents' findings***

From the documents analysis perspective, it is seen that the Mauritian Government wants to capitalise on its human capital and, therefore, wants Mauritian graduates to be multi-skilled including being autonomous learners who have the ability to demonstrate critical thinking for the progress of the economy (National ICT Strategic Plan 2007; Allybokus 2015).

Consequently, to denote the importance of the requirement to move away from the culture of spoon-feeding, while at the same time, to acknowledge the fact that more work needs to be done within higher education institutions to progress towards a culture of autonomous learning, this first sub-characteristic of 'Mindset and cultural shift' was named 'From spoon-feeding towards autonomous learning'.

- **From examinations-oriented and individualistic mindsets towards a sharing and collaborative culture**

  - ***Interview findings***

The second sub-characteristic of 'Mindset and cultural shift' captures the need for a more sharing and collaborative culture away from an exams-focussed mindset which is often the main barrier towards sharing, for fear of others doing better than oneself. As seen in previous discussions in this study (see Sections 2.12.3, 5.9.2.3 and 5.9.2.4), the Mauritian education system is highly elitist and exams-oriented with the fierce competition hindering a sharing and collaborative culture. However, effective online environment requires some form of interaction not just between students and their instructors, but also among students themselves (Cheawjindakarn, Suwannatthachote and Theeraroungchaisri 2012). Interaction and collaboration among students improve learning performance and satisfaction in the E-learning environment, as recognised by several researches (Fulford and Zhang 1993; Graham and Scarborough 1999; Phillips and Peters 1999; Driver 2002). In fact, participants' interaction, as discussed in the literature review chapter (Chapter 2) is considered a key element of a successful learning environment, making it more conducive to knowledge construction as well as promoting an atmosphere of trust and mutual understanding (Selim 2007b). In this regard, it is essential that higher education institutions move from an exams-oriented mindset to a culture of sharing and collaboration for E-learning success. Furthermore,

sharing is a concept central to the Semantic Web and hence for the move towards E-learning 3.0. This culture of sharing and collaboration is deemed critical within higher education institutions including between students, between students and lecturers and between lecturers. But, as noted by interviewees, Semantic Web and the use of ontologies in Mauritius are seen as initiatives for the distant future (see section 5.9.2.5), as the culture of sharing is not prominent in the current educational landscape: "*I do not think this* [the use of Semantic and ontologies] *would be possible in a near future. Use of semantic web or OWL may find a way when the country moves towards a knowledge base and digital economy. The only option I foresee this happening is in the context of an African regional effort to produce and share data and information. However, E-learning is still in its infancy in the country and this will take time. There is also a lack of sharing culture in the country which unless sorted, we cannot progress towards semantic web or think about the use of ontologies*" *(Participant_L14)*. Therefore, the change from an exams-oriented mindset to that of a culture of sharing and collaboration is a must to progress towards effective E-learning and E-learning 3.0.

- ***Documents' findings***

Furthermore, the Mauritian Government acknowledges the reluctance to engage in information sharing across numerous sectors in the economy, including the education sector, and wants to bring about change to this attitude to facilitate the country's progress towards the digital Mauritius and regional knowledge hub initiatives (Ministry of Technology & Communication & Innovation 2018). It recognises the need for the "*fluid sharing of knowledge*" as a critical component for the development of a knowledge hub (Human Resource Development Council 2006, 14).

Taking all these findings into considerations, the second sub-characteristic of 'Mindset and cultural shift' was termed 'From examinations-oriented and individualistic mindsets towards a sharing and collaborative culture'. This new sub characteristic indicates the importance of moving away from the exams-oriented and individualistic mindsets, while at the same time, acknowledges the fact that more work needs to be done within higher education institutions to facilitate the shift to a culture of sharing and collaboration.

- **E-learning understanding across stakeholders**
  - ***Interview findings***

"*Mauritius will first need to understand E-learning properly before moving towards semantic web." (Participant_L1)*, "*…we are still working with understanding E-learning*." *(Participant_L2), "we still need to understand basic E-learning first." (Participant_L13)* were opinions commonly held by interviewees as discussed under section 5.9.2.5. Similarly, a proper understanding of E-learning among different stakeholders of E-learning including the students, the lecturers, parents, management and the Government, were perceived as important to further advance E-learning in Mauritius and a lack thereof was perceived as one of the barriers to E-learning as shown by some of these comments:

> *"parent traditional thinking" (Participant_L3)*
>
> *"lecturers need to understand that their role is not diminished with e-learning. On the contrary, their role is redefined and enhanced." (Participant_A5)*
>
> *"they understand practically nothing at top management level." (Participant_L11)*
>
> *"absence of an e-learning framework at the regulatory body for higher education. The institution and government bodies need to work together to establish a proper regulatory body to support E-learning and provide the necessary support at all levels (policies, infrastructure, training, financial investments, recruitment of E-learning experts and educational technologies). Otherwise, we won't progress in this direction at the pace we need to." (Participant_L14)*

Despite the significant and continuous efforts by the Centre for Innovative and Lifelong Learning (CILL) in Mauritius, as pointed out in section 2.12.5, to promote E-learning for what is it, particularly in terms of course designs and innovative teaching and learning beyond the traditional ways, the claim cannot be made that there is an e-

learning culture in higher education institutions in Mauritius (Cooshna-Naik et al. 2012). There is still a strong focus on the traditional modes of teaching and learning. Apprehension is often sensed from different parties, including students, parents and lecturers with regards to non-conventional and non-traditional teaching environment and as commented by Participant_L20, "*Mauritians still hold the belief that education entails whiteboard, chairs, table.*". A proper understanding of E-learning and what it entails, including re-assessing and reviewing traditional practices, while at the same time being open to a change in mindset and to harnessing newer educational paradigms, will facilitate its acceptance.

However, Rogers, in his Diffusion of Innovations theory (Rogers 1995), warned that past experiences can result in the mis-adoption of innovation, such as the use of traditional teaching approaches in the context of e-learning, thereby not harnessing the full potential of E-learning (Elgort 2005). Consequently, a proper understanding of E-learning beyond the static delivery of learning content online, is a considered a stepping stone towards lessening the reticence and allaying apprehensions about such a learning environment and more support towards the move to new E-learning concepts such as E-learning 3.0 (Pudaruth et al. 2010; Cooshna-Naik et al. 2012). As pointed out by Liaw, Huang, and Chen (2007, 1069), "*no matter how advanced or capable the technology is, its effective implementation depends upon users having a positive attitude toward it*". Undoubtedly, E-learning success in higher education is attributed to "*a shared responsibility*" between the E-learning stakeholders (Wagner, Hassanein and Head 2008, 33). Success in E-learning is, therefore, the result of cooperation among these stakeholders, where they help address each other's concerns and provide the necessary support to fulfil each other's needs and motivations. Such collaboration creates "*effective and meaningful e-learning experiences*" with "*positive outcomes*" for all, extending "*beyond success in specific courses and programs to facilitate lifelong learning and discovery*" (Wagner, Hassanein and Head 2008, 33).

- ***Documents' findings***

In line with the above findings, it is important to note that the Government of Mauritius wants to adopt a holistic educational approach with the involvement of different education stakeholders in the educational process, including active parent involvement (Ministry of Education and Culture and Human Resources 2009a). The TEC recommends "*firm engagement*" by higher education institutions to integrate and communicate better with the wider community and society, not just their staff and

students (Tertiary Education Commission 2017, 19; 2008, 2012; Ministry of Education and Culture and Human Resources 2009a). Such engagements will ensure that "*the education reform agenda contributes to the cultural shift*" required as Mauritius moves forward with innovative teaching and learning practices and E-learning (Ministry of Finance and Economic Development 2014, 31).

Consequently, 'Understanding E-learning across stakeholders" was added as part of the 'Mindset and cultural shift' characteristic to capture the concerns of interviewees of the lack thereof and to highlight the crucial need for such an understanding for effective E-learning and to progress towards E-learning 3.0 in the country.

Based on the findings from the interviews and aligning with the concerns of the Mauritian Government and related agencies, as seen from the documents explored, the new characteristic 'Mindset and cultural shift' and its associated sub-characteristics 'From spoon-feeding towards autonomous learning', 'From examinations-oriented and individualistic mindsets towards a sharing and collaborative culture' and 'E-learning understanding across stakeholders', as shown in Table 5.12, are considered highly significant for a holistic representation of E-learning 3.0 for higher education in Mauritian. Appendix Q provides all the related responses from the interviews with lecturers and administrative personnel.

Table 5.12: Mindset and cultural shift characteristic and sub-characteristics

Mindset and cultural shift
From spoon-feeding towards autonomous learning
From examinations-oriented and individualistic mindsets towards a sharing and collaborative culture
E-learning understanding across stakeholders

A summary of the interviews and documents analysis is provided next, followed by the presentation of the final holistic E-learning 3.0 model.

5.10 Summary of interviews and documents analysis

The interview and documents analysis resulted in the retention of all the main characteristics from the revised holistic E-learning 3.0 model, namely 'Content Management', 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Web 3.0 System', 'Support' and 'Trust'. Changes were made to the names of some associated

sub-characteristics while the analysis also revealed some new sub-characteristics for ‘Content Management’, ‘Pedagogy’, ‘Collaboration’ and ‘Trust’ characteristics. The analysis also revealed the emergence of new characteristic ‘Mindset and cultural shift’ with three associated sub-characteristics namely ‘From spoon-feeding towards autonomous learning’, ‘From examinations-oriented and individualistic mindsets towards a sharing and collaborative culture’ and ‘E-learning understanding across stakeholders’. The interview findings, supported by documents from the Mauritian Government and Mauritian universities, validated the revised holistic E-learning 3.0 model and resulted in the final holistic E-learning 3.0 model, as shown in Figure 5.2. Changes to the revised holistic E-learning 3.0 model, which resulted from the interviews and documents analysis, are denoted in dark red font.

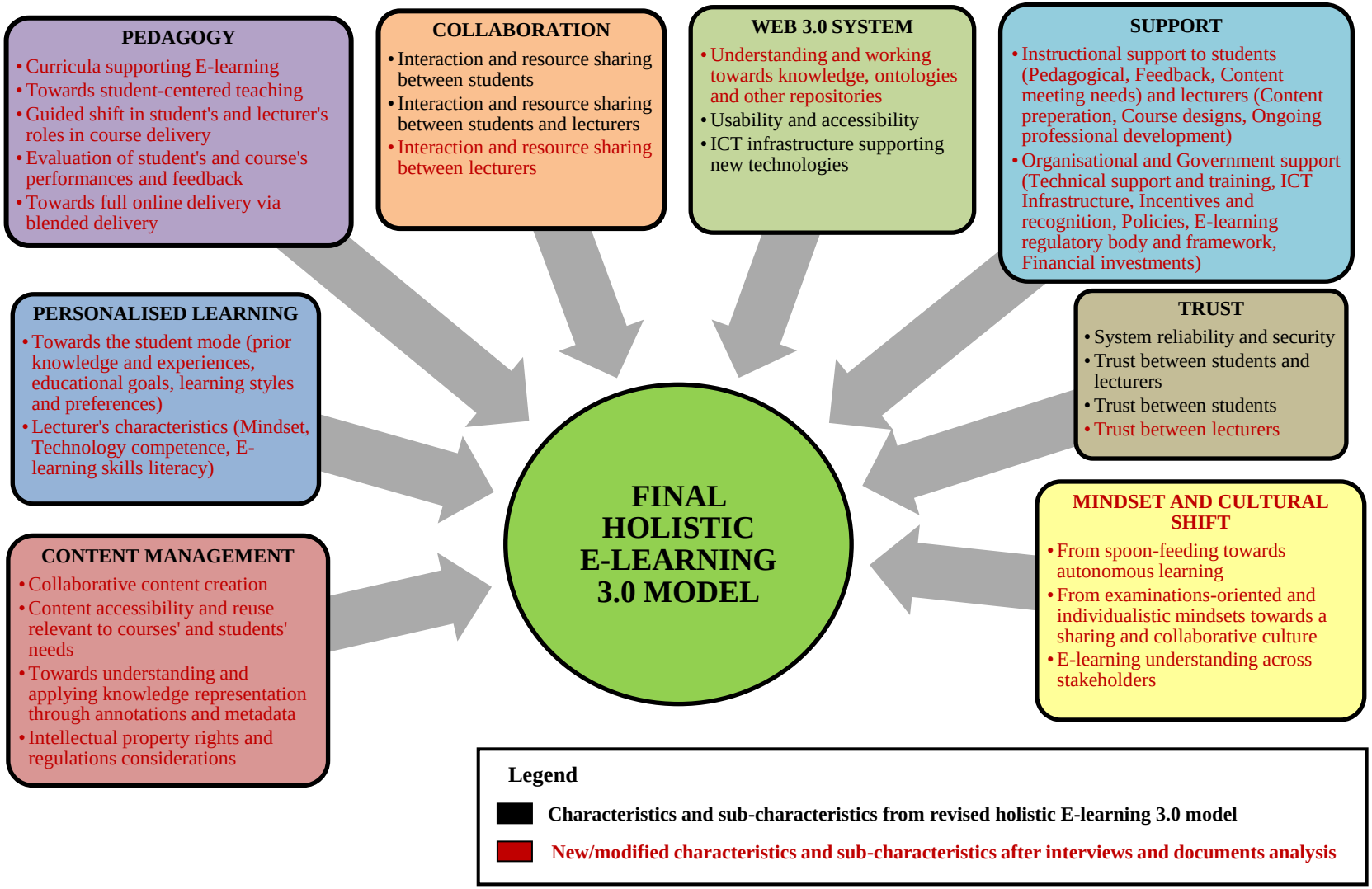


Figure 5.2: Final Holistic E-learning 3.0 Model (with changes after the interviews and documents analysis highlighted)

5.11 The Final Holistic E-Learning 3.0 Model

The development of the final holistic E-learning 3.0 model involved a three-step process, starting with a comprehensive literature review which led to the development of the initial holistic E-learning 3.0 model (Chapter 2 - Figure 2.30). This was followed by the analysis of surveys with students and lecturers from Mauritian higher education, resulting into a revised holistic E-learning 3.0 model (Chapter 4 - Figure 4.30, with changes from the surveys' findings highlighted in dark red). The final step, as discussed in this chapter, was the analysis of the interviews with lecturers and administrative personnel from Mauritian higher education, supported with findings from different documents from the Mauritian Government and related agencies and from universities' documents, leading to the final holistic E-learning 3.0 model (Chapter 5 - Figure 5.2, with changes made as a result of the interviews and documents analysis highlighted in dark red).

Consequently, the final holistic E-learning 3.0 model, as shown in Figure 5.3 below, is the final outcome of this study. It consists of eight characteristics, namely 'Content Management', 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Web 3.0 System', 'Support', 'Trust' and 'Mindset and cultural shift', each with a number of associated sub-characteristics, the derivation of which are detailed out in this study. As stated by King and Boyatt (2015, 1274), "*the widespread adoption of an innovation, such as e-learning, also relies on a shared vision, clear leadership, a conducive culture and high quality support*", all addressed comprehensively throughout this study. The final holistic E-learning 3.0 model did not only originate from solid grounds in the literature on Semantic Web and E-learning CSFs, but also captured the critical perceptions and valuable opinions of students, lecturers and administrative personnel from Mauritian higher education institutions as well as key strategic plans and visions of both Mauritian universities and the Government, thereby, providing critical and realistic insights for a holistic E-learning 3.0 model. The final holistic E-learning 3.0 is, therefore, an integrated representation of the many facets for consideration for E-learning 3.0, highlighting the critical need to address the proper implementation of E-learning as a key requirement towards the successful move to E-learning 3.0.

The final model highlights the barriers to E-learning 3.0 amongst stakeholders in Mauritius including the deep-rooted traditional educational culture not yet receptive to

innovation, misconceptions about E-learning, the lack of proper support structures for E-learning initiatives and the prevailing egoistic and individualistic attitudes and mindsets deterring collaboration, amongst others. In doing so, the model addresses key areas of concerns to be addressed by higher education stakeholders towards a successful and sustainable adoption, implementation and diffusion of E-learning 3.0. It acknowledges that, while Mauritius regroups all the necessary ingredients in fostering E-learning (Pudaruth et al. 2010) and has the necessary vision and keenness to embrace new emerging technologies and innovative practices within its higher education sector, it is still not yet there and more needs to be done to address critical aspects of both E-learning and E-learning 3.0 to optimise the benefits that can be harnessed through such endeavours. The model also stressed the importance of a guided move towards E-learning 3.0 to allow deep-rooted practices and stereotypes to be gradually changed and to allow the basics of E-learning to be properly understood across stakeholders towards the move to newer technologies and innovative undertakings such as E-learning 3.0.

The holistic E-learning 3.0 model derived from this study is, therefore, a comprehensive and realistic guide and action plan for Mauritius and its higher education sector in the move towards E-learning 3.0. It provides a sustainable representation of E-learning 3.0 involving technological, organisational as well as social changes to support the long-term implementation of E-learning as well as long term innovation processes towards E-learning 3.0 (Foo 2013; Sahid, Endut and Peng 2011). The model can also be further extended and customised by other developing countries based on their own E-learning 3.0 agenda.

The final holistic E-learning 3.0 model is presented in Figure 5.3 below.

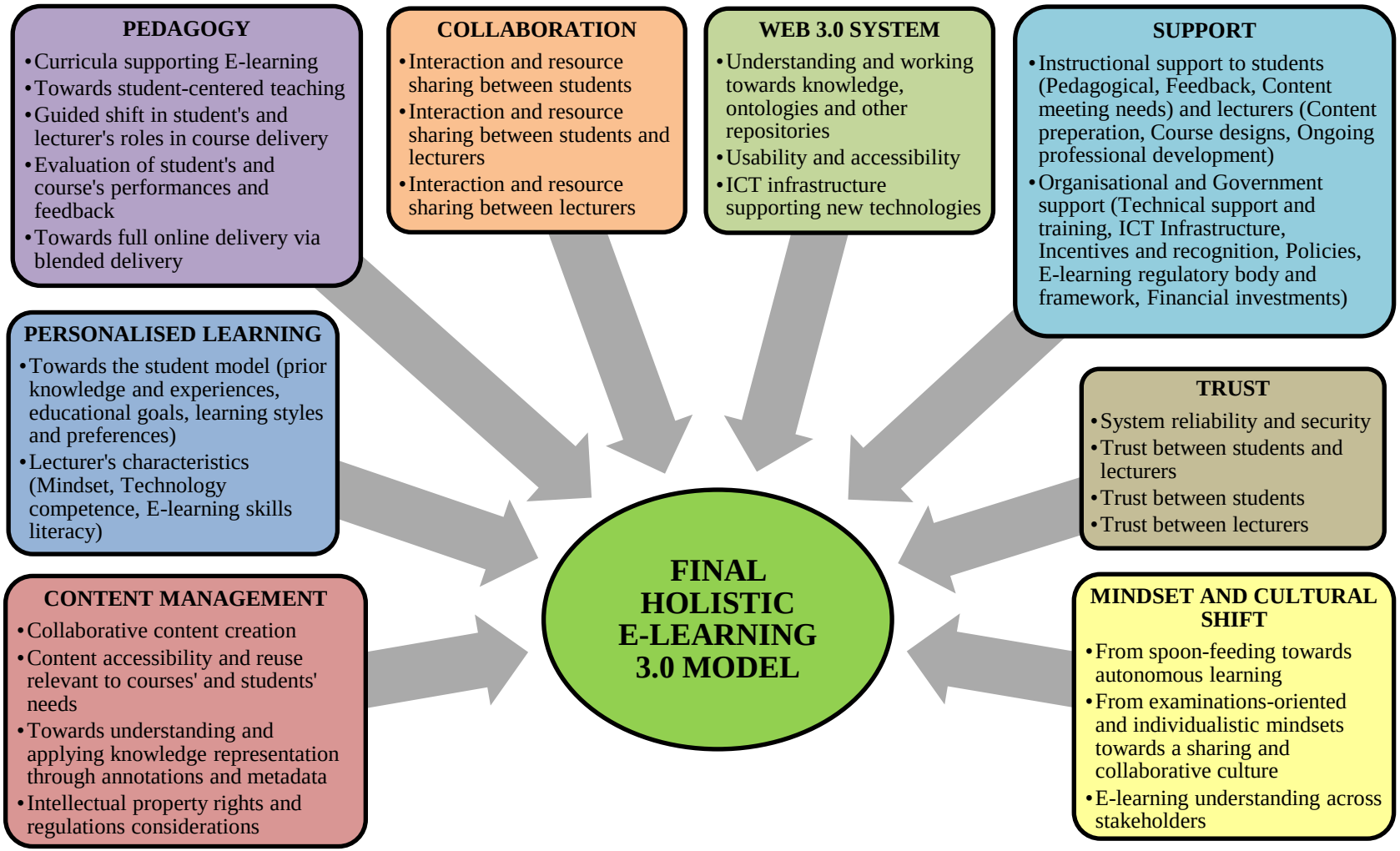


Figure 5.3: Final Holistic E-learning 3.0 Model

5.12 Chapter summary

This chapter discusses the qualitative phase of this study comprising interviews conducted with lecturers and administrative personnel from Mauritian higher education institutions and analysis of documents from the Mauritian Government and related agencies and universities. The chapter describes the interview participants and the interview process, how the interview questions were prepared and how data was collected and analysed. The interview data are thoroughly analysed and discussed and corroborated with documents evidence to validate the revised E-learning 3.0 model.

The outcome of this chapter and this phase of the study resulted in the final holistic E-learning 3.0 model. The final holistic E-learning 3.0 model is presented and is the result of a comprehensive review of the literature on Semantic Web characteristics and E-learning CSFs, validated through surveys with students and lecturers from higher education institutions in Mauritius and then further refined based on the outcomes of the interviews with lecturers and administrative personnel from higher education institutions in Mauritius and documents analysis. The model, therefore, encapsulates a comprehensive and realistic set of characteristics with their associated sub-characteristics for a holistic representation of E-learning 3.0 within the context of Mauritian higher education institutions, with the perceptions of critical stakeholders considered, namely students, lecturers and administrative personnel of Mauritian higher education institutions.

The next chapter summarises the research, discusses the research limitations and identifies avenues for future research.

CHAPTER 6: CONCLUSIONS

6.1 Introduction

This chapter concludes the thesis. A summary of the research is presented, highlighting the different phases of this study which resulted in the final holistic E-learning 3.0 model for higher education institutions in Mauritius. A review of the research questions is then carried out in relation to the findings from this study, followed by a list of recommendations proposed, in line with discussions, analysis and findings during this research. The theoretical and practical contributions of this research are discussed next to establish its relevance. The limitations of this study are then identified, establishing the basis for future research directions, which are discussed next. A chapter summary concludes the chapter followed by a list of references used throughout this thesis and several appendices which have been added for the reader's reference.

6.2 Summary of research

This research is based on studying critical Semantic Web characteristics and E-learning CSFs to develop a holistic set of E-learning 3.0 characteristics within the context of Mauritian higher education institutions. Mauritius, a small island developing nation with a high IT dependency, has E-learning and emerging technologies on the agenda towards achieving its vision of becoming a knowledge hub and the gateway to post-secondary education in the region. Addressing the dearth of researches on E-learning 3.0 within the highly unexplored context of small island developing states, this research captures the critical perceptions of students, lecturers and administrative personnel from Mauritian higher education institutions to develop a holistic E-learning 3.0 model, thereby establishing a comprehensive and realistic guide for higher education institutions and the Government in Mauritius to better harness the numerous benefits that E-learning and the Semantic Web can bring.

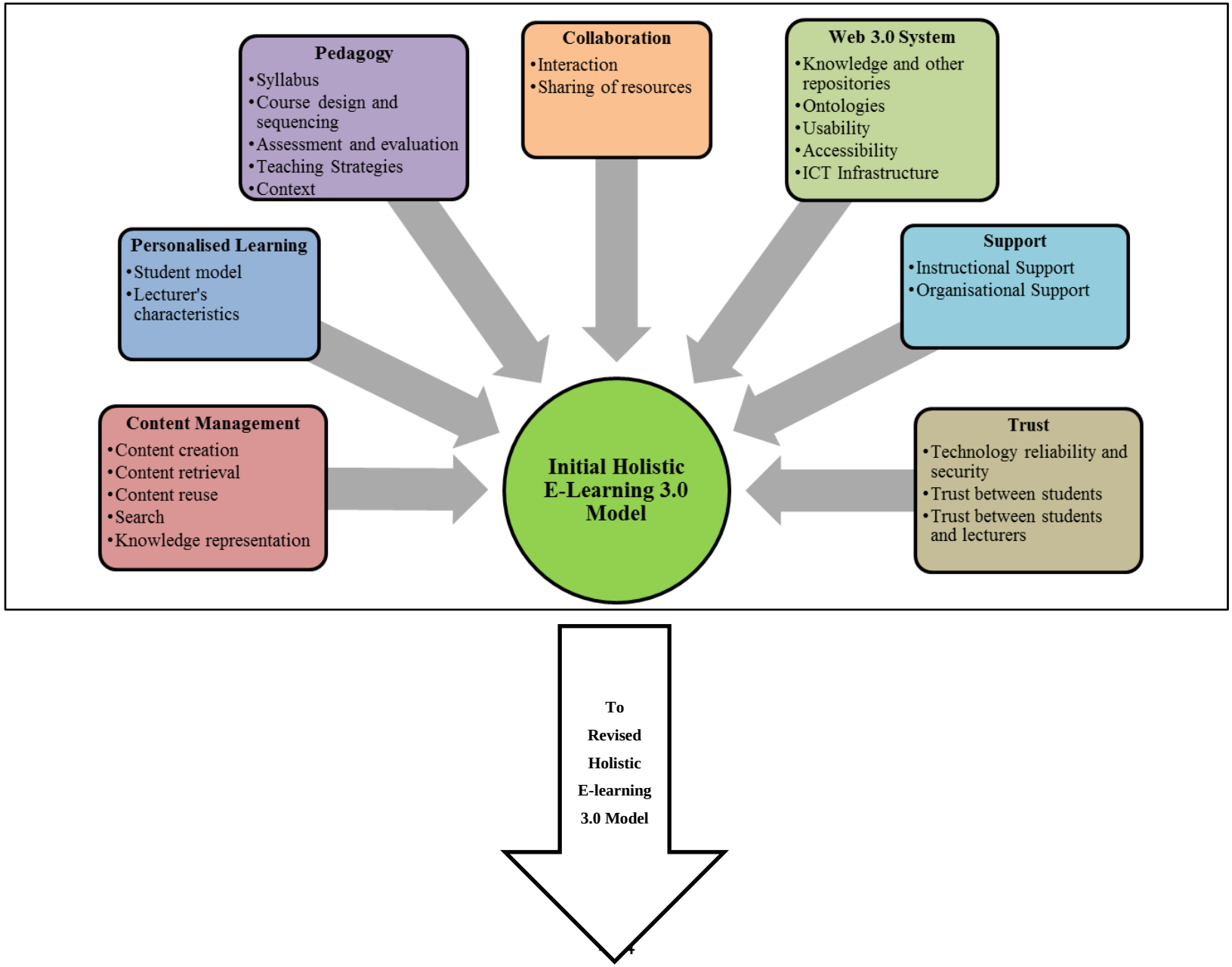
At the onset of this study, an extensive literature review (Chapter 2) was carried out on Semantic Web characteristics and E-learning CSFs to determine a priori set of E-learning 3.0 characteristics, resulting in an initial holistic E-learning 3.0 model. This model, which addressed numerous gaps in the literature, by providing a previously unavailable combined set of E-learning 3.0 characteristics based on the Semantic Web

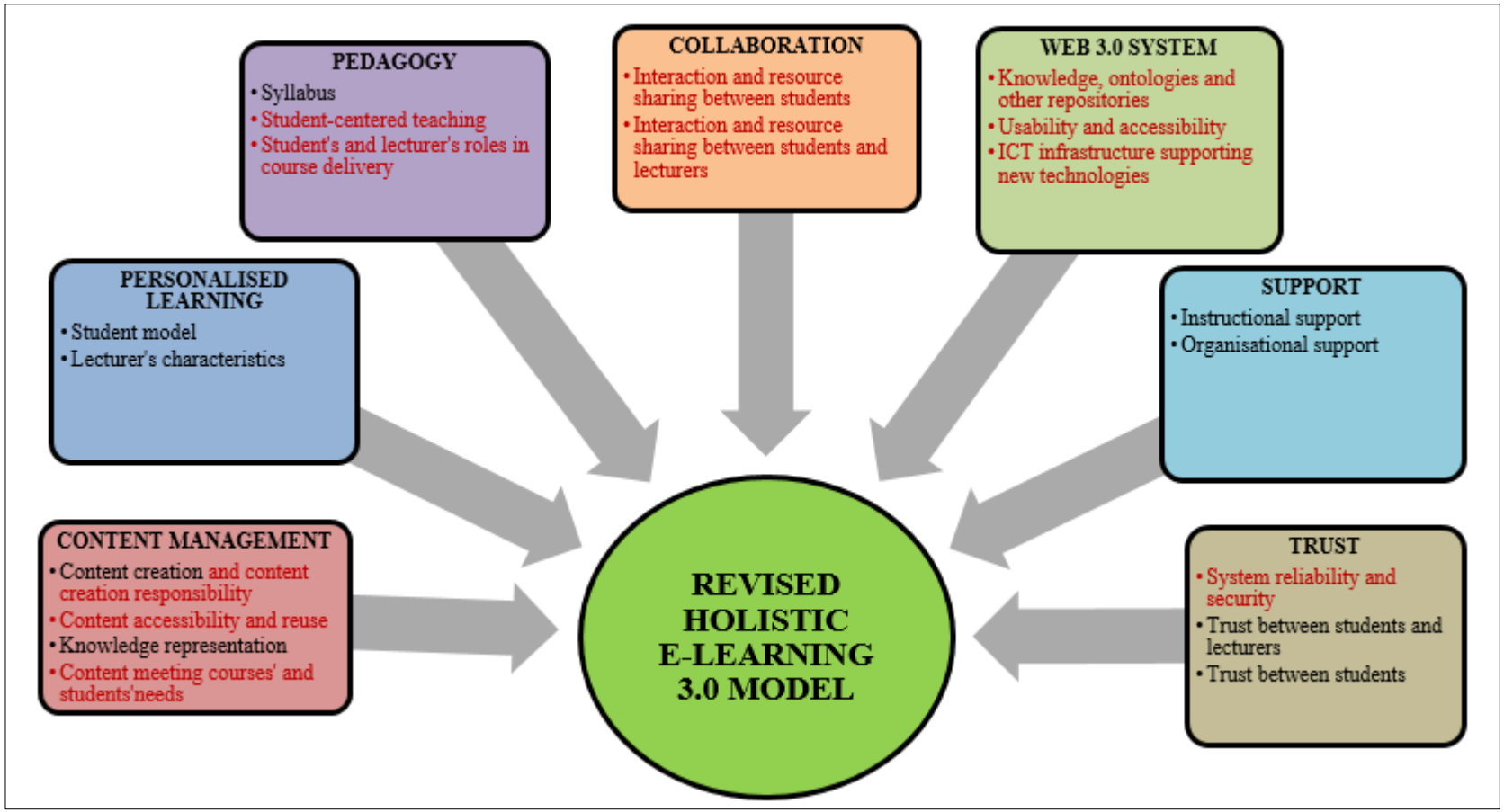
characteristics and E-learning CSFs, was then used as the basis for the subsequent phases in this research.

Being exploratory in nature, this research adopted a mixed-methods approach comprising quantitative and qualitative phases to enrich its findings. The quantitative phase (Chapter 4), in the form of two Web-based surveys to three hundred students and one hundred and five lecturers of Mauritian higher education institutions respectively, was used to evaluate the initial holistic E-learning 3.0 model. A preliminary analysis of both surveys was carried out, capturing the critical perceptions of students and lecturers from Mauritian higher education institutions on the initial model. Findings from the preliminary analysis revealed that statements from the online questionnaires, which challenged the traditional roles of students and lecturers were the ones with the most varied responses. Mixed responses were also gathered on statements from the surveys related to sharing and collaboration while unfamiliarity and uncertainty were noted for statements related to the Semantic Web concepts. With no unequivocal list of characteristics and associated sub-characteristics for a holistic E-learning 3.0 model, a factor analysis was then carried out, using SPSS, to determine a robust set of factors that is more consistent from the original groupings, resulting in a revised holistic E-learning 3.0 model.

To further validate the revised holistic E-learning 3.0 model, the qualitative phase of the study was then undertaken, namely the case study phase, in the form of interviews and documents analysis (Chapter 5). Semi-structured interviews based on the outcomes of the surveys, were carried out with twenty lecturers and seven administrative personnel from Mauritian higher education institutions. Information from universities in Mauritius showed that the roles of administrative personnel are more than often captured as part of the roles of lecturers such that the twenty-seven interviews were considered adequate for the study. Interviews' data were then analysed using content analysis technique with themes identification manually coded using both deductive and inductive content approaches. This allowed identified components from the revised holistic E-learning 3.0 to be further validated while at the same time, enabling new aspects of the holistic E-learning 3.0 to emerge, based on the interviews' findings corroborated with universities' and the Government's documents. The outcomes of the case study phase confirmed and also extended the surveys' outcomes, resulting in the final holistic E-learning 3.0 model.

The evolution of the holistic E-learning 3.0 E-learning model from (1) the initial holistic E-learning 3.0 E-learning model following the comprehensive literature review on existing E-learning 3.0 models and E-learning CSFs to the (2) revised holistic E-learning 3.0 E-learning model following quantitative phase of this study namely surveys with students and lecturers from Mauritian higher education institutions and then ultimately to the (3) final holistic E-learning 3.0 model following the qualitative case study phase consisting of interviews with lecturers and administrative personnel from Mauritian higher education institutions and analysis of documents from Mauritian universities and the Government, is shown in Figure 6.1 below.


Pedagogy
•Syllabus
•Course design and sequencing
•Assessment and evaluation
•Teaching Strategies
•Context
Collaboration
•Interaction
•Sharing of resources
Web 3.0 System
•Knowledge and other repositories
•Ontologies
•Usability
•Accessibility
•ICT Infrastructure
Personalised Learning
•Student model
•Lecturer's characteristics
Support
•Instructional Support
•Organisational Support
Content Management
•Content creation
•Content retrieval
•Content reuse
•Search
•Knowledge representation
Initial Holistic E-Learning 3.0 Model
Trust
•Technology reliability and security
•Trust between students
•Trust between students and lecturers
To
Revised
Holistic
E-learning
3.0 Model



To Final Holistic E-learning 3.0 Model

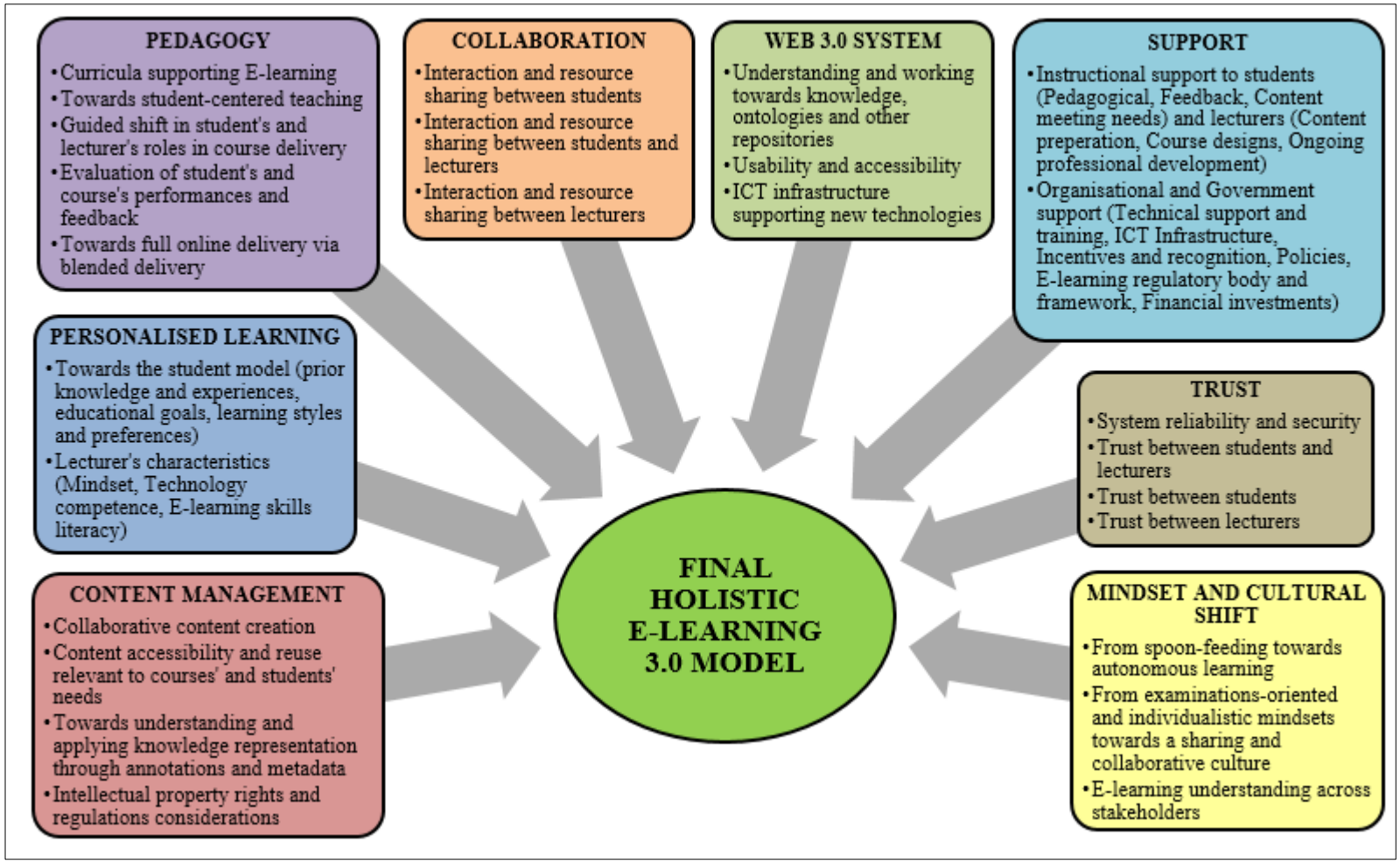


Figure 6.1: Evolution of Holistic E-learning 3.0 Model

The final holistic E-learning 3.0 model, derived following the multi-phased mixed-methods approach resulted in eight main characteristics for a holistic representation of E-learning 3.0 within the context of higher education institutions in Mauritius, namely 'Content Management', 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Web 3.0 System', 'Support', 'Trust' and 'Mindset and Cultural Shift'. These characteristics and their associated sub-characteristics (Figure 5.3) constituted the holistic representation of E-learning 3.0, capturing the critical perceptions of students, lecturers and administrative personnel from Mauritian higher education institutions. Hence, the E-learning 3.0 model derived from this study is a holistic and realistic guide for the move to E-learning 3.0 by Mauritius and its higher education institutions. It is also envisaged that other developing countries with an E-learning and E-learning 3.0 agenda, including small island developing states, can use the holistic E-learning 3.0 model, which can be further customised and extended based on their own needs and requirements. The holistic E-learning 3.0 model from this study is, therefore, both theoretically and practically significant as it addresses critical gaps in the literature for E-learning 3.0 while at the same time, provides a blueprint and a pragmatic action plan for the implementation of an E-learning 3.0 in the Mauritian higher education sector and, by extension, in other developing countries including small island states.

6.3 Research findings overview

As stated in Chapter 3, section 3.2.2, the scope of this study is framed by two research questions as follows:

- **RQ1**: What are the E-learning 3.0 characteristics required to develop a holistic E-learning 3.0 model?
- **RQ2**: What are the critical success factors of implementing and sustaining E-learning 3.0 in higher education institutions of Mauritius, based upon the perceptions and viewpoints of the education stakeholders?

The systemic and multi-phase mixed-methods approach adopted in this study together with their respective findings, as discussed in Chapter 2, Chapter 4 and Chapter 5, answered the research questions as explained below.

6.3.1 Research question one (RQ1)

RQ1: What are the E-learning 3.0 characteristics required to develop a holistic E-learning 3.0 model?

The first question is intended to identify the characteristics that constitute a holistic E-learning 3.0 model, in the context of higher education institutions in Mauritius. This research question was answered throughout this study by means of the different research phases including the literature review, the quantitative survey and the qualitative case study approach with interviews and documents analysis.

A comprehensive review of the literature pertaining to the Semantic Web characteristics and E-learning CSFs identified a priori set of E-learning 3.0 characteristics, which made up the initial holistic E-learning 3.0 model. The quantitative phase, via two Web-based surveys of students and lecturers of Mauritian higher education institutions, validated the initial model. To further confirm and extend, where appropriate, the surveys' findings for a holistic representation of E-learning 3.0 within the Mauritian higher education context, the quantitative phase, in the form of the case study approach was undertaken. It consisted of interviews with Mauritian lecturers and administrative personnel of higher education institutions and the analysis of documents from universities and the Government and related agencies in Mauritius. This led to the development of the final holistic E-learning 3.0 model, consisting of eight main characteristics for E-learning 3.0 namely 'Content Management', 'Personalised Learning', 'Pedagogy', 'Collaboration', 'Web 3.0 System', 'Support', 'Trust' and 'Mindset and Cultural Shift', each with a number of associated characteristics (see sections 5.9.2, 5.10 and 5.11 for details on these characteristics and their associated characteristics).

Given the multi-phased mixed-methods approach adopted to derive these E-learning 3.0 characteristics and associated sub-characteristics, they are considered robust and unique as they address significant gaps in the literature namely, the unavailability of a collective set of E-learning 3.0 characteristics based on the Semantic Web and E-learning CSFs as well as the dearth of empirically validated E-learning 3.0 models, particularly within the context of small island developing states like Mauritius. E-learning is in the vanguard as the solution to a number of the higher education sector issues in Mauritius and is seen as having potential to assist the country to achieve its vision to become a knowledge hub and a gateway for post-secondary education in the region. Consequently, the holistic E-learning 3.0 model derived from this study binds together critical aspects for considerations to facilitate Mauritius and its higher education institutions to optimise E-learning adoption and to better harness the benefits of embracing new emerging technologies like the Semantic Web. Therefore, in

addressing the first research question, the final holistic E-learning 3.0 model does not just provide a list of characteristics and associated sub-characteristics to be considered for E-learning 3.0, but also provides a blueprint and an action plan towards E-learning 3.0 for the Mauritian higher education sector and at the same time, for other developing and small developing island nations in their E-learning 3.0 endeavours.

6.3.2 Research question two (RQ2)

RQ2: What are the critical success factors of implementing and sustaining E-learning 3.0 in higher education institutions of Mauritius, based upon the perceptions and viewpoints of the education?

The second research question was addressed through the mixed-methods approach comprising the quantitative survey phase followed by the qualitative case study phase in the form on interviews and documents analysis. The surveys with students and lecturers as well as the interviews with lecturers and administrative personnel from Mauritian higher education institutions captured their critical perceptions on the different E-learning 3.0 characteristics and associated sub-characteristics derived from the different phases of this study and allowed participants to express their views on what they considered as critical aspects to be included a holistic E-learning 3.0 within the Mauritian context.

The surveys of students and lecturers in Mauritian higher education institutions addressed part of the second research question by providing deep insights on how the E-learning 3.0 characteristics derived from the literature review were perceived by the students and the lecturers. Outcomes from the surveys retained the original list of E-learning 3.0 characteristics from the literature review namely ‘Content Management’, ‘Personalised Learning’, ‘Pedagogy’, ‘Collaboration’, ‘Web 3.0 System’, ‘Support’ and ‘Trust’ with the main changes captured within the sub-characteristics, as explained in section 4.9. While many of the characteristics’ associated sub-characteristics were retained, at times combined and/or renamed based on the surveys’ data analysis and related findings, mixed results were obtained on some of the E-learning 3.0 aspects, including content creation responsibility, knowledge representation, students’ ability to be autonomous learners, the culture of sharing and collaboration, Semantic Web related concepts such as knowledge repositories and ontologies and a restrained interpretation of support and trust amongst others. Consequently, to further validate the outcomes from the surveys, interviews, supported by documents analysis, provided

additional perceptions from lecturers and administrative personnel from the higher education institutions in Mauritius, thereby fully addressing the second research question.

Interviews with Mauritian lecturers and administrative personnel led to the final holistic E-learning 3.0 model (as shown in section 5.11). The final model retained the main characteristics from the surveys' analysis with changes made to the naming of some associated sub-characteristics and with some new sub-characteristics emerging. The changes made to the naming of existing sub-characteristics mostly reflected the need to establish a solid foundation for E-learning 3.0, through a gradual and guided approach. Some of the sub-characteristics were also renamed to explicitly elaborate their components, as perceived by the participating lecturers and administrative personnel, to ensure the model accurately and holistically represents the perceptions of participants. New emerging sub-characteristics from the interviews reflected participants' concerns that needed to be addressed such as intellectual property rights and regulations and more interaction, sharing and trust between lecturers. The final holistic model also saw the emergence of a new characteristic namely 'Mindset and Cultural Shift', addressing a critical aspect to be included in the E-learning 3.0 model, as it was reiterated a significant amount of times by participating lecturers and administrative personnel and further corroborated by documents' findings.

Therefore, the final holistic E-learning 3.0 model (Figure 5.3) consolidated with a set of recommendations (see section 6.4), provides guidelines for the implementation of both E-learning and E-learning 3.0 in the Mauritian context.

6.4 Recommendations

The focus of this research was on the identification of a holistic set of characteristics for E-learning 3.0 in the context of higher education institutions in Mauritius. Subsequently, based on the discussions and findings from this research, several recommendations can be made to different stakeholders of the higher education institutions in Mauritius including the students, the lecturers, policy makers such as the government and its related agencies and the higher education institutions in general. These recommendations also demonstrate some of the practical implications of this study for different stakeholders in higher education institutions, that may be directly or indirectly concerned with E-learning in general and E-learning 3.0

specifically. They could also be used by other higher education institutions from both developed and developing countries in their E-learning and E-learning 3.0 endeavours. These recommendations are discussed in the sub-sections below.

6.4.1 Dedicated team for content creation including educational technologist and instructional designers

From this research, it was seen that higher education institutions in Mauritius clearly lack a team dedicated to the creation of content which, most of the time, is carried out by the lecturers as part of their roles as academics and subject experts. While the lecturers' knowledge of the courses is undoubtedly critical to learning materials preparation, the need for instructionally designed content suitable to promote an effective learning process, particularly within an E-learning environment, cannot be overlooked. These concerns have been strongly expressed by both lecturers and administrative personnel and advocated by governmental policies as key initiatives to be considered and undertaken by universities, as discussed in section 5.9.2.1. Taking these into considerations, it is, therefore, recommended that higher education institutions have a dedicated team for content creation which includes, besides the subject experts, other content experts such as educational technologists and instructional designers.

6.4.2 Mandated institutional intellectual property (IP) policies supported by awareness and outreach programmes to educate stakeholders on IP matters

Concerns regarding intellectual property (IP) rights were noted in this study's findings and were highlighted as part of the characteristic 'Content Management' under the sub characteristic 'Intellectual property rights and regulations considerations', as discussed in section 5.9.2.1. These concerns have hindered the creation of quality content and discouraged the sharing of content among academics as pointed out by interview participants. As a matter of fact, addressing the issue of IP rights in any E-learning environment has been considered critical, particularly in terms of ensuring the quality of courses and content being delivered to students (Papp 2000; Andersson and Grönlund 2009). Policy-making as well as decision-making bodies in Mauritius have also raised concerns about the inadequate regulatory and legal framework which surrounds IP within tertiary institutions and the lack of awareness by staff at universities on matters pertaining to IP rights (Tertiary Education Commission 2012;

Ministry of Technology & Communication & Innovation 2018; Mengistie and Hardowar 2017). While higher education institutions such as the University of Mauritius, have made efforts to develop an institutional intellectual property policy through the establishment of knowledge transfer offices, such efforts have not been replicated across all higher education institutions in the country. Additionally, many stakeholders have expressed concerns about the inadequacy of staff trained to provide guidance and support on matters pertaining to content generation, collaboration and protection including the rights and benefits of authors and researchers with respect to intellectual properties within higher education institutions in Mauritius (Mengistie and Hardowar 2017). Therefore, in line with these concerns, it is recommended that the offering of intellectual property in higher education institutions be strengthened by establishing official bodies to actively implement and manage intellectual property policies and actively engage in creating awareness and outreach programmes to better educate staff and other stakeholders on intellectual property rights and implications.

6.4.3 Fostering an environment of active learning and engagement and innovative teaching and learning practices through concrete measures

As seen from findings in this study, tertiary institutions and the Government in Mauritius acknowledge the benefits offered by innovative teaching and learning practices that promote student-centered teaching and learning and lifelong learning, moving away from a knowledge transmission to a knowledge construction culture. However, on the other hand, the Mauritian education system is still deeply rooted in the traditional teaching paradigm, with instructors considered as the having the knowledge ready to be transferred to their respective students in whatever ways they wish to (Allybokus 2015). A number of recommendations and measures are outlined in the Government and universities' strategic plans towards the move to a culture of innovative teaching and learning practices that promote autonomous learners, away from the traditional authoritarian teaching practices (as discussed in sections 5.9.2.2, 5.9.2.3, 5.9.2.4, 5.9.2.6 and 0). Some of these include considering individual learners' needs and interests in course delivery, a reduction in class sizes to support customised delivery, recommended certified training to higher educational staff in online teaching and learning and pedagogy and working towards a reformed curricula which is more supporting and diverse to meeting learners' needs, which support innovative assessment strategies focusing on students' achieved skill and competencies as

opposed to how much knowledge has been accumulated, which embrace student-centered instructional methods and which promote and support more collaboration as well as contextualised and autonomous learning (Human Resource Development Council 2006; National ICT Strategic Plan 2007; Gillwald and Islam 2011; Ministry of Education and Culture and Human Resources 2009a; Tertiary Education Commission 2015, 2017; Ministry of Technology & Communication & Innovation 2018). However, many of these recommendations and measures, particularly those from the Government, are subject to the political climate of the country and depend on the Government's priorities in terms of its political agenda. Furthermore, a change in the Government could lead to changes in these national strategies based on the new Government's agenda. While the proposed recommendations are promising and appealing, unless concrete steps are undertaken to action them, they may be well just 'words on paper'. Therefore, it is recommended that concrete measures be undertaken by both policy makers and higher education institutions to promote active learning and engagement as well as innovative teaching and learning practices. These measures, as discussed previously, can include mandatory training of all higher educational lecturers on innovative teaching and learning practices similar to the initiatives undertaken by the University of Mauritius to mandate the course Post Graduate Certificate in Teaching and Learning to all new academic recruits, which also include a fully online module on educational technologies, allowing lecturers to experience the online mode of delivery to better equip them with technology enhanced teaching and learning strategies (Gunness 2011). Aligning with this, higher education institutions could mandate online learning components for all their courses to familiarise students and lecturers on technology enhanced teaching and learning approaches, in line with the country's Digital Mauritius vision (Ministry of Technology & Communication & Innovation 2018). All higher education institutions, both public and private, could be mandated to submit reports to the TEC in Mauritius on measures they are undertaking to foster an environment of engagement and innovative teaching and learning practices. The TEC, under its purview, could tightened its monitoring of universities' actual implementation of their strategic plans, including the measures they proposed to enhance teaching and learning and to promote student autonomy (Tertiary Education Commission Mauritius 2016a). Incentives and more support could be given to lecturers, encouraging them to experiment with innovative IT-enhanced teaching

strategies as well as to collaborate more as explained further in the next recommendation.

6.4.4 Providing incentives and increased and continued support to lecturers to encourage E-learning uptake and technology-enhanced teaching practices

Lecturers play a critical role in determining the students' attitudes towards the acceptance of E-learning (Lee 2008; Bhuasiri et al. 2012). However, as discussed in section 5.9.2.6, interviewees pointed out the lack of incentives including financial, career pathways and recognition and support they encounter to experiment with E-learning, innovative IT-enhanced teaching strategies as well as to collaborate more with learning content production and sharing (Gunness 2011; Veer Ramjeawon and Rowley 2017). As seen in this study's findings, this lack of support and incentives, coupled with large class sizes, have discouraged E-learning uptake and student-centered teaching practices, which are often associated with additional work load (Wagner, Hassanein and Head 2008). It is, therefore, recommended that incentives should be provided to lecturers to encourage the move towards E-learning and technology-enhanced teaching practices. Such incentives could be in the form of financial renumerations and/or career promotions and recognition as pointed out by lecturers during the interview phase of this study. To ensure fair recognition and provision of incentives for all academics, higher education institutions can link lecturers' key performance indicators to their E-learning initiatives and innovative teaching practices, which can then be evaluated and revised, if required, during their performance management. It is also recommended that lecturers be offered the required training related to E-learning including instructional design and support with technology courses (Wagner, Hassanein and Head 2008). High quality professional training and development should be ongoing, particularly for new innovative technologies and teaching and learning practices to address concerns and misconceptions and to sustain positive changes in lecturers' attitudes and beliefs and as seen by previous researches (Guskey 2002; Rogers 1995; Nichols 2008). Initiatives such as the course in Teaching and Learning as discussed in the previous recommendation (see section 6.4.3) could be subsidised or provided free of cost to all academic staff across all higher education institutions in the country, as part of their professional development. More academic staff could be recruited to reduce class sizes, thereby decreasing the workload and hours of lecturers, which could be

dedicated to developing innovative teaching practices and initiatives. Lecturers who are more comfortable with E-learning and the use of technology and who are prepared to share their experiences and coach their colleagues could be given additional incentives to act as mentors and technology champions to facilitate the diffusion of educational technology and new practices (Covington, Petherbridge and Warren 2005; Birch and Burnett 2009). Building such communities of practice will also contribute to promoting the sharing culture between colleagues, which as seen in this study, is seriously lacking among higher education lecturers (King and Boyatt 2015).

6.4.5 Integrating E-learning and supporting new technologies as part of mainstream practices within higher education institutions

As seen under section 5.9.2.8, apprehensions still prevail from different stakeholders when it comes to E-learning or any non-conventional and non-traditional teaching and learning environment, as the Mauritian educational system is deeply rooted in the traditional classroom system. Critical elements required within an E-learning environment are yet to be cultivated within the Mauritian culture. As discussed in this study, Mauritian students are not used to being autonomous learners, but rather expect spoon-feeding or at the very least high level of guidance from their lecturers. The culture of sharing and collaboration, critical to E-learning, is hindered by the elitist and exams-oriented nature of the education system, extending into the workplace. Most lecturers still prefer the traditional mode of delivery for different reasons. Some lack the confidence to deliver within an online environment, while other tend to evade the possible increase in their already bulky workload that is often associated with online teaching and learning and innovative teaching and learning practices. Some lecturers also have the instilled believes in the traditional delivery method with which they are familiar and, therefore, show reticence to any change. Similarly, most parents in Mauritius are accustomed to the traditional classroom settings, with E-learning often being viewed as a foreign concept by many. While attitudes towards E-learning and new technologies are changing in Mauritius with initiatives such as the CILL and the Open University of Mauritius as discussed in the literature review (see section 2.12.5), findings in this study showed that the traditional mode of delivery is still the preferred mode, and a culture of E-learning is yet to be fostered, despite the Government's reiteration of its commitment to making the country a knowledge society and its keenness to embrace emerging technologies to remain at the cutting edge globally

(Ministry of Technology & Communication & Innovation 2018; Gillwald and Islam 2011; Cooshna-Naik et al. 2012). Oliver (2001, 225) stated that "*If online learning is to return the benefits and opportunities it promises, it must become part of mainstream practice in the university setting*". This will allow E-learning to be integrated into daily teaching and learning activities as opposed to be treated as an "*external*" project, paving the way for a more sustainable use of E-learning technology within higher education (Nichols 2008, 603). However, for this to occur, E-learning and supporting new technologies, such as the move towards E-learning 3.0, must sit comfortably with the concerned stakeholders, particularly students and lecturers who are at the forefront of it all and whose attitudes and acceptance are critical for its adoption, promotion and success. As proposed in the final holistic E-learning 3.0 model (refer to Figure 5.3 and section 5.9.2.3 about sub-characteristic 'Towards full online delivery via blended delivery' under the characteristic 'Pedagogy'), a blended approach to E-learning is the ideal starting point to combat the apprehensions, uneasiness and biases that come with online learning within the still very traditional educational settings in Mauritius (Vencatachellum and Munusami 2003). Similarly, providing support at different levels, creating awareness and working towards a change in mindset are steppingstones towards E-learning integration. Therefore, based on findings from this study and aligning with the Mauritian Government's visions, strategies and policies discussed throughout this study, it is recommended that E-learning and supporting new technologies be integrated as part of the mainstream courses and practices within the higher educational settings, to allow for a seamless shift to E-learning and eventually E-learning 3.0. Such an integration will affirm the commitments of higher education institutions' and other concerned authorities including the Government to E-learning and new technologies, thereby fostering and promoting confidence in stakeholders regarding E-learning adoption (Andersson and Grönlund 2009).

6.4.6 Establishing an independent regulatory body for E-learning

As stated by Wagner, Hassanein, and Head (2008, 26) "*Successful implementation of e-learning is dependent on the extent to which the needs and concerns of the stakeholder groups involved are addressed*". However, in order for such needs and concerns to be properly addressed, whether in terms of policies, financial support, training, recruitment, infrastructure or the overall E-learning logistics, it is critical to have a regulatory body to oversee the planning, implementation and promotion

involved, which aligns with the stated strategies and policies of higher education institutions and the Government. While the TEC in Mauritius, as explained in this study, is the regulatory body for post-secondary education in the country and therefore ensures accountability and optimum use of resources by institutions under its overarching regulatory framework (Tertiary Education Commission Mauritius 2016a), its purview does not encompass a separate and distinct section dedicated to E-learning. Rather, the focus of the TEC is more in line with providing guidelines for setting up new post-secondary institutions, providing programmes accreditation, registering private institutions, granting awarding powers to institutions and providing general quality insurance control through auditing (Tertiary Education Commission Mauritius 2016a). As pointed out by participants during the interview phase of this study, the establishment of an independent regulatory body dedicated to supporting E-learning is key to the country's progress in that direction, to ensure a more streamline approach towards E-learning and its supporting technologies. The needs of all stakeholders can be better managed by an unbiased, independent body, ensuring accountability of higher education institutions and policy makers on their stated E-learning objectives and initiatives. Better standardised guidelines, policies and strategies can then be formulated to promote and support E-learning. At the same time, the regulatory body can provide the necessary quality control to promote and ensure quality E-learning delivery, thereby, creating an atmosphere of confidence towards E-learning uptake among stakeholders. Concerns and issue can be better addressed as the regulatory body will provide independent monitoring and evaluations of E-learning programmes and initiatives. In the final holistic E-learning 3.0 model, the critical need for a regulatory framework administered by an independent E-learning regulatory body is captured under the 'Support' characteristic. Therefore, in line with findings from this study, it is recommended that an independent regulatory body be established to oversee E-learning and its implementation and promotion in the country. It is also suggested that, given the fact that the TEC is already an established independent regulatory body for higher education in the country, a separate division be created, within the TEC itself, dedicated to E-learning and its supporting technologies.

Following these recommendations, the research contributions of this study are outlined next.

6.5 Research contributions

This research makes several contributions to the field of E-learning in general and more specifically to E-learning 3.0. Its overarching contribution lies in the development of a holistic E-learning 3.0 model for the Mauritian higher education institutions, which merges Semantic Web characteristics and E-learning CSFs. This research, therefore, addresses major gaps in the literature by exploring E-learning 3.0 within the context of a small island developing state and by providing a holistic representation of E-learning 3.0 that is empirically validated based on data evidence from participants namely students, lecturers and administrative personnel from Mauritian higher education institutions.

The outcomes of this research also align with and contribute to the vision and strategic plans of the Mauritian Government in positioning the country as a regional knowledge hub, through the strengthening of E-learning within the higher education sector, as one of its objectives. The model provides a blueprint for online learning and supporting new technologies, as a means of increasing access to tertiary education and lifelong learning locally and regionally.

The final holistic E-learning 3.0 also significantly captures the critical components necessary for an effective diffusion and sustainable implementation of E-learning 3.0 within Mauritian higher education institutions. While the combined consideration of learning content management, pedagogy and technology is vital for sustainable E-learning (Sridharan, Deng and Corbitt 2010, 2008), the final holistic E-learning 3.0 also brings to light numerous barriers and concerns that need to be addressed for an effective implementation of E-learning and towards the move to E-learning 3.0 within the Mauritian higher education context. Consequently, the final holistic E-learning 3.0 model highlights the gap between theory and practice with respect to the critical aspects required for a sustained and effective adoption and implementation of E-learning 3.0, particularly within the context of a small island developing state like Mauritius. While the model acknowledges that E-learning 3.0 is still a novel concept for the Mauritian higher education sector and that E-learning itself is yet to achieve a sustainable state, as an integral and expected part of teaching and learning, it also lays out the fundamental considerations to effectively move towards E-learning 3.0 and to achieve E-learning sustainability and beyond. Therefore, it is envisioned that the holistic E-learning 3.0 model developed and evaluated in this study, as well its resulting recommendations, as discussed in section 6.4, will guide Mauritius and other

developing countries, particularly Small Island Developing States (SIDS), in their move towards E-learning 3.0. It also lays the foundation for further E-learning 3.0 research into other SIDS and developing nations with an E-learning and innovative teaching and learning practices agenda.

The data analysis and findings from this study, resulting in the final holistic E-learning 3.0 model, addressed eight main areas of E-learning 3.0, namely: (1) Content Management, (2) Personalised Learning, (3) Pedagogy, (4) Collaboration, (5) Web 3.0 System, (6) Support, (7) Trust and (8) Mindset and Cultural Shift. The sub-sections below highlight the major findings and contributions of each of these areas from both the theoretical and practical perspectives.

6.5.1 Content Management

A major contribution of this research is its highlighting of the importance of content within the context of E-learning as it provides critical insights on several key issues to be considered regarding learning content creation, reuse, collaboration and sharing. As pointed out by Kanaksabee, Odit, and Ramdoyal (2011, 111), "*the answer to succeed in E-learning is high quality educational content*". The characteristic 'Content Management' provides a comprehensive representation of content management for a sustainable implementation of E-learning 3.0. In fact, as stated by Sridharan, Deng, and Corbitt (2010), the effective management of content is a critical part of sustainable E-learning. Its sub-characteristics 'towards understanding and applying knowledge representation through annotations and metadata and 'Content accessibility and reuse relevant to courses' and students' needs' are central to harnessing the benefits of the Semantic Web and considered critical components towards sustainable E-learning (Sofiadin 2012; Sridharan, Deng and Corbitt 2010). Through phrase like 'towards understanding and applying', the lack of familiarity with concepts such as knowledge representation, annotation and metadata, critical for E-learning 3.0, have also been pinpointed, thereby indicating an underlying need for the Mauritian higher education sector to work on the basics of E-learning first, as a starting point. Its sub-characteristic 'collaborative content creation' highlights the need for and current lack of content experts such as educational technologist and instructional designers to work on learning resources suitable or the online learning environment. The sub-characteristic 'Intellectual property rights and regulations considerations' addresses concerns regarding the lack of intellectual property rights considerations within tertiary

institutions in Mauritius, as one of the reasons hindering content sharing and collaboration among lecturers, with one of the study's recommendations being the mandating of intellectual property rights policies within tertiary institutions. Therefore, the characteristic 'Content Management' provides a comprehensive and sustainable representation of content management for a sustainable implementation of E-learning 3.0.

6.5.2 Personalised Learning

While the Government in Mauritius wants individual interests and needs to be considered, the 'Personalised Learning' characteristic confirms the deep rooted 'one size-fits-all' culture that dominates the education sector in Mauritius. This research highlights how E-learning in higher education institutions can contribute to the personalised learning of students, via the student model, which is currently deemed unrealisable within the context of the traditional classroom settings with large student numbers. It also reveals the various barriers which prevent lecturers from being willing and ready to provide a customised learning experience to their students based on needs and preferences and as such provide essential guidelines to higher education institutions on how they can better support their academic teams.

6.5.3 Pedagogy

The 'Pedagogy' characteristic in this study provides essential insights on the "*teacher-centred, syllabus-driven, textbook-centred and examination-oriented*" education system in Mauritius (Allybokus 2015, 31). From the practical angle, this research reveals several critical issues to be considered, in the form of the five sub-characteristics under 'Pedagogy' towards bringing a realistic change to the archaic educational system in the country to adequately support E-learning and optimise its benefits. Aligning with the Government policies, the 'Pedagogy' characteristic highlights the needs for a curriculum which supports E-learning, emphasises the gradual move towards a student centered teaching environment, accentuates the need to guide students and lecturers towards a change in their roles, emphasises a holistic approach to evaluation and promotes blended learning as a starting point for Mauritius towards fully online programmes and innovative E-learning practices. As Paxton (2003, 38) stated, "*effective e-learning is much more than "digital page turning" (as in the more traditional classroom teaching) it is a holistic educational experience that focuses on deep and insightful learning*". Consequently, this research, under the

'Pedagogy' characteristic, provides significant guidance on aspects to be considered towards achieving an online teaching learning environment that is realistically "*commensurate with the requirements of emerging and future economic challenges*" in line with the Mauritian Government's quest to make Mauritius the digital island of the region (Rughooputh 2003, 2). Pedagogical consideration emphasises the importance of the teaching and learning needs, as opposed to a solely technology-driven approach. Such consideration is deemed critical for the sustainable adoption of new practices and more so to get 'buy-ins' from lecturers and to promote a more conducive environment for the adoption of less traditional practices. Areas for improvement also need to be addressed based on the recommendations provided.

6.5.4 Collaboration

The 'Collaboration' characteristic raises an important, often overlooked, concern within the higher education sector namely the lack of a culture of sharing and collaboration amongst lecturers. This attitude has been attributed to the 'knowledge hoarding' mindset of lecturers who often perceive knowledge as power and the sharing of that knowledge as giving away part of that power as discussed in section 5.9.2.4. It also underlines the individualistic culture that is ingrained in the Mauritian education system, which needs to be addressed in order to optimise the benefits of online learning. While the TEC has raise concerns about the poor sharing culture amongst academics and recommended that higher education institutions work to remedy the situation towards a more inclusive, open and sharing culture, findings from this study also revealed that higher education institutions are slowly but positively undertaking initiatives to directly and indirectly address the barriers to collaboration amongst their academics. Educating lecturers and content providers about Intellectual Property rights is one such step towards building their confidence to collaborate. Similarly, through workshops designed to introduce novel concepts such as OER, which is gaining momentum, a bigger picture of the importance of content sharing and collaboration is provided to lecturers. Lecturers are being made aware how collaboration and sharing can enable the leverage of high quality content from the international community, beneficial for the teaching and learning process, the students and the lecturers themselves. With regard to E-learning 3.0, such collaboration is key as the Semantic Web technologies, through metadata and ontologies, are considered as the ideal tool for optimising the discovery, sharing and reuse of content. Therefore, the different

components under 'Collaboration' provide an integrated view of collaboration that higher education institutions need to consider and address in the pursuit of an effective and collaborative online learning environment.

6.5.5 Web 3.0 System

Undoubtedly, adopting latest technologies which support better management of learning content is central towards creating sustainable reusable content in the form of reusable learning objects repositories (Sridharan, Deng and Corbitt 2010). The sub-characteristic 'Understanding and working towards knowledge, ontologies and other repositories' acknowledges the criticality of the knowledge repositories and the metadata ontologies as vital to achieve the sustainable management of learning resources within the E-learning 3.0 model. However, it also highlights the fact that these concepts are yet to be fully grasped by the Mauritian higher education stakeholders. Most of them still need to come to terms with fundamental and requisite E-learning components such as E-learning appropriate content, customised content delivery based on students' needs, technology efficacy and competence and collaboration amongst others. On the other hand, while efforts from higher education institutions and the Government cannot be denied including investments in the ICT sector, the need to have the appropriate infrastructure that can support and evolve with new technologies is also emphasised in the model. This aligns with the Government's agenda of remaining at the cutting of technologies in its quest to make the country a knowledge hub (Ministry of Technology & Communication & Innovation 2018; Gillwald and Islam 2011). Consequently, the characteristic 'Web 3.0 System' and its associated sub-characteristics denotes a realistic picture of the E-learning 3.0 system for the Mauritian higher education. It highlights critical system components namely the required repositories, usability and accessibility and the ICT infrastructure, while at the same time acknowledges and emphasises the need to understand and work towards an effective, adaptable and sustainable E-learning 3.0 system.

6.5.6 Support

This research provides critical insights regarding the different types of support that are required for the move to E-learning 3.0. Apart from the more obvious and frequently mentioned ones such as training and investments in ICT infrastructures, this research also highlights other support factors that are often overlooked but are just as crucial. These include the need for more support to lecturers in terms of content preparation

and designs and incentives and recognition to adopt E-learning and new teaching practices. Additionally, as a means of addressing the misconceptions related to E-learning as well as anxiety and uncertainty related to adopting new technologies and innovative practices, the professional development of lecturers, as a vital strategic activity, is highlighted as a major support focus. A "*coherent institutional-wide approach offering guidance, resources and recognition*" is also deemed critical to encourage and support staff in their adoption of new practices and technologies (King and Boyatt 2015, 1277). Another often disregarded aspect of 'Support' is the need to have a regulatory body with a supporting framework, which oversees E-learning in the country, to provide an independent and streamlined approach to E-learning initiatives and to provide the quality control required to ensure quality E-learning delivery that addresses the needs and concerns of all concerned parties in a fair and unbiased way. Similarly, having the proper support in terms of Governmental and institutional policies is deemed essential as seen from this study' findings. Therefore, the support factors derived from this study provide a more explicit and broader view of support within the E-learning 3.0 model, thereby establishing a comprehensive and integrated picture of the E-learning needs and requirements for Mauritius and similar developing countries in general.

6.5.7 Trust

The characteristic 'Trust' emphasises the critical connection between fostering an atmosphere of collaboration and sharing and fostering an atmosphere of trust. It also highlights, one more time, the prevailing individualistic attitude that exists in Mauritian higher education institutions, between students and regrettably between lecturers as well, despite universities and the Government acknowledging the importance of a developing a more collaborative culture. The 'trust' characteristic reinforces the need for concrete measures to be undertaken across the board and particularly at the organisation and Government levels in order to build trust between different stakeholders to optimise the benefits of E-learning 3.0 and E-learning in general and to position Mauritius as a knowledge society.

6.5.8 Mindset and Cultural Shift

From a practical perspective, the 'Mindset and Cultural Shift' characteristic captures the essential groundwork that needs to be done to establish an E-learning culture in Mauritius and to facilitate the country to achieve the vision of becoming a knowledge

society. The 'Mindset and Cultural Shift' characteristic highlights the ingrained cultural barriers within the Mauritian education sector that need to be addressed as steppingstones towards innovative teaching and learning practices and technologies, including the move towards E-learning 3.0. It emphasises the need for a change in the spoon-feeding culture that the higher education sector is accustomed to and finds hard to move away from. It also highlights the entrenched exams oriented and competitive culture that continue to hinder collaboration and sharing between students and between staff. More importantly, it stresses the need to educate all directly and indirectly concerned stakeholders on the basics of E-learning to do away with the attitude that E-learning is just the passive transmission of course content online but rather constitutes of an integrated leaning experience that requires a panoply of critical requirements to be considered and undertaken to reap its full benefits. Hence, more awareness is created on the "s*hared responsibility*" required between the E-learning stakeholders for its acceptance and success (Wagner, Hassanein and Head 2008, 33).

The holistic E-learning 3.0 model from this study (Figure 5.3) serves as a blueprint for Mauritius in its quest towards E-learning and new and innovative technologies, such as the Semantic Web, within the higher education sector. Simultaneously, although the model pertains specifically to Mauritian higher education institutions and reflects largely the opinions and perceptions of Mauritian students, lecturers and administrative personnel, it has the scope to be generalised to other developing countries, particularly other small island developing states. Therefore, the holistic E-learning 3.0 model can be used as a guide which captures the critical components to be considered for E-learning implementation in developing countries. It also establishes the necessary foundation for E-learning 3.0 and for future researches in E-learning 3.0 implementation.

However, despite the several significant contributions of this research, it has its limitations, which are discussed next.

6.6 Research Limitations

While this research offers some significant theoretical and practical contributions, it nonetheless, has its limitations as discussed below.

The focus of this research was on the higher education sector, particularly higher education institutions in Mauritius. The characteristics and associated sub-characteristics derived from this study could be different in other Mauritian teaching and learning environments such as in professional training programs and learning programs within the workplace. Similarly, while the findings of this study can be generalised to other developing countries, including small island developing nations, the set of E-learning 3.0 characteristics and associated sub-characteristics could still be different for the different educational settings for other countries.

Time and resource constraints limited the types of stakeholders involved in the data collection phases of this research. The opinions and perceptions of students, lecturers and administrative personnel from Mauritian higher education institutions were gathered in this study. However, the opinions and perceptions of other stakeholders such as management staff in tertiary institutions and staff from Governmental agencies, such as the Tertiary Education Commission (TEC), would have added more insights on E-learning and E-learning 3.0 in the country.

The participation rate from public and private institutions for the students' and lecturers' surveys were quite similar despite more students are enrolled into and more lecturers are employed by public tertiary institutions in the country. A more proportionate participation rate reflective of universities' population would have provided a broader perspective on E-learning and E-learning 3.0.

Documents examined and referred to in this study such as the Digital Mauritius 2030 report, the National Broadband Policy 2012 - 2020 (NBP2012), the Education and Human Resources Strategy Plan 2008-2020, are based on objectives and the political agenda of the current government. These objectives and their priorities may change depending on the political climate of the country.

6.7 Future research directions

The limitations of this study provide several opportunities for future research. Firstly, this research could be extended to other educational settings in Mauritius, including workplace learning environments and professional training programs within the Mauritian business sector, thereby providing grounds for comparisons between the higher education sector and other educational environments. Similarities and differences between the different educational settings can then be analysed with best practices recommended. Similarly, this research could also be extended to other

developing countries, including small island developing states. This would assist with the evaluation of the holistic E-learning 3.0 model in the context of other developing countries, allowing the comparison of E-learning and the move towards E-learning 3.0 in Mauritius with other similar countries. This would provide a basis for Mauritius and similar countries to learn from each other and adopt best practices regarding E-learning and supporting new technologies such as the Semantic Web and innovative teaching and learning practices. Furthermore, a comparative analysis of the extent to which findings from this study align with or differ from developed countries can bring additional insights to the literature on E-learning 3.0.

With emphasis laid on critical success factor of E-learning for a holistic representation of E-learning 3.0, further research could be carried out to develop a system for evaluating online courses in both developed and developing countries using the identified characteristics and sub-characteristics of this study as a base line.

A wider perspective on E-learning and E-learning 3.0 from management in higher education institutions and from national level policy makers, such as Government agencies like the TEC, would add more depth to the final holistic E-learning 3.0 model. The perspectives of management and policy makers could then be integrated into the model which is currently based on a more teaching and learning perspective. Additionally, a sample which include a more proportionate representation of respondents from public and private tertiary institutions and from different educational settings, would assist to further refine the holistic E-learning 3.0 model.

As a future extension of this research, a longitudinal study examining how the characteristics and associated sub-characteristics for the holistic E-learning 3.0 model derived from this research change over time when Mauritius is more mature in its E-learning endeavours, can be carried out. Such a study can reveal critical findings in terms of the progress made on E-learning and innovative technologies and practices in line with findings from this research including discussed governmental strategies and policies, tertiary institutions' strategies and initiatives as well as the country's vision of positioning itself as a knowledge society and regional ICT hub.

A future study could also investigate E-learning and the move towards new supporting technologies such as the Semantic Web following the implementation of the holistic E-learning 3.0 model and its recommendations. The model can then be customised by different institutions and educational settings to filter off sections that have already been implemented and to address their specific needs.

6.8 Chapter summary

This chapter concludes the thesis by highlighting the contributions that this research to the areas of E-learning and E-learning 3.0, particularly in the context of Mauritius as a small island developing nation. The chapter begins with a summary of the research, outlining the different data collection and analysis phases within the Mauritian higher education sector, that resulted in the final holistic E-learning 3.0 model. An overview of the research findings pertaining to the research questions is then provided. Recommendations derived from the findings of this study are discussed next to further assist stakeholders such as tertiary institutions and policy makers in the sound implementation of E-learning 3.0. The major findings and contributions of this research based on each of the eight areas captured in the final holistic E-learning 3.0 model are then outlined, from both the theoretical and practical perspectives. Theoretically, the final holistic E-learning 3.0 model fills numerous literature gaps by providing a collective set of E-learning 3.0 factors based on the combined characteristics of the Semantic Web and E-learning CSFs, within the mostly unexplored context of a small island developing state, namely Mauritius, while capturing the critical perspectives of students, lecturers and administrative personnel from Mauritian tertiary institutions to empirically validate its findings. In terms of its practical significance, the final holistic E-learning 3.0 model provides critical guidance to Mauritian tertiary institutions and policy makers of with regard to E-learning initiatives, including new supporting technologies and teaching and learning practices. It also addresses the foundation work that needs to be carried out for the move towards E-learning 3.0. The limitations of this study were also acknowledged and discussed. These provided grounds for future research avenues such as an extension of the research scope to include other developing countries and the gathering of perspectives from other stakeholder groups for further refinement of the E-learning 3.0 model, amongst others.

A list of references is provided next followed by several appendices to provide additional information to readers on various aspects of this study.

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Appendix A - Semantic Web characteristics by main and sub themes

Table A:1: Semantic Web characteristics by themes – Prepared by the Researcher

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Main Theme: Content Management			
E-Learning based on E-learning based on the Semantic Web	Stojanovic, Staab, and Studer (2001)	Learning materials production (creation and reuse)	Content creation
Semantic Services in E-Learning	Moreale and Vargas-Vera (2004)	Learning materials production and provision	
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Learning content provision	
Development of an E-learning System Incorporating Semantic Web	Shamsi and Khan (2012)	Course content provision	
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Course Content	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Provision of study materials	
Ontology-Driven E-Learning System	Snae and Brueckner (2007)	Content	
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	Educational content	
Conceptual Framework based on ontologies for knowledge management in e-learning systems	Pah et al. (2007)	Knowledge management – creation, extraction, classification, retrieval, sharing	
Towards a knowledge portal for E-learning based on Semantic Web	Yanyan and Mingkai (2008)	Knowledge acquisition	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Adaptive E-Learning Content Generation based on Semantic Web Technology	(Holohan et al. 2005)	Learning objects provision	
An Ontology of Construction Education for Elearning via the Semantic Web	Ahmed, Shaik, and Aouad (2006)	Pedagogically enriched content	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Navigation of learning materials	Content retrieval
		Pedagogical agents interacting with learning materials	
		Learning content retrieval	
Development of an E-learning System Incorporating Semantic Web	Shamsi and Khan (2012)	Course content retrieval	
A New Framework Semantic Web Technology Based E-Learning	Shrivastava, Sharma, and Bawankan (2012)	Course content search and retrieval	
		Access materials	
Conceptual Framework based on ontologies for knowledge management in e-learning systems	Pah et al. (2007)	Knowledge management – creation, extraction, classification, retrieval, sharing	
Towards a knowledge portal for E-learning based on Semantic Web	Yanyan and Mingkai (2008)	Knowledge retrieval	
Adaptive E-Learning Content Generation based on Semantic Web Technology	Holohan et al. (2005)	Navigation of learning content	
E-Learning based on E-learning based on the Semantic Web	Stojanovic, Staab, and Studer (2001)	Learning materials production (creation and reuse)	Content reuse
Using Semantic Web to support Advanced Web-Based Environment	Fouad et al. (2011)	Reuse	
Conceptual Framework based on ontologies for knowledge management in e-learning systems	Pah et al. (2007)	Knowledge management – creation, extraction, classification, retrieval, sharing	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
A framework for an E-learning system based on semantic Web	Mahmoud, Abd-El-Hafeez, and Badawy (2013)	Reuse	
E-Learning based on E-learning based on the Semantic Web	Stojanovic, Staab, and Studer (2001)	Semantic querying of learning materials	Semantic Search
Semantic Services in E-Learning	Moreale and Vargas-Vera (2004)	Semantic Search	
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Semantic Search	
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Query	
		Search	
Development of an E-learning System Incorporating Semantic Web	Shamsi and Khan (2012)	Semantic search	
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Semantic Search	
A New Framework Semantic Web Technology Based E-Learning	Shrivastava, Sharma, and Bawankan (2012)	Course content search and retrieval	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Database query	
Semantic Approach for E-learning System	Guo and Chen (2006)	Semantic Querying	
Identification of Ontology Based Object Using Instructional Design	Srimathi and Srivatsa (2008)	Semantic querying	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	Author(s) & Year	Characteristics of Model/Framework	Main and Sub Themes
Knowledge representation of LMS using ontology	Srimathi (2010)		
E-Learning based on E-learning based on the Semantic Web	Stojanovic, Staab, and Studer (2001)	Learning materials descriptions (metadata)	Knowledge representation
Semantic Services in E-Learning	Moreale and Vargas-Vera (2004)	Semantic mark-ups of content (annotation)	
An Intelligent Semantic E-learning Framework using Context-Aware Semantic Web Technologies	Huang, Webster, et al. (2006)	Semantic Mark-ups	
Ontological Support for E-learning courses	De Nicola, Missikoff, and Schiappelli (2004)	Learning resources mapping to domain concepts	
Ontology based learning objects sequencing Ontology-based learning objects search and course generation	Neri (2005) Neri and Colombetti (2009)	Semantic descriptions of learning resources	
Design Engineering Educational Framework Using ShareFast: A Semantic Web-Based E-Learning System	Hiekata et al. (2007)	Documents linked to workflows	
Semantic Web and Intelligent Management Systems (ILMS)	Šimić, Gašević, and Devedžić (2004)	Student tools – student profile, course navigator, annotation, collaboration, assessment	
Education and the Semantic Web	Devedzic (2004)	Semantic Mark-ups	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Learning resources descriptions (Metadata)	
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Annotation	
		Semantically Enriched Learning Resources	
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Annotation	
A framework for an E-learning system based on semantic Web	Mahmoud, Abd-El-Hafeez, and Badawy (2013)	Semantic structure of content	
Semantic Approach for E-learning System	Guo and Chen (2006)	Learning Resources Descriptions (metadata)	
		Content, Context, Structure	
		Semantic Mapping	
E-Learning System Overview based on Semantic Web	Alsultanny (2006)	Knowledge Representation	
		Content, context and structure	
Semantic Web-Based Educational Knowledge Service System for E-learning	Huang, Yang, et al. (2006)	Annotation	
		Learning Resources Metadata	
Towards a knowledge portal for E-learning based on Semantic Web	Yanyan and Mingkai (2008)	Knowledge acquisition	
		Knowledge refinement	
		Knowledge maintenance	
		Knowledge retrieval	
		Knowledge accessing	
		Authoring tools	
Identification of Ontology Based Object Using Instructional Design	Srimathi and Srivatsa (2008)	Metadata	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Knowledge representation of LMS using ontology	Srimathi (2010)		
A semantic web based personalized learning service for programming course in e-learning	Jinghua (2011)	Information Model – domain knowledge, learning resources, learners' preferences	
An Ontological Approach to Support Personalized E-Learning System	Sudhana, Raj, and Sikamani (2013)	Domain knowledge representation	
		Content, learning resources mapped to ontologies	
Main Theme: Personalised Learning			
E-Learning based on E-learning based on the Semantic Web	Stojanovic, Staab, and Studer (2001)	Personalisation	Personalised learning
Semantic Services in E-Learning	Moreale and Vargas-Vera (2004)	Personalised Learning	
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Personalised learning	
Development of an E-learning System Incorporating Semantic Web	Shamsi and Khan (2012)	Personalisation	
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Personalisation	
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	Personalisation	
Semantic Approach for E-learning System	Guo and Chen (2006)	Personalisation	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Using Semantic Web to support Advanced Web-Based Environment	Fouad et al. (2011)	Personalised Learning	
An Ontological Approach to Support Personalized E-Learning System	Sudhana, Raj, and Sikamani (2013)	Personalised Learning	
An Ontology of Construction Education for Elearning via the Semantic Web	Ahmed, Shaik, and Aouad (2006)	Personalisation	
An Intelligent Semantic E-learning Framework using Context-Aware Semantic Web Technologies	Huang, Webster, et al. (2006)	Learner's model	Student model
Adaptive E-Learning Content Generation based on Semantic Web Technology	Holohan et al. (2005)	Students' preferences	
Ontology based learning objects sequencing Ontology-based learning objects search and course generation	Neri (2005) Neri and Colombetti (2009)	Learners' needs	
Design Engineering Educational Framework Using ShareFast: A Semantic Web-Based E-Learning System	Hiekata et al. (2007)	Learner's behaviour	
Semantic Web and Intelligent Management Systems (ILMS)	Šimić, Gašević, and Devedžić (2004)	Student tools – student profile, course navigator, annotation, collaboration, assessment	
Education and the Semantic Web	Devedzic (2004)	Student Model	
A New Framework Semantic Web Technology Based E-Learning	Shrivastava, Sharma, and Bawankan (2012)	Learner profile	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Learner profile	
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	Learner's goals	
Semantic Web Ontology for E-learning in Higher Education	Bucos, Dragulescu, and Veltan (2010)	Student Model and Educational plans	
Semantic Approach for E-learning System	Guo and Chen (2006)	User preferences, types and knowledge level	
E-Learning System Overview based on Semantic Web	Alsultanny (2006)	Student Model	
Conceptual Framework based on ontologies for knowledge management in e-learning systems	Pah et al. (2007)	Personal user profile	
Semantic Web-Based Educational Knowledge Service System for E-learning	Huang, Yang, et al. (2006)	Learner profile	
Towards a knowledge portal for E-learning based on Semantic Web	Yanyan and Mingkai (2008)	Learner profile	
Identification of Ontology Based Object Using Instructional Design Knowledge representation of LMS using ontology	Srimathi and Srivatsa (2008) Srimathi (2010)	Learner profile	
Development of student model ontology for personalization in an e-learning system based on semantic web	Pramitasari et al. (2009)	Personalised learning	
A semantic web based personalized learning service for programming course in e-learning	Jinghua (2011)	Student profile: preferences, knowledge level and progress	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
An Ontological Approach to Support Personalized E-Learning System	Sudhana, Raj, and Sikamani (2013)	Education Support Preferences	
Main Theme: Pedagogy			
Ontology based learning objects sequencing Ontology-based learning objects search and course generation	Neri (2005) Neri and Colombetti (2009)	Pedagogy	Pedagogy
Ontology of Learning objects Repository for Pedagogical Knowledge Sharing	Wang (2009)	Pedagogy – subject, learning objective, instructional method, delivery instrument, assessment instrument and assessment outcome	
Identification of Ontology Based Object Using Instructional Design Knowledge representation of LMS using ontology	Srimathi and Srivatsa (2008) Srimathi (2010)	Pedagogy	
Ontology of Learning objects Repository for Pedagogical Knowledge Sharing	Wang (2009)	Pedagogy – subject, learning objective, instructional method, delivery instrument, assessment instrument and assessment outcome	Syllabus
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Course document	
Ontology-Driven E-Learning System	Snae and Brueckner (2007)	Course Syllabus	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Semantic Web Ontology for E-learning in Higher Education	Bucos, Dragulescu, and Veltan (2010)	Establishing curricula	
Semantic Services in E-Learning	Moreale and Vargas-Vera (2004)	Pedagogy and course sequencing	Course design and sequencing
An Intelligent Semantic E-learning Framework using Context-Aware Semantic Web Technologies	Huang, Webster, et al. (2006)	Course design and sequencing	
Adaptive E-Learning Content Generation based on Semantic Web Technology	Holohan et al. (2005)	Course sequencing	
Ontology based learning objects sequencing Ontology-based learning objects search and course generation	Neri (2005) Neri and Colombetti (2009)	Course sequencing	
An Ontology of Construction Education for Elearning via the Semantic Web	Ahmed, Shaik, and Aouad (2006)	Pedagogically enriched content for course design	
Semantic Web and Intelligent Management Systems (ILMS)	Šimić, Gašević, and Devedžić (2004)	Teacher tools – pedagogy, course composition and sequencing	
Education and the Semantic Web	Devedzic (2004)	Course sequencing	
Education and the Semantic Web	Devedzic (2004)	Instructional designs and learning theories	
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Course sequencing	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
A New Framework Semantic Web Technology Based E-Learning	Shrivastava, Sharma, and Bawankan (2012)	Course planning and sequencing	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Course planning and sequencing	
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	Instructional process	
Semantic Web Ontology for E-learning in Higher Education	Bucos, Dragulescu, and Veltan (2010)	Course sequencing	
Semantic Approach for E-learning System	Guo and Chen (2006)	Course sequencing	
E-Learning System Overview based on Semantic Web	Alsultanny (2006)	Course sequencing	
Identification of Ontology Based Object Using Instructional Design Knowledge representation of LMS using ontology	Srimathi and Srivatsa (2008) Srimathi (2010)	Sequencing and navigation	
Identification of Ontology Based Object Using Instructional Design Knowledge representation of LMS using ontology	Srimathi and Srivatsa (2008) Srimathi (2010)	Instructional design principles	
A semantic web based personalized learning service for programming course in e-learning	Jinghua (2011)	Process Model – learning path of students, knowledge point of selection, learning activities selection, strategies for resource selection	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Design Engineering Educational Framework Using ShareFast: A Semantic Web-Based E-Learning System	Hiekata et al. (2007)	Pedagogy – subject, learning objective, instructional method, delivery instrument, assessment instrument and assessment outcome	Assessment and evaluation
Semantic Web and Intelligent Management Systems (ILMS)	Šimić, Gašević, and Devedžić (2004)	Student tools – student profile, course navigator, annotation, collaboration, assessment	
Education and the Semantic Web	Devedzic (2004)	Assessment	
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Evaluation	
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Assessment and Evaluation	
Development of an E-learning System Incorporating Semantic Web	Shamsi and Khan (2012)	Evaluation and Assessment	
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Assessments and Progress Reports	
A New Framework Semantic Web Technology Based E-Learning	Shrivastava, Sharma, and Bawankan (2012)	Assessment	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Evaluation & assessments	
Ontology-Driven E-Learning System	Snae and Brueckner (2007)	Learning Evaluation	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Semantic Web Ontology for E-learning in Higher Education	Bucos, Dragulescu, and Veltan (2010)	Students' progress monitoring	
Ontology based learning objects sequencing Ontology-based learning objects search and course generation	Neri (2005) Neri and Colombetti (2009)	Matching learning content to pedagogical aspects – teaching methods	Teaching strategies
Ontology of Learning objects Repository for Pedagogical Knowledge Sharing	Wang (2009)	Pedagogy – subject, learning objective, instructional method, delivery instrument, assessment instrument and assessment outcome	
Education and the Semantic Web	Devedzic (2004)	Teaching & Learning	
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Interactive Tutorials	
Ontology-Driven E-Learning System	Snae and Brueckner (2007)	Teaching Approach	
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	Educational tools	
Conceptual Framework based on ontologies for knowledge management in e-learning systems	Pah et al. (2007)	didactics	
A semantic web based personalized learning service for programming course in e-learning	Jinghua (2011)	Process Model – learning path of students, knowledge point of selection, learning activities selection, strategies for resource selection	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Semantic Services in E-Learning	Moreale and Vargas-Vera (2004)	context	Context
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Context	
Semantic Approach for E-learning System	Guo and Chen (2006)	Content, Context, Structure	
E-Learning System Overview based on Semantic Web	Alsultanny (2006)	Content, context and structure	
Main Theme: Web 3.0 System			
An Intelligent Semantic E-learning Framework using Context-Aware Semantic Web Technologies	Huang, Webster, et al. (2006)	Personal Agents	Knowledge and other repositories
Education and the Semantic Web	Devedzic (2004)	Pedagogical agents interacting with learning materials	
A framework for an E-learning system based on semantic Web	Mahmoud, Abd-El-Hafeez, and Badawy (2013)	RDF triples	
E-Learning based on E-learning based on the Semantic Web	Stojanovic, Staab, and Studer (2001)	Knowledge Warehouse – ontology, metadata, other data	
An Intelligent Semantic E-learning Framework using Context-Aware Semantic Web Technologies	Huang, Webster, et al. (2006)	Ontologies & knowledge base	
Semantic Web and Intelligent Management Systems (ILMS)	Šimić, Gašević, and Devedžić (2004)	Administrative tools – maintenance of records, security management, domain knowledge management	
		Data and metadata repositories	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Knowledge repository including ontologies and other databases	
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Other databases	
Development of an E-learning System Incorporating Semantic Web	Shamsi and Khan (2012)	Knowledge base – ontologies, inference rules, metadata, learning resources in RDF	
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Knowledge Base	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Database query	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	RDF based learning databases	
Semantic Web-Based Educational Knowledge Service System for E-learning	(Huang, Yang, et al. 2006)	Knowledge Repository	
Identification of Ontology Based Object Using Instructional Design Knowledge representation of LMS using ontology	Srimathi and Srivatsa (2008) Srimathi (2010)	Semantic educational servers	
An Ontological Approach to Support Personalized E-Learning System	Sudhana, Raj, and Sikamani (2013)	Learner profile repository Learning content repository	
E-Learning based on E-learning based on the Semantic Web	Stojanovic, Staab, and Studer (2001)	Course Ontology	Ontologies

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Semantic Services in E-Learning	Moreale and Vargas-Vera (2004)	Services linked to ontologies	
An Intelligent Semantic E-learning Framework using Context-Aware Semantic Web Technologies	Huang, Webster, et al. (2006)	Context Model, Ontologies & knowledge base	
Adaptive E-Learning Content Generation based on Semantic Web Technology	Holohan et al. (2005)	Ontologies	
Ontological Support for E-learning courses	De Nicola, Missikoff, and Schiappelli (2004)	Ontologies	
Ontology of Learning objects Repository for Pedagogical Knowledge Sharing	Wang (2009)	Ontologies	
Education and the Semantic Web	Devedzic (2004)	Ontologies	
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Knowledge repository including ontologies and other databases	
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Content Ontology	
A New Framework Semantic Web Technology Based E-Learning	Shrivastava, Sharma, and Bawankan (2012)	Ontology for course content	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Ontology	
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	Ontologies	
Semantic Approach for E-learning System	Guo and Chen (2006)	Ontologies	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Semantic Web-Based Educational Knowledge Service System for E-learning	Huang, Yang, et al. (2006)	Ontology	
Towards a knowledge portal for E-learning based on Semantic Web	Yanyan and Mingkai (2008)	Ontologies	
Development of student model ontology for personalization in an e-learning system based on semantic web	Pramitasari et al. (2009)	Student Ontology: student learning style, student performance and student personal data	
Using Semantic Web to support Advanced Web-Based Environment	Fouad et al. (2011)	Learning Profile ontology	
		Learning Objects ontology	
		Domain ontology	
		Ontologies: domain ontology, resource ontology, instruction ontology, learner ontology	
An Ontological Approach to Support Personalized E-Learning System	Sudhana, Raj, and Sikamani (2013)	Ontologies: learner, domain	
An Ontology of Construction Education for Elearning via the Semantic Web	Ahmed, Shaik, and Aouad (2006)	Ontology	
E-Learning based on E-learning based on the Semantic Web	Stojanovic, Staab, and Studer (2001)	Usability & Access	Usability
Semantic Web and Intelligent Management Systems (ILMS)	Šimić, Gašević, and Devedžić (2004)	Student tools – student profile, course navigator, annotation, collaboration, assessment	
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Usability and Access	
Development of an E-learning System Incorporating Semantic Web	Shamsi and Khan (2012)	Course navigation	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Ontology-Driven E-Learning System	Snae and Brueckner (2007)	Interface design	
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	Systems interface	
Semantic Web-Based Educational Knowledge Service System for E-learning	Huang, Yang, et al. (2006)	User Interface – access, store, view, search	
An Ontological Approach to Support Personalized E-Learning System	Sudhana, Raj, and Sikamani (2013)	User Interface – query	
E-Learning based on E-learning based on the Semantic Web	Stojanovic, Staab, and Studer (2001)	Usability & Access	Accessibility
Semantic Services in E-Learning	Moreale and Vargas-Vera (2004)	Access via user interface	
Semantic Web and Intelligent Management Systems (ILMS)	Šimić, Gašević, and Devedžić (2004)	Student tools – student profile, course navigator, annotation, collaboration, assessment	
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Registration and notification	
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Registration	
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Navigation	
Development of an E-learning System Incorporating Semantic Web	Shamsi and Khan (2012)	Registration	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Authentication & Secure access, registration, notification	
A New Framework Semantic Web Technology Based E-Learning	Shrivastava, Sharma, and Bawankan (2012)	Course Registration, notification	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Registration	
Ontology-Driven E-Learning System	Snae and Brueckner (2007)	System login	
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	Systems interface	
Conceptual Framework based on ontologies for knowledge management in e-learning systems	Pah et al. (2007)	Accessibility	
Semantic Web-Based Educational Knowledge Service System for E-learning	Huang, Yang, et al. (2006)	User Interface – access, store, view, search	
Semantic Web and Intelligent Management Systems (ILMS)	Šimić, Gašević, and Devedžić (2004)	Administrative tools – maintenance of records, security management, domain knowledge management	Security
E-learning Model Based on the Semantic Web Technology	Ghaleb et al. (2006)	Access via user interface	
Development of an E-learning System Incorporating Semantic Web	Shamsi and Khan (2012)	Authentication	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Authentication & Secure Access	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Authentication	
Ontology-Driven E-Learning System	Snae and Brueckner (2007)	System login	
Main Theme: Collaboration			
Semantic Web and Intelligent Management Systems (ILMS)	Šimić, Gašević, and Devedžić (2004)	Student tools – student profile, course navigator, annotation, collaboration, assessment	Collaboration
Education and the Semantic Web	Devedzic (2004)	Collaboration	
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Collaboration	
Development of Semantic E-Learning Web using Protégé	Dwivedi and Bawankan (2013)	Collaboration	
A computational model for developing semantic web-based educational systems	Bittencourt et al. (2009)	Collaboration	
Conceptual Framework based on ontologies for knowledge management in e-learning systems	Pah et al. (2007)	organisational support	
Towards a knowledge portal for E-learning based on Semantic Web	Yanyan and Mingkai (2008)	Learner and instructor interactions	Interaction and sharing
A Proposed Model of E-Learning Management System Using Semantic Web Technology	Rashid, Khan, and Ahmed (2013)	Help and Discussion	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Web 3.0 System**	**Collaboration**

Model/Framework	**Author(s) & Year**	**Characteristics of Model/Framework**	**Main and Sub Themes**
A New Framework Semantic Web Technology Based E-Learning	Shrivastava, Sharma, and Bawankan (2012)	Interaction	
Ontology-Driven E-Learning System	Snae and Brueckner (2007)	Communication	
		Help	
		Promotion and News	
		Feedback	
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Discussion	
Adaptive E-Learning model for Educational Institutions Using Semantic Web	Altameem (2014)	Sharing	

Appendix B - E-Learning critical success factors (CSFs) by main and sub-themes

Table B:1: E-learning CSFs by themes – Prepared by the Researcher

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
Main Theme Content Management				
Critical Success Factors for Distance Learning	Papp (2000)	Intellectual property		Content development and maintenance
		Suitability for a DL environment		
		Course Content		
Critical success factors for on-line course resources	Soong et al. (2001)	Instructor's time and effort put into the resources		
Critical success factors for on-line course resources	Soong et al. (2001)	Instructor's time and effort put into the resources		
E-Learning QUICK Checklist	Khan (2005)	Management	Content Development	
			Delivery and Maintenance	
Kindling a passion for acquiring new knowledge: critical success factors for creating appropriate curricula for e-Learning	McPherson and Baptista Nunes (2007a)	Content Considerations	Up-to-date	
			Relevant	
			Structured	
What drives a successful e-Learning? An empirical investigation of the critical success factors influencing learner satisfaction	Sun et al. (2008)	e-Learning course flexibility		
Critical success factors in e-learning ecosystems: a qualitative study	Sridharan, Deng, and Corbitt (2010)	Management Factors	Management: capture, organise, authenticate, retrieve	
			Consistent presentation	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
A web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	Managing Learning Resources	Facilitating search of resources	
			Facilitating reuse of resources	
			Facilitating sharing of resources	
		Web 2.0 Technology	Generating content	
			Aggregating content	
			Sharing content	
			Co-authoring	
			Contributing to content	
			Communicating synchronously	
			Subscribing to content	
Building Trust in E-Learning	Wang (2014)	Trust in Course Instruction	High information and design quality	
Successful implementation of e-learning Pedagogical considerations	Govindasamy (2001)	Developing content		
		Storing and managing content		
		Packaging content		
A taxonomy of factors to promote quality web-supported learning	Fresen (2007)	Instructional Design factors	Learning resources	
			Learning materials	
Critical Success Factors for Online Distance Learning in Higher Education: A Review of the Literature	Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012)	Instructional Design	Content Quality	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
Critical Success Factors in E-learning: An Examination of Technology and Student Factors	Musa and Othman (2012)	Student's characteristics	Student content – availability of course materials in a timely manner	
Critical success factors for adoption of web-based learning management systems in Tanzania	Lwoga (2014)	Information Quality		
Critical success factors for on-line course resources	Soong et al. (2001)	Reusable learning objects		Reuse
Critical success factors in e-learning ecosystems: a qualitative study	Sridharan, Deng, and Corbitt (2010)	Management Factors	reuse	
A web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	Web 2.0 Technology	Reusing content	
Critical success factors in e-learning ecosystems: a qualitative study	Sridharan, Deng, and Corbitt (2010)	Management Factors	Metadata: content, context, structure, validation, learner profile content,	Knowledge representation
A web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	Personal Knowledge Management	Recording information	
			Classifying information	
			Organising information	
			Integrating information	
			Represent knowledge	
Main Theme: Personalised Learning				
Critical success factors in online education	Volery and Lord (2000)	Student	Previous use of technology	Student's characteristics
			Previous computer knowledge	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
Critical success factors for on-line course resources	Soong et al. (2001)	Student's Technical Competence		
		Student's Mindset (about learning)		
Strategies for assuring the quality of online learning in Australian higher education	Oliver (2001)	Student Readiness	Technology skills	
			Access to technology	
			Self-regulated learning	
Kindling a passion for acquiring new knowledge: critical success factors for creating appropriate curricula for e-Learning	McPherson and Baptista Nunes (2007a)	People and Skills Considerations		
Critical success factors for e-learning acceptance: Confirmatory factor models	Selim (2007a)	Student characteristic	Computer competency	
			Interactive collaboration	
			E-learning course content and design	
What drives a successful e-Learning? An empirical investigation of the critical success factors influencing learner satisfaction	Sun et al. (2008)	Learner computer anxiety		
Critical Success Factors for the continuation of e-learning initiatives	McGill, Klobas, and Renzi (2014)	Keeping up to date with technology		
Trust in electronic learning and teaching relationships: the case of "WINFO-Line"	von Kortzfleisch and Winand (2000)	Readiness of actors to trust		
An exploratory study of the critical success factors affecting	Folorunso, Shawn Ogunseye, and Sharma (2006)	E-learning Awareness		

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
the acceptability of E-learning in Nigerian universities				
A taxonomy of factors to promote quality web-supported learning	Fresen (2007)	Student Factors	Communication	
			Time management	
			Self-directed learning	
			Client expectations	
			Critical thinking	
			Motivation	
			Problem solving	
			Client satisfaction	
Critical Success Factors in E-learning: An Examination of Technology and Student Factors	Musa and Othman (2012)	Student's characteristics	Student's computing – learning by participation	
			Technical competence	
Critical success factors in online education	Volery and Lord (2000)	Instructor	Attitudes towards students	Lecturer's characteristics
			Technical competence	
Critical success factors for on-line course resources	Soong et al. (2001)	Instructor's time and effort put into the resources		
		Instructor's motivational skills		
		Instructor's Technical Competence		
		Instructor's Mindset (about learning)		
Strategies for assuring the quality of online learning in Australian higher education	Oliver (2001)	Teacher expertise in online teaching	Teaching online	
			Technology currency	
Kindling a passion for acquiring new knowledge: critical success factors for creating appropriate curricula for e-Learning	McPherson and Baptista Nunes (2007a)	People and Skills Considerations		

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
Critical success factors for e-learning acceptance: Confirmatory factor models	Selim (2007a)	Instructor characteristics	Attitude towards and control of technology	
			Teaching style	
What drives a successful e-Learning? An empirical investigation of the critical success factors influencing learner satisfaction	Sun et al. (2008)	Instructor attitude towards e-Learning enhanced via support		
Critical Success Factors for the continuation of e-learning initiatives	McGill, Klobas, and Renzi (2014)	Keeping up to date with technology		
Building Trust in E-Learning	Wang (2014)	Trust in Course Instruction	Prior positive experience	
		Instructor's assertiveness		
		Instructor's responsiveness		
Trust in electronic learning and teaching relationships: the case of "WINFO-Line"	von Kortzfleisch and Winand (2000)	Readiness of actors to trust		
An exploratory study of the critical success factors affecting the acceptability of E-learning in Nigerian universities	Folorunso, Shawn Ogunseye, and Sharma (2006)	E-learning Awareness		
A taxonomy of factors to promote quality web-supported learning	Fresen (2007)	Lecturer Factors	Interaction with students	
			Feedback to students	
			Professional training	
			Evaluation of teaching competence	
			Academic background	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
			Community and empathy	
Critical success factors for adoption of web-based learning management systems in Tanzania	Lwoga (2014)	Instructor Quality		
Main Theme: Pedagogy				
Critical Success Factors for Distance Learning	Papp (2000)	Suitability for a DL environment		Course design and sequencing
		Building the course		
Strategies for assuring the quality of online learning in Australian higher education	Oliver (2001)	Reusable learning designs		
E-Learning QUICK Checklist	Khan (2005)	Pedagogical	Content analysis	
			Audience Analysis	
			Goal Analysis	
			Medium Analysis	
			Design Approach	
			Learning Strategies	
		Delivery and maintenance		
Flying High or Crash Landing? Technological Critical Success Factors for e-Learning	McPherson and Baptista Nunes (2006a)	Technological factors	Design Issues - pedagogical	
Kindling a passion for acquiring new knowledge: critical success factors for creating appropriate curricula for e-Learning	McPherson and Baptista Nunes (2007a)	Curriculum Design and Development	Pedagogical Considerations	
		Curriculum Design and Development	Formal Process	
			Contextualised	
			Team Effort	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
		Process Considerations		
Negotiating the Path from Curriculum Design to E-Learning Course Delivery: A Study of Critical SuccessFactors for Instructional Systems Design	McPherson and Baptista Nunes (2007b)	Instructional Systems Design	Suitability of the pedagogical approach	
			Addressing the challenge of designing for learning	
			Attending to process issues	
Critical issues for e-learning delivery: what may seem obvious is not always put into practice	McPherson and Nunes (2008)	Delivery model		
What drives a successful e-Learning? An empirical investigation of the critical success factors influencing learner satisfaction	Sun et al. (2008)	e-Learning course flexibility		
		e-Learning course quality		
Critical success factors in e-learning ecosystems: a qualitative study	Sridharan, Deng, and Corbitt (2010)	Pedagogical Strategy	adaptive	
			Collaborative	
			Explorative	
			Interactive	
			Concept Map	
			Blended	
A web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	Instructional Support	Designing activities	
Building Trust in E-Learning	Wang (2014)	High information and design quality		
	Fresen (2007)	Instructional Design factors	Higher cognitive levels	
			Interactivity	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
A taxonomy of factors to promote quality web-supported learning			Standards	
			Course evaluation	
			Inclusively	
			Student motivation	
			Modular chunks	
			Use of media	
			Use of images, graphics, animation	
			Complete learning package	
			Layout and presentation	
			Usability	
			Reusable learning objects	
			Reusable learning designs	
		Pedagogical factors	Learning outcomes	
			High expectations	
			Assessment strategies	
			Diversity	
			Clearly stated expectations	
			Self-reflection	
			Non-threatening environment	
			Research methodology	
			Relevance of content	
			Accuracy of content	
			Currency of content and learning resources	
			Continuous improvement	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
			Educationally significant goals	
			Adaptable, sustainable, scalable	
			Learner centred environment	
			Multiple learning pathways	
Critical Success Factors for Distance Learning	Papp (2000)	Measuring success		Assessment and evaluation
E-Learning QUICK Checklist	Khan (2005)	Evaluation	E-learning content development process evaluation	
			Assessment	
			Program Evaluation	
What drives a successful e-Learning? An empirical investigation of the critical success factors influencing learner satisfaction	Sun et al. (2008)	Diversity in assessments		
A web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	Instructional Support	Assessing student work	
			Providing feedback	
		Instructional Design factors	Course evaluation	
Successful implementation of e-learning Pedagogical considerations	Govindasamy (2001)	Assessment		

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
A taxonomy of factors to promote quality web-supported learning	Fresen (2007)	Pedagogical factors	Assessment strategies	
Critical Success Factors for Online Distance Learning in Higher Education: A Review of the Literature	Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012)	Instructional Design	Learning assessment	
		Course evaluation		
Critical Success Factors in E-learning: An Examination of Technology and Student Factors	Musa and Othman (2012)	Assessment		
Strategies for assuring the quality of online learning in Australian higher education	Oliver (2001)	Teacher expertise in online teaching	Using technology in teaching	Teaching strategies
E-Learning QUICK Checklist	Khan (2005)	Delivery and maintenance		
Critical issues for e-learning delivery: what may seem obvious is not always put into practice	McPherson and Nunes (2008)	Delivery model		
A web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	Instructional Support	Using multiple teaching strategies	
Main Theme: Collaboration				
Critical success factors in online education	Volery and Lord (2000)	Technology	Level of interaction	Interaction
		Instructor	Classroom interaction	
	Karunasena, Deng, and Zhang (2012)	Collaboration	Discussing with peers	
			Discussing with instructor	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
A web 2.0 Based e-Learning Success Model in Higher Education			Participating in group activities	
Anonymity and learning in digitally mediated communications: authenticity and trust in cyber education	Baggio (2011)	Interaction among learners		
Trust Online	Friedman, Khan, and Howe (2000)	Online interpersonal interactions		
Trust in electronic learning and teaching relationships: the case of "WINFO-Line"	von Kortzfleisch and Winand (2000)	Interaction		
		Integration: mutual discussions		
A taxonomy of factors to promote quality web-supported learning	Fresen (2007)	Lecturer Factors	Interaction with students	
		Instructional Design factors	Group learning	
Critical Success Factors for Online Distance Learning in Higher Education: A Review of the Literature	Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012)	Learning environment	Interactive learning	
Critical Success Factors in E-learning: An Examination of Technology and Student Factors	Musa and Othman (2012)	Student's characteristics	Student collaboration – with fellow students and instructors	
Critical success factors for on-line course resources	Soong et al. (2001)	Level of collaboration		Collaboration

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
Negotiating the Path from Curriculum Design to E-Learning Course Delivery: A Study of Critical SuccessFactors for Instructional Systems Design	McPherson and Baptista Nunes (2007b)	Instructional Systems Design	Collaboration between all staff involved	
Building trust and shared knowledge in communities of e-learning practice	Jameson et al. (2006)	Collaborative leadership		
A web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	Collaboration	Sharing resources	Sharing of resources
			Accessing shared resources	
Building trust and shared knowledge in communities of e-learning practice	Jameson et al. (2006)	Knowledge sharing		
Main Theme: System				
Critical success factors in online education	Volery and Lord (2000)	Technology	Ease of access and navigation	Usability
			Interface Design	
E-Learning QUICK Checklist	Khan (2005)	Interface Design	Page and Site Design	
			Content Design	
			Usability	
What drives a successful e-Learning? An empirical investigation of the critical success factors influencing learner satisfaction	Sun et al. (2008)	e-Learning course flexibility		
		Perceived usefulness		
		Perceived ease of use		
Building Trust in E-Learning	Wang (2014)	Trust in Course Instruction	High information and design quality	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
Critical Success Factors for Online Distance Learning in Higher Education: A Review of the Literature	Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012)	Learning Environment	Access and navigation	
Critical success factors for adoption of web-based learning management systems in Tanzania	Lwoga (2014)	System Quality		
Critical success factors in online education	Volery and Lord (2000)	Technology	Ease of access and navigation	Accessibility
E-Learning QUICK Checklist	Khan (2005)	Interface design	Navigation	
			Accessibility	
Flying High or Crash Landing? Technological Critical Success Factors for e-Learning	McPherson and Baptista Nunes (2006a)	Technological factors	Design issues - access	
Critical success factors for e-learning acceptance: Confirmatory factor models	Selim (2007a)	Technology	Ease of access	
Building Trust in E-Learning	Wang (2014)	Trust in Course Instruction	Reliable and Timely access	
A taxonomy of factors to promote quality web-supported learning	Fresen (2007)	Technology factors	Accessibility	
Critical Success in E-learning: An Examination of Technological and Institutional Support Factors	Masrom, Zainon, and Rahiman (2008)	Technological factor – Ease of Access	Browser efficiency	
			Ease of use of course Website	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
Critical Success Factors for Online Distance Learning in Higher Education: A Review of the Literature	Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012)	Learning Environment	Access and navigation	
Critical success factors for adoption of web-based learning management systems in Tanzania	Lwoga (2014)	System Quality		
Critical Success Factors for Distance Learning	Papp (2000)	Be prepared for possible problems		ICT Infrastructure
		The platform		
Critical success factors for on-line course resources	Soong et al. (2001)	Perceived IT Infrastructure	Good ICT Infrastructure	
Strategies for assuring the quality of online learning in Australian higher education	Oliver (2001)	Technology Infrastructure	Courseware delivery systems	
			Technology infrastructure	
			Service provision	
E-Learning QUICK Checklist	Khan (2005)	Technological	Infrastructure Planning	
			Hardware	
			Software	
Organisational issues for e-learning Critical success factors as identified by HE practitioners	McPherson and Baptista Nunes (2006b)	Technological	Reliable, robust and secure ICT Infrastructure	
Flying High or Crash Landing? Technological Critical Success Factors for e-Learning	McPherson and Baptista Nunes (2006a)	Technological factors	Design Issues – Usability, access	
			Technological Infrastructure Issues	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
			Interoperability/Standards	
			Software Issues	
			Technological appropriateness	
			Web Issues	
			Bandwidth	
Critical success factors for e-learning acceptance: Confirmatory factor models	Selim (2007a)	Technology	Infrastructure	
Critical success factors in e-learning ecosystems: a qualitative study	Sridharan, Deng, and Corbitt (2010)	Technology and Other Factors	Supporting technologies	
			Supporting learning objects	
			Supporting management activities	
A web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	Personal Knowledge Management	Recording information	
			Classifying information	
			Organising information	
			Integrating information	
			Represent knowledge	
Trust Online	Friedman, Khan, and Howe (2000)	Reliability and security of the technology		
An exploratory study of the critical success factors affecting the acceptability of E-learning in Nigerian universities	Folorunso, Shawn Ogunseye, and Sharma (2006)	IT Infrastructure		
A taxonomy of factors to promote quality web-supported learning	Fresen (2007)	Technology Factors	Appropriate use	
			Reliability	
			IT support and training for lecturers	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
			IT support and training for students	
Critical Success in E-learning: An Examination of Technological and Institutional Support Factors	Masrom, Zainon, and Rahiman (2008)	Technological factor - ICT Infrastructure	Browser efficiency	
			Computer network reliability	
Critical Success Factors for Online Distance Learning in Higher Education: A Review of the Literature	Cheawjindakarn, Suwannatthachote, and Theeraroungchaisri (2012)	Learning Environment	Course Management System	
			Technical Infrastructure	
			Interactive Learning	
Critical Success Factors in E-learning: An Examination of Technology and Student Factors	Musa and Othman (2012)	Technological Characteristics		
Critical success factors for adoption of web-based learning management systems in Tanzania	Lwoga (2014)	System Quality		
Main Theme: Support				
Critical Success Factors for Distance Learning	Papp (2000)	Be prepared for possible problems		Support
Critical success factors for e-learning acceptance: Confirmatory factor models	Selim (2007a)	Support		
E-Learning QUICK Checklist	Khan (2005)	Resource Support	Online support	Instructional support
			Online resources	
			Offline resources	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
A web 2.0 Based e-Learning Success Model in Higher Education	Karunasena, Deng, and Zhang (2012)	Instructional support		
Anonymity and learning in digitally mediated communications: authenticity and trust in cyber education	Baggio (2011)	Support to learners		
Successful implementation of e-learning Pedagogical considerations	Govindasamy (2001)	Student support		
A taxonomy of factors to promote quality web-supported learning	Fresen (2007)	Lecturer factors	Feedback to students	
Critical success factors for on-line course resources	Soong et al. (2001)	Perceived IT infrastructure	Technical support	Organisational support
		Teacher expertise in online teaching	Teacher training	
E-Learning QUICK Checklist	Khan (2005)	Ethical	Social and political influence	
			Cultural diversity	
			Bias	
			Geographical diversity	
			Learner diversity	
			Digital divide	
			Etiquette	
			Legal issues	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
		Institutional	Need assessment	
			Financial readiness	
			Infrastructure readiness	
			Cultural readiness	
			Content readiness	
Organisational issues for e-learning Critical success factors as identified by HE practitioners	McPherson and Baptista Nunes (2006b)	Organisational Factors	Leadership, structural, and culture – good communicational leadership	
			Efficient technical support	
		Delivery	Existence of institutional e-learning champions	
Flying High or Crash Landing? Technological Critical Success Factors for e-Learning	McPherson and Baptista Nunes (2006a)	Technological factors	Organisational issues	
		Delivery issues	Delivery issues – learner support, feedback/evaluation	
		Technical support		
Critical issues for e-learning delivery: what may seem obvious is not always put into practice	McPherson and Nunes (2008)	E-learning delivery	Staffing	
			Training	
			Leadership issues	
Critical Success Factors for the continuation of e-learning initiatives	McGill, Klobas, and Renzi (2014)	Institutional Support	Financial support	
			Technical support	
		Teachers and Development Involvement		
Building Trust in E-Learning	Wang (2014)		Contact details	

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
		Trust in course instruction	A sense of care and community	
Trust in electronic learning and teaching relationships: the case of "WINFO-Line"	von Kortzfleisch and Winand (2000)	Institutional support		
An exploratory study of the critical success factors affecting the acceptability of E-learning in Nigerian universities	Folorunso, Shawn Ogunseye, and Sharma (2006)	Funding support		
A taxonomy of factors to promote quality web-supported learning	Fresen (2007)	Institutional Factors		
		Technology factors	bandwidth and download demands	
Critical Success in E-learning: An Examination of Technological and Institutional Support Factors	Masrom, Zainon, and Rahiman (2008)	Institutional Support Factor	Technical support/help desk	
		Institutional Management		
		Services support	Training	
			Communicational tools,	
			Helpdesk	
Main Theme: Trust				
Organisational issues for e-learning Critical success factors as identified by HE practitioners	McPherson and Baptista Nunes (2006b)	Technological	Reliable, robust and secure ICT Infrastructure	Technology reliability and security
Flying High or Crash Landing? Technological Critical Success Factors for e-Learning	McPherson and Baptista Nunes (2006a)	Technological factors	Technological Reliability	
	Baggio (2011)	Trust in Technology		

Legend:	**Content Management**	**Personalised Learning**	**Pedagogy**	**Collaboration**	**System**	**Support**	**Trust**

Model/Framework	**Author(s) & Year**	**E-learning Critical Success Factors**		**Main and Sub Themes**
Anonymity and learning in digitally mediated communications: authenticity and trust in cyber education				
		Trust in users of the technology		
Trust, collaboration, e-learning and organisational transformation	Mason and Lefrere (2003)	Technology that work		
		Standard and protocols		
Building Trust in E-Learning	Wang (2014)	Trust in Course Instruction	Good reputation	
			Reliable and timely access	
		Trust in the Privacy and Security		
Trust Online	Friedman, Khan, and Howe (2000)	Reliability and security of the technology		
		Privacy		
Trust, collaboration, e-learning and organisational transformation	Mason and Lefrere (2003)	Knowledge sharing		Trust between students
		activities		
		Consensus building		
Building trust and shared knowledge in communities of e-learning practice	Jameson et al. (2006)	Participation in an atmosphere of trust		
Trust in electronic learning and teaching relationships: the case of “WINFO-Line”	von Kortzfleisch and Winand (2000)	Student trusting instructors		Trust between students and lecturers

Appendix C - Students' survey questionnaire

Survey Consent

Dear Sir/Madam

I am a PhD student in the School of Information Systems; I am conducting research to examine users' reaction toward E-learning and E-learning 3.0 in Mauritius. Your assistance in this research would be greatly appreciated and would assist in the success of its findings.

This research involves a survey, which will take up to 10 minutes to complete. The survey contains eight sections. Please read each statement and then tick the box/choose the option which shows how you feel.

To complete the survey please click on:

the NEXT Button below

(Bottom Right of Page)

If you feel uncomfortable in answering certain questions, please feel free to disregard them.

We would appreciate it if you can complete this survey within a week if possible. However, if this is too short a space of time, please response as soon as you are able to.

Participation in this research is completely voluntary and your responses will be completely anonymous. Participants may withdraw at any time without prejudice or negative consequences, and do not need to provide a reason. By completing the survey, you are consenting to participate.

Any information provided by you through the survey will be held as strictly confidential. Information will not be disclosed to any parties besides the researchers,

unless required to do so by law. Finally, the researchers will ensure that published material will not contain any information that can identify you or your organization.

If you need any additional information, please contact us as follows:

- *The researcher at* raadila@gmail.com *or* r.hajeeahmud@student.curtin.edu.au
- *The PhD supervisor Dr. Tomayess Issa at* Tomayess.Issa@cbs.curtin.edu.au
- *The co-supervisor Dr. Vanessa Chang at* Vanessa.Chang@curtin.edu.au
- *The associate supervisor Prof. Pedro Isaias at* Pedro.Isaias@curtin.edu.au

*This study has been approved by the Curtin University Human Research Ethics Committee (**Approval Number RDBS-02-15**). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University, GPO Box U1987, Perth, 6845 or by telephoning +61(8) 9266 2784 or by emailing* hrec@curtin.edu.au.

Thank you in advance.

Yours faithfully,

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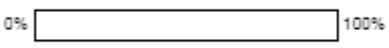

NEXT

For each statement/question, please choose the answer that best represents your situation.

BACKGROUND INFORMATION

What is your gender?

- ○ Male
- ○ Female

What is your age?

- ○ 16-25
- ○ 26-35
- ○ 36-45
- ○ 46-50
- ○ 51 and above

Is your University Public or Private?

- ○ Public
- ○ Private

What is your main field of study?

- ○ Agriculture
- ○ Art & Design
- ○ Business, Accounting & Finance
- ○ Engineering
- ○ Health
- ○ Information Technology and Systems
- ○ Law and Management
- ○ Science
- ○ Social Studies & Humanities
- ○ Tourism
- ○ Others

Which University Programme are you currently enrolled in?

- ○ Foundation
- ○ Undergraduate Certificate
- ○ Undergraduate Diploma
- ○ Undergraduate Degree/Bachelor Degree
- ○ Postgraduate Diploma
- ○ Postgraduate Degree/Masters
- ○ PhD/Research
- ○ Others

CONTENT MANAGEMENT

Refers to the handling of learning materials including creating, updating and searching of learning materials.

Please indicate your level of agreement to each statement:

*With respect to **Content Management**, in E-learning*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Only lecturers can create learning materials	○	○	○	○	○
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc.)	○	○	○	○	○
Learning content should be easily accessible/retrievable	○	○	○	○	○
Learning content should be reusable	○	○	○	○	○
Learning content should match students' needs	○	○	○	○	○
Learning content should allow me to construct my own knowledge of the course	○	○	○	○	○
Learning content should be quick to search	○	○	○	○	○

Comments

Please add any comments you may have on ***Content Management***:

PERSONALISED LEARNING

Refers to customised learning that meets students' needs including their educational goals, their existing knowledge of the subject, their learning styles and preferences.

Please indicate your level of agreement to each statement:

*With respect to **Personalised Learning**,*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
My existing knowledge of the course should be taken into account	○	○	○	○	○
My learning style preferences should be taken into account	○	○	○	○	○
I should be allowed to select learning materials based on my learning style preferences	○	○	○	○	○
I should be able to receive different learning materials than my peers based on my learning profile (e.g. considering my existing knowledge and learning style preferences)	○	○	○	○	○
My educational goals should be met	○	○	○	○	○
Lecturers deliver courses based on students' needs	○	○	○	○	○
Lecturers are keen to facilitate students' learning	○	○	○	○	○

Lecturers have the skills and competence to support personalised learning	○	○	○	○	○

Comments

Please add any comments you may have on ***Personalised Learning***:

PEDAGOGY

Refers to the syllabus, course and assessment objectives, structure of learning content and how learning content is delivered to students

Please indicate your level of agreement to each statement:

*With respect to **Pedagogy**, E-learning courses should*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Have clear learning objectives for each lesson	○	○	○	○	○
Have clear organisation of lessons which is easy to follow	○	○	○	○	○
Have clear assessments instructions	○	○	○	○	○
Be delivered in a pre-determined way where I am a passive participant only	○	○	○	○	○
Allow me to be an active participant where I can construct and manage my own	○	○	○	○	○

personal knowledge					
Be delivered according to my learning profile (e.g. considering my existing knowledge and learning style preferences)	○	○	○	○	○
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet my needs	○	○	○	○	○

Comments

Please add any comments you may have on ***Pedagogy***:

COLLABORATION

Refers to different activities that encourage the sharing of knowledge and resources between students and their peers and between lecturers and students.

Please indicate your level of agreement to each statement:

*With respect to **Collaboration**, in E-learning, it is important to*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Have facilities for collaboration between peers	○	○	○	○	○

Have facilities for collaboration between lecturers and students (e.g. using emails, skype)	○	○	○	○	○
Share resources with peers	○	○	○	○	○
Share resources with lecturers	○	○	○	○	○
Have group activities	○	○	○	○	○

Comments

Please add any comments you may have on ***Collaboration***:

WEB 3.0 SYSTEM

Web 3.0 is the next generation of the Web after Web 2.0 (which is characterized by social media and dynamic Web-pages).

Web 3.0 will allow for faster searches with the ability to key in complex sentences into search engines to get more accurate hits.

Computers will be able to scan and interpret information on Web pages and they will be able to do that because Web 3.0 will have collections of information known as **Ontologies**.

Ontology in simple terms can be described as a file that defined the relationships between a group of terms. For e.g. a simple ontology can be as follows:
*author is **the same as** writer where **'the same as'** is the relationship between the term **author** and **writer**.*

Please indicate your level of agreement to each statement:

*With respect to **Web 3.0 System**, the E-learning system should*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Maintain effective records of information and resources	○	○	○	○	○
Support customised access to learning resources	○	○	○	○	○
Keep records of students' learning profiles	○	○	○	○	○
Support new technologies	○	○	○	○	○
Be easy to navigate	○	○	○	○	○
Have easy access to resources	○	○	○	○	○
Have effective IT infrastructure	○	○	○	○	○

Comments

Please add any comments you may have on ***Web 3.0 System***:

SUPPORT

Refers to the necessary support in E-learning to facilitate the teaching and learning process. It includes technical, educational and organisation support.

Please indicate your level of agreement to each statement:

*With respect to **Support**, in E-learning*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Peer assistance is important to me	○	○	○	○	○
Lecturers' support is important (e.g. through students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles)	○	○	○	○	○
Ongoing feedback from lecturers about my learning performance is important	○	○	○	○	○
I should be able to provide feedback about my learning experience	○	○	○	○	○
Training to use the system is important	○	○	○	○	○
Effective and appropriate technology infrastructure is important	○	○	○	○	○
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	○	○	○	○	○

Comments

Please add any comments you may have on ***Support***:

TRUST

Refers to trust between lecturers and students, students and their peers and trust in the E-learning system.

Please indicate your level of agreement to each statement:

*With respect to **Trust**, in E-learning*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Interaction between lectures and students is important	○	○	○	○	○
I am comfortable using resources (such as links, presentations) shared by known peers	○	○	○	○	○
I am comfortable using resources (such as links, presentations) from peers even if they are not directly known to me	○	○	○	○	○
Continuous feedback to and from lecturers promotes trust between students and lecturers	○	○	○	○	○
The system should be reliable	○	○	○	○	○
The system should be secure	○	○	○	○	○

I am confident to learn in an E-learning environment	○	○	○	○	○

Comments

Please add any comments you may have on ***Trust***:

Appendix D - Lecturers' survey questionnaire

Survey Consent

Dear Sir/Madam

I am a PhD student in the School of Information Systems; I am conducting research to examine users' reaction toward E-learning and E-learning 3.0 in Mauritius. Your assistance in this research would be greatly appreciated and would assist in the success of its findings.

This research involves a survey, which will take up to 10 minutes to complete. The survey contains eight sections. Please read each statement and then tick the box/choose the option which shows how you feel.

To complete the survey please click on:

the NEXT Button below

(Bottom Right of Page)

If you feel uncomfortable in answering certain questions, please feel free to disregard them.

We would appreciate it if you can complete this survey within a week if possible. However, if this is too short a space of time, please response as soon as you are able to.

Participation in this research is completely voluntary and your responses will be completely anonymous. Participants may withdraw at any time without prejudice or negative consequences, and do not need to provide a reason. By completing the survey, you are consenting to participate.

Any information provided by you through the survey will be held as strictly confidential. Information will not be disclosed to any parties besides the researchers,

unless required to do so by law. Finally, the researchers will ensure that published material will not contain any information that can identify you or your organization.

If you need any additional information, please contact us as follows:

- *The researcher at* raadila@gmail.com *or* r.hajeeahmud@student.curtin.edu.au
- *The PhD supervisor Dr. Tomayess Issa at* Tomayess.Issa@cbs.curtin.edu.au
- *The co-supervisor Dr. Vanessa Chang at* Vanessa.Chang@curtin.edu.au
- *The associate supervisor Prof. Pedro Isaias at* Pedro.Isaias@curtin.edu.au

*This study has been approved by the Curtin University Human Research Ethics Committee (**Approval Number RDBS-02-15**). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University, GPO Box U1987, Perth, 6845 or by telephoning +61(8) 9266 2784 or by emailing* hrec@curtin.edu.au.

Thank you in advance.

Yours faithfully,

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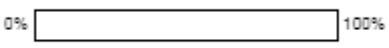

NEXT

For each statement/question, please choose the answer that best represents your situation.

BACKGROUND INFORMATION

What is your gender?

- ○ Male
- ○ Female

What is your age?

- ○ 22-35
- ○ 36-45
- ○ 46-50
- ○ 51-55
- ○ 56-60
- ○ 61 and Above

Is your University Public or Private?

- ○ Public
- ○ Private

Which faculty do you belong to?

- ○ Agriculture
- ○ Art & Design
- ○ Business, Accounting & Finance
- ○ Engineering
- ○ Health
- ○ Information Technology and Systems
- ○ Law and Management
- ○ Science
- ○ Social Studies & Humanities
- ○ Tourism
- ○ Others

What is your highest education level?

- ○ Undergraduate Degree/Bachelor Degree
- ○ Postgraduate Certificate
- ○ Postgraduate Diploma
- ○ Postgraduate Degree/Masters
- ○ PhD/Research
- ○ Others

Which teaching mode do you prefer?

- ○ Face to face classes
- ○ Online classes
- ○ Blended Classes (A mix of Face to Face and Online Classes)

CONTENT MANAGEMENT

Refers to the handling of learning materials including creating, updating and searching of learning materials.

Please indicate your level of agreement to each statement:

*With respect to **Content Management**, in E-learning*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Only lecturers can create learning materials	○	○	○	○	○
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc.)	○	○	○	○	○
Learning content should match the course requirements	○	○	○	○	○
Learning content should match students' needs	○	○	○	○	○
Learning content should be easily accessible/retrievable	○	○	○	○	○
Learning content should be reusable	○	○	○	○	○
Lecturers should be able to annotate learning content	○	○	○	○	○

Learning content annotations and descriptions (e.g. metadata) is important	○	○	○	○	○
Learning content should be flexible enough to allow students to construct their own knowledge of the course	○	○	○	○	○
Learning content should be searchable	○	○	○	○	○

Comments

Please add any comments you may have on ***Content Management***:

PERSONALISED LEARNING

Refers to customised learning that meets students' needs including their educational goals, their existing knowledge of the subject, their learning styles and preferences.

Please indicate your level of agreement to each statement:

With respect to ***Personalised Learning****,*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Taking into account existing course knowledge of students is important	○	○	○	○	○
Taking into account students' learning style preferences is important	○	○	○	○	○

Learning content should meet students' educational goals	○	○	○	○	○
Students should be allowed to select learning materials that match their needs	○	○	○	○	○
Courses are delivered taking into consideration students' learning profiles (e.g. considering existing knowledge, learning style preferences etc.)	○	○	○	○	○
I am keen to deliver courses based on students' individual needs	○	○	○	○	○
I have the skills and competence to support personalised learning	○	○	○	○	○

Comments

Please add any comments you may have on ***Personalised Learning***:

PEDAGOGY

Refers to the syllabus, course and assessment objectives, structure of learning content and how learning content is delivered to students.

Please indicate your level of agreement to each statement:

*With respect to **Pedagogy**, E-learning courses should*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Have clear learning objectives for each lesson	○	○	○	○	○
Have clear organisation of lessons which is easy to follow	○	○	○	○	○
Have clear assessments instructions	○	○	○	○	○
Align with the university's vision and mission	○	○	○	○	○
Be delivered in a pre-determined way where students are passive participants only	○	○	○	○	○ \
Allow students to be active participants where they can construct and manage their own personal knowledge	○	○	○	○	○

Be delivered according to students' learning profiles (e.g. considering students' existing knowledge and learning style preferences)	○	○	○	○	○
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet students' needs	○	○	○	○	○
Have learning content linked to a context	○	○	○	○	○

Comments

Please add any comments you may have on ***Pedagogy***:

COLLABORATION

Refers to different activities that encourage the sharing of knowledge and resources between students and their peers and between lecturers and students.

Please indicate your level of agreement to each statement:

*With respect to **Collaboration**, in E-learning, it is important to*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)	○	○	○	○	○

Have facilities for collaboration between students and their peers	○	○	○	○	○
Have facilities for resource sharing between lecturers and students (e.g. through Wikis, blogs, discussion boards, etc.)	○	○	○	○	○
Have facilities for resource sharing between students and their peers	○	○	○	○	○
Have group activities (e.g. through Google docs)	○	○	○	○	○

Comments

Please add any comments you may have on ***Collaboration***:

WEB 3.0 SYSTEM

Web 3.0 is the next generation of the Web after Web 2.0 (which is characterized by social media and dynamic Web-pages).

Web 3.0 will allow for faster searches with the ability to key in complex sentences into search engines to get more accurate hits.

Computers will be able to scan and interpret information on Web pages and they will be able to do that because Web 3.0 will have collections of information known as **Ontologies**.

Ontology in simple terms can be described as a file that defined the relationships between a group of terms. For e.g. a simple ontology can be as follows:
*author is **the same as** writer where **'the same as'** is the relationship between the term **author** and **writer**.*

Please indicate your level of agreement to each statement:

*With respect to **Web 3.0 System**, the E-learning system should*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Support knowledge representation for customised access to learning materials	○	○	○	○	○
Maintain effective learning materials records	○	○	○	○	○
Keep track of students' learning profiles and patterns	○	○	○	○	○
Support new technologies	○	○	○	○	○
Be easy to navigate	○	○	○	○	○
Have easy access to resources	○	○	○	○	○
Have effective IT infrastructure	○	○	○	○	○

Comments

Please add any comments you may have on ***Web 3.0 System***:

SUPPORT

Refers to the necessary support in E-learning to facilitate the teaching and learning process. It includes technical, educational and organisation support.

Please indicate your level of agreement to each statement:

*With respect to **Support**, in E-learning*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Students should assist their peers	○	○	○	○	○
Lecturers should support students (e.g. students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles)	○	○	○	○	○
Ongoing feedback to students about their learning performances is important	○	○	○	○	○
Ongoing feedback from students about their learning experience is important	○	○	○	○	○
Training to use the system is important	○	○	○	○	○
Effective and appropriate technology infrastructure is important	○	○	○	○	○
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	○	○	○	○	○

Comments

Please add any comments you may have on ***Support***:

TRUST

Refers to trust between lecturers and students, students and their peers and trust in the E-learning system.

Please indicate your level of agreement to each statement:

*With respect to **Trust**, in E-learning*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Interaction between lectures and students is important	○	○	○	○	○
Interaction between students and their peers is important	○	○	○	○	○
Continuous feedback to and from students promotes trust between lecturers and students	○	○	○	○	○
The system should be reliable	○	○	○	○	○
The system should be secure	○	○	○	○	○
I am confident to teach in an E-learning environment	○	○	○	○	○

Comments

Please add any comments you may have on ***Trust***:

Appendix E – Surveys' statements and the related characteristics and sub-characteristics from the Initial Holistic E-learning 3.0 Model

Table E:1: Surveys' statements for 'Content Management' characteristic and sub-characteristics

Statements related to characteristic 'Content Management'	Sub-characteristic(s) for 'Content Management'
Students' Survey	
Only lecturers can create learning materials	Content creation
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)	Content creation
Learning content should be easily accessible/retrievable	Content retrieval
Learning content should be reusable	Content reuse
Learning content should match students' needs	Knowledge representation
Learning content should allow me to construct my own knowledge of the course	Knowledge representation
Learning content should be quick to search	Search
Lecturers' Survey	
Only lecturers can create learning materials	Content creation
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)	Content creation
Learning content should match the course requirements	Content creation Knowledge representation
Learning content should match students' needs	Content retrieval Knowledge representation Search
Learning content should be easily accessible/retrievable	Content retrieval
Learning content should be reusable	Content reuse
Lecturers should be able to annotate learning content	Knowledge representation
Learning content annotations and descriptions (e.g. metadata) is important	Knowledge representation
Learning content should be flexible enough to allow students to construct their own knowledge of the course	Knowledge representation
Learning content should be searchable	Search

Table E:2: Surveys' statements for 'Personalised Learning' characteristic and sub-characteristics

Statements related to characteristic 'Personalised Learning'	Sub-characteristic(s) for 'Personalised Learning'
Students' Survey	
My existing knowledge of the course should be taken into account	Student model
My learning style preferences should be taken into account	Student model
I should be allowed to select learning materials based on my learning style preferences	Student model
I should be able to receive different learning materials than my peers based on my learning profile (e.g. considering my existing knowledge and learning style preferences)	Student model
My educational goals should be met	Student model
Lecturers deliver courses based on students' needs	Lecturer's characteristics
Lecturers are keen to facilitate students' learning	Lecturer's characteristics
Lecturers have the skills and competence to support personalised learning	Lecturer's characteristics
Lecturers' Survey	
Taking into account existing course knowledge of students is important	Student Model
Taking into account students' learning style preferences is important	Student Model
Learning content should meet students' educational goals	Student Model
Students should be allowed to select learning materials that match their needs	Lecturer's Characteristics
Courses are delivered taking into consideration students' learning profiles (e.g. considering existing knowledge, learning style preferences etc)	Lecturer's Characteristics
I am keen to deliver courses based on students' individual needs	Lecturer's Characteristics
I have the skills and competence to support personalised learning	Lecturer's Characteristics

Table E:3: Surveys' statements for 'Pedagogy' characteristic and sub-characteristics

Statements related to characteristic 'Pedagogy'	Sub-characteristic(s) for 'Pedagogy'
Students' Survey	
Have clear learning objectives for each lesson	Syllabus
Have clear organisation of lessons which is easy to follow	Syllabus
Have clear assessments instructions	Assessment and evaluation
Be delivered in a pre-determined way where I am a passive participant only	Course design and sequencing Teaching strategies
Allow me to be an active participant where I can construct and manage my own personal knowledge	Course design and sequencing Teaching strategies
Be delivered according to my learning profile (e.g. considering my existing knowledge and learning style preferences)	Course design and sequencing Teaching strategies
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet my needs	Teaching strategies
Lecturers' Survey	
Have clear learning objectives for each lesson	Syllabus
Have clear organisation of lessons which is easy to follow	Syllabus
Have clear assessments instructions	Assessment and evaluation
Align with the university's vision and mission	Syllabus
Be delivered in a pre-determined way where students are passive participants only	Course design and sequencing Teaching strategies Context
Allow students to be active participants where they can construct and manage their own personal knowledge	Course design and sequencing Teaching strategies
Be delivered according to students' learning profiles (e.g. considering students' existing knowledge and learning style preferences)	Course design and sequencing Teaching strategies
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet students' needs	Course design and sequencing Teaching strategies
Have learning content linked to a context	Context

Table E:4: Surveys' statements for 'Collaboration' characteristic and sub-characteristics

Statements related to characteristic 'Collaboration'	Sub-characteristic(s) for 'Collaboration'
Students' Survey	
Have facilities for collaboration between peers	Interaction
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)	Interaction
Share resources with peers	Sharing of resources
Share resources with lecturers	Sharing of resources
Have group activities	Interaction
Lecturers' Survey	
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)	Interaction
Have facilities for collaboration between students and their peers	Interaction
Have facilities for resource sharing between lecturers and students (e.g. through Wikis, blogs, discussion boards, etc)	Sharing of resources
Have facilities for resource sharing between students and their peers	Sharing of resources
Have group activities (e.g. through Google docs)	Interaction

Table E:5: Surveys' statements for 'Web 3.0 System' characteristic and sub-characteristics

Statements related to characteristic 'Web 3.0 System'	Sub-characteristic(s) for 'Web 3.0 System'
Students' Survey	
Maintain effective records of information and resources	Knowledge and other repositories
Support customised access to learning resources	Knowledge and other repositories Ontologies
Keep records of students' learning profiles	Knowledge and other repositories Ontologies
Support new technologies	Web 3.0 System
Be easy to navigate	Usability
Have easy access to resources	Accessibility
Have effective IT infrastructure	ICT Infrastructure
Lecturers' Survey	
Support knowledge representation for customised access to learning materials	Knowledge and other repositories Ontologies
Maintain effective learning materials records	Knowledge and other repositories

Keep track of students' learning profiles and patterns	Knowledge and other repositories Ontologies
Support new technologies	Web 3.0 System
Be easy to navigate	Usability
Have easy access to resources	Accessibility
Have effective IT infrastructure	ICT Infrastructure

Table E:6: Surveys' statements for 'Support' characteristic and sub-characteristics

Statements related to characteristic 'Support'	**Sub-characteristic(s) for 'Support'**
Students' Survey	
Peer assistance is important to me	Instructional Support
Lecturers' support is important (e.g. through students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles)	Instructional Support
Ongoing feedback from lecturers about my learning performance is important	Instructional Support
I should be able to provide feedback about my learning experience	Instructional Support
Training to use the system is important	Organisational Support
Effective and appropriate technology infrastructure is important	Organisational Support
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	Organisational Support
Lecturers' Survey	
Students should assist their peers	Instructional Support
Lecturers should support students (e.g. students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles)	Instructional Support
Ongoing feedback to students about their learning performances is important	Instructional Support
Ongoing feedback from students about their learning experience is important	Instructional Support
Training to use the system is important	Organisational Support
Effective and appropriate technology infrastructure is important	Organisational Support
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	Organisational Support

Table E:7: Surveys' statements for 'Trust' characteristic and sub-characteristics

Statements related to characteristic 'Trust'	Sub-characteristic(s) for 'Trust'
Students' Survey	
Interaction between lectures and students is important	Trust between students and lecturers
I am comfortable using resources (such as links, presentations) shared by known peers	Trust between students
I am comfortable using resources (such as links, presentations) from peers even if they are not directly known to me	Trust between students
Continuous feedback to and from lecturers promotes trust between students and lecturers	Trust between students and lecturers
The system should be reliable	Technology reliability and security
The system should be secure	Technology reliability and security
I am confident to learn in an E-learning environment	Technology reliability and security
Lecturers' Survey	
Interaction between lectures and students is important	Trust between students and lecturers
Interaction between students and their peers is important	Trust between students
Continuous feedback to and from students promotes trust between lecturers and students	Trust between students and lecturers
The system should be reliable	Technology reliability and security
The system should be secure	Technology reliability and security
I am confident to teach in an E-learning environment	Technology reliability and security

Appendix F – Descriptive statistics from students' survey

Table F:1: Descriptive statistics – Students' survey

(*In ascending order of mean value*)

Statements related to the characteristics of the Initial Holistic E-learning 3.0 Model	Min Value	Max Value	Mean	Standard Deviation	Variance	Total Responses
Have effective ICT infrastructure	1	2	1.07	.256	.065	300
Support new technologies	1	3	1.15	.393	.155	300
Be easy to navigate	1	2	1.27	.443	.196	300
Have easy access to resources	1	2	1.36	.480	.230	300
The system should be secure	1	2	1.36	.480	.230	300
The system should be reliable	1	2	1.36	.482	.232	300
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	1	2	1.40	.491	.241	300
Training to use the system is important	1	2	1.42	.495	.245	300
Effective and appropriate technology infrastructure is important	1	2	1.43	.495	.245	300
Learning content should match students' needs	1	3	1.46	.532	.283	300
Learning content should be easily accessible/retrievable	1	2	1.50	.501	.251	300
Continuous feedback to and from lecturers promotes trust between students and lecturers	1	2	1.50	.501	.251	300
Learning content should be quick to search	1	2	1.50	.501	.251	300
Lecturers' support is important (e.g. through students' encouragements, provision of study materials, assessment and exams hints, use of different teaching	1	3	1.51	.539	.291	300
My Educational goals should be met	1	3	1.51	.507	.257	300
I am confident to learn in an E-learning environment	1	3	1.53	.609	.371	300

Statements related to the characteristics of the Initial Holistic E-learning 3.0 Model	Min Value	Max Value	Mean	Standard Deviation	Variance	Total Responses
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet my needs	1	2	1.54	.499	.249	300
Have clear assessments instructions	1	3	1.54	.635	.403	300
Interaction between lectures and students is important	1	3	1.54	.544	.296	300
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)	1	2	1.56	.498	.248	300
Ongoing feedback from lecturers about my learning performance is important	1	3	1.57	.669	.447	300
Support customised access to learning resources	1	3	1.57	.515	.266	300
Have clear learning objectives for each lesson	1	3	1.60	.629	.395	300
I should be able to provide feedback about my learning	1	3	1.60	.634	.402	300
Maintain effective records of information and resources	1	3	1.60	.517	.267	300
Have clear organisation of lessons which is easy to follow	1	3	1.62	.613	.376	300
Keep records of students' learning profiles	1	3	1.67	.584	.341	300
Peer assistance is important	1	4	1.69	.736	.542	300
Learning content should be reusable	1	3	1.75	.715	.511	300
Be delivered according to my learning profile (e.g. considering my existing knowledge and learning style preferences)	1	3	1.76	.644	.415	300
Share resources with lecturers	1	3	1.79	.542	.294	300
I am comfortable using resources (such as links, presentations) shared by known peers	1	4	1.80	.674	.455	300
My existing knowledge of the course should be taken into account	1	3	1.81	.661	.437	300
Have group activities	1	3	1.84	.638	.407	300

Statements related to the characteristics of the Initial Holistic E-learning 3.0 Model	Min Value	Max Value	Mean	Standard Deviation	Variance	Total Responses
I should be allowed to select learning materials based on my learning style preferences	1	3	1.87	.722	.522	300
Learning content should allow me to construct my own knowledge of the course	1	3	1.88	.765	.585	300
My learning style preferences should be taken into account	1	3	1.93	.698	.487	300
Have facilities for collaboration between peers	1	4	1.94	.708	.501	300
Allow me to receive different learning materials than my peers based on my learning profile (e.g. considering my existing knowledge and learning style preferences)	1	5	1.98	.920	.846	300
I am comfortable using resources (such as links, presentations) from peers even if they are not directly known to me	1	5	2.00	.832	.692	300
Share resources with peers	1	4	2.14	.689	.475	300
Be delivered in a pre-determined way where I am a passive participant only	1	5	2.29	.971	.942	300
Only lecturers should create learning materials	1	5	2.61	.942	.887	300
Allow me to be an active participant where I can construct and manage my own personal knowledge	1	4	2.89	.994	.988	300
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)	1	5	3.23	.758	.574	300
Lecturers have the skills and competence to support personalised learning	2	5	3.51	.973	.946	300
Lecturers are keen to facilitate students' learning	2	5	3.74	.963	.927	300
Lecturers deliver courses based on students' needs	2	5	3.86	.891	.794	300

Appendix G - Descriptive statistics from lecturers' survey

Table G:1: Descriptive statistics – Lecturers' survey

(*In ascending order of mean value*)

Statements related to the characteristics of the Initial Holistic E-learning 3.0 Model	Min Value	Max Value	Mean	Standard Deviation	Variance	Total Responses
Learning content should be easily accessible/retrievable	1	2	1.11	.320	.102	105
Learning content should match the course requirements	1	2	1.14	.352	.124	105
Have clear assessments instructions	1	2	1.23	.422	.178	105
Have effective IT infrastructure	1	2	1.24	.428	.183	105
Have easy access to resources	1	2	1.27	.444	.197	105
Have clear learning objectives for each lesson	1	2	1.29	.454	.206	105
Learning content should match students' needs	1	2	1.30	.463	.214	105
Have clear organisation of lessons which is easy to follow	1	2	1.31	.466	.218	105
Maintain effective learning materials records	1	2	1.31	.466	.218	105
Be easy to navigate	1	2	1.32	.470	.221	105
Support new technologies (e.g. Semantic Web, the use of ontologies)	1	2	1.35	.480	.230	105
Ongoing feedback to students about their learning performances is important	1	3	1.37	.524	.274	105
Please indicate your level of agreement to each statement: With respect to Trust, in E-learning-The system should be trustworthy	1	2	1.37	.486	.236	105
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	1	2	1.38	.488	.238	105
Align with the university's vision and mission	1	2	1.38	.488	.238	105
Training to use the system is important	1	2	1.38	.488	.238	105

Statements related to the characteristics of the Initial Holistic E-learning 3.0 Model	Min Value	Max Value	Mean	Standard Deviation	Variance	Total Responses
Learning content should be reusable	1	2	1.41	.494	.244	105
Learning content should be searchable	1	2	1.41	.494	.244	105
Lecturers should support students (e.g. students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles	1	2	1.41	.494	.244	105
Effective and appropriate technology infrastructure is important	1	2	1.41	.494	.244	105
Continuous feedback to and from students promotes trust between lecturers and students	1	3	1.42	.533	.284	105
Ongoing feedback from students about their learning experience is important	1	3	1.44	.536	.287	105
I am confident to teach in an E-learning environment	1	4	1.45	.635	.403	105
The system should meet lecturers' teaching goals	1	4	1.46	.555	.308	105
Have facilities for resource sharing between lecturers and students (e.g. through Wikis, blogs, discussion boards, etc)	1	2	1.47	.501	.251	105
Interaction between lectures and students is important	1	2	1.47	.501	.251	105
Have facilities for collaboration between students and their peers	1	3	1.49	.539	.291	105
Have group activities (e.g. through Google docs)	1	3	1.49	.574	.329	105
Have facilities for resource sharing between students and their peers	1	3	1.50	.557	.310	105
Interaction between students and their peers is important	1	3	1.51	.574	.329	105
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)	1	2	1.53	.501	.251	105

Statements related to the characteristics of the Initial Holistic E-learning 3.0 Model	Min Value	Max Value	Mean	Standard Deviation	Variance	Total Responses
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet students' needs	1	2	1.58	.496	.246	105
Taking into account existing course knowledge of students is important	1	3	1.75	.515	.265	105
Learning content should meet students' educational goals	1	3	1.75	.533	.284	105
Have learning content linked to a context	1	3	1.77	.486	.236	105
Be delivered according to students' learning profiles (e.g. considering students' existing knowledge and learning style preferences)	1	4	1.86	.627	.393	105
Students should assist their peers	1	4	1.96	.706	.499	105
Taking into account students' learning style preferences is important	1	4	1.97	.700	.490	105
Support knowledge representation for customised access to learning materials	1	3	2.16	.748	.560	105
I have the skills and competence to support personalised learning	1	4	2.25	.617	.380	105
Students should be allowed to select learning materials that match their needs	1	4	2.37	.724	.524	105
Lecturers should be able to annotate learning content	2	4	2.45	.537	.288	105
Learning content should be flexible enough to allow students to construct their own knowledge of the course	1	4	2.46	.694	.481	105
Keep track of students' learning profiles and patterns	2	3	2.47	.501	.251	105
Only lecturers can create learning materials	1	5	2.61	1.326	1.760	105
I am keen to deliver courses based on students' individual needs	1	5	2.64	.889	.791	105

Statements related to the characteristics of the Initial Holistic E-learning 3.0 Model	Min Value	Max Value	Mean	Standard Deviation	Variance	Total Responses
Allow students to be active participants where they can construct and manage their own personal knowledge	2	4	2.76	.779	.606	105
Learning content annotations and descriptions (e.g. metadata) is important	2	4	2.82	.647	.419	105
Be delivered in a pre-determined way where students are passive participants only	2	4	3.06	.830	.689	105
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)	1	4	3.10	.887	.787	105
Courses are delivered taking into consideration students' learning profiles (e.g. considering existing knowledge, learning style preferences etc)	2	4	3.20	.752	.565	105

Appendix H - Mean responses for surveys' statements

Table H:1: Mean responses for 'Content Management' statements

Please indicate your level of agreement to each statement: ***With respect to Content Management, in E-learning…***	**Strongly Agree (1)**	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**
Students' Survey					
Only lecturers can create learning materials		$\bar{x}$			
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)			$\bar{x}$		
Learning content should be easily accessible/retrievable	$\bar{x}$				
Learning content should be reusable	$\bar{x}$				
Learning content should match students' needs	$\bar{x}$				
Learning content should allow me to construct my own knowledge of the course	$\bar{x}$				
Learning content should be quick to search	$\bar{x}$				
Lecturers' Survey					
Only lecturers can create learning materials		$\bar{x}$			
Students can contribute to learning content creation (e.g. Students' portfolios, presentations etc)			$\bar{x}$		
Learning content should the course requirements	$\bar{x}$				
Learning content should match students' needs	$\bar{x}$				
Learning content should be easily accessible/retrievable	$\bar{x}$				
Learning content should be reusable	$\bar{x}$				
Lecturers should be able to annotate learning content		$\bar{x}$			
Learning content annotations and descriptions (e.g. metadata) is important		$\bar{x}$			

Learning content should be flexible enough to allow students to construct their own knowledge of the course		$\bar{x}$			
Learning content should be searchable	$\bar{x}$				

Table H:2: Mean responses for 'Personalised Learning' statements

Please indicate your level of agreement to each statement: ***With respect to Personalised Learning,***	**Strongly Agree (1)**	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**
Students' Survey					
My existing knowledge of the course should be taken into account	$\bar{x}$				
My learning style preferences should be taken into account	$\bar{x}$				
I should be allowed to select learning materials based on my learning style preferences	$\bar{x}$				
I should be able to receive different learning materials than my peers based on my learning profile (e.g. considering my existing knowledge and learning style preferences)	$\bar{x}$				
My educational goals should be met	$\bar{x}$				
Lecturers deliver courses based on students' needs			$\bar{x}$		
Lecturers are keen to facilitate students' learning			$\bar{x}$		
Lecturers have the skills and competence to support personalised learning			$\bar{x}$		
Lecturers' Survey					
Taking into account existing course knowledge of students is important	$\bar{x}$				
Taking into account students' learning style preferences is important	$\bar{x}$				

Learning content should meet students' educational goals	$\bar{x}$				
Students should be allowed to select learning materials that match their needs		$\bar{x}$			
Courses are delivered taking into consideration students' learning profiles (e.g. considering existing knowledge, learning style preferences etc)			$\bar{x}$		
I am keen to deliver courses based on students' individual needs		$\bar{x}$			
I have the skills and competence to support personalised learning		$\bar{x}$			

Table H:3: Mean responses for 'Pedagogy' statements

Please indicate your level of agreement to each statement: ***With respect to Pedagogy, E-learning courses should…***	**Strongly Agree (1)**	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**
Students' Survey					
Have clear learning objectives for each lesson	$\bar{x}$				
Have clear organisation of lessons which is easy to follow	$\bar{x}$				
Have clear assessments instructions	$\bar{x}$				
Be delivered in a pre-determined way where I am a passive participant only		$\bar{x}$			
Allow me to be an active participant where I can construct and manage my own personal knowledge		$\bar{x}$			
Be delivered according to my learning profile (e.g. considering my existing knowledge and learning style preferences)	$\bar{x}$				

Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet my needs	$\bar{x}$				
Lecturers' Survey					
Have clear learning objectives for each lesson	$\bar{x}$				
Have clear organisation of lessons which is easy to follow	$\bar{x}$				
Have clear assessments instructions	$\bar{x}$				
Align with the university's vision and mission	$\bar{x}$				
Be delivered in a pre-determined way where students are passive participants only			$\bar{x}$		
Allow students to be active participants where they can construct and manage their own personal knowledge		$\bar{x}$			
Be delivered according to students' learning profiles (e.g. considering students' existing knowledge and learning style preferences)	$\bar{x}$				
Use teaching approaches (e.g. lectures, examples, quizzes, case studies, lab work) that meet students' needs	$\bar{x}$				
Have learning content linked to a context	$\bar{x}$				

Table H:4: Mean responses for 'Collaboration' statements

Please indicate your level of agreement to each statement: ***With respect to Collaboration, in E-learning, it is important to…***	**Strongly Agree (1)**	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**
Students' Survey					
Have facilities for collaboration between peers	$\bar{x}$				
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)	$\bar{x}$				
Share resources with peers		$\bar{x}$			

Share resources with lecturers	$\bar{x}$				
Have group activities	$\bar{x}$				
Lecturers' Survey					
Have facilities for collaboration between lecturers and students (e.g. using emails, skype)	$\bar{x}$				
Have facilities for collaboration between students and their peers	$\bar{x}$				
Have facilities for resource sharing between lecturers and students (e.g. through Wikis, blogs, discussion boards, etc)	$\bar{x}$				
Have facilities for resource sharing between students and their peers	$\bar{x}$				
Have group activities (e.g. through Google docs)	$\bar{x}$				

Table H:5: Mean responses for 'Web 3.0 System' statements

Please indicate your level of agreement to each statement: ***With respect to Web 3.0 System, E-learning system should…***	**Strongly Agree (1)**	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**
Students' Survey					
Maintain effective records of information and resources	$\bar{x}$				
Support customised access to learning resources	$\bar{x}$				
Keep records of students' learning profiles	$\bar{x}$				
Support new technologies	$\bar{x}$				
Be easy to navigate	$\bar{x}$				
Have easy access to resources	$\bar{x}$				
Have effective IT infrastructure	$\bar{x}$				
Lecturers' Survey					

Support knowledge representation for customised access to learning materials		$\bar{x}$			
Maintain effective learning materials records	$\bar{x}$				
Keep track of students' learning profiles and patterns		$\bar{x}$			
Support new technologies	$\bar{x}$				
Be easy to navigate	$\bar{x}$				
Have easy access to resources	$\bar{x}$				
Have effective IT infrastructure	$\bar{x}$				

Table H:6: Mean responses for 'Support' statements

Please indicate your level of agreement to each statement: ***With respect to Support in E-learning…***	**Strongly Agree (1)**	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**
Students' Survey					
Peer assistance is important to me	$\bar{x}$				
Lecturers' support is important (e.g. through students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles)	$\bar{x}$				
Ongoing feedback from lecturers about my learning performance is important	$\bar{x}$				
I should be able to provide feedback about my learning experience	$\bar{x}$				
Training to use the system is important	$\bar{x}$				
Effective and appropriate technology infrastructure is important	$\bar{x}$				
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	$\bar{x}$				

Lecturers' Survey					
Students should assist their peers	$\bar{x}$				
Lecturers should support students (e.g. students' encouragements, provision of study materials, assessment and exams hints, use of different teaching styles)	$\bar{x}$				
Ongoing feedback to students about their learning performances is important	$\bar{x}$				
Ongoing feedback from students about their learning experience is important	$\bar{x}$				
Training to use the system is important	$\bar{x}$				
Effective and appropriate technology infrastructure is important	$\bar{x}$				
Ongoing IT Support is important (e.g. help, FAQs, Help desk)	$\bar{x}$				

Table H:7: Mean responses for 'Trust' statements

Please indicate your level of agreement to each statement: ***With respect to Trust, in E-learning…***	**Strongly Agree (1)**	**Agree (2)**	**Neither Agree nor Disagree (3)**	**Disagree (4)**	**Strongly Disagree (5)**
Students' Survey					
Interaction between lectures and students is important	$\bar{x}$				
I am comfortable using resources (such as links, presentations) shared by known peers	$\bar{x}$				
I am comfortable using resources (such as links, presentations) from peers even if they are not directly known to me		$\bar{x}$			

Continuous feedback to and from lecturers promotes trust between students and lecturers	$\bar{x}$				
The system should be reliable	$\bar{x}$				
The system should be secure	$\bar{x}$				
I am confident to learn in an E-learning environment	$\bar{x}$				
Lecturers' Survey					
Interaction between lectures and students is important	$\bar{x}$				
Interaction between students and their peers is important	$\bar{x}$				
Continuous feedback to and from students promotes trust between lecturers and students	$\bar{x}$				
The system should be reliable	$\bar{x}$				
The system should be secure	$\bar{x}$				
I am confident to teach in an E-learning environment	$\bar{x}$				

Appendix I - Students' survey factor items and associated characteristics/sub-characteristics

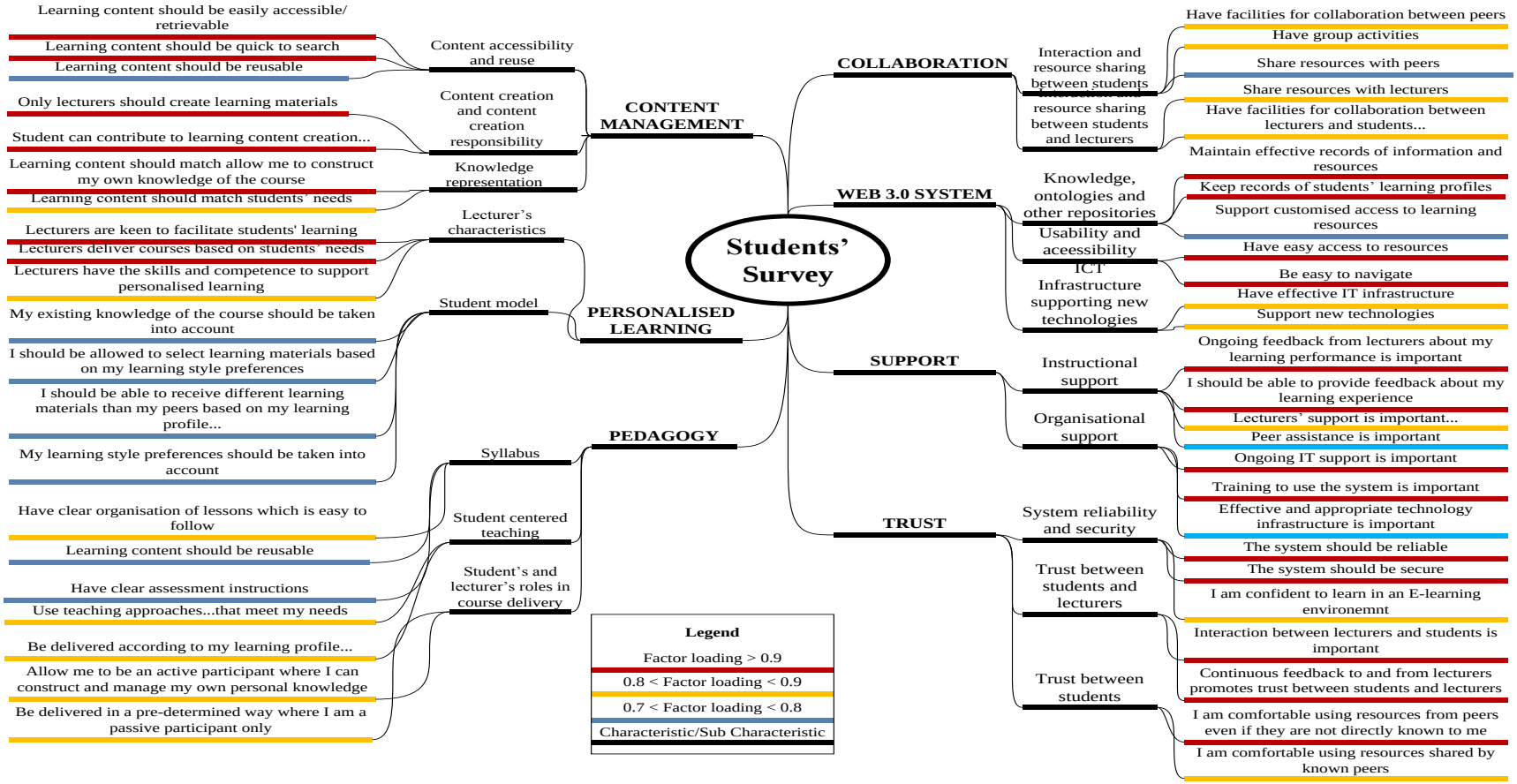

Figure I:1: Students' Survey – Factor items and associated characteristics and sub-characteristics

Appendix J - Lecturers' survey factor items and associated characteristics/sub-characteristics

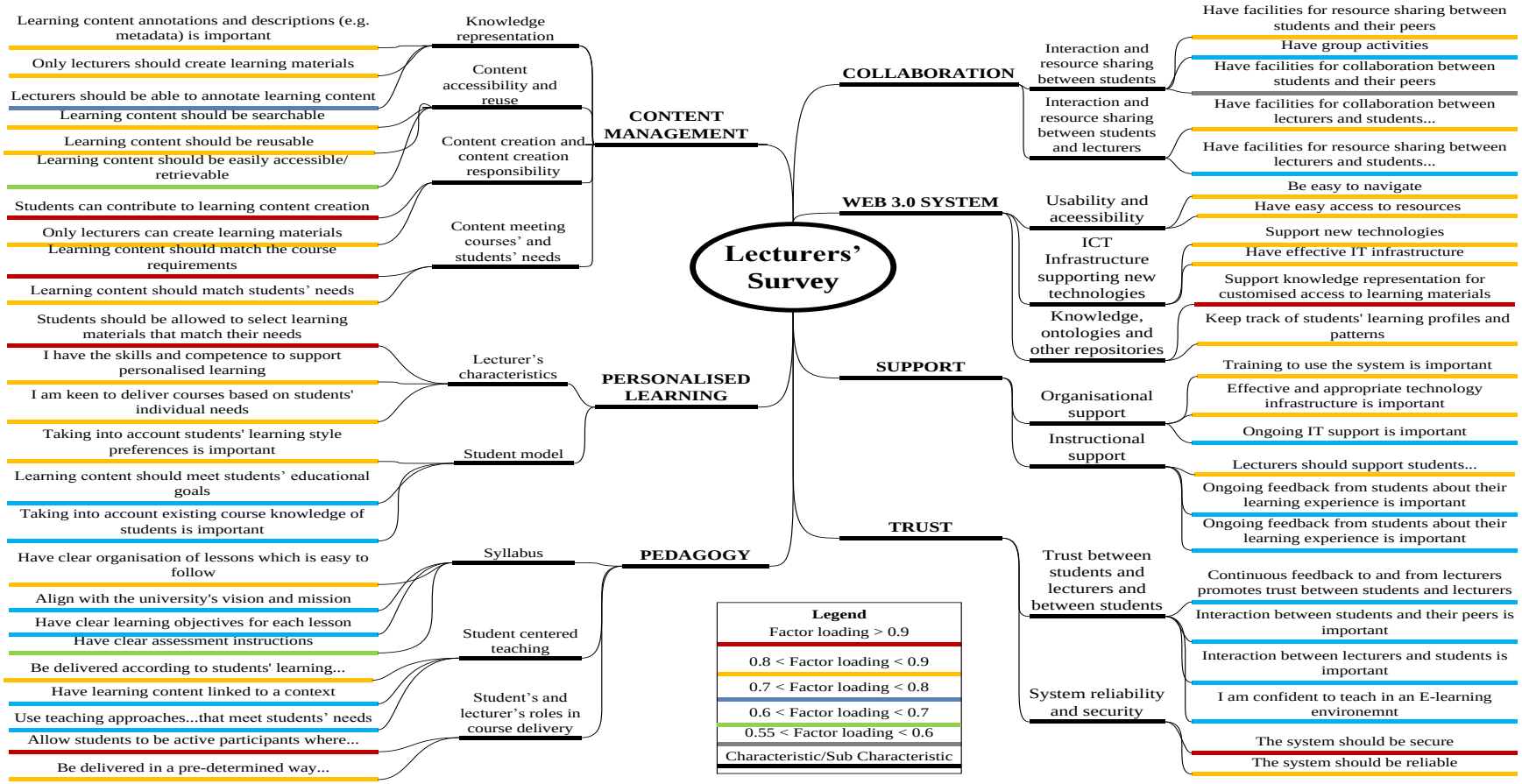

Figure J:1: Lecturers' survey – Factor items and associated characteristics and sub-characteristics

Appendix K - Invitation letter for interview

Curtin University of Technology
School of Information Systems

A Holistic Model for E-learning 3.0 for Higher Education Institutions in Mauritius

Dear Sir/Madam

My name is Raadila Hajee Ahmud-Boodoo. I am currently completing a PhD research titled "A Holistic Model for E-learning 3.0 for Higher Education Institutions in Mauritius", at Curtin University of Technology, Western Australia.

This email is seeking your permission to participate in an interview to evaluate my draft E-learning 3.0 model. You can choose to have **an email interview**, **a telephone interview** or **a Skype interview**, depending on your preference and convenience. If you agree to participate, you will be asked to complete some questions regarding E-learning and E-learning 3.0 in Mauritius, based on your perspective and experience.

Participation in this research is completely voluntary and your responses will be completely anonymous. You may withdraw at any time without prejudice or negative consequences, and do not need to provide a reason.

Your participation is highly encouraged because this research will provide valuable insights to determine the essential characteristics of an E-learning 3.0 model in Mauritius. Your assistance in this research is greatly appreciated and is crucial for the success of its findings. We hope that the results of this research will allow us to develop a customised E-learning 3.0 model for the Mauritian higher education institutions that will make use of latest technologies of the Semantic Web.

If you would like to participate, please contact me at via the emails or number listed below. I will then email you the interview questions, the participation information statement, which will provide more information about this research project, and the consent form to confirm your participation. ***Please kindly advise your preferred***

interview option in the return email (Email interview, Telephone interview or Skype interview).

Email (1): r.hajeeahmud@postgrad.curtin.edu.au
Email (2): raadila@gmail.com

You may also contact the project supervisor, Dr Tomayess Issa, for any queries related the project or if you require more information at *Tomayess.Issa@cbs.curtin.edu.au*.

Please note that Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number **HRE2016-0142**). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

Your cooperation is highly appreciated.

With kind regards,
Raadila Hajee Ahmud-Boodoo
Curtin University of Technology
Western Australia

Appendix L - Interview questions for Lecturers

A Holistic Model for E-learning 3.0 for Higher Education Institutions in Mauritius

Dear Sir/Madam

I am a PhD student in the School of Information Systems; I am conducting research to examine users' reaction toward E-learning and E-learning 3.0 in Mauritius. Your assistance in this research would be greatly appreciated and would assist in the success of its findings.

This research involves a series of questions in the form of an interview, which will take up to 45 minutes to complete. This interview contains five sections and is accessible online at the provided link. Please read each statement and then answer according to how you feel.

To complete the interview please click on the NEXT BUTTON below.
(Bottom Right of Page)

If you feel uncomfortable in answering certain questions, please feel free to disregard them.

We would appreciate it if you can complete this interview within a week if possible, however, if this is too short a space of time, please respond as soon as you are able.

Participation in this research is completely voluntary and your responses will be completely anonymous. Participants may withdraw at any time without prejudice or negative consequences, and do not need to provide a reason. By completing the interview, you are consenting to participate.

Any information provided by you through the interview will be held as strictly confidential. Information will not be disclosed to any parties besides the researchers, unless required to do so by law. Finally, the researchers will ensure that published material will not contain any information that can identify you or your organization.

We encourage you to participate because this research will provide valuable insights to determine the essential characteristics of an E-learning 3.0 model in Mauritius. Your assistance in this research is greatly appreciated and is crucial for the success of its findings.

Your interest and consideration are greatly appreciated. If you need any additional information from us, please let us know at raadila@gmail.com or r.hajeeahmud@postgrad.curtin.edu.au or Tomayess.Issa@cbs.curtin.edu.au.

Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number: HRE2016-0142). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

Thank you in advance.

Yours faithfully,

Raadila Hajee Ahmud-Boodoo
School of Information Systems
Curtin University of Technology
Australia
Email (1): raadila@gmail.com
Email (2): r.hajeeahmud@student.curtin.edu.au

Dr. Tomayess Issa
Senior Lecturer - School of Information Systems;
Curtin University Australia
Email: Tomayess.Issa@cbs.curtin.edu.au

NEXT

YOUR ROLE

Please choose one of the following roles

- ○ I am a Lecturer/Academic Staff
- ○ I am an Administrative Personnel

BACKGROUND INFORMATION

What is your gender?

- ○ Male
- ○ Female

What is your age?

- ○ 22-35
- ○ 36-45
- ○ 46-50
- ○ 51-55
- ○ 56-60

- ○ 61 and Above

Is your University Public or Private?

- ○ Public
- ○ Private

Which Faculty do you belong to?

- ○ Agriculture
- ○ Art & Design
- ○ Business, Accounting & Finance
- ○ Engineering
- ○ Health
- ○ Information Technology and Systems
- ○ Law and Management
- ○ Science
- ○ Social Studies & Humanities
- ○ Tourism
- ○ Others

What is your Highest Education Level?

- ○ Undergraduate Degree/Bachelor Degree
- ○ Postgraduate Certificate

- ○ Postgraduate Diploma
- ○ Postgraduate Degree/Masters
- ○ PhD/Research
- ○ Others

E-LEARNING AND YOU

What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome?

Do you think E-learning works or will work in Mauritius? Please give details.

What do you think are the barriers to make Mauritius E-learning ready?

How comfortable and confident are you to teach online classes? Please give details.

Is there any form of E-learning happening already in your classes? Please give details.

Do you use any E-learning system/platforms for your classes such as Blackboard, WebCT, Moodle etc? Please give details.

What do you think are the barriers for Mauritian lecturers to be E-learning ready?

Are you ready as a lecturer to change your role from an active instructor to a collaborator in learning?

E-LEARNING AND STUDENTS

Do your students use learning tools such as discussion board, chat rooms, wiki, blog etc? Please give details.

Do you think understanding students prior experience and knowledge and their learning styles and preferences are essential at the time of teaching delivery? Please give details.

Do you think Mauritian students can collaborate to their learning or rather they can only succeed if they are spoon fed by their lecturers? Please give details.

What is your perception on the culture of sharing and collaboration in Mauritian universities?

How comfortable do you think Mauritian students are or will be in the foreseeable future with online classes instead of face to face? Please give details.

How would you rate the importance of students' course evaluation? Please provide details.

- Highly Important
- Important
- Neutral
- Slightly Important
- Not Important

Do you think that course evaluation feedback is genuinely taken into consideration for future course planning and delivery? Please provide details.

- Yes
- Maybe

- ○ Probably not

- ○ Definitely not

How important do you think trust in the system security and reliability, trust between students and lecturers and trust between students are in the E-learning environment?

E-LEARNING AND LEARNING MATERIALS

Who create learning materials for your classes?

- ○ I create my own learning materials
- ○ The University provides the learning materials

(Please state the name of the unit/department which create the learning materials)

- ○ Other *(Please specify)*

What is the proportion of digital materials you use in your classes?

- ○ All my materials are digital
- ○ Half of my materials are digital
- ○ A small proportion of my materials are digital

- ○ I do not use digital materials

Do you often reuse learning materials from your previous courses or from other colleagues/ institutions? Please give details.

Do you use authoring tools for your class materials? Please give details.

Do you do learning materials annotations?

- ○ Yes
- ○ No

Display This Question:
If Do you do learning materials annotations? = Yes

Do you consider annotating learning materials an extra burden on lecturers?

Display This Question:
If Do you do learning materials annotations? = No

Who does learning materials annotations for your course(s)?

How would you rate the importance of metadata of learning materials?

- ○ Highly Important

- ○ Important
- ○ Neutral
- ○ I do not see its importance
- ○ I have not dealt with metadata before

Have you heard about the Semantic Web?

- ○ Yes
- ○ No

Display This Question:

If Have you heard about the Semantic Web? = Yes

Where do you see Mauritius with respect to the Semantic Web?

Have you heard about ontologies?

- ○ Yes
- ○ No

Display This Question:

If Have you heard about ontologies? = Yes

Do you think that the Mauritian higher education sector will use or promote the usage of ontologies?

Appendix M - Interview questions for Administrative Personnel

A Holistic Model for E-learning 3.0 for Higher Education Institutions in Mauritius

Dear Sir/Madam

I am a PhD student in the School of Information Systems; I am conducting research to examine users' reaction toward E-learning and E-learning 3.0 in Mauritius. Your assistance in this research would be greatly appreciated and would assist in the success of its findings.

This research involves a series of questions in the form of an interview, which will take up to 45 minutes to complete. This interview contains five sections and is accessible online at the provided link. Please read each statement and then answer according to how you feel.

To complete the interview please click on the NEXT BUTTON below.
(Bottom Right of Page)

If you feel uncomfortable in answering certain questions, please feel free to disregard them. We would appreciate it if you can complete this interview within a week if possible, however, if this is too short a space of time, please respond as soon as you are able.

Participation in this research is completely voluntary and your responses will be completely anonymous. Participants may withdraw at any time without prejudice or negative consequences, and do not need to provide a reason. By completing the interview, you are consenting to participate.

Any information provided by you through the interview will be held as strictly confidential. Information will not be disclosed to any parties besides the researchers,

unless required to do so by law. Finally, the researchers will ensure that published material will not contain any information that can identify you or your organization.

We encourage you to participate because this research will provide valuable insights to determine the essential characteristics of an E-learning 3.0 model in Mauritius. Your assistance in this research is greatly appreciated and is crucial for the success of its findings.

Your interest and consideration are greatly appreciated. If you need any additional information from us, please let us know at raadila@gmail.com or r.hajeeahmud@postgrad.curtin.edu.au or Tomayess.Issa@cbs.curtin.edu.au.

Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number: HRE2016-0142). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

Thank you in advance.

Yours faithfully,

Raadila Hajee Ahmud-Boodoo
School of Information Systems
Curtin University of Technology
Australia
Email (1): raadila@gmail.com
Email (2): r.hajeeahmud@student.curtin.edu.au

Dr. Tomayess Issa
Senior Lecturer - School of Information Systems;
Curtin University Australia
Email: Tomayess.Issa@cbs.curtin.edu.au

NEXT

YOUR ROLE

Please choose one of the following roles

- ○ I am a Lecturer/Academic Staff
- ○ I am an Administrative Personnel

BACKGROUND INFORMATION

Is your University Public or Private?

- ○ Public
- ○ Private

Which faculty do you belong to?

- ○ Agriculture
- ○ Art & Design
- ○ Business, Accounting & Finance
- ○ Engineering
- ○ Health
- ○ Information Technology and Systems
- ○ Law and Management
- ○ Science

- Social sciences
- Tourism
- Others

BARRIERS TO E-LEARNING

What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome?

Do you think E-learning works or will work in Mauritius? Please give details.

What do you think are the barriers to make Mauritius E-learning ready?

What do you think are the barriers for Mauritian lecturers to be E-learning ready?

What do you think are the barriers for Mauritian students to be E-learning ready?

E-LEARNING AND STUDENTS

Do you think understanding students' prior experience and knowledge and their learning styles and preferences are essential at the time of course design? Please give details.

Do you think students can collaborate to their learning or rather they can only succeed if they are spoon fed by their lecturers? Please give details.

What is your perception on the culture of sharing and collaboration in Mauritian universities?

How comfortable do you think Mauritian students are or will be in the foreseeable future with online classes instead of face to face? Please give details.

How would you rate the importance of students' course evaluation? Please provide details.

- ○ Highly Important
- ○ Important
- ○ Neutral
- ○ Slightly Important
- ○ Not Important

Do you think that course evaluation feedback is genuinely taken into consideration for future course planning and delivery? Please provide details.

- ○ Yes
- ○ Maybe
- ○ Probably not
- ○ Definitely not

How important do you think trust in the system security and reliability, trust between students and lecturers and trust between students are in the E-learning environment?

E-LEARNING AND LEARNING MATERIALS

What is the proportion of digital materials used for courses?

- ○ All materials are digital
- ○ Half of the materials are digital

- ○ A small proportion of the materials are digital
- ○ No digital materials are used

Does reuse of learning materials from previous courses or from other institutions occur? Please give details.

Are authoring tools used for course materials? Please give details.

Do you or your department do learning materials annotations?

- ○ Yes
- ○ No

Display This Question:
If Do you or your department do learning materials annotations? = Yes

Do you consider annotating learning materials an extra burden?

Display This Question:
If Do you or your department do learning materials annotations? = No

Who does learning materials annotations for courses?

How would you rate the importance of metadata of learning materials?

- ○ Highly Important

- ○ Important
- ○ Neutral
- ○ I do not see its importance
- ○ I have not dealt with metadata before

Have you heard about the Semantic Web?

- ○ Yes
- ○ No

Display This Question:
If Have you heard about the Semantic Web? = Yes

Where do you see Mauritius with respect to the Semantic Web?

Have you heard about ontologies?

- ○ Yes
- ○ No

Display This Question:
If Have you heard about ontologies? = Yes

Do you think that the Mauritian higher education sector will use or promote the usage of ontologies?

Appendix N - Interview Consent Form

CONSENT FORM

HREC Project Number:	**HRE2016-0142**
Project Title:	A Holistic Model for E-learning 3.0 for Higher Education Institutions in Mauritius
Principal Investigator:	Dr. Tomayess Issa
Student researcher:	Mrs. Raadila Hajee Ahmud-Boodoo
Version Number:	V1
Version Date:	08/07/2016

- I have read the information statement version listed above and I understand its contents.
- I believe I understand the purpose, extent and possible risks of my involvement in this project.
- I voluntarily consent to take part in this research project.
- I have had an opportunity to ask questions and I am satisfied with the answers I have received.
- I understand that this project has been approved by Curtin University Human Research Ethics Committee and will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007).
- I understand I will receive a copy of this Information Statement and Consent Form.

Participant Name	
Participant Signature	
Date	

Declaration by researcher: I have supplied an Information Letter and Consent Form to the participant who has signed above, and believe that they understand the purpose, extent and possible risks of their involvement in this project.

Researcher Name	Raadila Hajee Ahmud-Boodoo
Researcher Signature	
Date	08/07/2016

Appendix O - Participant Information Sheet

Curtin University

PARTICIPANT INFORMATION STATEMENT

HREC Project Number:	**HRE2016-0142**
Project Title:	A Holistic Model for E-learning 3.0 for Higher Education Institutions in Mauritius
Principal Investigator:	Dr Tomayess Issa
Student Researcher	Raadila Hajee Ahmud-Boodoo
Version Number:	V1
Version Date:	08/07/2016

My name is Raadila Hajee Ahmud-Boodoo. I am currently completing a PhD research titled '**A Holistic Model for E-learning 3.0 for Higher Education Institutions in Mauritius**' at Curtin University of Technology. Your assistance in this research would be greatly appreciated and would assist in the success of its findings.

What is the Project About?

E-learning 3.0 models for higher education proposed in the literature outline some essential E-learning 3.0 characteristics that unfortunately tend to revolve around the complexities of the Semantic Web technology. Conversely, a comprehensive analysis of E-learning models in the literature reveals several E-learning critical success factors that are still relevant to the Semantic Web but often overlooked in E-learning 3.0 models. Hence, this research aims to define a new and combined set of E-learning 3.0 characteristics that will lead to the development of a new holistic E-learning 3.0 model integrating the essential characteristics of the Semantic Web and E-learning.

Who is doing the Research?

The project is being conducted by Raadila Hajee Ahmud-Boodoo. The results of this research project will be used by Raadila Hajee Ahmud-Boodoo to obtain a Doctor of Philosophy at Curtin University and is funded by the University. There will be no costs to you and you will not be paid for participating in this project.

Why am I being asked to take part and what will I have to do?

We are conducting research to examine users' reaction toward E-learning and E-learning 3.0 in Mauritius. Your assistance in this research would be greatly appreciated and would assist in the success of its findings.

This research involves a series of questions in the form of an interview, which will take up to 45 minutes to complete. Please read each statement and then answer according to how you feel.

We would appreciate it if you can complete this interview within a week if possible, however, if this is too short a space of time, please respond as soon as you are able.

Are there any benefits' to being in the research project?

We encourage you to participate in this research because this research will provide valuable insights to determine the essential characteristics of an E-learning 3.0 model in Mauritius. Your assistance in this research is greatly appreciated and is crucial for the success of its findings. We hope that the results of this research will allow us to develop a customised E-learning 3.0 model for Mauritian higher education institutions that will make use of latest technologies of the Semantic Web.

Are there any risks, side-effects, discomforts or inconveniences from being in the research project?

There are no foreseeable risks from this research project. Apart from giving up your time, we do not expect that there will be any risks or inconveniences associated with taking part in this study. If you feel uncomfortable in answering certain questions, please feel free to disregard them.

Who will have access to my information?

Any information provided by you through the interview will be held as strictly confidential and will be non-identifiable (Anonymous). We will not be collecting individual names and no one, not even the research team will be able to identify your information. Information will not be disclosed to any parties besides the researchers and the Curtin University Ethics Committee, unless required to do so by law.

You have the right to access, and request correction of, your information in accordance with relevant privacy laws.

The results of this research may be presented at conferences or published in professional journals. You will not be identified in any results that are published or presented.

All participants' responses will be kept electronically in a secure Curtin University drive and on password protected computer.

The information we collect in this study will be kept under secure conditions at Curtin University for 7 years after the research has ended and then it will be destroyed.

Will you tell me the results of the research?

We are not able to send you any results from this research as we do not collect any personal information.

Do I have to take part in the research project?

Participation in this research is completely voluntary and your responses will be completely anonymous. Participants may withdraw at any time without prejudice or negative consequences, and do not need to provide a reason.

What happens next and who can I contact about the research?

Your interest and consideration are greatly appreciated. If you need any additional information from us, please let us know at *raadila@gmail.com* or r.hajeeahmud@postgrad.curtin.edu.au or *Tomayess.Issa@cbs.curtin.edu.au*.

If you decide to take part in this research, we will ask you to sign the consent form. By signing it is telling us that you understand what you have read and what has been discussed. Signing the consent indicates that you agree to be in the research project. Please take your time and ask any questions you have before you decide what to do. You will be given a copy of this information and the consent form to keep.

Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number **HRE2016-0142**). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

Thank you for your involvement in this research. Your participation is greatly appreciated.

Appendix P - Interview Responses (By Questions)

What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome?	
Participant_L1	- There are lots of challenges like students not interested to come to class and those who come, do not find classes interesting anymore and do not ask questions. - E-learning will allow them to learn from anywhere. - Content may be presented in a more lively manner using virtual reality simulations for some topics. - Students do not ask much questions until the eve of exams.
Participant_L2	- Not all students live in close proximity to the institute and sometimes transport is a problem. - Students come late and do not have much flexibility with regard to their timetable - Not everything can be covered in a two hour face to face lecture as well. - E-learning could solve these problems by enabling students to learn at their own time in the comforts of their homes.
Participant_L3	- Time management and scheduling
Participant_L4	- In Mauritius, the concept of E-learning is making lecture notes available to students online. Materials like videos and online quizzes or tests must be created for students. The concept of E-learning is not well understood in Mauritius
Participant_L5	- Being able to view exact images to illustrate subject matter being studied
Participant_L6	- High number of students in the classroom and limited interaction possible - Varied/mixed ability students – difficult to deliver lecturers that suit all students, pace of learning is different for each student and E-learning environment can cater for that better as compared to face to face classes. - Low attention level of students. Student are bored quickly - With E-learning, student can access course materials from anywhere and anytime giving them more flexibility in their learning
Participant_L7	- How to encourage students to participate. How to keep them focussed for the whole duration of the lecture. How to give assessment on each lecture session. How to check the answer of each student for a particular case-study to make sure every student understood. - After some years of teaching the same module, it becomes repetitive for the lecturer and the lecturer might lose his enthusiasm about the subject.

	- Students find it boring to travel to the University, sit in a classroom for 2-3 hours without the use of new technology. - Make sure every student hears what you are speaking with a batch of 60-80 students.
Participant_L8	- Lack of Interaction
Participant_L9	- Interaction and personalisation. Because class sizes are big. Matching the pace of large group is also challenging
Participant_L10	- Absenteeism- students can study at their own time unlike face to face classes where students have to be physically present. - More effective learning - students can learn at their own pace
Participant_L11	- Face to face classes depend on the teaching style of the lecturer - it is teacher centered. e-Learning is learner centered - promotes autonomy of the student and gets a student to maturity quicker.
Participant_L12	- Usually during the face to face classes, especially with big cohorts, it is not always possible to get responses from students. Keeping track of students' progress is easier through an e-learning system. - Through an e-learning platform, students can access a variety of educational materials that can better meet their needs at their own pace.
Participant_L13	- Student participation/contribution
Participant_L14	- Nowadays students attention time in classroom is very short, it's becoming harder for lecturers to firstly retain the interest of the students and secondly to transfer maximum of content or know how in a traditional mode of lecture of 2 to 3 hours. Students are more at ease with discrete knowledge that they can go through at anytime from anywhere. Another acute problem in face to face sessions is that the students in a classroom or a lab do not or have difficulties in writing down notes from the whiteboard or when the lecturer is lecturing. Finally, the whole thinking has shifted to search engines, this is a major challenge.
Participant_L15	- Reduce cost in terms of traveling, infrastructure and equipment. 2. Less personal involvement. More professional/academic involvement. 3.Lecturers can focus on their topic without having to deal with students' bad behaviour. No more spoon feeding. More responsibility on students' side. 4. More control on students' performance and work progress.
Participant_L16	- In F2F classes: Scheduling is not flexible; large classrooms are difficult to manage; some students might be embarrassed or shy to ask questions; students learn at different pace and

	have different learning styles and this cannot be accommodated in F2F classrooms whereas E-learning can support that.
Participant_L17	- 1. Everyone learns at their own pace. 2. - 2. You do not have to be in class at a specific time and day - you may follow the lecture when you are free and do the coursework as well. - 3. Caters for all kinds of students - shy and extrovert - even shy students can answer quiz questions and even if answer is wrong it is ok - whereas in class it is mostly the extrovert students who answer and the shy ones rarely if ever participate.
Participant_L18	- accessibility pedagogical aspects - E-learning improve interaction between students and teachers.
Participant_L19	- E-learning improve interaction between students and teachers. We are now in the digital era with digital students. E-learning brings much motivation and encourage both constructivist and deep learning. With e-learning authentic tasks are performed and this led towards independent learners. E-learning can overcome monotony in class and encourage both teachers and students to move towards the 21st century education. E-learning improve the quality of learning and build life-long learners
Participant_L20	- In face to face classes students can miss some important notes or information but E-learning allows them to come back to their notes and access missed out information. - Besides, E-learning allows for more control concerning discussion. Discussion can be easily monitored as learners' voices will not overlap their peers'. - Face to face classes may not allow us to know each and every one in our classes but e learning, with the profile option made available to learners, we can better know our learners. We can easily access information about them from basic information such as their gender and contact info to their comments and grades. - Student can access course materials in a more interactive way allowing them to absorb the course concepts better and at their own pace and in their own time. This is not always possible in face to face classes with large student numbers.
Participant_A1	- 1. Absenteeism 2. E-learning provides more flexibility 3. E-Learning is initially expensive, but can prove to be a good model in the long run
Participant_A2	- Developing lifelong learning skills and autonomy of learners
Participant_A3	- Large cohorts of students... e-learning will help in the delivery of some courses where there are large cohorts of students.

Participant_A4	- Face to face classes with the students of university does not give the same outcome which an e-learning session can. There are a number of students who still have the fear to talk in front of the class. For example, if a question is asked to a group of students in a face to face session, hardly some will answer to it, whereas if the same question to same group of students in an e-learning session and almost all the students will share their views.
Participant_A5	- First, there is a problem of logistics. Space to accommodate so many students is a huge problem. At this level, e-learning can be answer to that problem. Moreover, content can be presented in different formats (word/html/video, etc.) and available 24/7. (flexibility of time and more responsibility of students) The pedagogical relevance of technology makes it easier to cater for different learning styles and different intelligences of students within an E-learning environment. Students who are also connected 24/7 to peers. More collaborative learning culture is encouraged by e-learning.
Participant_A6	- in case of poor infrastructure, face to face interaction can present challenges, such as unable to showcase videos and animations related to study.
Participant_A7	- Large number of students to accommodate onsite

Do you think E-learning works or will work in Mauritius? Please give details.	
Participant_L1	- Currently, E-learning is not working in Mauritius as there is no one who is really using it in the way it is meant to be used. - Courses who are given online are not given the same value by people and people somehow think that online courses should be free - I don't think e-learning will work in Mauritius in the foreseeable future.
Participant_L2	- I think Mauritius still require a blend of both e-learning platforms and face to face contact. E-learning requires a culture of self-reflection which has not yet been adopted by Mauritians. It also requires more self-discipline which could be an issue for younger students. - More work needs to be done to prepare lecturers on how to create E-learning materials and deliver courses in an interactive way. Otherwise, it will just be like face to face classes in an online platform and is not worth the change to an online environment.
Participant_L3	- I believe it will be difficult to implement as students are still very much under parent's influence, who still believe in the traditional classroom setting.

	- Also, the students themselves aren't used to using IT as much in secondary school and so are not accustomed to that method of teaching/learning - There need also the need to be a review of the curriculum to support E-learning.
Participant_L4	- It will work provided the materials are well created in an interactive way. - the curriculum needs to be adapted to meet the needs of E-learning. The current courses are not structured to suit E-learning. It is more for face to face delivery.
Participant_L5	- Yes, with initiatives such as tables to secondary students etc. We are on the way to more E-learning in Mauritius.
Participant_L6	- Yes, if the required platform is put in place and necessary support and feedback are provided to the students in terms of their learning. However, in certain areas such as engineering, it may be difficult because of the high practical components and equipment.
Participant_L7	- Yes, it will work. With the setup of distance learning university, more students are going for work and study combination. And very often, they prefer to secure a job early so that when they graduate, they have work experience already and are financially independent.
Participant_L8	- Yes, cyber island and future needs
Participant_L9	- Yes. Will surely improve learning process. Gives the learners the opportunity to have access to resources adapted to their needs. Teamwork can improve.
Participant_L10	- Yes e-learning will work in Mauritius as the cost is lower and students can learn and work at the same time
Participant_L11	- Yes, it works - for the past decade this is what we have been doing.
Participant_L12	- Currently there are courses being offered in fully online and also in blended mode. However, there is sometimes a contradiction as students are used to a teacher centered approach and the aspect of social presence and the feeling of isolation from some of them may be a problem with fully online modalities. Will it work in Mauritius or does it work??? well I think it depends on several factors such as proper internet facilities, excellent bandwidth, access and the willingness to be autonomous learners.
Participant_L13	- Yes. Because most families now have internet connection.
Participant_L14	- E-learning will work to some extent, but more has to be done at both the producer (content & platform provider) and the consumer (learners) ends. As a matter of fact, the trend for the adoption of ODL mode is on the rise in Mauritius for multiple reasons that suit them. However, the quality of the output is not satisfactory if we look at the preferences of the employers, public as well as private.

Participant_L15	- If universities dare to put adequate, easy to use system which supports ease of access to customised resources and encourage to change the mindset, E-learning will work.
Participant_L16	- E-learning can eventually work with proper training of instructors to help prepare them to become effective online instructors. It might be more challenging to convince lecturers with old-school mentality who do not believe in online education.
Participant_L17	- Yes, it can work but for a category of people. It will not work for quite a few students since they will have to do independent learning - which requires more maturity and ability to manage one's time - not always easy for some students.
Participant_L18	- There is no true e-learning in Mauritius. Supports of ICT is given only. The design and content of courses must be changed to adapt to E-learning, then only we can make some progress in that direction.
Participant_L19	- Yes, it will work because as a developing country, our educational system has improved a lot since the last decades. With the new objectives set by the Ministry of Education (Objectives 2020), e-learning is one of the targets set to integrate technology in education. However, the infrastructure is still lacking in terms of accessibility to e-learning tools. Professional development and expertise of lecturers need to be ensured in a better way to be able to guarantee a better access to elearning. In both primary and secondary schools E-learning is lacking in most of the colleges. Universities adopt e-learning but there is still need for improvement.
Participant_L20	- It all depends on the profile of our learners. But considering the new educational landscape that favours the use of ICT in education, I would say that with proper guidance and resources, E-learning can definitely work.
Participant_A1	- It can work but the main issue is technology and price. Internet bandwidth is too low to allow full and proper use of E-learning facilities. Moreover, the price may be prohibitive for some people. - with the availability of relevant content to match the course within the E-learning environment, yes.
Participant_A2	- Increasingly, it will work as we have an emerging lifelong learning population who appreciate flexibility of elearning. But we need to ensure there is the right content in place, the right course design to support students and the right technology.
Participant_A3	- Yes, it is working well and I'm sure it will in future. More and more learners, especially adults/working people are turning towards e-learning to pursue their studies. The online

	learning mode provide them with much flexibility. However, most of the e-learning course here are on mixed mode, that is, we still have a face-to-face component (tutorials on weekly or fortnight basis).
Participant_A4	- Yes, eLearning is working in Mauritius. Currently, a course namely web and multimedia development is using eLearning to run the course. The course is partly based on eLearning and partly face to face, the outcome which the students have in their eLearning courses are better than the face to face sessions. Which clearly proves that eLearning is working currently and does have a better future. - Also, Currently the form of E-Learning happening in our course is text-driven, where the content is pre-set with the pedagogical aspect helping the student to understand the course just by reading the resources. These text-driven resources are often supported by some interactive material or videos which makes learning better and - results in the students having better outputs.
Participant_A5	- E-learning has definitely made its way in Mauritius at different levels within the education sector and it is playing an innovative role in educational design and delivery. Example: Sankore project and interactive whiteboard at primary level; free tablets to students at secondary level; and of course, modules and even whole programmes being offered fully online (Moodle) at our university. However, mentality has to change to fully adopt innovative and creative pedagogical approaches.
Participant_A6	- yes, if high bandwidth, good policies e.g. who is responsible when a student cannot upload his assignment online at 11.54pm and deadline set by lecturer is 11.55pm! lecturers and students should be well trained and versed with the e-learning system. - Student should be supported in using the system with regular feedback and with content matching their needs
Participant_A7	- Yes, students are keen to use technology. Some lecturers might need persuasion to start E-learning courses because they are too familiar with face to face classes only. - More needs to be done to have the materials ready for lecturers to be able to deliver. This is a big mis-conception in Mauritius where E-learning is the downloading of notes and course materials from an online portal. The materials and the delivery need to be interactive and support students to learn by themselves.

What do you think are the barriers to make Mauritius E-learning ready?	
Participant_L1	- There is a lack of skilled staff to prepare interactive materials for E-Learning - Most educators find current tools difficult to use.
Participant_L2	- The Mauritian education system does not prepare students to be sufficiently independent and reflective. - Internet Speed and cost could still be an issue (even though work is being done in this direction)
Participant_L3	- Parents' traditional thinking. - Slow Internet in Mauritius
Participant_L4	- Training should be provided to create interactive contents. Professional must create multimedia contents.
Participant_L5	- Lack of infrastructure, slow Internet availability
Participant_L6	- Very important is the Internet connectivity which is quite poor in Mauritius. The available bandwidth is too low and still expensive. The necessary infrastructure needs to be put in place.
Participant_L7	- Internet connection facility. - Cost of the E-learning infrastructure. Whether the E-learning materials will be paid and how much - Mindset of the people who are used to traditional delivery methods and are afraid of changes because it is unknown. - Intellectual property rights are not enforced
Participant_L8	- Cost and implementation
Participant_L9	- Logistics and access to the required infrastructure can be an issue.
Participant_L10	- Internet connection is still slow.
Participant_L11	- A change in mindset and culture from students who rely on spoon feeding and exams. - Poor leadership at organisational level as they understand practically nothing at top management level - Poorly competent regulatory authority
Participant_L12	- Barriers could include the IT infrastructure/bandwidth etc. Secondary School does not prepare our students to be autonomous learners and when one embarks on an e-learning programme, they have to be fully prepared to have a discipline approach to work, have a sharing culture
Participant_L13	- Students' motivation

Participant_L14	- absence of an e-learning framework at the regulatory body for higher education. The institution and government bodies need to work together to establish a proper regulatory body to support E-learning and provide the necessary support at all levels (policies, infrastructure, training, financial investments, recruitment of E-learning experts and educational technologies). Otherwise, we won't progress in this direction at the pace we need to. - change in mindset – - lack of content providers – - lack of instructional designers - - deeper recognition of ODL programmes - Internet access
Participant_L15	- Spoon feeding - Political implications - Conventional administrators who are not opened to innovation - Lack of proper training
Participant_L16	- The misconceptions that people normally associate with e-learning can be a barrier to e-learning in Mauritius, for instance, that students need to be tech savvy, that online learning doesn't have any kind of support and interaction with the instructor, that online learning isn't taken seriously since there is no defined schedule and learners can study at any time. - In addition, creating online courses need time and money. It is an investment that has to be made and the resources have to be made available for this purpose.
Participant_L17	- Poor internet connection for some people. Young people in Mauritius not always mature enough to learn independently and manage their time.
Participant_L18	- The small island and the culture of spoon feeding
Participant_L19	- The budget because Mauritius is still a developing country. It will take time in order to set all the necessary infrastructure. Lecturers are not willing to get out of their comfort zone in context with traditional teaching Infrastructure of schools needs to be upgraded Lack of professional development and training of staffs. Inadequate skills and experience, the curriculum does not cater for E-learning. With a bulky curriculum, this defeat the purpose of teachers to concentrate in significant use of technology, but instead it is exams-focused only
Participant_L20	- Economic status of some people - they may not have the resources (pc, Web) to follow E-learning courses. - Mauritians still hold the belief that education entails whiteboard, chairs, table. People's current mindset can be a barrier. - No such investment in E-learning.

Participant_A1	- Cultural. The new generation is quickly embracing change but we still lag behind most developed countries. - Political. Prices are dependent on government policies. - Infrastructure/Technology.
Participant_A2	- Expertise of content experts, instructional designers are a must as key to the E-learning environment is the availability of useful content that meet students' needs, - cultural barriers and attitude (need to move from spoon-feeding to autonomy)
Participant_A3	- May be the Internet connectivity.
Participant_A4	- The mindset of the people is the biggest barrier to make Mauritius E-learning ready. E-Learning is representing the same traditional book-like content in a better way. There are people who still thinks that E-Learning is meant for students who are taking courses outside the country.
Participant_A5	- For e-learning to be fully exploited to become more productive, there is the need to go beyond internet access and providing hardware. There is a need to review the whole course structure. A holistic approach/ecosystem including adequate curriculum, pertinent educational resources as well as relevant teacher training in the use and application of ICT in - education is vital to fully exploit the pedagogical use of ICT in education. Mauritius needs to focus more on the holistic approach instead of piecemeal one.
Participant_A6	- high cost of internet access and reliable infrastructure
Participant_A7	- Both students and lecturers are too classrooms oriented.

How comfortable and confident are you to teach online classes? Please give details.	
Participant_L1	- I have never taken online classes so far
Participant_L2	- Teaching online classes will require work in terms of documenting and scoping the students' learning experience. - Materials such as i-lectures will need to be prepared and I may need to be available for discussion sessions with students during set times. - I am quite confident that this would be an interesting experience.
Participant_L3	- I believe I will be able to but will need some type of coaching/mentoring from an academic who has carried out online classes before.

Participant_L4	- Yes, quite confident. But it is important that the everyone plays their role including lecturers, students, the organisation and the system in place. The E-learning platform must be easy to use for easy acceptance.
Participant_L5	- I feel I need to have more training
Participant_L6	- I have mainly been involved in face to face teaching up to now. The necessary initiatives to use the existing online platform were not provided. Contact hours given was significantly reduced in the online mode therefore we have to conduct more lectures. I will be happy to teach online classes as this may allow me to save time for more research. We need to have a system in place that allows us to meet our teaching goals and at the same time allow students to get the best of the class. The online platform must be reliable and both lecturers and students should feel that they are getting the best out of the it as they would in face to face.
Participant_L7	- For some modules that are mainly theoretical, these can be easily ported to the online platform. But for modules that is practical oriented, then it will be tough. For e.g. How do we assess lab works of student, how to we make them do presentations which is an important evaluation technique?
Participant_L8	- Fair, depends on means available
Participant_L9	- Very confident. We need to adopt new technologies and believe that it will make teaching and learning better for us as lecturers and especially for our students. This is the way forward, but we need to have the willingness to give it a try.
Participant_L10	- I have already had training sessions on how to work with Moodle. However, more training will be required to be able to start teaching online
Participant_L11	- I am a recognised expert in elearning internationally. I have been teaching all my classes practically online since 2007. We need to have the confidence that the system will work. This is what is lacking in Mauritius. We are often scared and not willing to try something different and out of our comfort zone. We want to stick how we have always 'done things'.
Participant_L12	- I am pretty comfortable and confident as it is more than 10 years than I am in the field. I myself did my masters in Educational Technologies fully online and I now apply the skills developed in my professional practice. The key is to communicate clearly with your class and provide timely feedback.
Participant_L13	- If all logistics are available, the system is easy to use and the software allows for easy and efficient creation/update of contents and access to learning materials, then I would be

	comfortable and confident. Lecturers and students will eventually have to be confident that online is the way forward.
Participant_L14	- I am confident but not comfortable as it's too much screen focused. Although body language can be seen through a web cam, personally it's difficult to convey to lecture without eye contact and in a virtual environment.
Participant_L15	- So far, I haven't teach online classes but I monitor students' work progress via e-mail. But I wished there were an adequate system to do the same. During my doctoral studies, research progress was monitored via an online system. This was effective for both supervisor and student. All changes and improvements and step by step process were recorded throughout 4years and available instantly at any time. Further, wherever we were around the globe, we could have access.
Participant_L16	- Online classes are definitely different from F2F classes in many aspects. With the correct tools, training, and financial resources, it is totally do-able.
Participant_L17	- I am comfortable to teach online. I will need to make sure I communicate with my students regularly to ensure that they are comfortable with their online classes. Feedback will be key especially at the beginning to ensure that the system is meeting their requirements.
Participant_L18	- I can say that i am experienced as a student and now as a tutor in completing online courses.
Participant_L19	- Online classes have been restricted only in the participation in online forums with my students in context with feedback after correction of an assignment.
Participant_L20	- I am quite comfortable and confident to teach online classes since as a lecturer, I have the assistance of some people who are specialized in setting up platforms for E-learning to take place. Our job becomes easier in this sense, since any technical problems are dealt by the experts.

Is there any form of E-learning happening already in your classes? Please give details	
Participant_L1	- Yes, posting notes on Moodle platform.
Participant_L2	- Yes, at our institution we already have access to i-lectures and a wealth of resources from the online library. All unit resources are on blackboard. - A number of self-learning programmes such as Academic Integrity Programme and SUCCESS are also fully online.
Participant_L3	- No

Participant_L4	-	Yes, we are making use of Moodle and google docs to interact with students.
Participant_L5	-	Taking the students to the computer room to view specific programmes available online.
Participant_L6	-	I am already using an LCMS – Moodle to post my lecture notes before face to face lectures. Student access the materials online and normally go through them before coming to lectures.
Participant_L7	-	I use Moodle to upload lectures, links to reference materials, share white papers, journals etc.
Participant_L8	-	E-lecture notes
Participant_L9	-	E-learning platforms that allow interaction
Participant_L10	-	No
Participant_L11	-	Yes - as i said all my classes are fully online - and based on self-instructional materials
Participant_L12	-	Yes, we do have fully online programmes at BSc and MSc. We make use of several e-learning approaches, we make use of an e-learning platform and we use asynchronous and synchronous communication tools with our students.
Participant_L13	-	Not really. Only using a CMS for lecture notes upload, setting and submission of assignments by students, discussion forum
Participant_L14	-	yes, course materials are posted on a platform. students have a few face-to-face sessions whereby only core elements are discussed. Most of the activities are on the shoulders of the learners.
Participant_L15	-	As mentioned earlier, I monitor students work progress via email. They send their projects development and I comment for improvement. They don't have to travel to the university for face to face supervision.
Participant_L16	-	No. Only face to face teaching.
Participant_L17	-	Not really - My lecture notes are on Moodle and i have provided my students details of some MOOCs that they can access to enhance their knowledge but not as part of lectures etc
Participant_L18	-	No, I use Moodle as support
Participant_L19	-	Yes. All notes and explanations are done through power-point representations All notes are on-line All assignment are submitted online Forum are being organized for debating and discussion of modules
Participant_L20	-	Some classes are online where I post videos, questions and students have to respond in the discussion forum.

Do you use any E-learning system/platforms for your classes such as Blackboard, WebCT, Moodle etc? Please give details	
Participant_L1	- Yes, Moodle
Participant_L2	- Blackboard and Moodle for different courses.
Participant_L3	- Blackboard, wikispaces
Participant_L4	- Moodle to upload materials
Participant_L5	- No
Participant_L6	- I use Moodle to post lecture notes for all my lectures. However, explanation and queries are tackled in the face to face lectures.
Participant_L7	- I use Moodle for uploading lecture notes, assignments, links to reference materials, video presentations by experts in the fields.
Participant_L8	- No
Participant_L9	- Moodle. For sharing of notes, chats, forums and uploading files for assignment.
Participant_L10	- No
Participant_L11	- We use MOODLE as the official e-learning platform of the University
Participant_L12	- Yes, we are currently using MOODLE
Participant_L13	- Using Moodle
Participant_L14	- Moodle for posting but not an active user of e-learning platform as it would raise dramatically the time spent on the laptop which I personally believe is directly proportional to the quality of life.
Participant_L15	- No. For design classes I am still looking for an appropriate platform. I tried Moodle but I don't see it as user friendly for Graphic design classes.
Participant_L16	- I use blackboard to share class materials, for announcements/discussions and for students to submit assignments. The assignments are graded and students are given feedback and grades.
Participant_L17	- All my lecture notes, tutorials, lab sheets and information for my module are on Moodle.
Participant_L18	- Moodle
Participant_L19	- No
Participant_L20	- I make use of Moodle. It is a great platform where I post the module information sheet, all reading materials that students can access at their own pace, links and videos. The platform also allows me to monitor student's participation and progress closely. I can also create discussion threads.

What do you think are the barriers for Mauritian Lecturers to be E-learning ready?	
Participant_L1	- Reduce workload - Lecturers need to be trained to prepare interactive content using appropriate tools
Participant_L2	- Mindset – resistance to change (I have always done it in a certain way, why should I change?) - Lack of training and maybe insufficient exposure - Infrastructure could also be an issue in some institutions. - The courses are not designed to suit E-learning.
Participant_L3	- Many older lecturers may still be less accustomed to using IT in the classrooms
Participant_L4	- Training of lecturers to produce materials suitable for E-learning. - The focus is on finishing a bulky syllabus rather than providing an interesting learning experience for students. Lecturers have to ensure all content are covered before exams. Too many students and no time to think about adapting content to E-learning
Participant_L5	- Lack of training, and facilities including the relevant infrastructure.
Participant_L6	- Most lecturers will be willing to move to E-learning if the necessary incentives are given. E.g. reduced workload. - Also, knowledge of necessary platforms is a limiting factor. Lecturers should be trained to use the platforms.
Participant_L7	- Copyright issues. How do you protect your materials as lots of people just copy the work of others without bothering about intellectual property rights?
Participant_L8	- Lack of infrastructure - I don’t want to spend the time creating online appropriate content for my students and others just copy my work. There need to be better regulations surrounding content ownership and sharing
Participant_L9	- Readiness to change to a new way of teaching. The mindset I'd say.
Participant_L10	- Appropriate infrastructure and Internet connectivity
Participant_L11	- It’s just that they are comfortable with the current system and they don’t want to change. They are not aware of the personal benefits that adoption of e-learning could bring to them. They don’t want to adopt things that others are better at them in doing.
Participant_L12	- Mauritian Lecturers would need to be trained to use the platform and also get training in e-tutoring. They are perhaps not well acquainted to technologies. They prefer may be to meet students for 1-2 hours in a lecture instead of having to respond online.

Participant_L13	- Maybe a short training would be required
Participant_L14	- New generation of Mauritian learners are more keen to lecture online and are actually e-learning ready from a teacher point of view. As far as content production, quality of support and application of best practices are concerned there is room for improvement. The main barriers are training, financial incentives and recognition. As mentioned earlier the absence of an ODL framework at the level of the higher education authority engenders a mess and contributions towards elearning is not yet a KPI in academic staff career path.
Participant_L15	- Students are not always willing to use system unfamiliar to them. If you force them, they write complaints. The change should be imposed by the administration then it will easier to introduce it to students. But the administration itself work with people having the improper qualifications, therefore they act as barriers to Innovative system.
Participant_L16	- Lack of training for lecturers; overcoming the F2F culture which have been prevailing for a very long time.; knowing how to properly structure contents (different lecturers have different teaching style)
Participant_L17	- I don't think it is an issue for lecturers who are already in IT - as for the others i guess it depends on how at ease they are with the technologies.
Participant_L18	- we do not have access to the right online campus. The online portal must have the necessary features to support an online learning environment, which is user friendly and at the same time provide us with the necessary resources as and when needed.
Participant_L19	- Lack of training and expertise. The bulky curriculum does not cater for E-learning. As product of traditional schools, lecturers cannot get out from traditional teachings. They will need to be trained on how to create and adapt content to E-learning.
Participant_L20	- Availability of appropriate resources. Training on E-learning, ethical issues, and how to manipulate technological devices and navigate through technical issues.
Participant_A1	- Resistance to change the way they work (lecturers) - Lack of willingness to invest from institutions (public or private) - Lack of training for lecturers - Fear of the unknown. Fear of technology
Participant_A2	- Finding time to devote to course design is a key challenge. This is why it is important to have clear course structure and content (particularly from content developers and educational technologist) to allow lecturers to focus on delivery.
Participant_A3	- Many lecturers are reluctant to put their content online. It’s just a matter of mindset.

Participant_A4	- Mauritian lecturers have to get over the traditional teaching techniques. One of the biggest barriers is that the teachers do not want to experience new things in their learning way. There are some of the teachers who find it difficult to switch to E-Leaning due to the subject they teach.
Participant_A5	- Lecturers are not expert at creating content that is ideal for an E-learning environment. These need to be done by expert such as educational technologists working in collaboration with lecturers. - Reflections: lecturers need to understand that their role is not diminished with e-learning. On the contrary, their role is redefined and enhanced: they have not only to teach/, but also guide, coach and engage learners to facilitate their learning process.
Participant_A6	- old fashioned lecturers will be reluctant to embrace the e-learning as there will be resistance to change
Participant_A7	- Time can be an issue to adapt to technology use, content preparation etc.

What do you think are the barriers for Mauritian students to be E-learning ready?	
Participant_A1	- Costs. Connection may be expensive. Bandwidth. Connection may be slow. - Cultural. Change in the way they are used to learn and be assessed.
Participant_A2	- Internet cost is expensive.
Participant_A3	- Internet connectivity
Participant_A4	- Cost related to online learning including Internet costs and equipment costs
Participant_A5	- Students may need to be monitored to make sure they are on track with their learning. For some, online learning might be a challenge and can find it hard to manage their learning on their own
Participant_A6	- students are mostly carefree nowadays. many have immature behaviours. they will use the e-learning platform as a scapegoat for their own errors. this is why i believe more important than all for e-learning to succeed is a very good well explained policies for both students, admins, and tutors. student will need to have internet access and the appropriate electronic equipment to access the elearning may involve a hefty investment for many.
Participant_A7	- Students might need time to adjust as they are too used to classroom environments. They will need to trust that the online learning environment is meeting their educational needs as face to face classes are.

Are you ready as a lecturer to change your role from an active instructor to a collaborator in learning?	
Participant_L1	- Currently time is limited so I don't think I can take up new roles. I would rather continue with the current teaching methods we have been using.
Participant_L2	- Fully ready. Our learners are changing. The instructor is no more the prime source of information. Digital natives now have access to a wealth of information via the Internet and it would seem that they better through collaboration on social media platforms. As an instructor, I need to adapt to this preference for learning.
Participant_L3	- Yes, but this will take time as most lecturers and students are familiar with the traditional lecture style and may take time to adapt.
Participant_L4	- Yes, the students need to be the focus rather than the syllabus. However, students will need time to adjust because they will be expected to take more control of their progress and studies. It might be a challenge for some.
Participant_L5	- Yes, that is the only way to engage students in class by giving them what they need.
Participant_L6	- Yes, I will be happy to make this shift so as to have more time to invest in my research.
Participant_L7	- Yes, but it will take time
Participant_L8	- Yes, especially at university level, students need to take more responsibility for their learning
Participant_L9	- A definite yes to keep them motivated. This is also the new age of education where traditional teaching can no longer fully apply.
Participant_L10	- Yes, as I believe that E-Learning will be part of any educational programme in the future
Participant_L11	- I am already doing this
Participant_L12	- Yes, but it could be hard as everyone is used to the traditional class model and students and lecturers will need support to adapt to new ways of teaching and learning
Participant_L13	- Yes, but overtime with a change in mindset.
Participant_L14	- Not really as I want to spend lesser time on computers. As an associate professor and an active researcher competing for a full professor position, I find teaching in e-learning mode more time consuming, although a collaborator in learning is more meaningful for highly mature students like MPhil/PhD students.
Participant_L15	- Yes, this is what we need to aim towards
Participant_L16	- Yes, this is the future of education. But this is a gradual change. Elements of e-classrooms should be incorporated gradually into existing classroom environments, creating some sort of mixed environments, where the best of both methods can be fully tapped.

Participant_L17	- Yes, but this will take time. Most lecturers are used a 2 hr lectures with students taking notes. Students will also need to adapt which might be hard.
Participant_L18	- Yes, this is how it is done abroad.
Participant_L19	- I am already trying to be more collaborative in my teaching. Yes, it is high time we shift towards a 21st century teaching where learning goals are more challenging and appropriate to build the career of our students
Participant_L20	- Yes, I am ready for the change because I Believe that change is truly the word of this century. The 21st century learners are independent enough to navigate through the course on their own. hence, I would say that the change is a two way process: it involves both lecturers and students

Do your students use learning tools such as discussion boards, chat rooms, wikis, blogs etc. Please give details.	
Participant_L1	- They use Facebook and WhatsApp.
Participant_L2	- Yes, but they also use more of Facebook for discussions.
Participant_L3	- Students use a common Facebook page.
Participant_L4	- Yes, to do research for assignments they are encourages to use these tools.
Participant_L5	- Rarely
Participant_L6	- Not really, they mainly communicate via emails and they have face to face discussions.
Participant_L7	- No
Participant_L8	- Yes, they do interact a lot by themselves and this helps build a better conducive atmosphere for learning. Gradually the trend is changing and a more collaborative environment is seen between students because of things like social media which is great for their learning.
Participant_L9	- For researching purposes mainly. Some do have their own blogs and aim at sharing their experiences as well. This encourages others to participate if they feel they are benefiting from the experience.
Participant_L10	- No
Participant_L11	- Yes, we use all of them depending the context and nature of learning activities and it is first and foremost outcome based. I do not use the tools because they exist.
Participant_L12	- Yes. Students in the modules I teach are brought to use various online tools such as discussion forum, they have activities where they publish collaboratively on a wiki. They are also encouraged to post their reflections on blogs. or in online journals.
Participant_L13	- Discussion forums maybe

Participant_L14	- Those students studying on the ODL mode, yes, they do use the learning tools whereas those in traditional setup not really. I should say that there is a dearth in discussions and reading. The whole educational system from pry-primary to be blamed.
Participant_L15	- No. Not to my knowledge.
Participant_L16	- Yes, discussion board on Blackboard is used to post questions and queries about lecture materials and assignments. But unless it is a requirement for students to participate, or they trust that the information they are getting are going to be useful to them, many do not like to contribute.
Participant_L17	- I used to provide blog/discussion room on Moodle - but it has to be moderated and unfortunately i did not have time to always do so - i stopped now.
Participant_L18	- No
Participant_L19	- yes, Discussion board
Participant_L20	- Some of them do participate in discussion forums to share their ideas and opinions. But many do not because there is not much a culture of sharing in Mauritius because the education system is too focussed on exams and getting better results than your fellow classmates.

Do you think understanding students' prior experience and knowledge and their learning styles and preferences are essential at the time of teaching delivery? Please give details.	
Participant_L1	- No, but that won't help as even if everyone has different knowledge and experience, we need to teach the same way whether some students have already got the knowledge or not and whether they have different learning preference.
Participant_L2	- Definitely. For e.g. we sometimes make assumptions on the IT exposure of students or on the fact that they are all online or all on Facebooks. Unfortunately, this is not always the case.
Participant_L3	- Yes, depending on the size of the class. A general idea is important though
Participant_L4	- Yes, to make students interested in the topic, I must always relate the materials in their field
Participant_L5	- Yes, it helps to plan what needs to be covered in the limited time we have in our face to face delivery. - However, delivery of the course will be standard to all students and not based on their learning style or preferences.

Participant_L6	- Yes, it is important to understand the students prior experience and learning style and preferences so as you better customised the learning materials to the need and level of the students. However, it is very rare to have a homogenous class and students have different prior experience. - Ideally, we want to be able to cater course delivery to meet different students' learning style and preferences. However, in an E-learning setting that might be possible with different teaching approaches, but within a face to face class, this is impossible due to the large number of students and we need to finish our syllabus content"
Participant_L7	- Yes, sometimes students forget some concepts, based on their response to question I might need to do a recap of topics covered in previous semesters or year. In other situation, I might skip slides that they already know.
Participant_L8	- Not that much because we have specific set of lessons to cover in class and finishing the syllabus is the essential part whether the student has prior knowledge and experience or not. - Learning style is not considered. We give lectures and students make notes.
Participant_L9	- Yes. Student profiling is an essential according to me. This guides me on the way to deliver the course.
Participant_L10	- Definitely as the educational background of the students should be considered to have effective learning. - Within an E-learning environment, we might also be able to consider students learning style which is not the case in face to face classes where the mode of delivery are lectures with students downloading notes prior.
Participant_L11	- It will depend on the nature of the course being delivered. If it is a third year module which is a continuity of a second year module then yes.
Participant_L12	- Yes, it is important as we need to know what students already know before so as to provide them with better learning experience and cater for content that meet their needs
Participant_L13	- Yes, but maybe understanding students prior knowledge. E-learning can make this easier but it will take time as in Mauritius we are used to one way of teaching for all students and learning styles preferences are never considered.
Participant_L14	- Yes surely, sometimes some modules require prerequisites and it is important to be aware about the knowledge level of the students on a particular module over topic before engaging deeper. It happens very often in the case of master students. To give you an example, many students doing MSc In Computer Security have poor or even no computer networking background but they have a module on wireless network security, this is a nightmare for the lecturers.

Participant_L15	- Of course. Otherwise we waste time in trying to make students understand topic they have never come across or covering topics they already master.
Participant_L16	- It depends. If it is an advanced course, then some kind of pre-assessment might be necessary for the students to determine if they are ready for this course or whether they need to take the introductory version prior to taking the advanced course. on the other hand, students can always look up concepts they do not understand as they go along.
Participant_L17	- It helps in cases where students have different backgrounds and knowledge - but this can be taken care of by having a basic introductory course. - With their learning styles, this is something that cannot be accommodated in the large face to face classes that we have. It might something left to E-learning maybe, although this will be take time as lectures are mostly used to one style of delivery.
Participant_L18	- Yes, it is the foundation of education
Participant_L19	- Yes, it is important as once we are aware of prior experience and knowledge and learning preferences to some extent, we can plan our teaching in a better way to meet students' needs. As a lecturer, we need to understand the different levels of knowledge for our students to make them achieve the goals set by the module. It is also important to know prior knowledge to align students in terms of knowledge dispensed and acquired. - E-learning is the way forward to delivery courses personalised to students' needs including their learning preference. This is critical in today's learning environment, but not necessarily something done in Mauritius.
Participant_L20	- Yes, I think it is very important to know students prior knowledge. This help me in shaping my lessons for instance knowing what students have learnt help me in the selection of reading materials, I choose articles and books that will challenge their knowledge. - Large students numbers do not always allow us to cater for different learning styles which is something that E-learning can support better and at the same time allow students to have a more tailored approach to course delivery.
Do you think understanding students' prior experience and knowledge and their learning styles and preferences are essential at the time of course design? Please give details.	
Participant_A1	- It might be useful but not crucial as all courses have a minimum entry requirement.
Participant_A2	- yes, part of design process. It is important to understand as much as possible about students' needs and experience to be able to customise the content and delivery to meet those needs
Participant_A3	- Of course, yes... in most courses, we do have a Warm-up Activity to test prior knowledge.

Participant_A4	- Yes, it is very important to understand the students. It is very much necessary to understand the mindset of students before setting the content, as not all the students have the same mindset towards studies.
Participant_A5	- Yes, although prior knowledge is usually captured through pre-requisites, learning styles and preferences is much harder and is usually not taken into consideration.
Participant_A6	- course design should be as simple to understand as possible but at the same time it should capture students' needs and this is only possible if students experience, prior knowledge and preferences are taken into consideration
Participant_A7	- Yes, E-learning supports more personalised delivery where it is easier to meet the needs of different learners based on their knowledge and learning style. This is much harder in face to face classes where the delivery is via standard lectures for all learners.

Do you think Mauritian students can collaborate to their learning or rather they can only succeed if they are spoon fed by their lecturers? Please give details.	
Participant_L1	- Some students can succeed. Most will not.
Participant_L2	- I strongly think that collaboration can work if guided. Already a lot of collaboration is already happening via social media. What is lacking there is a structure. For e.g. instead of an unstructured discussion on a topic, students could be given a case study to discuss on or an ethical dilemma to reflect on or simply a problem to solve via social media. The level of discussion which often follows is quite amazing. The lecturer only intervenes for advice and direction.
Participant_L3	- If given the choice, students will obviously prefer the easy way out. However, if they believe it is the only method available, they will surely make the effort. - There are some who are very selfish with their studies because of the very competitive nature of Mauritian education and the focus of getting the best grades for exams. They will need to be provided with no choice but collaborate for them do to that. Unless they are confident that interaction will assist them with their studies, they won't do it.
Participant_L4	- They can collaborate to their learning provided they are guided properly at the start. Or evaluation is done at different stages.
Participant_L5	- Yes, because so much knowledge is available online and they need to take an active part in their learning by taking responsibility of their learning process
Participant_L6	- At tertiary levels, students should be mature enough to learn through E-learning systems.

Participant_L7	- Both students and lecturers can be collaborators if delivery is well structured with clear milestones and deliverables etc. That is after each topic, there are MCQs to test students' understanding of the topics they read about and a small assessment is conducted after each topic with feedback about things they need to improve.
Participant_L8	- Yes, they can collaborate if they are given proper feedback
Participant_L9	- Students are used to spoon feeding and lecturers just want to deliver their lessons for the day and move on. This will be challenging for Mauritius because there is no visible incentive to change the way things are done.
Participant_L10	- Mauritian students have been spoon fed since an early age and I strongly believe that at university level, this should not be the case. Independent learning should be encouraged. Mauritian students studying abroad collaborate to their learning, and so there is no reason why students in Mauritius should be spoon fed.
Participant_L11	- Yes, they can but first of all there is a need to shift from an exam based mindset.
Participant_L12	- I think the students if given the opportunity through active projects, working on collaborative projects, problem-based activities they can become more autonomous. - The lecturer should be there to facilitate. I also think that the pedagogical approaches should evolve and technology should be integrated whereby students are given the opportunities to learn through technologies.
Participant_L13	- Many students do collaborate in their learning. However, I believe most of them are happier when they are spoon fed!
Participant_L14	- This is a quite subjective. It depends on the students primary and secondary background, the subject areas, the students grading and many other factors. But what is noticeable is that both at secondary and university levels, there is a very high rate of absenteeism, students are opting to download all course materials and to learn on their own at home or with peers. Whether this is a sign that they are doing more collaborative learning or coming to schools and universities is of no use or boring, there is indeed a sociological reason behind this behaviour.
Participant_L15	- Spoon feeding is a big issue in Mauritius. Even at tertiary education level students do not want to do the effort especially at undergraduate level.
Participant_L16	- With easy access to technology nowadays, newer generations students are definitely more tech savvy and many would prefer making use of online platforms for many purposes. With the convenience of online learning and all the facilities provided by online classroom management systems, including discussion board, I am positive that younger generation students can easily

	adapt to online learning. In fact, the more they interact with each other online, the more confident they seem to get. - However, government servants and industry often sponsor middle-aged employees for tertiary education. It might be more challenging for that age group to fully benefit from e-learning environments.
Participant_L17	- Unfortunately, since they have almost always been spoon-fed, they tend to require this - but this can be changed since when we study abroad, we are not spoon-fed and we succeed - so it should be possible. But it is not easy.
Participant_L18	- They can definitely collaborate. but there is reluctance to do so because they like to be spoon fed and also because of the competitive nature of many students who see collaboration as a way of others performing as good as them.
Participant_L19	- They can collaborate if they are given proper guide and training because Mauritius got many talents. We just need to look for the appropriate resources to exploit - these talents.
Participant_L20	- I would say that the idea that spoon-feeding will result into students' success is a myth that teachers and lecturers themselves have created. I truly believe that if given the proper support and guidance, students can collaborate to their own learning and that they can succeed as well. Also, if students collaborate to their own learning, they will feel empowered and more independent. These are skills that as a lecturer, I wish my students develop and harness.
Participant_A1	- In Mauritius the students are normally spoon fed up to HSC level. At university, they are given more opportunities to collaborate and this is working well as far as i know.
Participant_A2	- It is changing
Participant_A3	- Yes, they can collaborate. They are quite active on the chats, forums etc. and seem to enjoy the experience of online platform during these interactions and if properly guided they can become independent in their learning process.
Participant_A4	- This depends on the lecturers. As there are a number of courses at the University, and the students who attend are HSC passed which is, they are being spoon fed. In our course we often give them the resources and let them learn on their own, whereas other faculties still use the spoon feeding way to teach their students.
Participant_A5	- With proper guidance, absolutely

Participant_A6	- spoon feeding should be banned practice. the lecturer should be skilled enough to put content which stimulates the minds of the students. the e-learning platform will be simply a tool to do it faster.
Participant_A7	- Yes, if they are supported properly and provided with timely feedback.

What is your perception on the culture of sharing and collaboration in Mauritian universities?	
Participant_L1	- High achievers do not like to share their knowledge while low achievers like group work with high achievers to get good grades.
Participant_L2	- As mentioned before, I strongly think that collaboration can work if guided as students already collaborate a lot via social media.
Participant_L3	- The education system does not promote teamwork and university students are usually forced into teams because the course assignments require them to.
Participant_L4	- Students can collaborate.
Participant_L5	- There is no culture of sharing and collaboration in Mauritian universities. Students work together either because they have to as part of the course requirements or because they can benefit being part of a team for good grades.
Participant_L6	- A sharing culture should be the norm at the university level. Mauritius is not there yet.
Participant_L7	- Many lecturers do not put in the effort to create appropriate materials for their courses and just enjoy using the work of others. As a result, there is reluctance to collaborate at times because of this. Sharing and collaboration is often used by those who see personal benefits in it.
Participant_L8	- At the university level, students have to collaborate. They have no choice.
Participant_L10	- The culture of spoon-feeding is still a reality in our universities. But students should learn to collaborate more and be more independent learners.
Participant_L11	- Some Mauritian students (actually many of them) do not like to collaborate or share their resources and knowledge because they do not want other students to do better than them.
Participant_L12	- When they are given the opportunity to collaborate, students do so quite well. It is just a matter of giving them the chance to do so. Mauritian students are quite adaptable. But the lecturers should ensure that they assist with this using the right pedagogical approach.
Participant_L13	- Many students do collaborate in their learning. However, I believe most of them are happier when they are spoon fed!

Participant_L15	- No such culture. Spoon-feeding and stiff competition is the culture in Mauritius like I said before.
Participant_L17	- It is possible to establish such a culture in Mauritius. But it will take time as both students and lecturers are not used to such a culture.
Participant_L18	- There is a lot of competition and collaboration and sharing is seen as helping others to perform as good or even better. So many students do like to do so.
Participant_L19	- Given proper guidance, a culture of sharing and collaboration can be fostered.
Participant_L20	- Lecturers themselves do not like to collaborate with their colleagues because they themselves were not used to teamwork as students. So, they do not necessarily encourage collaboration among students as they themselves often do not perceive its usefulness.
Participant_A1	- Students are collaborating well at the university level.
Participant_A3	- Collaboration is already happening on the online platform and on social media.
Participant_A4	- Students usually learn on their own. They collaborate when it is part of the course requirement only.
Participant_A5	- Many students do not like to share their knowledge with others as the system is very competitive. But if encouraged, it is possible. This also applies to some lecturers as well.
Participant_A6	- Collaboration should be part of the system, not an option. Even lecturers should be encouraged to collaborate with each other for their content and for the best pedagogical approach. Not just students.
Participant_A7	- Universities encourage collaboration and sharing through teamwork, discussions etc. But there is more to be done with proper support.

How comfortable do you think Mauritian students are or will be in the foreseeable future with online classes instead of face to face classes	
Participant_L1	- I don’t think they will take it seriously - Low bandwidth and high internet costs are also major issues in the country
Participant_L2	- Again, as mentioned earlier, if guided and trained from an early age, Mauritian students should be quite comfortable.
Participant_L3	- I believe students themselves will be comfortable, only if they have some form of face to face contact as well with their lecturers
Participant_L4	- They can adjust with the online system

Participant_L5	- They are already fully immersed in the digital word but face to face sessions will still be needed.
Participant_L6	- Face to face medium is still the most preferred mode of learning for Mauritian students. However, if the necessary facilities are made available, then many may choose to go for online classes.
Participant_L7	- They will be interested to experience things that is considered to be trendy worldwide just like mobile phones, mobile apps, and social media has caught their attention.
Participant_L8	- Quite conversant
Participant_L9	- With time, they will have to adopt the changes. It might definitely take some time. Which is why change management should be carefully done.
Participant_L10	- Millennials and Generation Z have been living in the digital age and are very comfortable and at ease with technology. So, they will easily adapt to and even welcome online classes.
Participant_L11	- We already see that majority of students do not attend classes. This means they are not interested or they can get the 'satisfaction' elsewhere. So yes, in the future classrooms will be even more empty.
Participant_L12	- For students to be active online learners, it is up to us the lecturers to be creative, proactive and innovate in our classroom. I think the Mauritian students today have easier access to technology and are rather computer proficient. We should tap on the potential of technologies to make the learning environment more conducive. It does not mean that there should not be face to face session. I think the flipped classroom model would be beneficial whereby the classroom time is devoted to discussion, hands on activities instead of the teacher lecturing and the students copying notes.
Participant_L13	- I believe students would take this positively.
Participant_L14	- As answered to the previous question the trend is about less physical movement towards institutions premises, so students prefer to go for online education, the recent statistics for intakes have shown that traditional universities have lesser intake by 25 - 60% whereas ODL institutions are having negligible impact on their intakes.
Participant_L15	- Mature students would probably be more comfortable than fresh students.
Participant_L16	- The shift from F2F to online classes should be gradual. From F2F, instructors should incorporate some elements of e-learning such that in the future, more and more e-learning components would gradual pave the way to a class which is entirely conducted online.

Participant_L17	- I think most students are already quite at ease with online videos and tutorials - so i am positive that slowly things will change and the Mauritian students will be able to follow online courses comfortably.
Participant_L18	- they will be comfortable provided the right approach is used.
Participant_L19	- They will be comfortable because most youngsters are computer-literate. So, it is just a matter of training and organizing through proper channel of education. I do think that it is high time to allow new blood in the education sector for us to meet the new educational challenges.
Participant_L20	- Mauritian students nowadays are technophiles. Give them any gadgets and we immediately grab their attention. I am pretty much confident and hopeful that Mauritian students will be comfortable with online classes given that their learning are monitored.
Participant_A1	- As the new generation is not afraid of technology, i think that they will have no problems with online classes.
Participant_A2	- They will quickly adapt
Participant_A3	- For the moment, I must say that face to face really help to maintain the students focus on their learning but I suppose in a near future learners will be much at ease with fully online modules. But we may need to have a mixed approach to facilitate the move to fully online learning.
Participant_A4	- Mauritian students are influenced by a culture where technology plays a vital role. To get them diverted to online classes with the use to technology will not be a big challenge.
Participant_A5	- The new generation enjoys everything to do with technology. So, this will not be an issue. Lecturers might need to adapt more, particularly those not well versed with technology. Maybe a mix of face to face and online learning is the way.
Participant_A6	- most Mauritian students are immature and living in a bubble even at 22. these are specially with those students who have never worked before. a student who has work experience at 17 is more likely to be more mature and responsible than one who has never worked and is 22. Thus, many students will need face to face interaction more as its difficult for them to learn on their own. if these students follow online classes, they are likely to get low marks. however responsible students will have no such difficulties. the lecturer should devise course strategies to make the students login frequently on the elearning platform.
Participant_A7	- They will adapt to new technology.

How would you rate the importance of students' course evaluation?		Do you think that course evaluation feedback is genuinely taken into consideration for future course planning and delivery? Please provide details.
Participant_L1	- Important	Probably not.
Participant_L2	- Highly Important. They are our main stakeholders and they are the ones who need to learn. Without their feedback, it is difficult to know if the lecturer is going in the right direction.	Yes, in our institution course evaluation feedback is discussed in details and lecturers are encouraged to reflect strongly on the outcome of each course evaluation.
Participant_L3	- Important	Maybe
Participant_L4	- Highly Important. By this we know what we are lacking and what we can improve in the future.	Yes
Participant_L5	- Highly Important	Maybe
Participant_L6	- Important. Students being our customer, it is important to get their feedback.	Yes, course feedback may be a very useful tool to improve course delivery. Yes, I genuinely use them.
Participant_L7	- The aim of teaching is to impart knowledge to students and evaluating them gives indication whether the - knowledge transfer was done successfully	Probably not. Students have requested for microphone in lecture rooms so that they can hear better but nothing has been done.
Participant_L8	- Highly important	Maybe
Participant_L9	- Highly important	I try to improve my classes as far as possible. But whether it's a general practice I cannot guarantee.
Participant_L10	- Highly important	Maybe
Participant_L11	- Important. As long as it's not mandatory, not anonymous and is collaborative and part of the learning process	Maybe
Participant_L12	- Highly important	Maybe
Participant_L13	- Highly important. Students are our clients	Yes. at the university, we are advised to react to students' feedback

Participant_L14	- Highly Important. It gives another often a true picture of the course delivery and quality picture of the course	Probably not. Ego of lecturers are high
Participant_L15	- Highly important. This helps to improve provided the evaluation is constructive.	Definitely not. Not at the institution I work for.
Participant_L16	- Highly important	Maybe
Participant_L17	- Highly Important. To ensure that the message you want to pass is going through and to know how a course can be improved.	Yes. I think so yes. We do have a feedback system at our university and i know my colleagues and myself take the comment on board – can be adding more examples - changing examples - adding more classwork/discussion etc
Participant_L18	- Highly Important. indispensable. formative evaluation	Probably not
Participant_L19	- Highly Important	Yes
Participant_L20	- Highly Important. I would say evaluation is very important in order to make a judgment about learning and remedy the situation	Yes, because there is the system of feedback questionnaire as well so that as lecturers, we can improve on in designing our modules. I do take into consideration the feedback while planning for the other courses
Participant_A1	- Highly Important	Yes. Feedback is taken into consideration while planning or reviewing courses.
Participant_A2	- Highly Important	Yes
Participant_A3	- Highly Important	Yes. following feedback some courses are revised to suit the learners' needs.
Participant_A4	- Highly Important. Helps to know where the lecturer should improve in the coming year.	Yes
Participant_A5	- Highly Important	Maybe
Participant_A6	- Highly Important	Yes
Participant_A7	- Important	Maybe

How important do you think trust in the system security and reliability, trust between students and lecturers and trust between students are in the E-learning environment?	
Participant_L1	- Very important. Trust in the system is crucial and trust between students and lecturers usually exist as there is no choice. Trust between students, not sure. It is not as important as the other 2.
Participant_L2	- Very important. Mauritians are not too familiar with E-learning and trust in the system and collaboration with each other is needed to facilitate this transition
Participant_L3	- Trust in the system is important
Participant_L4	- Important.
Participant_L5	- Students trusting each other can be a bit hard because of the competitive nature of the system. However, if the system is secure and reliable and the lecturers support their students, then that should be enough.
Participant_L6	- Very important. Trust in the system as well as trusting each other is essential for E-learning to work in Mauritius.
Participant_L7	- Important. A trustworthy system supporting the needs of the students and the lecturers is the only way to get E-learning acceptance at the university level. Staff should also be trustworthy, but there is no fair play.
Participant_L8	- Important. Especially the system security and reliability
Participant_L9	- Important.
Participant_L10	- E-learning requires a lot of discipline. Mauritian students are too familiar with the culture of spoon-feeding. They will need to learn to start to collaborate more with each other for their learning.
Participant_L11	- The system must be reliable and secure for sure. Students must trust their lecturers in the E-learning environment as it is different from the classroom settings. There should be regular communication to ensure that this trust is maintained. Students can trust each other to learn to adapt to the E-learning environment.
Participant_L12	- Very important. Everyone using the system, not just lecturers and students should be able to trust it. It should have all the required functions to support proper learning, just like the classrooms.
Participant_L13	- The system should be secure and reliable. Trust between students and lecturers is important. Trust between students needs to be there for collaboration and teamwork. Otherwise, not all team members will benefit from the teamwork the same way.

Participant_L14	- Absolutely critical. The E-learning environment requires students to be autonomous learners. For this to happen, the system needs to be able to support students' needs and at the same time, the lecturers need to be able to facilitate students' learning. The E-learning environment can be daunting for new comers and trust each other through collaboration and discussion can assist with the journey.
Participant_L15	- Very important. All of them
Participant_L16	- The E-learning system needs to be reliable and secure, otherwise, lecturers and students will stick with face to face classes.
Participant_L17	- Important. Lecturers need to support their students to build that trust.
Participant_L18	- Very Important. Students may not trust each other straight away due to the competitive nature of the Mauritian system. But with online discussions and forums, they can collaborate more and the trust can be gradually built.
Participant_L19	- Critical. Trust in the system and in its users are pre-requisites for E-learning success.
Participant_L20	- Very important. We as lecturers need to ensure we get our students to trust the system and the learning environment, otherwise it won't work. Mauritian students are familiar with face to face classes and will need that trust to build the confidence in E-learning. Trust between students can be cultivated through online discussions and forums etc. The lecturers should also lead by example and collaborate with other colleagues to foster this atmosphere of trust.
Participant_A1	- Very important. The system must be very reliable. Otherwise, lecturers and students will complain.
Participant_A2	- Very important. We can already see that when students trust the system, they are more active online.
Participant_A3	- Very important. Because in our course, students need to be independent learners. The system must be able to assist them in their learning.
Participant_A4	- All of them are important for E-learning to work as it should be.
Participant_A5	- Very important, as E-learning will depend on how well the E-learning portal is to help students and lecturers.
Participant_A6	- The system must support independent learners are at the university level, students should not be spoon-fed. Lecturers should learn to collaborate and trust each other instead of competing with each other.

Participant_A7	- The lecturers need to be supportive for students to feel comfortable in the E-learning environment. Then they can collaborate more. The system must be reliable and secure.

Who create learning materials for your classes	
Participant_L1	- I create my own learning materials.
Participant_L2	- The university provides the learning materials
Participant_L3	- I create my own learning materials
Participant_L4	- The university provides the learning materials
Participant_L5	- I create my own learning materials
Participant_L6	- I create my own learning materials
Participant_L7	- I create my own learning materials
Participant_L8	- I create my own learning materials
Participant_L9	- I create my own learning materials
Participant_L10	- I create my own learning materials
Participant_L11	- I create my own learning materials
Participant_L12	- I create my own learning materials
Participant_L13	- I create my own learning materials
Participant_L14	- I create my own learning materials
Participant_L15	- I create my own learning materials
Participant_L16	- I create my own learning materials
Participant_L17	- I create my own learning materials
Participant_L18	- I create my own learning materials
Participant_L19	- I create my own learning materials
Participant_L20	- I create my own learning materials
What is the proportion of digital materials you use in your classes?	
Participant_L1	- Half of my materials are digital
Participant_L2	- All my materials are digital
Participant_L3	- All my materials are digital
Participant_L4	- All my materials are digital
Participant_L5	- Half of my materials are digital

Participant_L6	- All my materials are digital
Participant_L7	- All my materials are digital
Participant_L8	- All my materials are digital
Participant_L9	- All my materials are digital
Participant_L10	- A small proportion of my materials are digital
Participant_L11	- All my materials are digital
Participant_L12	- All my materials are digital
Participant_L13	- All my materials are digital
Participant_L14	- All my materials are digital
Participant_L15	- Half of my materials are digital
Participant_L16	- All my materials are digital
Participant_L17	- All my materials are digital
Participant_L18	- Half of my materials are digital
Participant_L19	- Half of my materials are digital
Participant_L20	- Half of my materials are digital
What is the proportion of digital materials used for courses?	
Participant_A1	- Half of my materials are digital
Participant_A2	- All my materials are digital
Participant_A3	- Half of my materials are digital
Participant_A4	- Half of my materials are digital
Participant_A5	- Half of my materials are digital
Participant_A6	- All my materials are digital
Participant_A7	- All my materials are digital

Do you often reuse learning materials from your previous courses or from other colleagues/institutions? Please give details.	
Participant_L1	- Yes, if it is an existing course, we often reuse the lecture notes with modifications where needed
Participant_L2	- yes, learning materials are often updated after a couple of semesters.
Participant_L3	- yes, especially activities in class, and handouts.

Participant_L4	- yes, always with continuous improvements to the materials
Participant_L5	- yes, but these are modified and updated depending on the requirements perceived through interaction with students and depending on the course needs. I do not use materials of others. There is no such culture.
Participant_L6	- Yes, lecture notes prepared for previous years are updated and reused. Moreover, we very often share modules between colleagues where we share our lecture notes and give the same lecture notes all students.
Participant_L7	- I re-use learning materials from previous courses whenever there are changes in syllabus. But when there is a new module to prepare then I use lecture notes from universities that is considered as reference in the field for example software engineering material from Carnegie Mellon university.
Participant_L8	- Yes, with updates
Participant_L9	- Most of the time. They are updated though to ensure that we cover the course syllabus.
Participant_L10	- I often reuse learning materials if they are still relevant to the course requirements.
Participant_L11	- Yes, I use main OERs.
Participant_L12	- Yes, I do reuse materials I have created but I may bring some updates
Participant_L13	- Yes. I sometimes reuse some learning materials for similar modules.
Participant_L14	- Yes, mainly videos to complement teaching on a particular topic whereby hardware resources are not available at the university
Participant_L15	- I reuse learning materials I prepared but always update every semester according to market trends and new research findings so that students are provided with the most relevant information and the course is kept current.
Participant_L16	- Yes. Materials can come from many sources. Courses which have been conducted over few years are definitely reuse of materials with the addition of newer/more up to date contents. But newer courses have to be prepared entirely from scratch.
Participant_L17	- I update my lecture notes quite often since a teach web programming and there are new technologies coming out very often. If I am teaching a module with another staff then we share lecture notes. I do not use lecture notes from other institutions.
Participant_L18	- Yes, sometimes depending on the course I am teaching
Participant_L19	- Yes, Sometimes I undertake sharing between classes where learning tools from previous classes are used with a new class. This allow collaboration between teachers and students.

Participant_L20	- Yes, definitely learning materials are reused with modifications at times to accommodate my learners' profiles (needs).
Does reuse of learning materials from previous courses or from other institutions occur?	
Participant_A1	- Yes, but all materials are reviewed at the beginning of each semester.
Participant_A2	- Yes, with the necessary changes made to reflect the current semester
Participant_A3	- Yes, but I only reuse materials for my own course.
Participant_A4	- I do no re-use the material from other institution. I prefer to create my own pedagogical course content keeping my students in focus.
Participant_A5	- Yes, if the course is the same, otherwise, new materials are created
Participant_A6	- Yes. it helps save time and use the time gained to refine the existing material
Participant_A7	- Yes, it is easier this way.

Do you use authoring tools for your class materials? Please give details.	
Participant_L1	- Web authoring tools - Office tools - Photo editing tools
Participant_L2	- Not really
Participant_L3	- No
Participant_L4	- No
Participant_L5	- Yes, extracts and quotations
Participant_L6	- I do not use specialised authoring tool. I mainly rely in PowerPoint presentation and you tube videos.
Participant_L7	- No
Participant_L8	- No
Participant_L9	- Yes
Participant_L10	- No
Participant_L11	- Given my current responsibilities it the educational technologists that do this for me with tools like Articulate or XERTE or exe depending on the nature of resources to be designed.
Participant_L12	- Yes. Flash /Articulate, Ispring with PPT are some of the authoring tools I use
Participant_L13	- No
Participant_L14	- No, I just use office productivity tools.

Participant_L15	- No
Participant_L16	- No
Participant_L17	- I have only used Camtasia.
Participant_L18	- yes, i do in a private online e-campus (not in Mu)
Participant_L19	- No
Participant_L20	- Yes, I regularly make use of the software PowerPoint and post it online so that students can learn by themselves. (navigations such as next, previous, help, exit are included to facilitate learning).
Are authoring tools used for course materials. Please give details.	
Participant_A1	- Not at our level. All course materials are developed by our academic partner.
Participant_A2	- Yes
Participant_A3	- No
Participant_A4	- Yes, we do use some of the authoring tool for the class material. They are often some professional software.
Participant_A5	- No
Participant_A6	- mostly word processing, online video links, spreadsheet, presentation and pdf are used to course materials
Participant_A7	- Yes

Do you do learning materials annotations?		Do you consider annotating learning materials an extra burden on lecturers?	Who does learning materials annotations for your course(S)?
Participant_L1	- No	- *[Question not shown]*	- It is not done
Participant_L2	- No	- *[Question not shown]*	- Students when required
Participant_L3	- No	- *[Question not shown]*	- Not sure
Participant_L4	- No	- *[Question not shown]*	- It is not done
Participant_L5	- No	- *[Question not shown]*	- I don’t think anyone does that
Participant_L6	- No	- *[Question not shown]*	- Not done
Participant_L7	- No	- *[Question not shown]*	- No one. As all additional notes for my PowerPoint are given

			to the students during the lecture in classroom.
Participant_L8	- No	- *[Question not shown]*	- I have no idea who does that or even if it is done at all. Most likely it is not done
Participant_L9	- No	- *[Question not shown]*	- I do not think that is done.
Participant_L10	- No	- *[Question not shown]*	- Do not use learning materials annotations
Participant_L11	- No	- *[Question not shown]*	- No one
Participant_L12	- No	- *[Question not shown]*	- This is a hard question because I do not know who does that. Maybe it is not done.
Participant_L13	- No	- *[Question not shown]*	- No one
Participant_L14	- No	- *[Question not shown]*	- there are reviewers appointed by the university
Participant_L15	- No	- *[Question not shown]*	- No one
Participant_L16	- No	- *[Question not shown]*	- No idea
Participant_L17	- Yes	- It is more work but not a burden. It makes the reading more interesting for the students. I personally quite like it when there are annotations in the text i am reading/video i am watching.	- *[Question not shown]*
Participant_L18	- No	- *[Question not shown]*	- Don't know. No one.
Participant_L19	- Yes	- It is time-consuming but learning becomes easier	- *[Question not shown]*
Participant_L20	- No	- *[Question not shown]*	- I believe this not regular practice.

Do you or your department do learning materials annotation?		Do you consider annotating learning materials an extra burden	- Who does learning materials annotations for courses?
Participant_A1	- No	- *[Question not shown]*	- This is not usually done.
Participant_A2	- Yes	- Anything on top of our usual tasks is considered extra.	- *[Question not shown]*
Participant_A3	- No	- *[Question not shown]*	- Maybe the lecturers. But I think it is not done at all.
Participant_A4	- Yes	- Maybe	- *[Question not shown]*
Participant_A5	- NO	- *[Question not shown]*	- Nobody. Never heard this before
Participant_A6	- Yes	- Yes	- *[Question not shown]*
Participant_A7	- No	- *[Question not shown]*	- lecturers

How would you rate the importance of metadata of learning materials	
Participant_L1	- Neutral
Participant_L2	- Neutral
Participant_L3	- I have not dealt with metadata before
Participant_L4	- Highly Important
Participant_L5	- I have not dealt with metadata before
Participant_L6	- Neutral
Participant_L7	- Neutral
Participant_L8	- Neutral
Participant_L9	- I have not dealt with metadata before
Participant_L10	- I have not dealt with metadata before
Participant_L11	- Neutral
Participant_L12	- I have not dealt with metadata before
Participant_L13	- I have not dealt with metadata before
Participant_L14	- I have not dealt with metadata before
Participant_L15	- I have not dealt with metadata before
Participant_L16	- Neutral

Participant_L17	- Neutral
Participant_L18	- Important
Participant_L19	- Neutral
Participant_L20	- Neutral
Participant_A1	- Neutral
Participant_A2	- I have not dealt with metadata before
Participant_A3	- Neutral
Participant_A4	- I have not dealt with metadata before
Participant_A5	- I have not dealt with metadata before
Participant_A6	- I have not dealt with metadata before
Participant_A7	- Neutral

Have you heard about the Semantic Web?		Where do you see Mauritius with respect to the Semantic Web?
Participant_L1	Yes	This is a new concept. Mauritius will first need to understand E-learning properly before moving towards semantic web.
Participant_L2	Yes	It will take time as this is a new concept and we are still not ready for usual E-learning.
Participant_L3	No	*[Question not shown]*
Participant_L4	Yes	Mauritius is still at the early stages of E-learning. So maybe this is something for the future.
Participant_L5	No	*[Question not shown]*
Participant_L6	Yes	It is not well understood in Mauritius and there is very limited use. Still a long way.
Participant_L7	Yes	Still at the theoretical aspect and not much done in practical
Participant_L8	No	*[Question not shown]*
Participant_L9	Yes	It's yet to come. Am not sure people are aware of that. They just have to be incorporated with the tools.
Participant_L10	Yes	The focus is still on E-learning.
Participant_L11	Yes	I think we are unconsciously aware of it. We use it without saying or knowing we are in it. Not any time soon

Participant_L12	No	*[Question not shown]*
Participant_L13	Yes	This is a new concept. It will take time.
Participant_L14	Yes	As mentioned earlier local data production is poor, so intra sharing of data as it happens in a semantic web is not relevant, there were some projects in the past like School IT Project with data centres for storage and dissemination of knowledge for secondary schools. Probably if there are similar projects including the industrial sectors, then the need for semantic web will be felt.
Participant_L15	No	*[Question not shown]*
Participant_L16	Yes	Not much is done or talked about on Semantic Web in Mauritius.
Participant_L17	Yes	I know people who are doing research on semantic web and i have also given assignment to my students on semantic web - but maybe in Mauritius it will be mostly people in IT who know what it is and its importance - as for Mauritius i honestly don't know. This is still too new a concept and we are still struggling with getting E-learning to where it should be.
Participant_L18	Yes	E-learning is still in its infancy. Semantic Web is a new concept. It will find its way, but it will take time.
Participant_L19	Yes	There is also a long way to go
Participant_L20	No	*[Question not shown]*
Participant_A1	Yes	E-learning needs to be applied properly first in Mauritius.
Participant_A2	No	*[Question not shown]*
Participant_A3	Yes	It will take time because we are still trying to understand how to deal with online platforms.
Participant_A4	Yes	It will take time for the people in Mauritius to get use to Semantic Web, but with continuous use of them will help them get used to it.
Participant_A5	Yes	there is still a long way to go as it is still a very new concept in Mauritius.
Participant_A6	No	*[Question not shown]*
Participant_A7	No	*[Question not shown]*

Have you heard about ontologies		Do you think that the Mauritian higher education sector will use or promote the usage of ontologies?
Participant_L1	- Yes	This is a too advanced concept for Mauritian.

Participant_L2	- Yes	Not really at this stage. Same as semantic web, it will take time as we are still working with understanding E-learning.
Participant_L3	- No	*[Question not shown]*
Participant_L4	- Yes	No, there is a lack of professional who understand ontologies. Not all academic are pro in usage of IT.
Participant_L5	- No	*[Question not shown]*
Participant_L6	- Yes	Again, there is very limited use of ontologies in Mauritius. If it is fully developed, then there is potential to use it in our higher education sector.
Participant_L7	- Yes	Still at the theoretical aspect. Nothing is done in practice.
Participant_L8	- No	*[Question not shown]*
Participant_L9	- Yes	Hard to say at this stage because it is still early stage
Participant_L10	- Yes	It is too new a concept and as far as I am aware, we are not doing anything in this direction.
Participant_L11	- Yes	No, I don't think so. It is too new a concept.
Participant_L12	- No	*[Question not shown]*
Participant_L13	- Yes	Maybe. But not anytime soon. It is a new thing and we still need to understand basic E-learning first.
Participant_L14	- Yes	I do not think this would be possible in a near future. Use of semantic web or OWL may find a way when the country moves towards a knowledge base and digital economy. The only option I foresee this happening is in the context of an African regional effort to produce and share data and information. However, E-learning is still in its infancy in the country and this will take time. There is also a lack of sharing culture in the country which unless sorted, we cannot progress towards semantic web or think about the use of ontologies
Participant_L15	- No	*[Question not shown]*
Participant_L16	- Yes	N/A In theory we have heard about it. But there is still a long way to go.
Participant_L17	- Yes	So far, it is only talked about in terms of assignments and research work given to students. But it is not really used or understood.
Participant_L18	- Yes	Very new concept, so it will take time before it can be used or promoted
Participant_L19	- Yes	I am not too sure. It is not really talked about or used in Mauritius and I am not familiar with it either.

Participant_L20	- No	*[Question not shown]*
Participant_A1	- Yes	Don't know. This is too new for Mauritius.
Participant_A2	- No	*[Question not shown]*
Participant_A3	- No	*[Question not shown]*
Participant_A4	- Yes	With time, maybe
Participant_A5	- Yes	Some research work at tertiary level has been done on the on the usage of ontologies but it is not a term that is commonly heard of. it will definitely be in the interest of Mauritian higher education to use ontologies for more structured, efficient and effective knowledge management systems.
Participant_A6	- No	*[Question not shown]*
Participant_A7	- No	*[Question not shown]*

Appendix Q - Interview Responses (By Characteristics)

Table Q:1: Interview responses for 'Content Management'

What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome?	
Participant_L1	- Content may be presented in a more lively manner using virtual reality simulations for some topics.
Participant_L6	- With E-learning, student can access course materials from anywhere and anytime giving them more flexibility in their learning
Participant _L12	- Through an e-learning platform, students can access a variety of educational materials that can better meet their needs at their own pace.
Participant _L14	- Nowadays students' attention time in classroom is very short, it's becoming harder for lecturers to firstly retain the interest of the students and secondly to transfer maximum of content or know how in a traditional mode of lecture of 2 to 3 hours. Students are more at ease with discrete knowledge that they can go through at anytime from anywhere.
Participant _L20	- Student can access course materials in a more interactive way allowing them to absorb the course concepts better and at their own pace and in their own time. This is not always possible in face to face classes with large student numbers.
Do you think E-learning works or will work in Mauritius? Please give details.	
Participant_L2	- More work needs to be done to prepare lecturers on how to create E-learning materials and deliver courses in an interactive way. Otherwise, it will just be like face to face classes in an online platform and is not worth the change to an online environment.
Participant _L4	- It will work provided the materials are well created in an interactive way.
Participant _L14	- E-learning will work to some extent, but more has to be done at both the producer (content & platform provider) and the consumer (learners) ends.
Participant_A1	- with the availability of relevant content to match the course within the E-learning environment, yes.
Participant_A7	- More needs to be done to have the materials ready for lecturers to be able to deliver. This is a big mis-conception in Mauritius where E-learning is the downloading of notes and course materials from an online portal. The materials and the delivery need to be interactive and support students to learn by themselves.
What do you think are the barriers to make Mauritius E-learning ready?	

Participant_L1	- There is a lack of skilled staff to prepare interactive materials key for E-learning
Participant_L4	- Training should be provided to create interactive contents. Professional must create multimedia contents.
Participant_L7	- Intellectual property rights are not enforced.
Participant_L14	- lack of content providers – - lack of instructional designers
Participant_A2	- Expertise of content experts, instructional designers are a must as key to the E-learning environment is the availability of useful content that meet students' needs
How comfortable and confident are you to teach online classes? Please give details.	
Participant_L13	- If all logistics are available and the software allows for easy and efficient creation/update of contents, then I would be comfortable and confident.
What do you think are the barriers for Mauritian Lecturers to be E-learning ready?	
Participant_L1	- Reduce workload - Lecturers need to be trained to prepare interactive content using appropriate tools
Participant_L4	- Training of lecturers to produce materials suitable for E-learning
Participant_L7	- Copyright issues. How do you protect your materials as lots of people just copy the work of others without bothering about intellectual property rights?
Participant_L8	- I don't want to spend the time creating online appropriate content for my students and others just copy my work. There need to be better regulations surrounding content ownership and sharing
Participant_L14	- As far as content production, quality of support and application of best practices are concerned there is room for improvement
Participant_L16	- knowing how to properly structure contents (different lecturers have different teaching style)
Participant_L20	- Availability of appropriate resources.
Participant_A2	- Finding time to devote to course design is a key challenge for Mauritian lecturers. This is why it is important to have clear course structure and content (particularly from content developers and educational technologist) to allow lecturers to focus on delivery.
Participant_A3	- Many lecturers are reluctant to put their content online. It's just a matter of mindset.
Participant_A5	- Lecturers are not expert at creating content that is ideal for an E-learning environment. These need to be done by expert such as educational technologists working in collaboration with lecturers.

What is your perception on the culture of sharing and collaboration in Mauritian universities?	
Participant_L7	- Many lecturers do not put in the effort to create appropriate materials for their courses and just enjoy using the work of others. As a result, there is reluctance to collaborate at times because of this.
What is the proportion of digital materials you use in your classes?	
Participant_L1	- Half of my materials are digital
Participant_L2	- All my materials are digital
Participant_L3	- All my materials are digital
Participant_L4	- All my materials are digital
Participant_L5	- Half of my materials are digital
Participant_L6	- All my materials are digital
Participant_L7	- All my materials are digital
Participant_L8	- All my materials are digital
Participant_L9	- All my materials are digital
Participant_L10	- A small proportion of my materials are digital
Participant_L11	- All my materials are digital
Participant_L12	- All my materials are digital
Participant_L13	- All my materials are digital
Participant_L14	- All my materials are digital
Participant_L15	- Half of my materials are digital
Participant_L16	- All my materials are digital
Participant_L17	- All my materials are digital
Participant_L18	- Half of my materials are digital
Participant_L19	- Half of my materials are digital
Participant_L20	- Half of my materials are digital
What is the proportion of digital materials used for courses?	
Participant_A1	- Half of my materials are digital
Participant_A2	- All my materials are digital
Participant_A3	- Half of my materials are digital
Participant_A4	- Half of my materials are digital
Participant_A5	- Half of my materials are digital

Participant_A6	- All my materials are digital
Participant_A7	- All my materials are digital
Do you often reuse learning materials from your previous courses or from other colleagues/institutions? Please give details.	
Participant_L1	- Yes, if it is an existing course, we often reuse the lecture notes with modifications where needed
Participant_L2	- yes, learning materials are often updated after a couple of semesters.
Participant_L3	- yes, especially activities in class, and handouts.
Participant_L4	- yes, always with continuous improvements to the materials
Participant_L5	- yes, but these are modified and updated depending on the requirements perceived through interaction with students and depending on the course needs. I do not use materials of others. There is no such culture.
Participant_L6	- Yes, lecture notes prepared for previous years are updated and reused. Moreover, we very often share modules between colleagues where we share our lecture notes and give the same lecture notes all students.
Participant_L7	- I re-use learning materials from previous courses whenever there are changes in syllabus. But when there is a new module to prepare then I use lecture notes from universities that is considered as reference in the field for example material from Carnegie Mellon university.
Participant_L8	- Yes, with updates
Participant_L9	- Most of the time. They are updated though to ensure that we cover the course syllabus.
Participant_L10	- I often reuse learning materials if they are still relevant to the course requirements.
Participant_L11	- Yes, I use main OERs.
Participant_L12	- Yes, I do reuse materials I have created but I may bring some updates
Participant_L13	- Yes. I sometimes reuse some learning materials for similar modules.
Participant_L14	- Yes, mainly videos to complement teaching on a particular topic whereby hardware resources are not available at the university
Participant_L15	- I reuse learning materials I prepared but always update every semester according to market trends and new research findings so that students are provided with the most relevant information and the course is kept current.
Participant_L16	- Yes. Materials can come from many sources. Courses which have been conducted over few years are definitely reuse of materials with the addition of newer/more up to date contents. But newer courses have to be prepared entirely from scratch.

Participant_L17	- I update my lecture notes quite often since a teach web programming and there are new technologies coming out very often. If I am teaching a module with another staff then we share lecture notes. I do not use lecture notes from other institutions.
Participant_L18	- Yes, sometimes depending on the course I am teaching
Participant_L19	- Yes, Sometimes I undertake sharing between classes where learning tools from previous classes are used with a new class. This allow collaboration between teachers and students.
Participant_L20	- Yes, definitely learning materials are reused with modifications at times to accommodate my learners' profiles (needs).
Does reuse of learning materials from previous courses or from other institutions occur?	
Participant_A1	- Yes, but all materials are reviewed at the beginning of each semester.
Participant_A2	- Yes, with the necessary changes made to reflect the current semester
Participant_A3	- Yes, but I only reuse materials for my own course.
Participant_A4	- I do no re-use the material from other institution. I prefer to create my own pedagogical course content keeping my students in focus.
Participant_A5	- Yes, if the course is the same, otherwise, new materials are created
Participant_A6	- Yes. it helps save time and use the time gained to refine the existing material
Participant_A7	- Yes, it is easier this way.
Do you use authoring tools for your class materials? Please give details	
Participant_L1	- Web authoring tools - Office tools - Photo editing tools
Participant_L2	- Not really
Participant_L3	- No
Participant_L4	- No
Participant_L5	- Yes, extracts and quotations
Participant_L6	- I do not use specialised authoring tool. I mainly rely in PowerPoint presentation and you tube videos.
Participant_L7	- No
Participant_L8	- No
Participant_L9	- Yes
Participant_L10	- No

Participant_L11	- Given my current responsibilities it the educational technologists that do this for me with tools like Articulate or XERTE or exe depending on the nature of resources to be designed.		
Participant_L12	- Yes. Flash /Articulate, Ispring with PPT are some of the authoring tools I use		
Participant_L13	- No		
Participant_L14	- No, I just use office productivity tools.		
Participant_L15	- No		
Participant_L16	- No		
Participant_L17	- I have only used Camtasia.		
Participant_L18	- Yes, i do in a private online e-campus (not in Mu)		
Participant_L19	- No		
Participant_L20	- Yes, I regularly make use of the software PowerPoint and post it online so that students can learn by themselves. (navigations such as next, previous, help, exit are included to facilitate learning).		
Are authoring tools used for course materials. Please give details.			
Participant_A1	- Not at our level. All course materials are developed by our academic partner.		
Participant_A2	- Yes		
Participant_A3	- No		
Participant_A4	- Yes, we do use some of the authoring tool for the class material. They are often some professional software.		
Participant_A5	- No		
Participant_A6	- mostly word processing, online video links, spreadsheet, presentation and pdf are used to course materials		
Participant_A7	- Yes		
Do you do learning materials annotations?		Do you consider annotating learning materials an extra burden on lecturers?	Who does learning materials annotations for your course(S)?
Participant_L1	- No	- *[Question not shown]*	- It is not done
Participant_L2	- No	- *[Question not shown]*	- Students when required
Participant_L3	- No	- *[Question not shown]*	- Not sure
Participant_L4	- No	- *[Question not shown]*	- It is not done
Participant_L5	- No	- *[Question not shown]*	- I don’t think anyone does that

Participant_L6	- No	- *[Question not shown]*	- Not done
Participant_L7	- No	- *[Question not shown]*	- No one. As all additional notes for my PowerPoint are given to the students during the lecture in classroom.
Participant_L8	- No	- *[Question not shown]*	- I have no idea who does that or even if it is done at all. Most likely it is not done
Participant_L9	- No	- *[Question not shown]*	- I do not think that is done.
Participant_L10	- No	- *[Question not shown]*	- Do not use learning materials annotations
Participant_L11	- No	- *[Question not shown]*	- No one
Participant_L12	- No	- *[Question not shown]*	- This is a hard question because I do not know who does that. Maybe it is not done.
Participant_L13	- No	- *[Question not shown]*	- No one
Participant_L14	- No	- *[Question not shown]*	- there are reviewers appointed by the university
Participant_L15	- No	- *[Question not shown]*	- No one
Participant_L16	- No	- *[Question not shown]*	- No idea
Participant_L17	- Yes	- It is more work but not a burden. It makes the reading more interesting for the students. I personally quite like it when there are annotations in the text i am reading/video i am watching.	- *[Question not shown]*
Participant_L18	- No	- *[Question not shown]*	- Don’t know. No one.
Participant_L19	- Yes	- It is time-consuming but learning becomes easier	- *[Question not shown]*
Participant_L20	- No	- *[Question not shown]*	- I believe this not regular practice.

Do you or your department do learning materials annotations?			
Participant_A1	- No	- *[Question not shown]*	- This is not usually done.
Participant_A2	- Yes	- Anything on top of our usual tasks is considered extra.	- *[Question not shown]*
Participant_A3	- No	- *[Question not shown]*	- Maybe the lecturers. But I think it is not done at all.
Participant_A4	- Yes	- Maybe	- *[Question not shown]*
Participant_A5	- NO	- *[Question not shown]*	- Nobody. Never heard this before
Participant_A6	- Yes	- Yes	- *[Question not shown]*
Participant_A7	- No	- *[Question not shown]*	- lecturers
How would you rate the importance of metadata of learning materials			
Participant_L1	- Neutral		
Participant_L2	- Neutral		
Participant_L3	- I have not dealt with metadata before		
Participant_L4	- Highly Important		
Participant_L5	- I have not dealt with metadata before		
Participant_L6	- Neutral		
Participant_L7	- Neutral		
Participant_L8	- Neutral		
Participant_L9	- I have not dealt with metadata before		
Participant_L10	- I have not dealt with metadata before		
Participant_L11	- Neutral		
Participant_L12	- I have not dealt with metadata before		
Participant_L13	- I have not dealt with metadata before		
Participant_L14	- I have not dealt with metadata before		
Participant_L15	- I have not dealt with metadata before		
Participant_L16	- Neutral		
Participant_L17	- Neutral		
Participant_L18	- Important		
Participant_L19	- Neutral		

Participant_L20	- Neutral
Participant_A1	- Neutral
Participant_A2	- I have not dealt with metadata before
Participant_A3	- Neutral
Participant_A4	- I have not dealt with metadata before
Participant_A5	- I have not dealt with metadata before
Participant_A6	- I have not dealt with metadata before
Participant_A7	- Neutral

Table Q:2: Interview responses for 'Personalised Learning'

What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome?	
Participant_L1	- There are lots of challenges like students not interested to come to class and those who come, do not find classes interesting anymore and do not ask questions. - E-learning will allow them to learn from anywhere. - Content may be presented in a more lively manner using virtual reality simulations for some topics.
Participant_L2	- Students come late and do not have much flexibility with regard to their timetable - Not everything can be covered in a two hour face to face lecture as well. - E-learning could solve these problems by enabling students to learn at their own time in the comforts of their homes.
Participant_L3	- Time management and scheduling
Participant_L5	- Being able to view exact images to illustrate subject matter being studied
Participant _L6	- Varied/mixed ability students – difficult to deliver lecturers that suit all students, pace of learning is different for each student and E-learning environment can cater for that better as compared to face to face classes. - Low attention level of students. Student are bored quickly
Participant _L7	- How to encourage students to participate. How to keep them focussed for the whole duration of the lecture. How to give assessment on each lecture session. How to check the answer of each student for a particular case-study to make sure every student understood. - After some years of teaching the same module, it becomes repetitive for the lecturer and the lecturer might lose his enthusiasm about the subject.

	- Students find it boring to travel to the University, sit in a classroom for 2-3 hours without the use of new technology. - Make sure every student hears what you are speaking with a batch of 60-80 students.
Participant_L9	- Interaction and personalisation. Because class sizes are big. Matching the pace of large group is also challenging
Participant_L10	- Absenteeism- students can study at their own time unlike face to face classes where students have to be physically present - More effective learning - students can learn at their own pace
Participant_L11	- Face to face classes depend on the teaching style of the lecturer - it is teacher centered. - e-Learning is learner centered - promotes autonomy of the student and gets a student to maturity quicker.
Participant_L12	- Keeping track of students' progress is easier through an e-learning system. - Through an e-learning platform, students can access a variety of educational materials that can better meet their needs at their own pace.
Participant_L14	- Nowadays students attention time in classroom is very short, it's becoming harder for lecturers to firstly retain the interest of the students and secondly to transfer maximum of content or know how in a traditional mode of lecture of 2 to 3 hours. Students are more at ease with discrete knowledge that they can go through at anytime from anywhere
Participant_L16	- students learn at different pace and have different learning styles and this cannot be accommodated in F2F classrooms whereas E-learning can support that.
Participant_L17	- 1. Everyone learns at their own pace. - 2. You do not have to be in class at a specific time and day - you may follow the lecture when you are free and do the coursework as well. - 3. Caters for all kinds of students
Participant_L20	- Face to face classes may not allow us to know each and every one in our classes but e learning, with the profile option made available to learners, we can better know our learners. - Student can access course materials in a more interactive way allowing them to absorb the course concepts better and at their own pace and in their own time. This is not always possible in face to face classes with large student numbers.
Participant_A5	- The pedagogical relevance of technology makes it easier to cater for different learning styles and different intelligences of students within an E-learning environment.
Do you think E-learning works or will work in Mauritius? Please give details.	

Participant_L4	- the curriculum needs to be adapted to meet the needs of E-learning
Participant_L9	- Yes. Will surely improve learning process. Gives the learners the opportunity to have access to resources adapted to their needs.
Participant_A7	- Yes, students are keen to use technology. Some lecturers might need persuasion to start E-learning courses because they are too familiar with face to face classes only.
What do you think are the barriers to make Mauritius E-learning ready?	
Participant_L1	- There is a lack of skilled staff to prepare interactive materials for E-Learning - Most educators find current tools difficult to use.
Participant_L7	- Mindset of the people who are used to traditional delivery methods and are afraid of changes because it is unknown.
Participant_L14	- change in mindset –
Participant_A7	- Both students and lecturers are too classrooms oriented.
How comfortable and confident are you to teach online classes? Please give details.	
Participant_L1	- I have never taken online classes so far
Participant_L2	- Teaching online classes will require work in terms of documenting and scoping the students' learning experience. - Materials such as i-lectures will need to be prepared and I may need to be available for discussion sessions with students during set times. - I am quite confident that this would be an interesting experience.
Participant_L3	- I believe I will be able to but will need some type of coaching/mentoring from an academic who has carried out online classes before.
Participant_L4	- Yes, quite confident. But it is important that the everyone plays their role including lecturers, students, the organisation and the system in place.
Participant_L5	- I feel I need to have more training
Participant_L6	- I have mainly been involved in face to face teaching up to now. The necessary initiatives to use the existing online platform were not provided. Contact hours given was significantly reduced in the online mode therefore we have to conduct more lectures. I will be happy to teach online classes as this may allow me to save time for more research. We need to have a system in place that allows us to meet our teaching goals and at the same time allow students to get the best of the class. The online platform must be reliable and both lecturers and students should feel that they are getting the best out of the it as they would in face to face.

Participant_L7	- For some modules that are mainly theoretical, these can be easily ported to the online platform. But for modules that is practical oriented, then it will be tough. For e.g. How do we assess lab works of student, how to we make them do presentations which is an important evaluation technique?
Participant_L8	- Fair, depends on means available
Participant_L9	- Very confident. We need to adopt new technologies and believe that it will make teaching and learning better for us as lecturers and especially for our students. This is the way forward, but we need to have the willingness to give it a try.
Participant_L10	- I have already had training sessions on how to work with Moodle. However, more training will be required to be able to start teaching online
Participant_L11	- I am a recognised expert in elearning internationally. I have been teaching all my classes practically online since 2007. We need to have the confidence that the system will work. This is what is lacking in Mauritius. We are often scared and not willing to try something different and out of our comfort zone. We want to stick how we have always 'done things'.
Participant_L12	- I am pretty comfortable and confident as it is more than 10 years than I am in the field. I myself did my masters in Educational Technologies fully online and I now apply the skills developed in my professional practice. The key is to communicate clearly with your class and provide timely feedback.
Participant_L13	- If all logistics are available and the software allows for easy and efficient creation/update of contents, then I would be comfortable and confident. Lecturers and students will eventually have to be confident that online is the way forward.
Participant_L14	- I am confident but not comfortable as it's too much screen focused. Although body language can be seen through a web cam, personally it's difficult to convey to lecture without eye contact and in a virtual environment.
Participant_L15	- So far, I haven't teach online classes but I monitor students' work progress via e-mail. But I wished there were an adequate system to do the same. During my doctoral studies, research progress was monitored via an online system. This was effective for both supervisor and student. All changes and improvements and step by step process were recorded throughout 4years and available instantly at anytime. Further, wherever we were around the globe, we could have access.
Participant_L16	- Online classes are definitely different from F2F classes in many aspects. With the correct tools, training, and financial resources, it is totally do-able.

Participant_L17	- I am comfortable to teach online. I will need to make sure I communicate with my students regularly to ensure that they are comfortable with their online classes. Feedback will be key especially at the beginning.
Participant_L18	- I can say that i am experienced as a student and now as a tutor in completing online courses.
Participant_L19	- Online classes have been restricted only in the participation in online forums with my students in context with feedback after correction of an assignment.
Participant_L20	- I am quite comfortable and confident to teach online classes since as a lecturer, I have the assistance of some people who are specialized in setting up platforms for E-learning to take place. Our job becomes easier in this sense, since any technical problems are dealt by the experts.
Is there any form of E-learning happening already in your classes? Please give details	
Participant_L1	- Yes, posting notes on Moodle platform.
Participant_L2	- Yes, at our institution we already have access to i-lectures and a wealth of resources from the online library. All unit resources are on blackboard. - A number of self-learning programmes such as Academic Integrity Programme and SUCCESS are also fully online.
Participant_L3	- *[No response]*
Participant_L4	- Yes, we are making use of Moodle and google docs to interact with students.
Participant_L5	- Taking the students to the computer room to view specific programmes available online.
Participant_L6	- I am already using an LCMS – Moodle to post my lecture notes before face to face lectures. Student access the materials online and normally go through them before coming to lectures.
Participant_L7	- I use Moodle to upload lectures, links to reference materials, share white papers, journals etc.
Participant_L8	- E-lecture notes
Participant_L9	- E-learning platforms that allow interaction
Participant_L10	- No
Participant_L11	- Yes - as i said all my classes are fully online - and based on self-instructional materials
Participant_L12	- Yes, we do have fully online programmes at BSc and MSc. We make use of several e-learning approaches, we make use of an e-learning platform and we use asynchronous and synchronous communication tools with our students.
Participant_L13	- Not really. Only using a CMS for lecture notes upload, setting and submission of assignments by students, discussion forum

Participant_L14	- yes, course materials are posted on a platform. students have a few face-to-face sessions whereby only core elements are discussed. Most of the activities are on the shoulders of the learners.
Participant_L15	- As mentioned earlier, I monitor students work progress via email. They send their projects development and I comment for improvement. They don't have to travel to the university for face to face supervision.
Participant_L16	- No. Only face to face teaching.
Participant_L17	- Not really - My lecture notes are on Moodle and i have provided my students details of some MOOCs that they can access to enhance their knowledge but not as part of lectures etc
Participant_L18	- No, I use Moodle as support
Participant_L19	- Yes. All notes and explanations are done through power-point representations All notes are on-line All assignment are submitted online Forum are being organized for debating and discussion of modules
Participant_L20	- Some classes are online where I post videos, questions and students have to respond in the discussion forum.
Do you use any E-learning system/platforms for your classes such as Blackboard, WebCT, Moodle etc? Please give details	
Participant_L1	- Yes, Moodle
Participant_L2	- Blackboard and Moodle for different courses.
Participant_L3	- Blackboard, wikispaces
Participant_L4	- Moodle to upload materials
Participant_L5	- *[No response]*
Participant_L6	- I use Moodle to post lecture notes for all my lectures. However, explanation and queries are tackled in the face to face lectures.
Participant_L7	- I use Moodle for uploading lecture notes, assignments, links to reference materials, video presentations by experts in the fields.
Participant_L8	- No
Participant_L9	- Moodle. For sharing of notes, chats, forums and uploading files for assignment.
Participant_L10	- No
Participant_L11	- We use MOODLE as the official e-learning platform of the University
Participant_L12	- Yes, we are currently using MOODLE
Participant_L13	- Using Moodle

Participant_L14	- Moodle for posting but not an active user of e-learning platform as it would raise dramatically the time spent on the laptop which I personally believe is directly proportional to the quality of life.
Participant_L15	- No. For design classes I am still looking for an appropriate platform. I tried Moodle but I don't see it as user friendly for Graphic design classes.
Participant_L16	- I use blackboard to share class materials, for announcements/discussions and for students to submit assignments. The assignments are graded and students are given feedback and grades.
Participant_L17	- All my lecture notes, tutorials, lab sheets and information for my module are on Moodle.
Participant_L18	- Moodle
Participant_L19	- No
Participant_L20	- I make use of Moodle. It is a great platform where I post the module information sheet, all reading materials that students can access at their own pace, links and videos. The platform also allows me to monitor student's participation and progress closely. I can also create discussion threads.
What do you think are the barriers for Mauritian Lecturers to be E-learning ready?	
Participant_L2	- Mindset – resistance to change (I have always done it in a certain way, why should I change?)
Participant_L3	- Many older lecturers may still be less accustomed to using IT in the classrooms
Participant_L4	- Too many students and no time to think about adapting content to E-learning
Participant_L9	- Readiness to change to a new way of teaching. The mindset I'd say.
Participant_L11	- It’s just that they are comfortable with the current system and they don’t want to change. They are not aware of the personal benefits that adoption of e-learning could bring to them. They don’t want to adopt things that others are better at them in doing.
Participant_L12	- Mauritian Lecturers would need to be trained to use the platform and also get training in e-tutoring. They are perhaps not well acquainted to technologies. They prefer may be to meet students for 1-2 hours in a lecture instead of having to respond online.
Participant_L16	- overcoming the F2F culture which have been prevailing for a very long time
Participant_A1	- Resistance to change the way they work (lecturers) - Fear of the unknown. Fear of technology
Participant_A3	- Many lecturers are reluctant to put their content online. It’s just a matter of mindset.
Participant_A4	- Mauritian lecturers have to get over the traditional teaching techniques. One of the biggest barriers is that the teachers do not want to experience new things in their learning way. There are some of the teachers who find it difficult to switch to E-Leaning due to the subject they teach.

Participant_A5	- Reflections: lecturers need to understand that their role is not diminished with e-learning. On the contrary, their role is redefined and enhanced: they have not only to teach/, but also guide, coach and engage learners to facilitate their learning process.
Participant_A6	- old fashioned lecturers will be reluctant to embrace the e-learning as resistance to change
Participant_A7	- Time can be an issue to adapt to technology use, content preparation etc.
Do you think understanding students prior experience and knowledge and their learning styles and preferences are essential at the time of teaching delivery? Please give details.	
Participant_L1	- No, but that won't help as even if everyone has different knowledge and experience, we need to teach the same way whether some students have already got the knowledge or not and whether they have different learning preference.
Participant_L2	- Definitely. For e.g. we sometimes make assumptions on the IT exposure of students or on the fact that they are all online or all on Facebooks. Unfortunately, this is not always the case.
Participant_L3	- Yes, depending on the size of the class. A general idea is important though
Participant_L4	- Yes, to make students interested in the topic, I must always relate the materials in their field
Participant_L5	- Yes, it helps to plan what needs to be covered in the limited time we have in our face to face delivery. - However, delivery of the course will be standard to all students and not based on their learning style or preferences.
Participant_L6	- Yes, it is important to understand the students prior experience and learning style and preferences so as you better customised the learning materials to the need and level of the students. However, it is very rare to have a homogenous class and students have different prior experience. - Ideally, we want to be able to cater course delivery to meet different students' learning style and preferences. However, in an E-learning setting that might be possible with different teaching approaches, but within a face to face class, this is impossible due to the large number of students and we need to finish our syllabus content
Participant_L7	- Yes, sometimes students forget some concepts, based on their response to question I might need to do a recap of topics covered in previous semesters or year. In other situation, I might skip slides that they already know.
Participant_L8	- Not that much because we have specific set of lessons to cover in class and finishing the syllabus is the essential part whether the student has prior knowledge and experience or not. - Learning style is not considered. We give lectures and students make notes.

Participant_L9	- Yes. Student profiling is an essential according to me. This guides me on the way to deliver the course.
Participant_L10	- Definitely as the educational background of the students should be considered to have effective learning. - Within an E-learning environment, we might also be able to consider students learning style which is not the case in face to face classes where the mode of delivery are lectures with students downloading notes prior.
Participant_L11	- It will depend on the nature of the course being delivered. If it is a third year module which is a continuity of a second year module then yes.
Participant_L12	- Yes, it is important as we need to know what students already know before so as to provide them with better learning experience and cater for content that meet their needs.
Participant_L13	- Yes, but maybe understanding students prior knowledge. E-learning can make this easier but it will take time as in Mauritius we are used to one way of teaching for all students and learning styles preferences are never considered.
Participant_L14	- Yes surely, sometimes some modules require prerequisites and it is important to be aware about the knowledge level of the students on a particular module over topic before engaging deeper. It happens very often in the case of master students. To give you an example, many students doing MSc In Computer Security have poor or even no computer networking background but they have a module on wireless network security, this is a nightmare for the lecturers.
Participant_L15	- Of course. Otherwise we waste time in trying to make students understand topic they have never come across or covering topics they already master.
Participant_L16	- It depends. If it is an advanced course, then some kind of pre-assessment might be necessary for the students to determine if they are ready for this course or whether they need to take the introductory version prior to taking the advanced course. on the other hand, students can always look up concepts they do not understand as they go along.
Participant_L17	- It helps in cases where students have different backgrounds and knowledge, but this can be taken care of by having a basic introductory course. - With their learning styles, this is something that cannot be accommodated in the large face to face classes that we have. It might something left to E-learning maybe, although this will be take time as lectures are mostly used to one style of delivery.
Participant_L18	- Yes, it is the foundation of education

Participant_L19	- Yes, it is important as once we are aware of prior experience and knowledge learning preferences to some extent, we can plan our teaching in a better way to meet students' needs. As a lecturer, we need to understand the different levels of knowledge for our students to make them achieve the goals set by the module. It is also important to know prior knowledge to align students in terms of knowledge dispensed and acquired. - E-learning is the way forward to delivery courses personalised to students' needs including their learning preference. This is critical in today's learning environment, but not necessarily something done in Mauritius.
Participant_L20	- Yes, I think it is very important to know students prior knowledge. This help me in shaping my lessons for instance knowing what students have learnt help me in the selection of reading materials, I choose articles and books that will challenge their knowledge. - Large students numbers do not always allow us to cater for different learning styles which is something that E-learning can support better and at the same time allow students to have a more tailored approach to course delivery.
Do you think understanding students prior experience and knowledge and their learning styles and preferences are essential at the time of course design? Please give details.	
Participant_A1	- It might be useful but not crucial as all courses have a minimum entry requirement.
Participant_A2	- yes, part of design process. It is important to understand as much as possible about students' needs and experience to be able to customise the content and delivery to meet those needs
Participant_A3	- Of course, yes... in most courses, we do have a Warm-up Activity to test prior knowledge.
Participant_A4	- Yes, it is very important to understand the students. It is very much necessary to understand the mindset of students before setting the content, as not all the students have the same mindset towards studies.
Participant_A5	- Yes, although prior knowledge is usually captured through pre-requisites, learning styles and preferences is much harder and is usually not taken into consideration.
Participant_A6	- course design should be as simple to understand as possible but at the same time it should capture students' needs and this is only possible if students experience, prior knowledge and preferences are taken into consideration
Participant_A7	- Yes, E-learning supports more personalised delivery where it is easier to meet the needs of different learners based on their knowledge and learning style. This is much harder in face to face classes where the delivery is via standard lectures for all learners.

Table Q:3: Interview responses for 'Pedagogy'

What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome?	
Participant_L5	- Being able to view exact images to illustrate subject matter being studied
Participant_L11	- Face to face classes depend on the teaching style of the lecturer - it is teacher centered. e-Learning is learner centered - promotes autonomy of the student and gets a student to maturity quicker.
Participant_L12	- Keeping track of students' progress is easier through an e-learning system.
Participant_L15	- Less personal involvement. More professional/academic involvement. 3.Lecturers can focus on their topic without having to deal with students' bad behaviour. No more spoon feeding. More responsibility on students' side. 4. More control on students' performance and work progress.
Participant_L18	- accessibility pedagogical aspects
Participant_L19	- We are now in the digital era with digital students. E-learning brings much motivation and encourage both constructivist and deep learning. With e-learning authentic tasks are performed and this led towards independent learners. E-learning can overcome monotony in class and encourage both teachers and students to move towards the 21st century education. E-learning improve the quality of learning and build life-long learners
Participant_A2	- Developing lifelong learning skills and autonomy of learners
Do you think E-learning works or will work in Mauritius? Please give details.	
Participant_L2	- I think Mauritius still require a blend of both e-learning platforms and face to face contact. E-learning requires a culture of self-reflection which has not yet been adopted by Mauritians. It also requires more self-discipline which could be an issue for younger students. - More work needs to be done to prepare lecturers on how to create E-learning materials and deliver courses in an interactive way. Otherwise, it will just be like face to face classes in an online platform and is not worth the change to an online environment.
Participant _L3	- Also, the students themselves aren't used to using IT as much in secondary school and so are not accustomed to that method of teaching/learning. - There is also the need to be a review of the curriculum to support E-learning.
Participant_L4	- The curriculum needs to be adapted to meet the needs of E-learning. The current courses are not structured to suit E-learning. It is more for face to face delivery.
Participant_L12	- Currently there are courses being offered in fully online and also in blended mode. However, there is sometimes a contradiction as students are used to a teacher centered approach and the

	aspect of social presence and the feeling of isolation from some of them may be a problem with fully online modalities.
Participant _L14	- E-learning will work to some extent, but more has to be done at both the producer (content & platform provider) and the consumer (learners) ends.
Participant_L18	- There is no true e-learning in Mauritius. Support of ICT is given only. The design and content of courses must be changed to adapt to E-learning, then only we can make some progress in that direction.
Participant_A2	- Increasingly, it will work as we have an emerging lifelong learning population who appreciate flexibility of elearning. But we need to ensure there is the right content in place, the right course design to support students and the right technology.
Participant_A3	- most of the e-learning course here are on mixed mode, that is, we still have a face-to-face component (tutorials on weekly or fortnight basis).
Participant_A7	- More needs to be done to have the materials ready for lecturers to be able to deliver. This is a big mis-conception in Mauritius where E-learning is the downloading of notes and course materials from an online portal. The materials and the delivery need to be interactive and support students to learn by themselves.
What do you think are the barriers to make Mauritius E-learning ready?	
Participant_L8	- Cost and implementation
Participant _L19	- Inadequate skills and experience, the curriculum does not cater for E-learning. With a bulky curriculum, this defeat the purpose of teachers to concentrate in significant use of technology, but instead it is exams-focused only.
Participant_A5	- For e-learning to be fully exploited to become more productive, there is the need to go beyond internet access and providing hardware. There is a need to review the whole course structure. A holistic approach/ecosystem including adequate curriculum, pertinent educational resources as well as relevant teacher training in the use and application of ICT in education are vital to fully exploit the pedagogical use of ICT in education. Mauritius needs to focus more on the holistic approach instead of piecemeal one.
Participant_A7	- Both students and lecturers are too classrooms oriented.
What do you think are the barriers for Mauritian Lecturers to be E-learning ready?	
Participant_L2	- The courses are not designed to suit E-learning.

Participant_L4	- The focus is on finishing a bulky syllabus rather than providing an interesting learning experience for students. Lecturers have to ensure all content are covered before exams. Too many students and no time to think about adapting content to E-learning
Participant_L19	- The bulky curriculum does not cater for E-learning. As product of traditional schools, 'lecturers cannot get out from traditional teachings
Participant_A4	- Mauritian lecturers have to get over the traditional teaching techniques. One of the biggest barriers is that the teachers do not want to experience new things in their learning way. There are some of the teachers who find it difficult to switch to E-Leaning due to the subject they teach.
How comfortable do you think Mauritian students are or will be in the foreseeable future with online classes instead of face to face classes? Please give details.	
Participant_L3	- I believe students themselves will be comfortable, only if they have some form of face to face contact as well with their lecturers
Participant_L5	- They are already fully immersed in the digital word but face to face sessions will still be needed.
Participant_L6	- Face to face medium is still the most preferred mode of learning for Mauritian students. However, if the necessary facilities are made available, then many may choose to go for online classes.
Participant_L9	- With time, they will have to adopt the changes. It might definitely take some time. Which is why change management should be carefully done.
Participant_L12	- For students to be active online learners, it is up to us the lecturers to be creative, proactive and innovate in our classroom. I think the Mauritian students today have easier access to technology and are rather computer proficient. We should tap on the potential of technologies to make the learning environment more conducive. It does not mean that there should not be face to face session. I think the flipped classroom model would be beneficial whereby the classroom time is devoted to discussion, hands on activities instead of the teacher lecturing and the students copying notes.
Participant_L16	- The shift from F2F to online classes should be gradual. From F2F, instructors should incorporate some elements of e-learning such that in the future, more and more e-learning components would gradual pave the way to a class which is entirely conducted online.
Participant_L17	- I think most students are already quite at ease with online videos and tutorials - so i am positive that slowly things will change and the Mauritian students will be able to follow online courses comfortably.

Participant_L20	- Mauritian students nowadays are technophiles. Give them any gadgets and we immediately grab their attention. I am pretty much confident and hopeful that Mauritian students will be comfortable with online classes given that their learning are monitored.
Participant_A3	- For the moment, I must say that face to face really help to maintain the students focus on their learning but I suppose in a near future learners will be much at ease with fully online modules. But we may need to have a mixed approach to facilitate the move to fully online learning.
Participant_A5	- The new generation enjoys everything to do with technology. So, this will not be an issue. Lecturers might need to adapt more, particularly those not well versed with technology. Maybe a mix of face to face and online learning is the way.
Are you ready as a lecturer to change your role from an active instructor to a collaborator in Learning?	
Participant_L1	- Currently time is limited so I don't think I can take up new roles. I would rather continue with the current teaching methods we have been using.
Participant_L2	- Fully ready. Our learners are changing. The instructor is no more the prime source of information. Digital natives now have access to a wealth of information via the Internet and it would seem that they better through collaboration on social media platforms. As an instructor, I need to adapt to this preference for learning.
Participant_L3	- Yes, but this will take time as most lecturers and students are familiar with the traditional lecture style and may take time to adapt.
Participant_L4	- Yes, the students need to be the focus rather than the syllabus. However, students will need time to adjust because they will be expected to take more control of their progress and studies. It might be a challenge for some.
Participant_L5	- Yes, that is the only way to engage students in class by giving them what they need.
Participant_L6	- Yes, I will be happy to make this shift so as to have more time to invest in my research.
Participant_L7	- Yes, but it will take time
Participant_L8	- Yes, especially at university level, students need to take more responsibility for their learning
Participant_L9	- A definite yes to keep them motivated. This is also the new age of education where traditional teaching can no longer fully apply.
Participant_L10	- Yes, as I believe that E-Learning will be part of any educational programme in the future
Participant_L11	- I am already doing this
Participant_L12	- Yes, but it could be hard because everyone is used to the traditional class model and students and lecturers will need support to adapt to new ways of teaching and learning

Participant_L13	- Yes, but overtime with a change in mindset
Participant_L14	- Not really as I want to spend lesser time on computers. As an associate professor and an active researcher competing for a full professor position, I find teaching in e-learning mode more time consuming, although a collaborator in learning is more meaningful for highly mature students like MPhil/PhD students.
Participant_L15	- Yes, this is what we need to aim towards
Participant_L16	- Yes, this is the future of education. But this is a gradual change. Elements of e-classrooms should be incorporated gradually into existing classroom environments, creating some sort of mixed environments, where the best of both methods can be fully tapped.
Participant_L17	- Yes, but this will take time. Most lecturers are used a 2 hr lectures with students taking notes. Students will also need to adapt which might be hard.
Participant_L18	- Yes, this is how it is done abroad.
Participant_L19	- I am already trying to be more collaborative in my teaching. Yes, it is high time we shift towards a 21st century teaching where learning goals are more challenging and appropriate to build the career of our students
Participant_L20	- Yes, I am ready for the change because I Believe that change is truly the word of this century. The 21st century learners are independent enough to navigate through the course on their own. hence, I would say that the change is a two way process: it involves both lecturers and students
Do you think Mauritian students can collaborate to their learning or rather they can only succeed if they are spoon fed by their lecturers? Please give details.	
Participant_L1	- Some students can succeed. Most will not.
Participant_L2	- I strongly think that collaboration can work if guided. Already a lot of collaboration is already happening via social media. What is lacking there is a structure. For e.g. instead of an unstructured discussion on a topic, students could be given a case study to discuss on or an ethical dilemma to reflect on or simply a problem to solve via social media. The level of discussion which often follows is quite amazing. The lecturer only intervenes for advice and direction.
Participant_L3	- If given the choice, students will obviously prefer the easy way out. However, if they believe it is the only method available, they will surely make the effort
Participant_L4	- They can collaborate to their learning provided they are guided properly at the start. Or evaluation is done at different stages.
Participant_L5	- Yes, because so much knowledge is available online and they need to take an active part in their learning by taking responsibility of their learning process

Participant_L6	- At tertiary levels, students should be mature enough to learn through E-learning systems.
Participant_L7	- Both students and lecturers can be collaborators if delivery is well structured with clear milestones and deliverables etc. That is after each topic, there are MCQs to test students' understanding of the topics they read about and a small assessment is conducted after each topic with feedback about things they need to improve.
Participant_L8	- Yes, they can collaborate if they are given proper feedback
Participant_L9	- Students are used to spoon feeding and lecturers just want to deliver their lessons for the day and move on. This will be challenging for Mauritius because there is no visible incentive to change the way things are done
Participant_L10	- Mauritian students have been spoon fed since an early age and I strongly believe that at university level, this should not be the case. Independent learning should be encouraged. Mauritian students studying abroad collaborate to their learning, and so there is no reason why students in Mauritius should be spoon fed.
Participant_L11	- Yes, they can but first of all there is a need to shift from an exam based mindset.
Participant_L12	- I think the students if given the opportunity through active projects, working on collaborative projects, problem-based activities they can become more autonomous. - The lecturer should be there to facilitate. I also think that the pedagogical approaches should evolve and technology should be integrated whereby students are given the opportunities to learn through technologies.
Participant_L13	- Many students do collaborate in their learning. However, I believe most of them are happier when they are spoon fed!
Participant_L14	- This is a quite subjective. It depends on the students primary and secondary background, the subject areas, the students grading and many other factors. But what is noticeable is that both at secondary and university levels, there is a very high rate of absenteeism, students are opting to download all course materials and to learn on their own at home or with peers. Whether this is a sign that they are doing more collaborative learning or coming to schools and universities is of no use or boring, there is indeed a sociological reason behind this behaviour.
Participant_L15	- Spoon feeding is a big issue in Mauritius. Even at tertiary education level students do not want to do the effort especially at undergraduate level.
Participant_L16	- With easy access to technology nowadays, newer generations students are definitely more tech savvy and many would prefer making use of online platforms for many purposes. With the convenience of online learning and all the facilities provided by online classroom management

	systems, including discussion board, I am positive that younger generation students can easily adapt to online learning. In fact, the more they interact with each other online, the more confident they seem to get. - However, government servants and industry often sponsor middle-aged employees for tertiary education. It might be more challenging for that age group to fully benefit from e-learning environments.
Participant_L17	- Unfortunately, since they have almost always been spoon-fed, they tend to require this - but this can be changed since when we study abroad, we are not spoon-fed and we succeed - so it should be possible. But it is not easy.
Participant_L18	- They can definitely collaborate. But there is reluctance to do so because they like to be spoon fed and also because of the competitive nature of many students who see collaboration as a way of others performing as good as them.
Participant_L19	- They can collaborate if they are given proper guide and training because Mauritius got many talents. We just need to look for the appropriate resources to exploit - these talents.
Participant_L20	- I would say that the idea that spoon-feeding will result into students' success is a myth that teachers and lecturers themselves have created. I truly believe that if given the proper support and guidance, students can collaborate to their own learning and that they can succeed as well. Also, if students collaborate to their own learning, they will feel empowered and more independent. These are skills that as a lecturer, I wish my students develop and harness.
Participant_A1	- In Mauritius the students are normally spoon fed up to HSC level. At university, they are given more opportunities to collaborate and this is working well as far as i know.
Participant_A2	- It is changing
Participant_A3	- Yes, they can collaborate. They are quite active on the chats, forums etc, and if properly guided they can become independent in their learning process.
Participant_A4	- This depends on the lecturers. As there are a number of courses at the University, and the students who attend are HSC passed which is, they are being spoon fed. In our course we often give them the resources and let them learn on their own, whereas other faculties still use the spoon feeding way to teach their students.
Participant_A5	- With proper guidance, absolutely

Participant_A6	- spoon feeding should be banned practice. the lecturer should be skilled enough to put content which stimulates the minds of the students. the e-learning platform will be simply a tool to do it faster.	
Participant_A7	- Yes, if they are supported properly and provided with timely feedback.	
What do you think are the barriers for Mauritian students to be E-learning ready?		
Participant_A5	- Students may need to be monitored to make sure they are on track with their learning. For some, online learning might be a challenge and can find it hard to manage their learning on their own	
How would you rate the importance of students' course evaluation?		Do you think that course evaluation feedback is genuinely taken into consideration for future course planning and delivery? Please provide details.
Participant_L1	- Important	Probably not.
Participant_L2	- Highly Important. They are our main stakeholders and they are the ones who need to learn. Without their feedback, it is difficult to know if the lecturer is going in the right direction.	Yes, in our institution course evaluation feedback is discussed in details and lecturers are encouraged to reflect strongly on the outcome of each course evaluation.
Participant_L3	- Important	Maybe
Participant_L4	- Highly Important. By this we know what we are lacking and what we can improve in the future.	Yes
Participant_L5	- Highly Important	Maybe
Participant_L6	- Important. Students being our customer, it is important to get their feedback.	Yes, course feedback may be a very useful tool to improve course delivery. Yes, I genuinely use them.
Participant_L7	- The aim of teaching is to impart knowledge to students and evaluating them gives indication whether the - knowledge transfer was done successfully	Probably not. Students have requested for microphone in lecture rooms so that they can hear better but nothing has been done.
Participant_L8	- Highly important	Maybe
Participant_L9	- Highly important	I try to improve my classes as far as possible. But whether it's a general practice I cannot guarantee.

Participant_L10	- Highly important	Maybe
Participant_L11	- Important. As long as it's not mandatory, not anonymous and is collaborative and part of the learning process	Maybe
Participant_L12	- Highly important	Maybe
Participant_L13	- Highly important. Students are our clients	Yes. at the university, we are advised to react to students' feedback
Participant_L14	- Highly Important. It gives another often a true picture of the course delivery and quality picture of the course	Probably not. Ego of lecturers are high
Participant_L15	- Highly important. This helps to improve provided the evaluation is constructive.	Definitely not. Not at the institution I work for.
Participant_L16	- Highly important	Maybe
Participant_L17	- Highly Important. To ensure that the message you want to pass is going through and to know how a course can be improved.	Yes. I think so yes. We do have a feedback system at our university and i know my colleagues and myself take the comment on board – can be adding more examples - changing examples - adding more classwork/discussion etc
Participant_L18	- Highly Important. indispensable. formative evaluation	Probably not
Participant_L19	- Highly Important	Yes
Participant_L20	- Highly Important. I would say evaluation is very important in order to make a judgment about learning and remedy the situation	Yes, because there is the system of feedback questionnaire as well so that as lecturers, we can improve on in designing our modules. I do take into consideration the feedback while planning for the other courses
Participant_A1	- Highly Important	Yes. Feedback is taken into consideration while planning or reviewing courses.
Participant_A2	- Highly Important	Yes
Participant_A3	- Highly Important	Yes. following feedback some courses are revised to suit the learners' needs.

Participant_A4	- Highly Important. Helps to know where the lecturer should improve in the coming year.	Yes
Participant_A5	- Highly Important	Maybe
Participant_A6	- Highly Important	Yes
Participant_A7	- Important	Maybe

Table Q:4: Interview responses for 'Collaboration'

What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome?	
Participant_L1	- There are lots of challenges like students not interested to come to class and those who come, do not find classes interesting anymore and do not ask questions. - Students do not ask much questions until the eve of exams.
Participant _L6	- High number of students in the classroom and limited interaction possible
Participant _L7	- How to encourage students to participate. How to keep them focused for the whole duration of the lecture.
Participant _L8	- Lack of interaction
Participant _L9	- Interaction and personalisation. Because class sizes are big. Matching the pace of large group is also challenging
Participant_L12	- Usually during the face to face classes, especially with big cohorts, it is not always possible to get responses from students.
Participant_L13	- Student Participation/Contribution
Participant_L16	- some students might be embarrassed or shy to ask questions/
Participant_L17	- Caters for all kinds of students - shy and extrovert - even shy students can answer quiz questions and even if answer is wrong it is ok - whereas in class it is mostly the extrovert students who answer and the shy ones rarely if ever participate.
Participant_L18	- E-learning improve interaction between students and teachers.
Participant_L19	- E-learning improve interaction between students and teachers. E-learning can overcome monotony in class and encourage both teachers and students to move towards the 21st century education
Participant_L20	- Besides, E-learning allows for more control concerning discussion. Discussion can be easily monitored as learners' voices will not overlap their peers'.

Participant_A4	- Face to face classes with the students of university does not give the same outcome which an e-learning session can. There are a number of students who still have the fear to talk in front of the class. For example, if a question is asked to a group of students in a face to face session, hardly some will answer to it, whereas if the same question to same group of students in an e-learning session and almost all the students will share their views.
Participant_A5	- More collaborative learning culture is encouraged by e-learning.
Do you think E-learning works or will work in Mauritius? Please give details.	
Participant_L9	- Teamwork can improve.
Do your students use learning tools such as discussion boards, chat rooms, wikis, blogs etc. Please give details.	
Participant_L1	- They use Facebook and WhatsApp.
Participant_L2	- Yes, but they also use more of Facebook for discussions.
Participant_L3	- Students use a common Facebook page.
Participant_L4	- Yes, to do research for assignments they are encourages to use these tools.
Participant_L5	- Rarely
Participant_L6	- Not really, they mainly communicate via emails and they have face to face discussions.
Participant_L7	- No
Participant_L8	- Yes, they do interact a lot by themselves and this helps build a better conducive atmosphere for learning. Gradually the trend is changing and a more collaborative environment is seen between students because of things like social media which is great for their learning.
Participant_L9	- For researching purposes mainly. Some do have their own blogs and aim at sharing their experiences as well. This encourages others to participate if they feel they are benefiting from the experience.
Participant_L10	- No
Participant_L11	- Yes, we use all of them depending the context and nature of learning activities and it is first and foremost outcome based. I do not use the tools because they exist.
Participant_L12	- Yes. Students in the modules I teach are brought to use various online tools such as discussion forum, they have activities where they publish collaboratively on a wiki. They are also encouraged to post their reflections on blogs. or in online journals.
Participant_L13	- Discussion forums maybe

Participant_L14	- Those students studying on the ODL mode, yes, they do use the learning tools whereas those in traditional setup not really. I should say that there is a dearth in discussions and reading. The whole educational system from pry-primary to be blamed.
Participant_L15	- No. Not to my knowledge.
Participant_L16	- Yes, discussion board on Blackboard is used to post questions and queries about lecture materials and assignments. But unless it is a requirement for students to participate, or they trust that the information they are getting are going to be useful to them, many do not like to contribute.
Participant_L17	- I used to provide blog/discussion room on Moodle - but it has to be moderated and unfortunately i did not have time to always do so - i stopped now.
Participant_L18	- No
Participant_L19	- yes, Discussion board
Participant_L20	- Some of them do participate in discussion forums to share their ideas and opinions. But many do not because there is not much a culture of sharing in Mauritius because the education system is too focussed on exams and getting better results than your fellow classmates.
How comfortable and confident are you to teach online classes? Please give details.	
Participant_L12	- I am pretty comfortable and confident as it is more than 10 years than I am in the field. I myself did my masters in Educational Technologies fully online and I now apply the skills developed in my professional practice. The key is to communicate clearly with your class and provide timely feedback.
Do you think Mauritian students can collaborate to their learning or rather they can only succeed if they are spoon fed by their lecturers? Please give details.	
Participant_L1	- Some students can succeed. Most will not.
Participant_L2	- I strongly think that collaboration can work if guided. Already a lot of collaboration is already happening via social media. What is lacking there is a structure. For e.g. instead of an unstructured discussion on a topic, students could be given a case study to discuss on or an ethical dilemma to reflect on or simply a problem to solve via social media. The level of discussion which often follows is quite amazing. The lecturer only intervenes for advice and direction.
Participant_L3	- If given the choice, students will obviously prefer the easy way out. However, if they believe it is the only method available, they will surely make the effort
Participant_L4	- They can collaborate to their learning provided they are guided properly at the start. Or evaluation is done at different stages.

Participant_L5	- Yes, because so much knowledge is available online and they need to take an active part in their learning by taking responsibility of their learning process
Participant_L6	- At tertiary levels, students should be mature enough to learn through E-learning systems.
Participant_L7	- Both students and lecturers can be collaborators if delivery is well structured with clear milestones and deliverables etc. That is after each topic, there are MCQs to test students' understanding of the topics they read about and a small assessment is conducted after each topic with feedback about things they need to improve.
Participant_L8	- Yes, they can collaborate if they are given proper feedback
Participant_L10	- Mauritian students have been spoon fed since an early age and I strongly believe that at university level, this should not be the case. Independent learning should be encouraged. Mauritian students studying abroad collaborate to their learning, and so there is no reason why students in Mauritius should be spoon fed.
Participant_L11	- Yes, they can but first of all there is a need to shift from an exam based mindset.
Participant_L12	- I think the students if given the opportunity through active projects, working on collaborative projects, problem-based activities they can become more autonomous. - The lecturer should be there to facilitate. I also think that the pedagogical approaches should evolve and technology should be integrated whereby students are given the opportunities to learn through as well as through technologies.
Participant_L13	- Many students do collaborate in their learning. However, I believe most of them are happier when they are spoon fed!
Participant_L15	- Spoon feeding is a big issue in Mauritius. Even at tertiary education level students do not want to do the effort especially at undergraduate level.
Participant_L17	- Unfortunately, since they have almost always been spoon-fed, they tend to require this - but this can be changed since when we study abroad, we are not spoon-fed and we succeed - so it should be possible. But it is not easy.
Participant_L18	- They can definitely collaborate, but there is reluctance to do so because they like to be spoon fed and also because of the competitive nature of many students who see collaboration as a way of others performing as good as them.
Participant_L19	- They can collaborate if they are given proper guide and training because Mauritius got many talents. We just need to look for the appropriate resources to exploit - these talents.

Participant_L20	- I would say that the idea that spoon-feeding will result into students' success is a myth that teachers themselves have created. I truly believe that if given the proper support and guidance, students can collaborate to their own learning and that they can succeed as well. Also, if students collaborate to their own learning, they will feel empowered and more independent. These are skills that as a lecturer, I wish my students develop and harness.
Participant_A1	- In Mauritius the students are normally spoon fed up to HSC level. At university, they are given more opportunities to collaborate and this is working well as far as i know.
Participant_A3	- Yes, they can collaborate. They are quite active on the chats, forums etc. and seem to enjoy the experience of online platform during these interactions ad if properly guided they can become independent in their learning process.
Participant_A4	- This depends on the lecturers. As there are a number of courses at the University, and the students who attend are HSC passed which is, they are being spoon fed. In our course we often give them the resources and let them learn on their own, whereas other faculties still use the spoon feeding way to teach their students.
Participant_A5	- With proper guidance, absolutely
Participant_A6	- spoon feeding should be banned practice. the lecturer should be skilled enough to put content which stimulates the minds of the students. the e-learning platform will be simply a tool to do it faster.
Participant_A7	- Yes, if they are supported properly and provided with timely feedback.
What is your perception on the culture of sharing and collaboration in Mauritian universities?	
Participant_L1	- High achievers do not like to share their knowledge while low achievers like group work with high achievers to get good grades.
Participant_L2	- As mentioned before, I strongly think that collaboration can work if guided as students already collaborate a lot via social media.
Participant_L3	- The education system does not promote teamwork and university students are usually forced into teams because the course assignments require them to.
Participant_L4	- Students can collaborate.
Participant_L5	- There is no culture of sharing and collaboration in Mauritian universities. Students work together either because they have to as part of the course requirements or because they can benefit being part of a team for good grades.
Participant_L6	- A sharing culture should be the norm at the university level. Mauritius is not there yet.

Participant_L7	- Many lecturers do not put in the effort to create appropriate materials for their courses and just enjoy using the work of others. As a result, there is reluctance to collaborate at times because of this. Sharing and collaboration is often used by those who see personal benefits in it.
Participant_L8	- At the university level, students have to collaborate. They have no choice.
Participant_L10	- The culture of spoon-feeding is still a reality in our universities. But students should learn to collaborate more and be more independent learners.
Participant_L11	- Some Mauritian students (actually many of them) do not like to collaborate or share their resources and knowledge because they do not want other students to do better than them.
Participant_L12	- When they are given the opportunity to collaborate, students do so quite well. It is just a matter of giving them the chance to do so. Mauritian students are quite adaptable. But the lecturers should ensure that they assist with this using the right pedagogical approach.
Participant_L13	- Many students do collaborate in their learning. However, I believe most of them are happier when they are spoon fed!
Participant_L15	- No such culture. Spoon-feeding and stiff competition is the culture in Mauritius like I said before.
Participant_L17	- It is possible to establish such a culture in Mauritius. But it will take time as both students and lecturers are not used to such a culture.
Participant_L18	- There is a lot of competition and collaboration and sharing is seen as helping others to perform as good or even better. So many students do like to do so.
Participant_L19	- Given proper guidance, a culture of sharing and collaboration can be fostered.
Participant_L20	- Lecturers themselves do not like to collaborate with their colleagues because they themselves were not used to teamwork as students. So, they do not necessarily encourage collaboration among students as they themselves often do not perceive its usefulness.
Participant_A1	- Students are collaborating well at the university level.
Participant_A3	- Collaboration is already happening on the online platform and on social media.
Participant_A4	- Students usually learn on their own. They collaborate when it is part of the course requirement only.
Participant_A5	- Many students do not like to share their knowledge with others as the system is very competitive. But if encouraged, it is possible. This also applies to some lecturers as well.

Participant_A6	- Collaboration should be part of the system, not an option. Even lecturers should be encouraged to collaborate with each other for their content and for the best pedagogical approach. Not just students.
Participant_A7	- Universities encourage collaboration and sharing through teamwork, discussions etc. But there is more to be done with proper support.
Do your students use learning tools such as discussion boards, chat rooms, wikis, blogs etc. Please give details.	
Participant_L1	- They use Facebook and WhatsApp.
Participant_L2	- Yes, but they also use more of Facebook for discussions.
Participant_L3	- Students use a common Facebook page.
Participant_L4	- Yes, to do research for assignments they are encourages to use these tools.
Participant_L5	- Rarely
Participant_L6	- Not really, they mainly communicate via emails and they have face to face discussions.
Participant_L7	- No
Participant_L8	- Yes, they do interact a lot by themselves and this helps build a better conducive atmosphere for learning. Gradually the trend is changing and a more collaborative environment is seen between students because of things like social media which is great for their learning.
Participant_L9	- For researching purposes mainly. Some do have their own blogs and aim at sharing their experiences as well. This encourages others to participate if they feel they are benefiting from the experience.
Participant_L10	- No
Participant_L11	- Yes, we use all of them depending the context and nature of learning activities and it is first and foremost outcome based. I do not use the tools because they exist.
Participant_L12	- Yes. Students in the modules I teach are brought to use various online tools such as discussion forum, they have activities where they publish collaboratively on a wiki. They are also encouraged to post their reflections on blogs. or in online journals.
Participant_L13	- Discussion forums maybe
Participant_L14	- Those students studying on the ODL mode, yes, they do use the learning tools whereas those in traditional setup not really. I should say that there is a dearth in discussions and reading. The whole educational system from pry-primary to be blamed.
Participant_L15	- No. Not to my knowledge.

Participant_L16	- Yes, discussion board on Blackboard is used to post questions and queries about lecture materials and assignments. But unless it is a requirement for students to participate, or they trust that the information they are getting are going to be useful to them, many do not like to contribute.
Participant_L17	- I used to provide blog/discussion room on Moodle - but it has to be moderated and unfortunately i did not have time to always do so - i stopped now.
Participant_L18	- No
Participant_L19	- yes, Discussion board
Participant_L20	- Some of them do participate in discussion forums to share their ideas and opinions. But many do not because there is not much a culture of sharing in Mauritius because the education system is too focussed on exams and getting better results than your fellow classmates.

Table Q:5: Interview responses for 'Web 3.0 System'

What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome	
Participant_L20	- Student can access course materials in a more interactive way allowing them to absorb the course concepts better and at their own pace and in their own time.
Do you think E-learning works or will work in Mauritius? Please give details.	
Participant_L6	- Yes, if the required platform is put in place
Participant_A1	- It can work but the main issue is technology and price. Internet bandwidth is too low to allow full and proper use of E-learning facilities. Moreover, the price may be prohibitive for some people
Participant_A6	- -yes, if high bandwidth…
Participant_L15	- If universities dare to put adequate, easy to use system which supports ease of access to customised resources and encourage to change the mindset, E-learning will work.
What do you think are the barriers to make Mauritius E-learning ready?	
Participant_L2	- Internet Speed and cost could still be an issue (even though work is being done in this direction)
Participant_L3	- Slow Internet in Mauritius
Participant_L5	- Lack of infrastructure, slow Internet availability
Participant_L6	- Very important is the Internet connectivity which is quite poor in Mauritius. The available bandwidth is too low and still expensive. The necessary infrastructure needs to be put in place.

Participant_L7	- Internet connection facility. - Cost of the E-learning infrastructure. Whether the E-learning materials will be paid and how much
Participant_L8	- Cost and implementation
Participant_L9	- Logistics and infrastructure can be an issue.
Participant_L10	- Internet connection is still slow.
Participant_L12	- Barriers could include the IT infrastructure/bandwidth etc
Participant_L17	- Poor internet connection for some people
Participant_L19	- The budget because Mauritius is still a developing country. It will take time in order to set all the necessary infrastructure.
Participant_A1	- Infrastructure/Technology.
Participant_A3	- May be the Internet connectivity.
Participant_A6	- high cost of internet access and reliable infrastructure
What do you think are the barriers for Mauritian Lecturers to be E-learning ready?	
Participant_L2	- Infrastructure could also be an issue in some institutions.
Participant_L5	- facilities including the relevant infrastructure.
Participant_L8	- Lack of infrastructure
Participant_L10	- Appropriate infrastructure and Internet connectivity
Participant_L18	- we do not have access to the right online campus. The online portal must have the necessary features to support an online learning environment, which is user friendly and at the same time provide us with the necessary resources as and when needed.
How comfortable and confident are you to teach online classes? Please give details.	
Participant_L4	- The E-learning platform must be easy to use for easy acceptance.
Participant_L6	- We need to have a system in place that allows us to meet our teaching goals and at the same time allow students to get the best of the class. The online platform must be reliable and both lecturers and students should feel that they are getting the best out of the it as they would in face to face.
Participant_L13	- If all logistics are available, the system is easy to use and the software allows for easy and efficient creation/update of contents and access to learning materials, then I would be comfortable and confident. Lecturers and students will eventually have to be confident that online is the way forward.
What do you think are the barriers for Mauritian Lecturers to be E-learning ready?	
Participant_L2	- Infrastructure could also be an issue in some institutions.

Participant_L8	- Lack of infrastructure	
Participant_L10	- Appropriate infrastructure	
Participant_L18	- we do not have access to the right online campus. The online portal must have the necessary features to support an online learning environment, which is user friendly and at the same time provide us with the necessary resources as and when needed.	
What do you think are the barriers for Mauritian students to be E-learning ready?		
Participant_A1	- Costs. Connection may be expensive. Bandwidth. Connection may be slow. - Cultural. Change in the way they are used to learn and be assessed.	
Participant_A2	- Internet cost is expensive.	
Participant_A3	- Internet connectivity	
Participant_A4	- Cost related to online learning including Internet costs and equipment costs	
How comfortable do you think Mauritian students are or will be in the foreseeable future with online classes instead of face to face classes		
Participant_L1	- Low bandwidth and high internet costs are also major issues in the country	
Have you heard about the Semantic Web?		Where do you see Mauritius with respect to the Semantic Web?
Participant_L1	- Yes	This is a new concept. Mauritius will first need to understand E-learning properly before moving towards semantic web.
Participant_L2	- Yes	It will take time as this is a new concept and we are still not ready for usual E-learning.
Participant_L3	- No	*[Question not shown]*
Participant_L4	- Yes	Mauritius is still at the early stages of E-learning. So maybe this is something for the future.
Participant_L5	- No	*[Question not shown]*
Participant_L6	- Yes	It is not well understood in Mauritius and there is very limited use. Still a long way.
Participant_L7	- Yes	Still at the theoretical aspect and not much done in practical
Participant_L8	- No	*[Question not shown]*
Participant_L9	- Yes	It's yet to come. Am not sure people are aware of that. They just have to be incorporated with the tools.
Participant_L10	- Yes	The focus is still on E-learning.

Participant_L11	- Yes	I think we are unconsciously aware of it. We use it without saying or knowing we are in it. Not any time soon
Participant_L12	- No	*[Question not shown]*
Participant_L13	- Yes	This is a new concept. It will take time.
Participant_L14	- Yes	As mentioned earlier local data production is poor, so intra sharing of data as it happens in a semantic web is not relevant, there were some projects in the past like School IT Project with data centres for storage and dissemination of knowledge for secondary schools. Probably if there are similar projects including the industrial sectors, then the need for semantic web will be felt.
Participant_L15	- No	*[Question not shown]*
Participant_L16	- Yes	Not much is done or talked about on Semantic Web in Mauritius.
Participant_L17	- Yes	I know people who are doing research on semantic web and i have also given assignment to my students on semantic web - but maybe in Mauritius it will be mostly people in IT who know what it is and its importance - as for Mauritius i honestly don't know. This is still too new a concept and we are still struggling with getting E-learning to where it should be.
Participant_L18	- Yes	E-learning is still in its infancy. Semantic Web is a new concept. It will find its way, but it will take time.
Participant_L19	- Yes	There is also a long way to go
Participant_L20	- No	*[Question not shown]*
	- Yes	E-learning needs to be applied properly first in Mauritius.
Participant_A1	- No	*[Question not shown]*
Participant_A2	- Yes	It will take time because we are still trying to understand how to deal with online platforms.
Participant_A3	- Yes	It will take time for the people in Mauritius to get use to Semantic Web, but with continuous use of them will help them get used to it.
Participant_A4	- Yes	there is still a long way to go as it is still a very new concept in Mauritius.
Participant_A5	- No	*[Question not shown]*
Participant_A6	- No	*[Question not shown]*

Participant_A7		
Have you heard about ontologies		Do you think that the Mauritian higher education sector will use or promote the usage of ontologies?
Participant_L1	- Yes	This is a too advanced concept for Mauritian.
Participant_L2	- Yes	Not really at this stage. Same as semantic web, it will take time as we are still working with understanding E-learning.
Participant_L3	- No	*[Question not shown]*
Participant_L4	- Yes	No, there is a lack of professional who understand ontologies. Not all academic are pro in usage of IT.
Participant_L5	- No	*[Question not shown]*
Participant_L6	- Yes	Again, there is very limited use of ontologies in Mauritius. If it is fully developed, then there is potential to use it in our higher education sector.
Participant_L7	- Yes	Still at the theoretical aspect. Nothing is done in practice.
Participant_L8	- No	*[Question not shown]*
Participant_L9	- Yes	Hard to say at this stage because it is still early stage
Participant_L10	- Yes	It is too new a concept and as far as I am aware, we are not doing anything in this direction.
Participant_L11	- Yes	No, I don't think so. It is too new a concept.
Participant_L12	- No	*[Question not shown]*
Participant_L13	- Yes	Maybe. But not anytime soon. It is a new thing and we still need to understand basic E-learning first.
Participant_L14	- Yes	I do not think this would be possible in a near future. Use of semantic web or OWL may find a way when the country moves towards a knowledge base and digital economy. The only option I foresee this happening is in the context of an African regional effort to produce and share data and information. However, E-learning is still in its infancy in the country and this will take time. There is also a lack of sharing culture in the country which unless sorted, we cannot progress towards semantic web or think about the use of ontologies
Participant_L15	- No	*[Question not shown]*
Participant_L16	- Yes	N/A In theory we have heard about it. But there is still a long way to go.

Participant_L17	- Yes	So far, it is only talked about in terms of assignments and research work given to students. But it is not really used or understood.
Participant_L18	- Yes	Very new concept, so it will take time before it can be used or promoted
Participant_L19	- Yes	I am not too sure. It is not really talked about or used in Mauritius and I am not familiar with it either.
Participant_L20	- No	*[Question not shown]*
Participant_A1	- Yes	Don't know. This is too new for Mauritius.
Participant_A2	- No	*[Question not shown]*
Participant_A3	- No	*[Question not shown]*
Participant_A4	- Yes	With time, maybe
Participant_A5	- Yes	Some research work at tertiary level has been done on the on the usage of ontologies but it is not a term that is commonly heard of. it will definitely be in the interest of Mauritian higher education to use ontologies for more structured, efficient and effective knowledge management systems.
Participant_A6	- No	*[Question not shown]*
Participant_A7	- No	*[Question not shown]*

Table Q:6: Interview responses for 'Support'

Do you think E-learning works or will work in Mauritius? Please give details.	
Participant _L1	- Currently, E-learning is not working in Mauritius as there is no one who is really using it in the way it is meant to be used. - I don't think e-learning will work in Mauritius in the foreseeable future.
Participant _L5	- Yes, with initiatives such as tables to secondary students etc. We are on the way to more E-learning in Mauritius.
Participant_L6	- Yes, if the required platform is put in place and necessary support and feedback are provided to the students in terms of their learning.
Participant_L11	- Yes, it works - for the past decade this is what we have been doing.
Participant_L12	- Will it work in Mauritius or does it work??? well I think it depends on several factors such as proper internet facilities, excellent bandwidth, access and the willingness to be autonomous learners.

Participant_L15	- If universities dare to put adequate system and encourage to change the mindset, E-learning will work.
Participant_L16	- E-learning can eventually work with proper training of instructors to help prepare them to become effective online instructors. It might be more challenging to convince lecturers with old-school mentality who do not believe in online education.
Participant_L18	- There is no true e-elearning in Mauritius. Support of ICT is given only. The design and content of courses must be changed to adapt to E-learning, then only we can make some progress in that direction.
Participant_L19	- Yes, it will work because as a developing country, our educational system has improved a lot since the last decades. With the new objectives set by the Ministry of Education (Objectives 2020), e-learning is one of the targets set to integrate technology in education. However, the infrastructure is still lacking in terms of accessibility to e-learning tools. Professional development and expertise of lecturers need to be ensured in a better way to be able to guarantee a better access to elearning. In both primary and secondary schools E-learning is lacking in most of the colleges. Universities adopt e-learning but there is still need for improvement.
Participant_L20	- It all depends on the profile of our learners. But considering the new educational landscape that favours the use of ICT in education, I would say that with proper guidance and resources, E-learning can definitely work.
Participant_A1	- It can work but the main issue is technology and price. Internet bandwidth is too low to allow full and proper use of E-learning facilities. - Moreover, the price may be prohibitive for some people.
Participant_A2	- Increasingly, it will work as we have an emerging lifelong learning population who appreciate flexibility of elearning. But we need to ensure there is the right content in place, the right course design to support students and the right technology.
Participant_A6	- yes, if high bandwidth, good policies e.g. who is responsible when a student cannot upload his assignment online at 11.54pm and deadline set by lecturer is 11.55pm! lecturers and students should be well trained and versed with the e-learning system. - Student should be supported in using the system with regular feedback and with content matching their needs
What do you think are the barriers to make Mauritius E-learning ready?	
Participant_L1	- Most educators find current tools difficult to use.
Participant_L2	- Internet Speed and cost could still be an issue (even though work is being done in this direction)

Participant_L3	- Slow Internet in Mauritius
Participant_L4	- Training should be provided to create interactive contents. Professional must create multimedia contents.
Participant_L5	- Lack of infrastructure, slow Internet availability
Participant_L6	- Very important is the Internet connectivity which is quite poor in Mauritius. The available bandwidth is too low and still expensive. The necessary infrastructure needs to be put in place.
Participant_L7	- Internet connection facility. - Cost of the E-learning infrastructure
Participant_L8	- Cost and implementation
Participant_L9	- Logistics and infrastructure can be an issue.
Participant_L10	- Internet connection is still slow.
Participant_L11	- Poor leadership at organisational level as they understand practically nothing at top management level - Poorly competent regulatory authority
Participant_L12	- Barriers could include the IT infrastructure/bandwidth etc
Participant_L14	- Internet Access
Participant_L15	- Lack of proper training
Participant_L16	- In addition, creating online courses need time and money. It is an investment that has to be made and the resources have to be made available for this purpose.
Participant_L17	- Poor internet connection for some people.
Participant_L19	- The budget because Mauritius is still a developing country. - It will take time in order to set all the necessary infrastructure. Lecturers are not willing to get out of their comfort zone in context with traditional teaching - It will take time in order to set all the necessary infrastructure. - Infrastructure of schools needs to be upgraded Lack of professional development and training of staffs.
Participant_L20	- Economic status of some people - they may not have the resources (pc, Web) to follow E-learning courses
Participant_A1	- Cultural. The new generation is quickly embracing change but we still lag behind most developed countries. - Political. Prices are dependent on government policies.

	- Infrastructure/Technology.
Participant_A3	- May be the Internet connectivity.
Participant_A5	- For e-learning to be fully exploited to become more productive, there is the need to go beyond internet access and providing hardware. There is a need to review the whole course structure. A holistic approach/ecosystem including adequate curriculum, pertinent educational resources as well as relevant teacher training in the use and application of ICT in - education is vital to fully exploit the pedagogical use of ICT in education. Mauritius needs to focus more on the holistic approach instead of piecemeal one.
Participant_A6	- high cost of internet access and reliable infrastructure
How comfortable and confident are you to teach online classes? Please give details.	
Participant_L3	- I believe I will be able to but will need some type of coaching/mentoring from an academic who has carried out online classes before.
Participant_L5	- I feel I need to have more training
Participant_L6	- I have mainly been involved in face to face teaching up to now. The necessary initiatives to use the existing online platform were not provided. Contact hours given was significantly reduced in the online mode therefore we have to conduct more lectures. I will be happy to teach online classes as this may allow me to save time for more research. We need to have a system in place that allows us to meet our teaching goals and at the same time allow students to get the best of the class. The online platform must be reliable and both lecturers and students should feel that they are getting the best out of the it as they would in face to face.
Participant_L7	- For some modules that are mainly theoretical, these can be easily ported to the online platform. But for modules that is practical oriented, then it will be tough. For e.g. How do we assess lab works of student, how to we make them do presentations which is an important evaluation technique?
Participant_L8	- Fair, depends on means available
Participant_L9	- Very confident. We need to adopt new technologies and believe that it will make teaching and learning better for us as lecturers and especially for our students. This is the way forward, but we need to have the willingness to give it a try.
Participant_L10	- I have already had training sessions on how to work with Moodle. However, more training will be required to be able to start teaching online
Participant_L11	- I am a recognised expert in elearning internationally. I have been teaching all my classes practically online since 2007.

Participant_L12	- I am pretty comfortable and confident as it is more than 10 years than I am in the field. I myself did my masters in Educational Technologies fully online and I now apply the skills developed in my professional practice.
Participant_L13	- If all logistics are available and the software allows for easy and efficient creation/update of contents, then I would be comfortable and confident.
Participant_L15	- So far, I haven't teach online classes but I monitor students' work progress via e-mail. But I wished there were an adequate system to do the same. During my doctoral studies, research progress was monitored via an online system. This was effective for both supervisor and student. All changes and improvements and step by step process were recorded throughout 4years and available instantly at anytime. Further, wherever we were around the globe, we could have access.
Participant_L16	- Online classes are definitely different from F2F classes in many aspects. With the correct tools, training, and financial resources, it is totally do-able.
Participant_L17	- I am comfortable to teach online. I will need to make sure I communicate with my students regularly to ensure that they are comfortable with their online classes. Feedback will be key especially at the beginning.
Participant_L20	- I am quite comfortable and confident to teach online classes since as a lecturer, I have the assistance of some people who are specialized in setting up platforms for E-learning to take place. Our job becomes easier in this sense, since any technical problems are dealt by the experts.
What do you think are the barriers for Mauritian Lecturers to be E-learning ready?	
Participant_L1	- Reduce workload - Lecturers need to be trained to prepare interactive content using appropriate tools
Participant_L2	- Lack of training and maybe insufficient exposure - Infrastructure could also be an issue in some institutions.
Participant_L4	- Training of lecturers to produce materials suitable for E-learning
Participant_L5	- Lack of training, and facilities including the relevant infrastructure.
Participant_L6	- Most lecturers will be willing to move to E-learning if the necessary incentives are given. E.g. reduced workload. - Also, knowledge of necessary platforms is a limiting factor. Lecturers should be trained to use the platforms.
Participant_L8	- Lack of infrastructure
Participant_L10	- Appropriate infrastructure and Internet connectivity

Participant_L12	- Mauritian Lecturers would need to be trained to use the platform and also get training in e-tutoring. They are perhaps not well acquainted to technologies. They prefer may be to meet students for 1-2 hours in a lecture instead of having to respond online.
Participant_L13	- Maybe a short training would be required
Participant_L14	- The main barriers are training, financial incentives and recognition. AS mentioned earlier the absence of an ODL framework at the level of the higher education authority engenders a mess and contributions towards elearning is not yet a KPI in academic staff career path.
Participant_L15	- Students are not always willing to use system unfamiliar to them. If you force them, they write complaints. The change should be imposed by the administration then it will easier to introduce it to students. But the administration itself work with people having the improper qualifications, therefore they act as barriers to Innovative system.
Participant_L16	- Lack of training for lecturers;
Participant_L17	- I don't think it is an issue for lecturers who are already in IT - as for the others i guess it depends on how at ease they are with the technologies.
Participant_L18	- we do not have access to the right online campus
Participant_L19	- Lack of training and expertise. The bulky curriculum does not cater for E-learning. As product of traditional schools, 'lecturers cannot get out from traditional teachings. They will need to be trained on how to create and adapt content to E-learning.
Participant_L20	- Availability of appropriate resources. Training on E-learning, ethical issues, and how to manipulate technological devices and navigate through technical issues.
Participant_A1	- Lack of willingness to invest from institutions (public or private) - Lack of training for lecturers - Fear of the unknown. Fear of technology
Participant_A2	- finding time to devote to course design
Participant_A5	- Reflections: lecturers need to understand that their role is not diminished with e-learning. On the contrary, their role is redefined and enhanced: they have not only to teach/, but also guide, coach and engage learners to facilitate their learning process.
Participant_A7	- Time can be an issue to adapt to technology use, content preparation etc.
Do you think Mauritian students can collaborate to their learning or rather they can only succeed if they are spoon fed by their lecturers? Please give details.	
Participant_L16	- With easy access to technology nowadays, newer generations students are definitely more tech savvy and many would prefer making use of online platforms for many purposes. With the

	convenience of online learning and all the facilities provided by online classroom management systems, including discussion board, I am positive that younger generation students can easily adapt to online learning. In fact, the more they interact with each other online, the more confident they seem to get. - However, government servants and industry often sponsor middle-aged employees for tertiary education. It might be more challenging for that age group to fully benefit from e-learning environments.
Participant_L17	- Unfortunately, since they have almost always been spoon-fed, they tend to require this - but this can be changed since when we study abroad, we are not spoon-fed and we succeed - so it should be possible. But it is not easy.
How comfortable do you think Mauritian students are or will be in the foreseeable future with online classes instead of face to face classes	
Participant_L1	- Low bandwidth and high internet costs are also major issues in the country
Participant_L2	- Again, as mentioned earlier, if guided and trained from an early age, Mauritian students should be quite comfortable.
Participant_L9	- With time, they will have to adopt the changes. It might definitely take some time. Which is why change management should be carefully done.
Participant_L19	- They will be comfortable because most youngsters are computer-literate. So, it is just a matter of training and organizing through proper channel of education. I do think that it is high time to allow new blood in the education sector for us to meet the new educational challenges.
What do you think are the barriers for Mauritian students to be E-learning ready?	
Participant_A1	- Costs. Connection may be expensive. Bandwidth. Connection may be slow.
Participant_A2	- Internet cost is expensive.
Participant_A3	- Internet connectivity
Participant_A4	- Cost related to online learning including Internet costs and equipment costs
Participant_A6	- students are mostly carefree nowadays. many have immature behaviours. they will use the e-learning platform as a scapegoat for their own errors. this is why i believe more important than all for e-learning to succeed is a very good well explained policies for both students, admins, and tutors. student will need to have internet - access and the appropriate electronic equipment to access the elearning may involve a hefty investment for many.

Table Q:7: Interview responses for 'Trust'

How comfortable and confident are you to teach online classes? Please give details.	
Participant_L1	- I have never taken online classes so far
Participant_L2	- Teaching online classes will require work in terms of documenting and scoping the students' learning experience. - Materials such as i-lectures will need to be prepared and I may need to be available for discussion sessions with students during set times. - I am quite confident that this would be an interesting experience.
Participant_L3	- I believe I will be able to but will need some type of coaching/mentoring from an academic who has carried out online classes before.
Participant_L4	- Yes, quite confident. But it is important that the everyone plays their role including lecturers, students, the organisation and the system in place. The E-learning platform must be easy to use for easy acceptance.
Participant_L5	- I feel I need to have more training
Participant_L6	- I have mainly been involved in face to face teaching up to now. The necessary initiatives to use the existing online platform were not provided. Contact hours given was significantly reduced in the online mode therefore we have to conduct more lectures. I will be happy to teach online classes as this may allow me to save time for more research. We need to have a system in place that allows us to meet our teaching goals and at the same time allow students to get the best of the class. The online platform must be reliable and both lecturers and students should feel that they are getting the best out of the it as they would in face to face.
Participant_L7	- For some modules that are mainly theoretical, these can be easily ported to the online platform. But for modules that is practical oriented, then it will be tough. For e.g. How do we assess lab works of student, how to we make them do presentations which is an important evaluation technique?
Participant_L8	- Fair, depends on means available
Participant_L9	- Very confident. We need to adopt new technologies and believe that it will make teaching and learning better for us as lecturers and especially for our students. This is the way forward, but we need to have the willingness to give it a try.

Participant_L10	- I have already had training sessions on how to work with Moodle. However, more training will be required to be able to start teaching online
Participant_L11	- I am a recognised expert in elearning internationally. I have been teaching all my classes practically online since 2007. We need to have the confidence that the system will work. This is what is lacking in Mauritius. We are often scared and not willing to try something different and out of our comfort zone. We want to stick how we have always 'done things'.
Participant_L12	- I am pretty comfortable and confident as it is more than 10 years than I am in the field. I myself did my masters in Educational Technologies fully online and I now apply the skills developed in my professional practice. The key is to communicate clearly with your class and provide timely feedback.
Participant_L13	- If all logistics are available and the software allows for easy and efficient creation/update of contents, then I would be comfortable and confident. Lecturers and students will eventually have to be confident that online is the way forward.
Participant_L14	- I am confident but not comfortable as it's too much screen focused. Although body language can be seen through a web cam, personally it's difficult to convey to lecture without eye contact and in a virtual environment.
Participant_L15	- So far, I haven't teach online classes but I monitor students' work progress via e-mail. But I wished there were an adequate system to do the same. During my doctoral studies, research progress was monitored via an online system. This was effective for both supervisor and student. All changes and improvements and step by step process were recorded throughout 4years and available instantly at anytime. Further, wherever we were around the globe, we could have access.
Participant_L16	- Online classes are definitely different from F2F classes in many aspects. With the correct tools, training, and financial resources, it is totally do-able.
Participant_L17	- I am comfortable to teach online. I will need to make sure I communicate with my students regularly to ensure that they are comfortable with their online classes. Feedback will be key especially at the beginning.
Participant_L18	- I can say that i am experienced as a student and now as a tutor in completing online courses.
Participant_L19	- Online classes have been restricted only in the participation in online forums with my students in context with feedback after correction of an assignment.
Participant_L20	- I am quite comfortable and confident to teach online classes since as a lecturer, I have the assistance of some people who are specialized in setting up platforms for E-learning to

	take place. Our job becomes easier in this sense, since any technical problems are dealt by the experts.
What do you think are the barriers for Mauritian students to be E-learning ready?	
Participant_A7	- Students might need time to adjust as they are too used to classroom environments. They will need to trust that the online learning environment is meeting their educational needs as face to face classes are.
How important do you think trust in the system security and reliability, trust between students and lecturers and trust between students are in the E-learning environment?	
Participant_L1	- Very important. Trust in the system is crucial and trust between students and lecturers usually exist as there is no choice. Trust between students, not sure. It is not as important as the other 2.
Participant_L2	- Very important. Mauritians are not too familiar with E-learning and trust in the system and collaboration with each other is needed to facilitate this transition
Participant_L3	- Trust in the system is important
Participant_L4	- Important.
Participant_L5	- Students trusting each other can be a bit hard because of the competitive nature of the system. However, if the system is secure and reliable and the lecturers support their students, then that should be enough.
Participant_L6	- Very important. Trust in the system as well as trusting each other is essential for E-learning to work in Mauritius.
Participant_L7	- Important. A trustworthy system supporting the needs of the students and the lecturers is the only way to get E-learning acceptance at the university level. Staff should also be trustworthy, but there is no fair play.
Participant_L8	- Important. Especially the system security and reliability
Participant_L9	- Important.
Participant_L10	- E-learning requires a lot of discipline. Mauritian students are too familiar with the culture of spoon-feeding. They will need to learn to start to collaborate more with each other for their learning.
Participant_L11	- The system must be reliable and secure for sure. Students must trust their lecturers in the E-learning environment as it is different from the classroom settings. There should be regular communication to ensure that this trust is maintained. Students can trust each other to learn to adapt to the E-learning environment.

Participant_L12	- Very important. Everyone using the system, not just lecturers and students should be able to trust it. It should have all the required functions to support proper learning, just like the classrooms.
Participant_L13	- The system should be secure and reliable. Trust between students and lecturers is important. Trust between students needs to be there for collaboration and teamwork. Otherwise, not all team members will benefit from the teamwork the same way.
Participant_L14	- Absolutely critical. The E-learning environment requires students to be autonomous learners. For this to happen, the system needs to be able to support students' needs and at the same time, the lecturers need to be able to facilitate students' learning. The E-learning environment can be daunting for newcomers and trust each other through collaboration and discussion can assist with the journey.
Participant_L15	- Very important. All of them
Participant_L16	- The E-learning system needs to be reliable and secure, otherwise, lecturers and students will stick with face to face classes.
Participant_L17	- Important. Lecturers need to support their students to build that trust.
Participant_L18	- Very Important. Students may not trust each other straight away due to the competitive nature of the Mauritian system. But with online discussions and forums, they can collaborate more and the trust can be gradually built.
Participant_L19	- Critical. Trust in the system and in its users are pre-requisites for E-learning success.
Participant_L20	- Very important. We as lecturers need to ensure we get our students to trust the system and the learning environment, otherwise it won't work. Mauritian students are familiar with face to face classes and will need that trust to build the confidence in E-learning. Trust between students can be cultivated through online discussions and forums etc. The lecturers should also lead by example and collaborate with other colleagues to foster this atmosphere of trust.
Participant_A1	- Very important. The system must be very reliable. Otherwise, lecturers and students will complain.
Participant_A2	- Very important. We can already see that when students trust the system, they are more active online.
Participant_A3	- Very important. Because in our course, students need to be independent learners. The system must be able to assist them in their learning.
Participant_A4	- All of them are important for E-learning to work as it should be.

Participant_A5	- Very important, as E-learning will depend on how well the E-learning portal is to help students and lecturers.
Participant_A6	- The system must support independent learners are at the university level, students should not be spoon-fed. Lecturers should learn to collaborate and trust each other instead of competing with each other.
Participant_A7	- The lecturers need to be supportive for students to feel comfortable in the E-learning environment. Then they can collaborate more. The system must be reliable and secure.

Table Q:8: Interview responses for 'Mindset and Cultural Shift'

What are the challenges you think exist in the current face to face classes that E-learning can improve/overcome?	
Participant_L4	- In Mauritius, the concept of E-learning is making lecture notes available to students online. Materials like videos and online quizzes or tests must be created for students. The concept of E-learning is not well understood in Mauritius
Participant _L15	- No more spoon feeding - More responsibility on students' side
Participant _L19	- With e-learning authentic tasks are performed and this led towards independent learners.
Do you think E-learning works or will work in Mauritius? Please give details.	
Participant _L1	- Currently, E-learning is not working in Mauritius as there is no one who is really using it in the way it is meant to be used. - Courses who are given online are not given the same value by people and people somehow think that online courses should be free - I don't think e-learning will work in Mauritius in the foreseeable future.
Participant _L2	- I think Mauritius still require a blend of both e-learning platforms and face to face contact. E-learning requires a culture of self-reflection which has not yet been adopted by Mauritians. It also requires more self-discipline which could be an issue for younger students.
Participant_L3	- I believe it will be difficult to implement as students are still very much under parent's influence, who still believe in the traditional classroom setting.
Participant_L7	- Yes, it will work. With the setup of distance learning university, more students are going for work and study combination. And very often, they prefer to secure a job early so that when they graduate, they have work experience already and are financially independent.

Participant_L10	- Yes e-learning will work in Mauritius as the cost is lower and students can learn and work at the same time
Participant_L11	- Yes, it works - for the past decade this is what we have been doing.
Participant_L12	- Will it work in Mauritius or does it work??? well I think it depends on several factors such as proper internet facilities, excellent bandwidth, access and the willingness to be autonomous learners.
Participant_L14	- As a matter of fact, the trend for the adoption of ODL mode is on the rise in Mauritius for multiple reasons that suit them. However, the quality of the output is not satisfactory if we look at the preferences of the employers, public as well as private.
Participant_L15	- If universities dare to put adequate system and encourage to change the mindset, E-learning will work.
Participant_L16	- E-learning can eventually work with proper training of instructors to help prepare them to become effective online instructors. It might be more challenging to convince lecturers with old-school mentality who do not believe in online education.
Participant_L17	- Yes, it can work but for a category of people. It will not work for quite a few students since they will have to do independent learning - which requires more maturity and ability to manage one's time - not always easy for some students.
Participant_L18	- There is no true e-learning in Mauritius. Support of ICT is given only
Participant_A5	- E-learning has definitely made its way in Mauritius at different levels within the education sector and it is playing an innovative role in educational design and delivery. Example: Sankore project and interactive whiteboard at primary level; free tablets to students at secondary level; and of course, modules and even whole programmes being offered fully online (Moodle) at our university. However, mentality has to change to fully adopt innovative and creative pedagogical approaches.
Participant_A7	- Yes, students are keen to use technology. Some lecturers might need persuasion to start E-learning courses because they are too familiar with face to face classes only.
What do you think are the barriers to make Mauritius E-learning ready?	
Participant_L2	- The Mauritian education system does not prepare students to be sufficiently independent and reflective.
Participant_L3	- Parents' traditional thinking.
Participant_L7	- Mindset of the people who are used to traditional delivery methods and are afraid of changes because it is unknown.

Participant_L11	- A change in mindset and culture from students who rely on spoon feeding and exams. - Poor leadership at organisational level as they understand practically nothing at top management level - Poorly competent regulatory authority
Participant_L12	- Secondary School does not prepare our students to be autonomous learners and when one embarks on an e-learning programme, they have to be fully prepared to have a discipline approach to work, have a sharing culture
Participant_L13	- Students' motivation
Participant_L14	- absence of an e-learning framework at the regulatory body for higher education. The institution and government bodies need to work together to establish a proper regulatory body to support E-learning and provide the necessary support at all levels (policies, infrastructure, training, financial investments, recruitment of E-learning experts and educational technologies). Otherwise, we won’t progress in this direction at the pace we need to. - change in mindset - deeper recognition of ODL programmes
Participant_L15	- Spoon feeding - Political implications - Conventional administrators who are not opened to innovation
Participant_L16	- The misconceptions that people normally associate with e-learning can be a barrier to e-learning in Mauritius, for instance, that students need to be tech savvy, that online learning doesn't have any kind of support and interaction with the instructor, that online learning isn't taken seriously since there is no defined schedule and learners can study at any time. - In addition, creating online courses need time and money. It is an investment that has to be made and the resources have to be made available for this purpose.
Participant_L17	- Young people in Mauritius not always mature enough to learn independently and manage their time.
Participant_L18	- The small island and the culture of spoon feeding
Participant_L19	- Lecturers are not willing to get out of their comfort zone in context with traditional teaching. - With a bulky curriculum, this defeat the purpose of teachers to concentrate in significant use of technology, but instead it is exams-focused only

Participant_L20	- Mauritians still hold the belief that education entails whiteboard, chairs, table. People's current mindset can be a barrier. - No such investment in E-learning.
Participant_A1	- Cultural. The new generation is quickly embracing change but we still lag behind most developed countries. - Political. Prices are dependent on government policies.
Participant_A2	- cultural barriers and attitude (need to move from spoon-feeding to autonomy)
Participant_A4	- The mindset of the people is the biggest barrier to make Mauritius E-learning ready. E-Learning is representing the same traditional book-like content in a better way. There are people who still thinks that E-Learning is meant for students who are taking courses outside the country.
Participant_A7	- Both students and lecturers are too classrooms oriented.
How comfortable and confident are you to teach online classes? Please give details.	
Participant_L1	- I have never taken online classes so far
Participant_L2	- Teaching online classes will require work in terms of documenting and scoping the students' learning experience. - Materials such as i-lectures will need to be prepared and I may need to be available for discussion sessions with students during set times. - I am quite confident that this would be an interesting experience.
Participant_L3	- I believe I will be able to but will need some type of coaching/mentoring from an academic who has carried out online classes before.
Participant_L9	- We need to adopt new technologies and believe that it will make teaching and learning better for us as lecturers and especially for our students. This is the way forward, but we need to have the willingness to give it a try.
Participant_L14	- I am confident but not comfortable as it's too much screen focused. Although body language can be seen through a web cam, personally it's difficult to convey to lecture without eye contact and in a virtual environment.
What do you think are the barriers for Mauritian Lecturers to be E-learning ready?	
Participant_L2	- Mindset – resistance to change (I have always done it in a certain way, why should I change?)
Participant_L3	- Many older lecturers may still be less accustomed to using IT in the classrooms
Participant_L6	- Most lecturers will be willing to move to E-learning if the necessary incentives are given. E.g. reduced workload.

Participant_L9	- Readiness to change to a new way of teaching. The mindset I'd say.
Participant_L11	- It's just that they are comfortable with the current system and they don't want to change. They are not aware of the personal benefits that adoption of e-learning could bring to them. They don't want to adopt things that others are better at them in doing.
Participant_L12	- Mauritian Lecturers would need to be trained to use the platform and also get training in e-tutoring. They are perhaps not well acquainted to technologies. They prefer may be to meet students for 1-2 hours in a lecture instead of having to respond online.
Participant_L14	- New generation of Mauritian learners are more keen to lecture online and are actually e-learning ready from a teacher point of view. The main barriers are training, financial incentives and recognition. As mentioned earlier the absence of an ODL framework at the level of the higher education authority engenders a mess and contributions towards elearning is not yet a KPI in academic staff career path.
Participant_L15	- Students are not always willing to use system unfamiliar to them. If you force them, they write complaints. The change should be imposed by the administration then it will easier to introduce it to students. But the administration itself work with people having the improper qualifications, therefore they act as barriers to Innovative system.
Participant_L16	- overcoming the F2F culture which have been prevailing for a very long time
Participant_L19	- The bulky curriculum does not cater for E-learning. As product of traditional schools, 'lecturers cannot get out from traditional teachings.
Participant_L20	- Availability of appropriate resources. Training on E-learning, ethical issues, and how to manipulate technological devices and navigate through technical issues.
Participant_A3	- Many lecturers are reluctant to put their content online. It's just a matter of mindset.
Participant_A4	- Mauritian lecturers have to get over the traditional teaching techniques. One of the biggest barriers is that the teachers do not want to experience new things in their learning way. There are some of the teachers who find it difficult to switch to E-Leaning due to the subject they teach.
Participant_A5	- Reflections: lecturers need to understand that their role is not diminished with e-learning. On the contrary, their role is redefined and enhanced: they have not only to teach/, but also guide, coach and engage learners to facilitate their learning process.
Participant_A6	- old fashioned lecturers will be reluctant to embrace the e-learning as there will be resistance to change
Are you ready as a lecturer to change your role from an active instructor to a collaborator in Learning?	

Participant_L4	- Yes, the students need to be the focus rather than the syllabus. However, students will need time to adjust because they will be expected to take more control of their progress and studies. It might be a challenge for some.
Participant_L12	- Yes, but it could be hard as everyone is used to the traditional class model and students and lecturers will need support to adapt to new ways of teaching and learning
Participant_L13	- Yes, but overtime with a change in mindset.
Participant_L17	- Yes, but this will take time. Most lecturers are used a 2 hr lectures with students taking notes. Students will also need to adapt which might be hard.
Do you think Mauritian students can collaborate to their learning or rather they can only succeed if they are spoon fed by their lecturers? Please give details.	
Participant_L1	- Some students can succeed. Most will not.
Participant_L10	- Mauritian students have been spoon fed since an early age and I strongly believe that at university level, this should not be the case. Independent learning should be encouraged. Mauritian students studying abroad collaborate to their learning, and so there is no reason why students in Mauritius should be spoon fed.
Participant_L11	- Yes, they can but first of all there is a need to shift from an exam based mindset.
Participant_L14	- This is a quite subjective. It depends on the students primary and secondary background, the subject areas, the students grading and many other factors. But what is noticeable is that both at secondary and university levels, there is a very high rate of absenteeism, students are opting to download all course materials and to learn on their own at home or with peers. Whether this is a sign that they are doing more collaborative learning or coming to schools and universities is of no use or boring, there is indeed a sociological reason behind this behaviour.
Participant_L15	- Spoon feeding is a big issue in Mauritius. Even at tertiary education level students do not want to do the effort especially at undergraduate level.
Participant_A6	- spoon feeding should be banned practice. the lecturer should be skilled enough to put content which stimulates the minds of the students. the e-learning platform will be simply a tool to do it faster.
How comfortable do you think Mauritian students are or will be in the foreseeable future with online classes instead of face to face classes	

Participant_L17	- I think most students are already quite at ease with online videos and tutorials - so i am positive that slowly things will change and the Mauritian students will be able to follow online courses comfortably.
Participant_L18	- they will be comfortable provided the right approach is used.
Participant_A6	- most Mauritian students are immature and living in a bubble even at 22. these are specially with those students who have never worked before. a student who has work experience at 17 is more likely to be more mature and responsible than one who has never worked and is 22. thus, many students will need face to face interaction more as its difficult for them to learn on their own. if these students follow online classes, they are likely to get low marks. however responsible students will have no such difficulties. the lecturer should devise course strategies to make the students login frequently on the elearning platform.
What do you think are the barriers for Mauritian students to be E-learning ready?	
Participant_A1	- Cultural. Change in the way they are used to learn and be assessed.
Participant_A6	- students are mostly carefree nowadays. many have immature behaviours. they will use the e-learning platform as a scapegoat for their own errors. this is why i believe more important than all for e-learning to succeed is a very good well explained policies for both students, admins, and tutors.
Participant_A7	- Students might need time to adjust as they are too used to classroom environments. They will need to trust that the online learning environment is meeting their educational needs as face to face classes are.
What is your perception on the culture of sharing and collaboration in Mauritian universities?	
Participant_L1	- High achievers do not like to share their knowledge while low achievers like group work with high achievers to get good grades.
Participant_L3	- The education system does not promote teamwork and university students are usually forced into teams because the course assignments require them to.
Participant_L5	- There is no culture of sharing and collaboration in Mauritian universities. Students work together either because they have to as part of the course requirements or because they can benefit being part of a team for good grades.
Participant_L6	- A sharing culture should be the norm at the university level. Mauritius is not there yet.
Participant_L10	- The culture of spoon-feeding is still a reality in our universities. But students should learn to collaborate more and be more independent learners.

Participant_L11	- Some Mauritian students (actually many of them) do not like to collaborate or share their resources and knowledge because they do not want other students to do better than them.
Participant_L13	- Many students do collaborate in their learning. However, I believe most of them are happier when they are spoon fed!
Participant_L15	- No such culture. Spoon-feeding and stiff competition is the culture in Mauritius like I said before.
Participant_L17	- It is possible to establish such a culture in Mauritius. But it will take time as both students and lecturers are not used to such a culture.
Participant_L18	- There is a lot of competition and collaboration and sharing is seen as helping others to perform as good or even better. So many students do like to do so.
Participant_L20	- Lecturers themselves do not like to collaborate with their colleagues because they themselves were not used to teamwork as students. So, they do not necessarily encourage collaboration among students as they themselves often do not perceive its usefulness.
Participant_A5	- Many students do not like to share their knowledge with others as the system is very competitive. But if encouraged, it is possible. This also applies to some lecturers as well.
How important do you think trust in the system security and reliability, trust between students and lecturers and trust between students are in the E-learning environment?	
Participant_L10	- E-learning requires a lot of discipline. Mauritian students are too familiar with the culture of spoon-feeding. They will need to learn to start to collaborate more with each other for their learning.