

Science and Mathematics Education Centre

**The Development and Evaluation of Innovative Use of Information
Technology to Change Behaviour, Motivate and Engage Tertiary
Learners to Improve Learning**

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**This thesis is presented for the degree of
Doctor of Philosophy
of
Curtin University**

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DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university. To the best of my knowledge and belief, this thesis contains no material previously published by any person except where due acknowledgement has been made.

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'Standing on the shoulders of giants' by Sir Isaac Newton, it occurred to me, while writing this passage, is a huge understatement. I am hugely indebted to many as I completed this arduous climb to the summit which, instead of a small mountain, because of a very significant number of supporters, felt like a colossal human pyramid.

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ABBREVIATIONS

BIAG	Business Groups and Interest Groups, Administrators and Government
CD	Compact Disc
CES	Classroom Environment Scale
CLEQ	Cultural Learning Environment Questionnaire
CLES	Constructivist Learning Environment
DNA	Deoxyribonucleic Acid
ERO	Education Review Office
HR	Human Resources
ILTQ	Inventory Learning to Teach Questionnaire
IT	Information Technology
LAN	Local Area Network
LEI	Learning environment questionnaire
MCI	My Classroom Inventory
MOE	Ministry of Education
NZ	New Zealand
NZTE	New Zealand Tertiary Education
QTI	Questionnaire on Teacher Interaction
QTI	Questionnaire on Teacher Interaction
NRSV	New Revised Standard Version
SCC	Supply Chain Concepts
SciAm	Scientific American
SLEI	Science Learning Environment Questionnaire
SPAQ	Learner Perception of Assessment Questionnaire Scales
TI	Technology Immigrants
TN	Technology Natives
TOFLEI	Technology-Rich-Outcomes-Focused Learning Environment Inventory
TOSRA	Test of Science Related Attitudes
USA	United States of America
WIHIC	What Is Happening In This Class

ABSTRACT

Technology proponents like Prensky and others want today's society to believe that technology today is superior and new, but is it really? This thesis highlights ancient technologies compared to technology available today to confirm that sophisticated technology has been around for centuries and have been manipulated by human beings through the ages to fulfil their needs. The New Zealand education sector, however, made structural adjustments to the sector based on technology to usher in the Ministry of Education Information Communication Technology Strategic Framework in 2006-2007.

However, presented in this thesis is compelling evidence that technology alone cannot motivate and engage learners in tertiary study in order to change their behaviour.

The findings of the combination of longitudinal study at a tertiary institution from 2007 to 2009 and face-to-face interviews at companies in 2009 provide clear evidence that technology alone cannot impact on learner or employee behaviour. Human relationships, the need for intergenerational cross pollination of ideas, culture and knowledge are crucial success factors to motivate and engage both employees and learners in learning.

Towards a Strategic Education Model, an open model is developed, which allows for accumulation of knowledge in the classroom and at organizations from both the learners and teacher. This open model allows for incorporation of current knowledge from colleagues, friends, families and experiences gained from field trips, case studies and action observation to further enrich the classroom learning environment and the organizational environment. The highlight of this thesis is the development and description of a Strategic Education Model characterised by the importance of the classroom learning environment, relationship building, connecting and sector wide collaboration.

Two unexpected finds were that, within the participating organizations, technology drastically impacts and intrudes on personal, family and home life and, more importantly, that the face-to-face communication skill is at risk. Both formal and informal meetings, including social events, were consistently scaled down over a number of years to the point that face-to-face meetings are at an absolute minimum and social activities arranged by the organization is virtually non-existent.

CHAPTER 1

INTRODUCTION

Most of all, perhaps, we need intimate knowledge of the past. Not that the past has any magic about it, but because we cannot study the future, and yet need something to set against the present, to remind us that the basic assumptions have been quite different in different periods and that much which seems certain to the uneducated is merely temporary fashionthe scholar has lived in many times and is therefore in some degree immune from the great cataract of nonsense that pours from the press and the microphone of his own age.

C S Lewis

1.1 INTRODUCTION

Is today's generation so radically and markedly different from today's teachers that 'a total disconnect' between teachers and learners is taking place? Should today's teachers and learners be polarized? Prensky (2001a, b) certainly believed that today's learners and teachers are fundamentally and distinctly different and blame technology for it. He proposed a theoretical polarization model, introducing the terms 'Digital Native' and 'Digital Immigrant' to illustrate the 'total disconnect'. The polarization model distinguished between people born around technology, such as computers cell phones, laptops and internet, for their whole lives (Digital Natives) on the one end of the continuum and teachers (Digital Immigrants) who have adopted the technology to some extent later in life on the opposite end of the continuum. The terminology stemmed from the understanding of immigrants and natives as it relates to country of birth.

Prensky attributed the extreme differences between teachers and learners for the demise of education in the USA today. Not only had learners radically changed the way they dress, talked and adorned themselves; the arrival and instant spreading of technology meant that learners today live in a completely different world to their teachers (Prensky, 2001a). Furthermore, Prensky was of the opinion that the neuro pathways of digital natives have changed dramatically, and quoted Perry as his source. Consequently, according to Prensky, a 'disconnect' between teacher and learner had taken place. Can classroom teachers do anything about the polarization and the 'disconnect'? Prensky believed that, not only are

these differences unbridgeable, they are also irreconcilable. With incalculable urgency, Prensky ushered in the concept of *edutainment*, where learners play entertaining video games, including *shoot to kill* games, to learn any subject matter. According to Prensky, *edutainment*, should be used instead of teachers (2001a, b). Furthermore, Prensky advocated for the removal of any words that referred, or even remotely referred to *education* or *lesson*, for example, by *the end of this lesson the learner will be able to....*

In support of the Prensky polarization model, Feeney (2005) accredited him with creating a 'buzz' in the education world. Using the Prensky polarization model as a basis, Feeney added a few more categories to form her own five category model. Furthermore, Feeney developed a simple YES/NO questionnaire (14 short questions) and made it available freely on the internet. The respondent, after answering the short questionnaire, obtains immediate categorised feedback, which helps identify a category of fit (Feeney, 2005).

Since the introduction of Prensky's polarization model, technology, as overarching education and replacing teachers, and the use of Information Communication Technology in education have been widely debated, resulting in a barrage of questions: Should technology and '*edutainment*' overarch education? Is there some value in using technology in education to substitute teaching? Should all teachers subscribe to substituting teaching with technology? To what extent should technology been used in teaching? Do *shoot to kill* games have a place in education and do these games have any impact on the brain? What about previous generations? Are there any differences between the younger and older generations in the past? If so, how are these differences reconciled? Do younger and older generations have the same knowledge base, education levels, wisdom, decision making ability and experience? Is technology and its uses in education a new concept?

1.2 BACKGROUND TO THIS STUDY

The Prensky polarization model, supported by Feeney and others, suggested the removal of teachers and anything that remotely related to or mentioned education, and be replaced with '*edutainment*', including '*shoot to kill*' video games. The idea is that, ushering in 'new sophisticated technology' and the 'removal of the teacher', would transform any poor performing, disinterested learner into a vibrant, well performing, interested genius (Prensky 2001a, b). The reality is, unlike what Prensky, Feeney and others would like us to believe,

'sophisticated technology' and technology in education, is not new. Since human existence, and down through the ages, technology has been adapted and submitted to fulfil human need (Brown, 1995). An examination and description of sophisticated technology through history, adapted to fulfil human need, is explained below.

The following sections examine technology through history and are comprised of three parts, namely, sophisticated technology, computers, the strategic technology framework introduction to the New Zealand (NZ) education system and a short summary. Sophisticated technology is explored by way of historical examples of technology: writing, education and the internet, building and aero technology. Computers: new or old delve through history in search of computer discoveries. The ICT strategic framework introduction in NZ provides step-by-step description of structural changes made to the tertiary education sector during the 2000's.

1.2.1. Sophisticated technology: new or old?

Unlike what the post-modernist and trans humanist theorists desire society to believe, this section provides indisputable historical evidence that sophisticated technology has existed since ancient times and that human beings manipulated these technologies to serve them (Brown, 1995). Writings, the alphabet, Khipu, databases, internet, the Pyramids of Giza, the Sakkara Object and a vast number of colossal ocean liners are explained, including their origins and uses.

1.2.1.1. Writings, the alphabet and communication tools

Writing can be traced back to the cradle of civilization. Since ancient times, different technologies have been used for communication. The first writings were on stone and clay tablets (Lerner, 2009); an example is the Ten Commandments, etched on two tablets of stone. When writing on stone, often chisels or sharpened tools were used to carve out words or objects.

The alphabet that we still use today to convey writing has a long history. More than 2,000 years ago the Romans and Greeks accredited Phoenicians, Egyptians, Assyrians, Cretans, and Hebrews with developing the alphabet. As more discoveries were made, the list grew to

include nearly every country in the eastern Mediterranean region (Von Fange, 1984).

According to the Encyclopedia Britannica, humans indeed accessed various communication tools;

from the complex tools, to painted pebbles, beadwork or wampum, rock paintings and carvings, engraved and scratched bone and ivory, pictorial symbols, cuneiform writing on clay tablets, hieroglyphics painted or carved or pressed on various surfaces, drums, and smoke signals (11th ed., 28, p. 852).

1.2.1.2. Khipu or Quipu, databases and the Internet

One such complex communication tool was used by the Inca in Peru. The Inca, according to centuries of scholars who researched and promoted that human beings had evolved, never figured out how to write (Boland, 2007). Yet their civilization is often described as the 'technology marvel' (brainsturbator.com).

Urton, a Harvard anthropologist, dispelled the myth that the Inca never figured out how to write and proved all the centuries of scholars wrong. He started untangling a device of knots, called Khipu or Quipu (Cook, 2007; Boland, 2007), and what he found was absolutely astounding.

This highly sophisticated communication device was used for accounting, to commit critical events to memory and to convey messages around the vast empire of Peru, around 3,000 miles (Von Fange, 1984; enperublog.com, 2007). Not only did the Inca of Peru know how to write, they knew how to store data for thousands of years. The Khipu was used in the same way that modern databases are used (Ascher, 2005; Ascher & Ascher, 1981), proof that human beings, for thousands of years, have had superior intelligence.



Figure 1 *Photograph of a Khipu (emperublog.com)*

The Khipu, meaning simply knot, consisted of a main cord, with thinner cords of different colours. Knots were tied along the cords in a specific way to provide a specific message to a recipient, commit events to memory and rule a 'vast, administratively complex empire' (Romero, New York Times, 2010).



Figure 2 *Khipu knots (wired.com).*

Sadly, during the 17th century, the Spanish, after finding out that the Khipu held records of all their acts during and after their invasion, burnt countless Khipu (Cook, 2007). The wide scale burning of Khipu, however, did not spell the end of this device. The Khipu was later utilized by many other nations, including Australia, Egypt and along the West coast of Africa, China, and the Pacific region from Melanesia to Formosa (Von Fange, 1984).

In stark contrast to what scholars believed and espoused to others for 500 years, the Inca were masters of writing and communication (Boland, 2007; Ascher & Ascher, 1981; Ascher, 2005; Cook, 2007; Von Fange, 1984;). In addition to the Khipu, the Inca is credited for putting

together an amazing type of internet. Their internet system consisted of messenger posts along major roads. 'In one day, Incan runners amped on cocoa leaves could relay news some 150 miles down the network' (Cook, 2007, p. 1).

1.2.1.3. The Pyramids and Leedskalnin's Castle

In the area of building technology, the pyramids, one of the wonders of the ancient world, are amongst the largest structures in the modern world and unequalled by modern technology. The Great Pyramid of Giza is one such structure, built around 2575 BC, centuries before the first Hebrew (Hawass & Lehner, 1994 & 1997). Zajac (1995) described the Great Pyramid of Giza as:

- the world's oldest structure in existence
- unequalled by modern technology
- advanced to the extent that it cannot be duplicated today, even using the latest technologies
- designed and built with Super Natural help
- three times greater than the empire state building, it has a base covering 13.6 acres and
- the structure visible from the moon (Europa.com).



Figure 3 *The Giza Pyramid (with permission from J. Denne: private collection).*

Ryan (2002) concurred with Zajac, describing the pyramids as colossal structures, adding that a solid technology, science and mathematics knowledge equipped the Egyptians to build such structures. Perhaps the most significant contribution describing the incredible Giza pyramid was made by the Astronomer Royal of Scotland, Smyth (1874). Besides the

remarkable structure, size and technology and visibility from the moon, Smyth depicted the incredible positioning of the pyramid of Giza, in a way that no other building could ever be positioned, save demolishing it and producing another building in its place (Smyth, 1874).

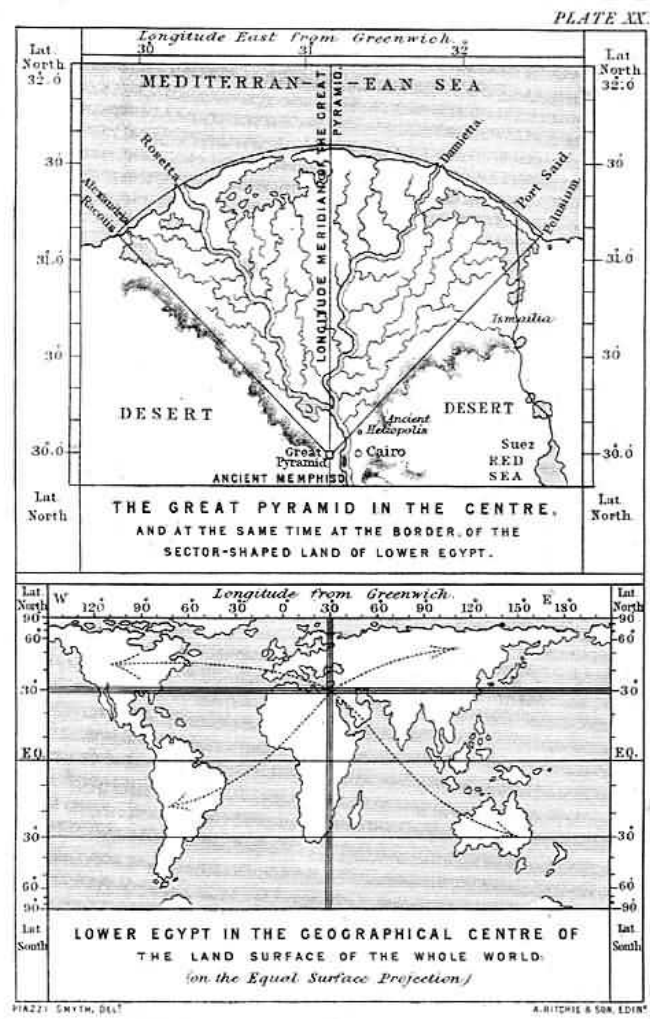


Figure 4 Graphical depiction the Pyramid of Giza by Charles Piazza Smyth (world-mysteries.com).

He provided a graphical depiction with a few words describing the Giza pyramid as positioned 'at the centre of gravity' and 'at the centre of the world', dividing the earth land mass neatly into four equal parts.

According to coralcastle.com and Daczynski (2004) Leedskalnin, the lone builder of the Coral Castle, utilized the secrets of pyramid technology and spent 28 years building his castle that is used as a landmark tourism attraction in Manhattan today. If Leedskalnin is to be believed, no one ever, even with the latest technology available today, had been able to

duplicate his single handed achievement. In addition to the Pyramids, Egypt boasts another first, the Sakkara Object, dating back to 200 BC.

1.2.1.4. The Sakkara Object, Mayan Observatory and Farmhouse in Scotland

According to the National Museum of Egypt, the Sakkara object, discovered in 1898, proved that the earliest flight technology dates back to 200 BC, based on a miniature representation of a bird found in the tomb of Pa-di-Imen.

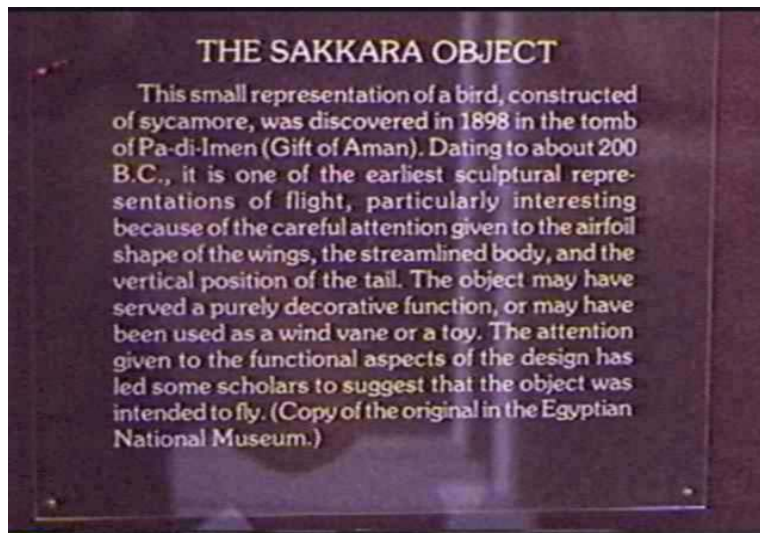


Figure 5 *The Sakkara object (paulzilla.org).*

Although the use of the Sakkara object has still not been clarified, Mercado (1990) recognises the similarity between this object and the airplane models flown during his childhood. The careful attention given to the streamline body, wing shape and the positioning of the tail was of particularly significant, and Mercado makes a connection between this object and other winged deities found in other tombs, including the tomb of Tuk-Ankh-Amen. On *Coast to Coast website*, Cranston, on his visit to the National Egypt museum, had this to say about the Sakkara object:

After looking at the object and reading its information, I walked out of the room, looked up, and immediately noticed "Space Ship One" hanging from the ceiling in the main entrance. That is when it struck me. I grabbed my camera and made photos of Space Ship One, then I went back and took photos of the replica of the Sakkara Object. The "tails" of both craft are identical!!! What are the odds of the first privately funded, non-governmental craft ever to fly into space sharing such an important

design characteristic with one of the first ancient artefacts of a flying craft ever discovered that helped launch the research into the "Ancient Aliens" theory ?!!!! I would love to know why the designers and engineers that built Space Ship One chose that particular tail design, and the performance advantages that particular design gave their craft in high altitude/sub-orbital flight (coasttocoastam.com).

Equally impressive are the feats of the ancient Mayans with 'high degree of intelligence, precision, knowledge and skill' shown in their engineering, architectural and time keeping skills. (Cardno, 1998, creation.com).



Figure 6 *Ruins of Ancient Mayan Astronomy Observatory (creation.com)*

Where did they get the technology to create buildings of observatories that looked very similar to today's observatory? Cardno explained the Mayans only had 'minute errors' in calculations in regards to our solar system, something that today's society could only recently do with the help of technology and computers. A more recent find of a house with living rooms, bedrooms and kitchen in Scotland led archaeologists to conclude that engineers of thousands of years ago were 'as skilled and intelligent as modern man' (Cramb, 2001).

1.2.1.5. Design, Building and Sailing of Ocean Liners

The Associated Press reported on a replica of the Biblical account of Noah’s Ark (www.foxnews.com). This replica of the Ark was 150 cubits long, 30 cubits high and 20 cubits wide, yet five times smaller than the real Noah’s Ark. The hull of Noah’s Ark had superior design and safety features to withstand the winds and waves of the Genesis flood (Hong, Na, Hyun, Hong, Gong, Kang, Suh, Lee & Je, 1994). Furthermore, the following table proved that ancient ships were reliant on sophisticated technology that rapidly advanced over a few centuries (Pierce, 2000). All these Ocean Liners were designed not just as models, but designed and built to successfully sail the indomitable oceans, ranging in size from a double banked gallery up to forty banks, under the authority of some of the mighty men of the ancient world.

Table 1

Vessels in the writings Of Pliny The Elder (Ad 23–79). (creation.com)

Vessel	Inventor	Authority	Approx. Time
Double-banked galley	The Erythraeans	Damastes	7th C. bc
Trireme (three banks of oars)	Aminocles of Corinth	Thucydides	6th C. bc
Quadrirème (four banks)	The Carthaginians	Aristotle	5th C. bc
Quinquerème (five)	The Salaminians	Mnesigiton	4th C. bc
Galleys with six banks of oars	The Syracusans	Xenagoras	4th C. bc
Up to ten banks	Alexander the Great	Mnesigiton	4th C. bc
Up to twelve banks	Ptolemy Soter	Philostephanus	3rd C. bc
Up to fifteen banks	Demetrius, son of Antigonus	Philostephanus	3rd C. bc
Up to thirty banks	Ptolemy Philadelphus	Philostephanus	3rd C. bc
Up to forty banks	Ptolemy Philopator, surname Tryphon	Philostephanus	3rd C. bc

1.2.1.6. Other Sophisticated Technology

Countless other significant discoveries have been made in the past pointing to the fact that sophisticated technology has been in existence throughout history (Cremo & Thompson, 1996.). The evidences are clearly documented: ancient observatories, canals, complex towers, high technology artefacts and even cities (Corliss, 2001, 2003) the existence of King Solomon’s temple described in detail in the Holy Bible and the well-constructed aqueducts from Rome and Greece (Schram, 2012) cannot be ignored. Other documented discoveries are of ancient skull surgery, sophisticated bone tools, modern clothing, including coloured cotton, Leonardo Da Vinci’s well known drawings of objects of flight, objects of flight

depicted in the Hindu sacred writings, high technology discoveries including ancient music instruments, scientific instruments and calculating devices.

1.2.1.7. Technocracy during the Depression Era

Contrary to what some scholars say, pre-occupation with technology as indomitable in this era is not new. Smith (2011) discussed the *Technocracy* social movement, a political party that was active in the USA. During 1930's the *Technocracy* social movement replaced politicians with scientists and engineers as they firmly believed, in line with Prenskey's thinking, that technology and science was the main core around which everything evolved. Furthermore, that technology and science was the answer to every problem. The *Technocracy* social movement was headed by Howard Scott, a firm supporter of Thorstein Veblen and Darwinism (Hodgson, 2003). This political party disappeared soon after the Second World War, leaving untold destruction in its wake (Argyle, 2007).

1.2.2. Computers: New or Old?

Computers have been introduced as one of the most recent technological advances, but are computers really new? In search of an answer, history may yet again shed some light. Archaeologists for centuries now have produced artefacts and historians have written history books showing the development, both through the ages and at different time frames through the ages.

1.2.2.1. The Ancient Greek Computer: Antikythera

In 2008, CBC news reported on a find that stunned and surprised today's scientists and technology world. The Scientific American Magazine (SciAm), popular for publishing the latest news and features on science issues that matter including earth, environment, and space first published two ground breaking articles by De Price (1959) on the Greek computer: *An Ancient Greek Computer'* and *On the Origin of Clockwork, Perpetual Motion Devices, and the Compass*.



Figure 7 *A fragment of the Antikythera discovery: Ancient Greek computer (Wikipedia.com).*

About the *Ancient Greek computer* he wrote:

In 1901 divers working off the isle of Antikythera found the remains of a clocklike mechanism 2,000 years old. The mechanism now appears to have been a device for calculating the motions of stars and plane..... Corroded and crumbling from 2,000 years under the sea, its dials, gear wheels and inscribed plates present the historian with a tantalizing problem. Because of them we may have to revise many of our estimates of Greek science. By studying them we may find vital clues to the true origins of that high scientific technology which hitherto has seemed peculiar to our modern civilization..... Consisting of a box with dials on the outside and a very complex assembly of gear wheels mounted within, it must have resembled a well-made 18th-century clock. Doors hinged to the box served to protect the dials, and on all available surfaces of box, doors and dials there were long Greek inscriptions describing the operation and construction of the instrument. At least 20 gear wheels of the mechanism have been preserved, including a very sophisticated assembly of gears that were mounted eccentrically on a turntable and probably functioned as a sort of epicyclic or differential, gear-system (pp. 60- 61).

De Price reconstructed the computer in collaboration with the National Scientific Research Centre and Karalos. A video on Youtube showing a proposed reconstructed working model of the Antikythera computer, and the number of years it took to reconstruct the computer provides overwhelming evidence that for thousands of years human beings had the intellect to build advanced computer.



Figure 8 *Reconstructed Computer (SciAm online, December 2009).*

His original work was followed by various articles relating to the Greek computer, including that of Weinberg, Grace, Edwards, Robinson, Throckmorton and Ralph (1965), Samuel (1972), de Price (1974), Neugebauer (1975) and more recently by Freeth (2009). Blaming storms for the discovery of the most important artifact, Freeth believes that, because the vessel carrying the Greek computer sunk, the world today has access to a very important piece of technology. So profound was this discovery that the Economist (2002) noted that there is no comparable instrument of this nature preserved in any another place, and, that, given the known history of science and technology in the Hellenistic age, if it was not for this apparatus, we would have felt it impossible that any gadget of this nature could have existed. This computer is a reminder that the Greeks were very sophisticated people, and their devices show real mathematical ingenuity. The Economist (September 19, 2002) provides a more recent description of the ancient Greek computer:

... was originally housed in a wooden box about the size of a shoebox, with dials on the outside and a complex assembly of bronze gear wheels within. X-ray photographs of the fragments, in which around 30 separate gears can be distinguished, led the late Derek De Price, a science historian at Yale University, to conclude that the device was an astronomical computer capable of predicting the positions of the sun and moon in the zodiac on any given date. A new analysis, though, suggests that the device was cleverer than Price thought, and reinforces the evidence for his theory of an Ancient Greek tradition of complex mechanical technology (pp. 75-76).

1.2.2.2. The Human computer versus the DNA computer

The most fascinating computers, around for about 6 000 years, the human DNA, can store more than a trillion CD's worth of data on less than 1/5th of a teaspoon(Safarti, 2003 & Gitt, 2007). Gitt provided mind-blowing mathematical calculations in an addendum of the density of DNA of a living cell. In *Addendum to Creation magazine article: Calculations* Gitt made this most remarkable statement: "If we are stretching out the material of a pinhead into a wire with the same thin diameter as a DNA molecule it would have a length more than 30 times around the equator" (Gitt, 1997. p.6). Comparatively, scientists have been developing a computer for over a decade, yet it still, after many years of committed effort and significant resources, cannot be used for any practical application, as it is too basic (Benenson, Paz-Elizur, Adar, Keinan, Livneh, Shapiro, 2001).

1.2.3. Structural adjustments and transformation of education in New Zealand

Despite history which shows with abundant clarity that sophisticated technology has been around for thousands of years and the "colossal failure of NZ in a test tube", as Kelsey (converge.org.nz) aptly described the structural adjustments to the NZ economy, the economy test tube exercise was extended to the education sector (Hansard Debates, 2007), with technology and the philosophy of Prensky in the forefront. The tertiary sector experienced a range of structural reforms during the 2000s that was implemented with urgency, because of the technology focus (ASTE, 2001, 2006 & 2007). These structural changes made to education had a direct impact on the classroom learning environment.

1.2.3.1. Changes to the Tertiary Education Commission funding model

The funding model was the first to undergo significant changes. By 2001, the funding model was '*bums on seats*'. The number of learners the institution enrolled determined the amount of funding given by the Tertiary Education Commission (TEC). Thereafter, the contestable funding model was introduced and tertiary institutions became profit focussed. Every tertiary institution had to apply for funding on a project and contestable basis. The TEC included technology organizations that were able to contest for the funding with tertiary institutions. If the project was accepted, the tertiary institution was funded. The project-based contestable funding model led to academics focusing on and being pre-occupied with

research. On the contrary, there was no specific funding allocated for the classroom learning environment.

1.2.3.2. Departments at institutions became cost centres

All departments at the institution where the author worked became cost centres, and every cost centre was to return a profit to the institution. Furthermore, the profit motive of the tertiary institutions resulted in continuous restructuring of courses and departments that did not return the desired profit, despite a clear understanding of different business cycles at these institutions. The most significant impact of the continuous changes was wide-scale job losses throughout the tertiary sector in both the North and South Islands. During the same time, while administrators at tertiary institutes continued wide scale restructuring, redundancies including voluntary redundancies of academic staff occurred while the number of administration staff including managers and directors increased sharply.

1.2.3.3. Pre-occupation with workload policies

At the institution where the author worked, the preoccupation of senior administration, with workload and work load policies for faculty staff, saw teaching periods reduced from 1½ hours to 50 minutes each, severely limiting the amount of time that teachers and learners could spend in the classroom. Any consulting with learners was limited and at times excluded when calculating workload policies.

1.2.3.4. Launch of ICT framework

Technology and the work of Prensky and others were projected as the answer to the sector orchestrated brain drain that now became very apparent in the tertiary sector after significant job losses of teaching staff. The government, represented by the Ministry of Education (MOE) and strongly supported by the TEC, business and interest groups, administrators and government (BIAG) across the tertiary education sector, ushered in the Information Communication Technology (ICT) strategic framework (see Figure 9) in 2006 (MOE, 2006). As it turned out, 2005 and 2006 were very busy years for both the MOE and TEC.

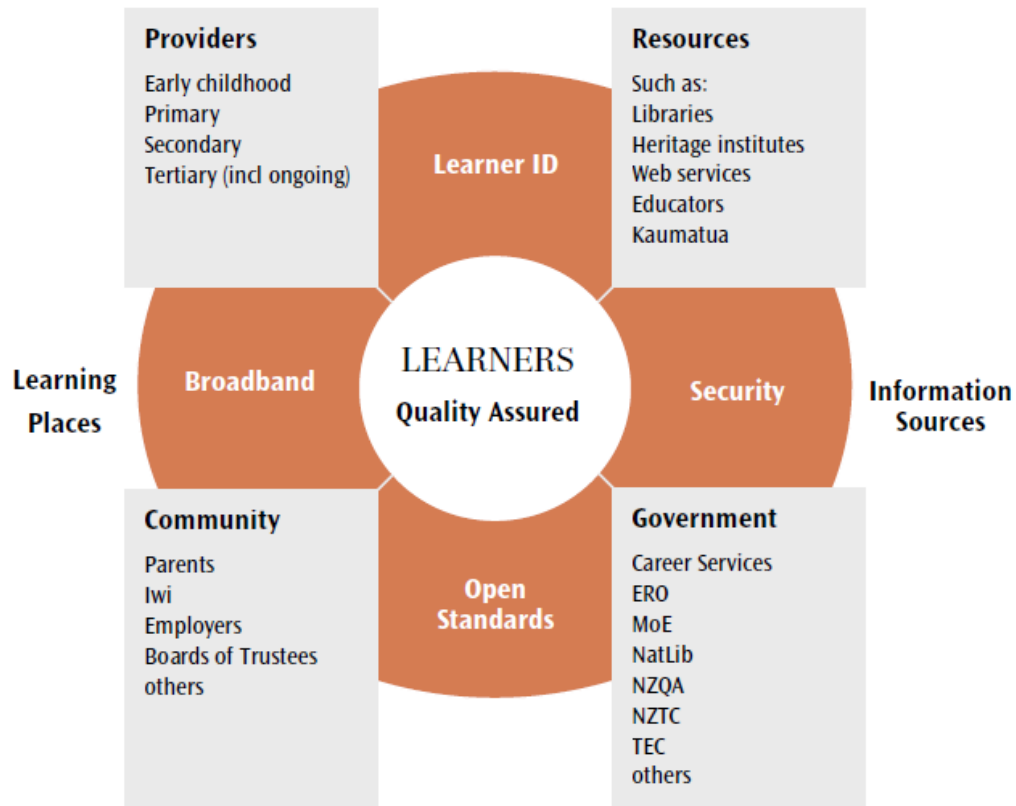


Figure 9 *ICT strategic framework 2006-7 (MOE, 2006, p. 7).*

1.2.3.5. ICT strategic framework removes teacher out of the classroom

The explanation that follows clarifies how the ICT strategic framework removes the teacher out of the classroom and is based on Figure 9. The input and control of BIAG was evidenced by the release of the MOE ICT strategic framework in 2006 that included a model for education from early childhood through to tertiary education (see Figure 9). This model put the word *learner* in a circle in the centre and the words '*quality assured*' beneath it. Nowhere in the ICT strategic framework were the words '*quality assured*', which has now taken an important place in the centre with the learner, defined or explained. Thereafter, another circle is placed around the learner. This circle is split into four parts named security ID, learner ID, broadband and open standards. The teacher is removed from the classroom learning environment and relegated to a role outside the classroom, at the same level as the libraries, heritage institutes, web services and Maori elders (Kaumatua). In addition, the ICT strategic framework vision described learner achievement as being dependent on 'fully connected and supported by the smart use of ICT' (MOE, p .2).

1.2.3.6. Popularization of ICT terminology

The terms *eLearning* and *mLearning* were popularised. Even before the ICT strategy was released by MOE, Victoria University, in partnership with a private company, eLeanz Inc, completed its first joint report (Marshall, 2005). This report was commissioned by the MOE with a substantial grant from the deliberately TEC-established eLearning research fund (educationcounts.govt.nz). The eLearning research fund diverted much needed funding from the classroom learning environment to elsewhere. The report that Marshall completed for the MOE was named the 'Determination of New Zealand Tertiary Institution e-Learning Capability: An Application of an e-Learning Maturity Model (eMM)' (educationcounts.govt.nz). The title created an illusion that eLearning had been around for a very long time through the use of the word *maturity*. Soon thereafter, in 2006, Marshall authored the second MOE-funded research report, which built on the first report, entitled:

E-Learning Maturity Model (Version Two) - New Zealand Tertiary Institution e-Learning Capability: Informing and Guiding e-Learning Architectural Change and Development (educationcounts.govt.nz).

Marshall, in reference to the second report, stated that:

It builds on the first report above by taking the ideas of process capability maturity and using them as a foundation for a form of benchmarking. This is explicitly intended to improve the quality of e-Learning for the benefit of learners, staff and institutions. This further iteration of the model is based on software process maturity models that have been found effective in supporting the transfer of good practice between projects (educationcounts.govt.nz).

The next MOE-funded report version 2.2, entitled '*eLearning Maturity Model process description*' by Marshall (2006), followed, and was 160 pages long.

1.2.3.7. Establishment of Ako Aotearoa

Once the teacher was removed out of the classroom through the ICT strategic framework, and funds were provided to certain universities and ICT companies, Ako Aotearoa, the New

Zealand's National Centre for Tertiary Teaching Excellence was established in 2006 from a \$NZ20 million fund (massey.ac.nz), diverting even more funds away from the classroom. According to the Massey University website, the purpose of Ako Aotearoa was to 'to boost the quality of teaching in all branches of the post-school education sector' (massey.ac.nz). Part of the Ako Aotearoa *value proposition* states: 'Ako Aotearoa leads the drive to establish what counts as good and effective tertiary teaching in Aotearoa' (ako.aotearoa.ac.nz).

More funds were thus continually and intentionally diverted from the classroom learning environment to areas that supported the BIAG model. The term *education* was replaced by terms like *eLearning* and *mLearning*. Words in the title of the reports on *eLearning* and *mLearning* were positioned to portray longevity of technology in education in the Marshall report Version 1, version 2 and version 2.2 as stated before. The title of the Marshall Report version 2.2 followed the version 1 and version 2: '*eLearning Maturity Model process description*'.

1.2.3.8. Centralization of classrooms booking system

At the academic institution where the author worked, the classroom bookings system moved from being controlled by the Schools to being centrally controlled, which impacted directly on any additional periods that students needed or the writing of mid-semester tests. Unless these tests were limited to 50 minutes or the particular subject had been scheduled as a double period at the beginning of the semester, the learners were unable to sit the test during normal class time, without the test being limited to 50 minutes. The next class would be queuing at the door, forcing the test writing learners out of the room. Neither were there any other classrooms available, as these were all pre-booked at the beginning of the semester.

1.2.3.9. Open plan offices for academic staff

Open plan offices for academic staff became a priority and were ushered in with urgency. Without any input from faculty, senior administrators allocated, passed and renovated offices. For the School of Business, during the offices renovation period, there was little attempt made by managers and senior administrators to provide faculty with an alternative to work elsewhere. Once health and safety issues were raised by concerned parties on the

campus, the human resource department (HR) director finally intervened and arranged that faculty be moved off the construction site. After the renovation was complete, faculty could, within limits, choose where they wanted to sit.

1.2.3.10. Purpose-built rooms

According to the plans which accompanied the open plan offices, purpose-built rooms were outfitted adjacent to the open plan office. Initially, staff were informed that these rooms were for faculty who needed privacy to consult with students, concentrate or make and answer telephone calls. After these purpose built rooms were outfitted, the senior administration team added these rooms to the central booking system for their use. As a result, faculty were almost never able to use the rooms. Telephone calls in these open plan offices became everybody's business. Any academic work that needed concentration was done at home. One glass panelled meeting room was set aside for meetings with learners with one round table and four chairs catering for the whole School of Business. One more room was available if the group consisted of more than four. This room was shared with the rest of the administration team of the institution and had to be booked via the central booking system. This meant that the School of Business faculty had to queue in line with the rest of the institution, despite the faculty being told initially that the rooms were for the School of Business.

Furthermore, the cleanliness of faculty desks, book cases and cupboards became an obsession and the weekly role of the senior management team, who would sweep through the office and remove anything off a table, desk, chair or cupboard that they believed was not '*tidy*' to their satisfaction.

1.2.3.11. Performance appraisals: teaching staff versus senior administration staff

Performance appraisals of teaching staff were enforced through the human resources department (HR), without any implementation of the same appraisal system for senior administration staff. In addition, learner evaluations were closely monitored, strictly enforced and carried significant weight as far as the performance of the faculty member was concerned. According to the senior administrative staff, the faculty was serving the learner, therefore the learner needed to evaluate faculty. At the same time, although the senior

administration staff served the teaching staff and often the learners, evaluations of the senior administrative staff were absent.

1.2.3.12. Transfer of Subject outlines and moderation to academic directorate

The next area impacted on was the subject outlines. Where once the different Schools at the institution were responsible for the subject outlines and moderation thereof in the School, it was now shifted to and controlled by the academic directorate. Without any evaluation of the existing or previous course outline, the academic directorate developed a 'new course outline'. No explanation for the new course outline or for the scrapping of the existing course outline was provided. The new course outline was sent for 'comment' to the Schools and thereafter was rushed through the academic senate approval process. Immediate after senate approval, implementation was enforced and supervised by senior administration staff. Although the existing subject outlines were of high and superior quality to the new course outline and standardized per School, these existing outlines were disregarded and the new course outline became the norm.

Furthermore, once the new outlines were implemented, moderation of the subject outlines was transferred from the various Schools at the institution to the academic directorate, stating 'quality assurance' as the reason for this transfer. All these changes from the Schools to academic directorate led to further harassment and bullying of academic staff, followed by illnesses, additional job losses and casualization of the teaching staff. At the same time, the role of the HR department underwent dramatic changes and existed primarily to ensure that litigation against the institution was minimized and that managers and senior administrative staff followed the accepted legal path. Again, funds were diverted from the classroom learning environment to pay solicitors for work on the cases brought against the institution. Most of these cases brought against the institution were settled out of court, further impacting on the available funds for use in the classroom learning environment.

1.2.3.13. Commoditizing of courses

By this time, several organizations and businesses developed *commoditized education packages* for example *first line management* and *Human Resources management*. The tertiary sector institutions then simply bought the packages off these organizations, found a *facilitator* to

present the course and then offered the course to the students. The word *teacher* was subtly replaced by the word *facilitator*. These *commoditized education packages* was installed on platforms like the Modular Object Orientated Dynamic Learning Environment (MOODLE). Once installed, the *facilitator* had no ability to change any information/content or assessments of the course. If the *facilitator* felt that any of changes or updates were necessary, the *facilitator* had to first go through the internal institutional processes to a point, then, once the 'changes' are approved, the *facilitator* had to contact the proprietor of the education package. If the proprietor felt that the changes were not needed, the *facilitator* continued without the changes. If the changes were done, the *facilitator* was unable to claim any *intellectual property rights* as all these rights automatically transferred to the proprietor. The academic freedom of the facilitator was therefore encroached upon. The students would access MOODLE to interact with the *facilitator* and rest of the students, whom they never met. Even if the information technology infrastructure was inadequate, and the students were frustrated and unable to access MOODLE, they had no recourse. At the end of the course, an evaluation sheet was provided (developed by the proprietor). By that time, many of the students who struggled with internet access, MOODLE, and other administrative and academic challenges, including inability to co-construct meaning or contribute to the academic improvement, had *thrown in the towel*. The retention rate of students was thus very poor. Despite the challenges that the students faced and the exceptionally poor retention rate, these education packages continued to be advertised and promoted. Although Hill and Oliver (2008) warned that transforming education into a marketable commodity was a backward step, the transformation was enforced and continued. Hill and Lee (2007) sounded a stern warning of the serious consequences that this transformation held for education, the transformation continued. New Zealanders were transformed from citizens to mere consumers through 'live experiment' on the New Zealand economy (Kelsey 1995, 1999). In the 2000s, that transformation, although a 'colossal failure' (Kelsey, 1995), was now extended to the education sector.

1.2.4. Summary

The Ancient Ocean Liners, Sakkara Object, lone built Leedskalnin's Castle, Giza and other pyramids, Mayan Observatories and time keeping skills, discovery of an ancient fully fledged house in Scotland, Khipu, the incredible human computer and the Ancient Greek Computer provide overwhelming evidence that advanced technology built and manipulated

by intelligent human beings unquestionably has existed throughout history. Not only is there evidence of the existence of these advanced technologies, structures like the pyramids have never been duplicated, despite modern society claims of advanced technology, and today's observatories look very similar to the Ancient Mayan ruins. Technology of today still cannot surpass that of thousands of years ago. Even the DNA computer that has been in development stages for more than a decade cannot equal or surpass the human computer, overwhelming credible evidence that very intelligent human beings manipulated sophisticated technology for thousands of years to fulfil human needs (Brown, 1995).

In NZ, the MOE leaders followed the political leaders who implemented structural reforms to the NZ economy. According to Kelsey (1995), the structural adjustments to the NZ economy, resulting in wide spread experimentation of a live economy, closely resembled the structural adjustment programmes implemented in developing countries. The effects on the NZ economy were impactful, severe and lasting. Despite the significant damage to the economy, the NZ MOE ushered in structural adjustments to the complete education system (early childhood to tertiary) in the form of the Information Communication Technology Strategic Framework (ICTSF) 2006-7.

Instead of ushering in major structural adjustments because of today's technology, could technology be adapted and submitted to fulfil a need in education to motivate and engage learners' learning in higher education?

1.3 RATIONALE FOR THIS STUDY

Prensky (2001a, 2001b) was the first to propose a polarization model of *Digital Natives* and *Digital Immigrants* that lumped together and criticized teachers and then advocated that technology, specifically gaming technology, which include 'shoot to kill' games, replace teachers. The terms digital native and immigrant were based on an analogy that any country's natives and immigrants often differed in terms of religion, language and customs. Prensky (2001) coined different terms including 'net generation', 'digital tourist', but eventually settled on the terms "Digital Native" and "Digital Immigrant".

In support of Prensky lumping all teachers in one category (i.e. digital immigrant), Cuban (2001) found modest differences in computer use based on age, frequency of use, level of

technical experience and gender amongst teachers. Feeney (2005) further extended on the Prensky's polarization model, by adding five more categories.

Feeney's description of Prensky's work as a 'buzz' was evidenced by numerous documented studies that followed, investigating the difference between technology immigrants(TI) and technology natives (TN) and integration issues (Ananthanarayanan, 2004; Arafeh, Levin, Rainie, & Lenhart, 2002; Brooks-Young, 2005; Graham, 2010; McPeeters, 2008; Mongan-Rallis, 2009; Petrina, Dobson & Guo, 2008; Powell, 2007; Prensky, 2006, 2007, 2008, 2010; Toledo, 2007). Where Prensky explained at length the behaviour of *TI* and *TN* and the radical change in learners and the use of different technology tools, Mongan-Rallis explored cross-generational differences and the use of technologies to enhance learning, given the constraints and support in a particular educational environment and Ananthanarayanan, concentrated on a questionnaire targeting the behaviours of each group. While most authors concentrated on the broader impact of TI and TN, Brooks-Young used the base developed thus far to explore integration issues for Catholic School teachers.

Using the Prensky model as a foundation, several other models have been developed. Feeney (2005), in particular, significantly expanded on Prensky model by adding five more categories namely *digital refuse*, *digital refugee*, *digital explorer*, *digital innovator* and *digital addict*. In addition, similar to Ananthanarayanan (2004), who developed a quiz targeting the behaviour of persons in each group, Feeney developed a short quiz to assist individuals identify their particular category of fit. Where previous authors concentrated on models and tests, Cuban (2002), Lor and Britz, (2005), Hiemstra, (2005), Badge, Dawson, Cann, and Scott (2008) and Kim and Rissel (2008), concentrated on the availability of information and information access. To confirm their commitment to freedom of information and assign additional strength to their argument, Lor and Britz, quoted *Article 4* of the *Declaration of Principles* issued at the 2003 Geneva Summit:

We reaffirm, as an essential foundation of the information society, and as outlined in Article 19 of the Universal Declaration of Human Rights, that everyone has the right to freedom of opinion and expression; that this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers. Communication is a fundamental social process, a basic human need and the foundation of all social organization. It is central to the information society. Everyone, everywhere should have the

opportunity to participate and no one should be excluded from the benefits the information society offers (2007, p. 388).

In addition, Cuban, Herring, Ogan, Ahuja, and Robinson (2006), specifically investigated gender and culture of computing, relating it to applied IT education.

Additional studies, specifically pertaining to the use of technology in assessments (Ng'ambi, 2008; Pimental & Omar, 2008; Sainsbury & Walker, 2008), the use of social psychology to motivate online learners (Beenen, Ling, Wang, Chang, Frankowski, Resnick & Kraut, 2004), developing of self –efficacy scales (Cassidy& Eachus, 2002), gender and ethical differences (Byers, 2008; Eccles, 2005), learner interactions (Piezon & Donaldson, 2005) workplace learning (Conference Board of Canada, 2008; Watt, 2008) and participation of all human elements in the education process (Ferrer, Romero, & Albareda, 2005; Osterhold, Rubiano, & Nicol, 2007; Spiegel, 2008) further emphasised the central role that technology concepts now play in education and the workplace.

Documented studies provide proof in line with historical evidence of presence of technology and computers and its uses in education and learning. Regardless of being entrenched in technology, there is no evidence to substantiate that the learning styles of today's young people are markedly different from learning styles observed before (Bennett, Maton & Kervin, 2008). They pointed out that, although the young may do things differently, there are no grounds to consider them alien to teachers. As these findings relate to young people who grew up entrenched with technology, the learners participating in this study form part of this group. Does it mean that learners own and use all technologies or emerging technologies?

Studies conducted by Kennedy, Krause, Judd, Churchward and Gray (2006), Kvavik, Crouse and Morgan (2004) and Oliver and Goerke (2007) found that, despite being entrenched in technology, learners do not own or necessarily use all technologies. Furthermore, the level of skill in using technology for content creation and editing was found to be lower in digital natives than what supporters of the *technology native /immigrant* debate wants researchers, educators and the public to believe.

Should all technologies released to the market, especially in education, be adopted? What level of research into educational technologies should be done prior to adoption? Maddux

and Cummings (2004) provide a stern warning against poorly researched technology, emphasising fads in education that come and go, its exorbitant cost and destruction that it brings to the education sector.

Most of the referred to studies either investigate the disconnect in the classroom, use of information technology and preferences, technology and education, education games, assessments using information technology and participation of humans, with the main thrust of placing technology at the centre of, overarching education, rather than using IT to motivate learners and recognize the firm connection between learners, classroom culture and organizational culture.

Therefore, the aim of this research thesis is to provide knowledge on the extent to which the culture of teachers and learners impact on class and organizational culture, and includes the development and evaluation of innovative methods to engage tertiary learners in learning.

The expected contribution of this study is to provide knowledge on the extent to which the culture of teachers and learners impact on classroom culture, and includes the development and evaluation of innovative methods to engage tertiary learners in learning. Observation, focus groups, a field trip, in-class case study and surveys provide qualitative and quantitative data for this study.

The greater part of literature uses the terms digital natives/technology natives and digital immigrants/technology immigrants interchangeably. For the purpose of this study the terms Technology Immigrants (TI) and Technology Natives (TN) are used.

1.4 AIM OF THE STUDY

This research study aims to contribute to existing literature, addressing the polarization model, learning and classroom culture. In elaborating on this thesis, the arguments are divided into three sections: At its very onset, this thesis provides an explanation of culture, organisational culture, technology and education, and how these terms are linked. In addition, terminology that is inextricably linked to these four concepts is explored.

The thesis then extends this subject in line with contemporary debates, to: first, research whether the technology and the preoccupation with it is altogether new; second, to provide

an analysis and critique of the polarization through history and the polarization of people into two culture groups, namely, Technology Immigrants and Natives; third, to, establish the extent to which the culture impacts on class culture and organizational culture and then; ultimately, determine how this knowledge can be utilized to best motivate benefit the learner.

The specific questions that guided this thesis are:

1. Is technology and pre-occupation with technology altogether new?
2. What differences are there in the way Technology Immigrants (TI) And Technology Natives (TN) impact classroom culture (higher learning) and organizational culture?
3. How can these differences be incorporated to ensure successful use of Information Technology (IT) in the learning process both at educational institutions and organizations?
4. Does the ability to successfully use IT improve the motivation of learners?

1.5 METHODOLOGY

For the purpose of this research, two groups were involved: senior employees at two corporate companies formed the face-to-face sample; learners doing a course on Supply Chain Management in New Zealand form the learner sample. Supply chain management is a first year university course, usually offered during the second semester of the learner's first year in tertiary study. In this research, it is assumed that, if learners and teachers are polarized, the learners' engagement in technology alone will positively impact on their motivation and engagement in the subject matter, and translate to their performance in the particular subject. Hence, in this study, the behaviour of the learners in the supply chain management class was observed, a field trip and case study intentionally and thoughtfully planned, followed by focus group sessions and careful analysis of learner's preferences. Finally, feedback, collation and analysis of the use of existing technology as part of the supply chain management course are presented in this thesis.

The methodology adopted for this thesis is detailed in Chapter Three and summarised here.

1.5.1. Action Observation

The behaviour of learners around technology (in the same technology related subject) was observed during class time for three consecutive years. In 2009, observation of the yearly field trip and observation at participating companies were included.

1.5.2. Field trip

An annual field trip to a local forestry company took place towards the beginning of the course, after learners were introduced to basic terminology used in supply chain management. The purpose of the field trip was to add a practical dimension to supply chain management. Normally, the visit consisted of a visit to the head office, where the head of operations addressed the learners. For 2009, the observations in class and the low average age of the class led to the inclusion of an excursion of the plant with the head office trip. Furthermore, learners studying business administration, a lower level of study, was included in the 2009 field trip. The purpose was to gauge whether learners on degree courses could inspire learners on lower level to aspire to higher levels. The lecturer on the business administration course prepared and briefed the learners prior to the field trip, and was present at the focus group after the field trip.

1.5.3. Face-to-face interviews

Face-to-face interviews were conducted with twelve employees at two corporate companies. As soon as the main threads were established, the information gathered from the face-to-face interviews and a range of self-administered questionnaires were used to develop an online questionnaire.

1.5.4. Focus groups

One focus group was held in 2008 and five focus group sessions were held with learners during 2009. Two focus groups were held with regard to the field trip, one before and one after the field trip. The third focus group after the simulation exercise, the fourth before and a final one after the case study. The purpose of the focus groups was to gauge learner perceptions on the value that the field trip, simulation exercise and case study added to their

existing experience. In addition, during face-to-face interviews at different companies, behaviour towards technology and organizational culture was observed. Two focus groups were held in 2008 followed by development of a questionnaire.

1.5.5. Questionnaire Development and Measurement

Based on the face-to-face interviews at three different corporate companies, further required data for this research were gathered through a self-administered questionnaire. All these participants were supply chain learners during the three year research period (2009). The research questionnaire was divided into three parts. Part A contained demographic questions to capture the profile of learners and their learning styles. Part B contained four technology familiarity and usage questions. Experience on the Supply Chain Management course and questions on the classroom learning environment were included in Part C. There were ten questions (with sub-questions) and two questions were about their entry into tertiary study.

1.5.6. Redevelopment of an existing supply chain simulation game

The in-class observations and the feedback of learners during the focus groups were used to redevelop the supply chain simulation game. The tool was redeveloped from July–December 2009, tested by the 2008 learners in during the development period and refined accordingly in 2010.

1.6 SIGNIFICANCE OF THIS STUDY

This study is significant as most of the initial research and articles investigated for this thesis differentiate between TI and TN on the one hand and on the other hand refers to the different products available to assist in bridging the gap between TN and TI, with the distinct purpose of placing technology in the centre entirely overarching education. There is little or no connection made between the culture of teacher and learner, class culture and the motivation of learners. The significance of this research is that the connection made between the cultural background of the learner and teacher, then connected with class culture and organisational culture, utilising technology as a tool for the exclusive purpose of engaging tertiary learners in study. The practical significance demonstrates that by connecting the learner and the teacher, learners are motivated and engaged in their own education.

THE ORGANIZATION OF THIS THESIS

The remainder of this thesis is organised into six chapters. Chapter 2 surveys the literature to provide a foundation for developing the hypotheses of the study. The dominant themes of the impact of TI and TN on organizational culture are explored along with how these differences have been poorly researched and overstated, placing technology at the centre and as overarching education.

Chapter 3 presents the research questions of the study. I propose three main questions to be answered: (1) Is there a difference in the way TI and TN impact on classroom culture (higher learning) and organisational culture? (2) How can the differences be incorporated to ensure successful use of IT in the learning process both at educational institutions and organisations? (3) Does the ability to successfully use technology motivate learners? In addition, Chapter 3 also outlines the research methodology of the present study, covering the location, selection of sampling methods and variables, data utilization and statistical methods of data analysis.

The heart of this thesis lies in Chapters 4, 5 and 6. Chapter 4 starts answering the research questions by detailing the results of the classroom and companies' action observation and the results of the focus groups. Part of the focus group results was used to redevelop the 1960s *beer game*. Visuals and a description of the comparison of the frames of the *beer game* and the redeveloped game, *supply chain concepts (SCC)*, are in Appendix 7. Chapter 5 completes the answers to the rest of the research questions by presenting the results obtained from the face-to-face interviews and the survey questionnaires. Chapter 6 presents the addition of this new knowledge to the existing body of knowledge, highlighted by the development of a Strategic Education Model (SEM) concludes this thesis.

1.7 CHAPTER SUMMARY

This chapter emphasises the importance of the learning environment. The latest debate on technology and education is discussed and historical evidence provided to form a firm foundation and perspective that technology, often in a very sophisticated form, has been around for centuries. Neither is preoccupation with technology new. The *Technocracy* social movement, with its preoccupation with technology and its disastrous impact on society is

highlighted. Furthermore, the MOE's technology-driven, step-by-step structural adjustments to the NZ education sector in the 2000's are outlined. These structural adjustments are of particular importance, given, as Kelsey (1995) describes, the 'colossal failure' of the structural adjustments brought about while experimenting on the live NZ economy.

The rationale for this study builds on the *technology in education* debate. The aim, research questions and significance of this study are stated, followed by the methodology employed during this study. This chapter closes with a brief summary of the six chapters and provides a basis for the literature review in Chapter 2.

What experience and history teaches us is that people and governments have never learned anything from history, or acted on principles deduced from it.

Georg Wilhelm Friedrich Hegel

CHAPTER 2

LITERATURE REVIEW

What experience and history teaches us is that people and governments have never learned anything from history, or acted on principles deduced from it.

Georg Wilhelm Friedrich Hegel

2.1 INTRODUCTION

A large body of researchers agree that technology should be used as an educational tool. Nonetheless, with abundant clarity, they argue that technology alone does not make a difference to a learner's learning environment (Brown & Czerniewicz, 2009; Bullen, Morgan & Qayyum, 2009, 2010; Czerniewicz & Brown, 2008, 2010). Waldrip & Fisher (1997, 2002, 2007) agree and stress that the culture of both learners and teachers has a significant impact on the classroom learning environment. Napierkowski (2009) built on the Waldrip and Fisher (1997) research and confirmed a connection between cultural and other support for culturally diverse learners, to motivate learners and increase their success.

There are several tools designed to create an effective learning environment, for example, observation, experiments, case studies, field trips and technology. The effectiveness of all these educational tools, including technology, however, depends on how successful it is implemented by the teacher to serve the learner in this important environment (Khine & Fisher, 2001; Waldrip & Fisher, 1997, 2002, 2007).

According to Brown (1995), throughout human existence and all the way down through the ages, technology has been adapted and submitted to serve human needs, which supports the Khine and Fisher (2001) and Waldrip and Fisher (1997, 2002, 2007) emphasis of the need for teachers to adapt their strategies and tools to serve the needs of the learners in the classroom learning environment.

The research described in this study examines how learners can be motivated and engaged in learning by using available tools, including technology tools in the *supply chain management* subject area. In this study, research into the motivation and engagement of

learners in supply chain management relies heavily on the classroom learning environment and how classroom culture can affect attitudes toward subjects and performance in subjects. Research has now extended beyond culture to include the impact of technology on the classroom learning environment (Fisher & Khine, 2006; Aldridge & Fraser, 2003; Khine & Fisher, 2006). The importance of the classroom learning environment forms the cornerstone and lies at the heart of education, evidenced by the sheer amount of attention it attracts from business and interest groups, including administrators and government (BIAG), the corporate environment, scholarly articles and books.

The expected contribution of this study is to add to the body of knowledge that addresses the polarization model and gives special emphasis to connecting the learner and the teacher in the classroom. Furthermore, educational tools, including technology tools are used in the classroom learning environment to motivate and engage learners in learning.

Therefore, at its very onset, this chapter provides first, an explanation of components inextricably linked to the classroom environment, secondly, the classroom learning environment, and thirdly, a brief summary and an introduction to Chapter 3.

Components inextricably linked to the classroom environment are discussed. Various definitions of culture are provided and the Hiebert and Hofstede models are deliberated upon. Culture, as defined by Hiebert and Hofstede, is described in the context of Chinese, Buddhist and Christian history. Thereafter, a deliberation follows on cultural hegemony, pointing out the two extremes in the definitions of culture, including the impacts of cultural hegemony, ethnocentrism in education, organizational culture and herd culture. The link between education and culture and technology is made.

The classroom environment is divided into the demise of education in the USA, Australia, and New Zealand, discussion around the polarization model and the contemporary debates around the different behaviours of technology immigrants (TI) and technology natives (TN). Also included are critical reviews and challenges to the extent to which technology is projected as a central focus that encompasses and dominates all of life, including the classroom learning environment. The literature that connects the learner and the teacher as the heartbeat of the classroom learning environment is explored. The development, validation and use of reliable and measuring tools to analyse this environment follow.

2.2 COMPONENTS LINKED TO THE CLASSROOM LEARNING ENVIRONMENT

The classroom environment is not a vacuous environment. There are two critical components and one indirect component of the classroom environment that determine classroom culture. First: the culture and cultural background of the learner; secondly, the culture and cultural background of the teacher; thirdly, the indirect component is the culture of the school as an organization, in other words, the organizational culture in the school. As the culture of the teacher and learner and the organization is the common denominator and focal point of the classroom learning environment, at its very onset, this section provides an in-depth discussion of culture. This discussion includes the difficulty of arriving at a universal definition of culture and historical examples of the major impact of culture on society, both local and global.

2.2.1. Culture

In everyday talk, culture could refer to the way the rich and elite behave (Glasser, Hiebert, Wagner, & Winter, 1976). This without doubt relates to a 'group' culture, the way in which a certain group behave, and is often seen as good or bad. By referring to the rich and elite, there must be a silent reference to an opposite group, the poor or the non-elite. In his book: *Organizational culture and leadership*, Schein (2004) states the following:

Culture, as a concept has had a long and checkered history. It has been used by the layman as a word to indicate sophistication, as when we say someone is very "cultured". It has been used by anthropologists to refer to the customs and rituals that societies develop over the course of history. In the last several decades, it has been used by some organizational researchers and managers to refer to the climate and practices that organizations develop (p. 7).

Yet the term 'culture' has deeper and more meanings and definitions (Carter, 2006; Glasser et.al., 1976; Hiebert, 1999; Hofstede, 1991; Khine & Fisher 2001; Schein, 2004, Waldrup & Fisher 1997, 2002, 2007). Cohen (2009) concurs with the already mentioned scholars by confirming that 50 years ago, there were already 164 different definitions of culture. Nonetheless, all definitions have the following in common; learnt behaviour and a

traditional, shared manner of operation (which implies 'group' behaviour), passed on from one generation to another. Whether in everyday simplistic talk or through a more academic definition, there is a definite explicit polarization and dichotomy when referring to different cultures. The three dimensional model of Hiebert (1999) and the five principles of Hofstede's model (1991) clearly point toward such polarization and dichotomy.

Hiebert (1999) defined culture as "more or less integrated systems of beliefs, feelings and values, and their associated symbols, patterns of behaviour and products shared by a group of people"(p. 374). Hiebert further identified three dimensions of culture; cognitive, which reveals the 'knowledge shared by the society'; affective, which involves 'attitudes, notions of beauty, taste in food and dress, likes and dislikes, enjoyments and sharing of sorrows; and evaluative, which deals with values, standards by which human relationships are judged, sense of right and wrong, and truth and falsehood.

The Hofstede (1991) dimensions model, that supports the notion of polarization and dichotomy, on the other hand, defines culture as the 'software of the mind' which guides us in our daily interactions. This model brings with it five principles; power, self, gender, predictability and time, and is often used to rate the culture of countries on a scale from 1 to 100. The principle of 'self' includes culture in both individualistic and collective environments. According to the self-dimension principle, in a collective culture, the rights of the group, which include tribal groups, whanau (family) and hapu (extended family), are more important than that of the individual person, the individual and their rights. Waldrup and Fisher (1997) used the Hofstede five-dimension cultural model to develop a questionnaire to test cultural aspects of the classroom environment and made a breakthrough in connecting culture and the classroom environment.

2.2.2. History and Culture

The earliest references to culture as defined by Hiebert and Hofstede can be found in Chinese history, Buddhist history and the Holy Bible. In Chinese history, the importance of dragons showed up by its appearance with royalty during the Tang Dynasty and later with humans. A depiction of dragons, a symbol of power, is synonymous with the Chinese culture and appears on the Chinese flag. Thus, it is used as a central theme during Chinese celebrations, and is depicted in BaiHai Park, a tourist hotspot in Beijing. For Buddhists, re-

incarnation, meditation and nirvana are integral parts of Buddhism culture. Examples in the Holy Bible of how culture was demonstrated are the washing of the feet of visitors (Genesis 18:4), institution of circumcision (Genesis 17), sodomy (Genesis 19: 1-9), intermarriage (Genesis 12:20), sacrifice (Genesis 22:13), mourning and burying of the dead (Genesis 23). Where the emphasis of Buddhism and the Holy Bible is on cultural equality, the Chinese dragon depicts a culture of superiority and in the age of emperors, the dragons were a show of imperial power.

2.2.3. Cultural Hegemony

The cultural superiority demonstrated during the imperial era in China is an illustration of an attitude of domination of one culture over another; a domination of imperial culture over the ordinary Chinese culture. Gramsci, a most frequently cited theorist and cultural critic of the twentieth century, according to Crehan (2002), termed the attitude of domination of one culture over another, 'cultural hegemony'. For cultural hegemony, and therefore for the attitude of cultural domination to prevail, there has to be a submissive culture over which the dominant culture can exercise power.

In support of Gramsci, Carter (2006) equates Hiebert's evaluative dimension of culture, which is concerned with values and standards judgments of human relationships, with Kraft's (2005) understanding of ethnocentrism, an attitude of cultural domination or superiority of over other cultures. In explaining ethnocentrism, Carter acknowledges that the recipe for maintaining superiority is a deep-seated dislike of difference and appraising one's own group as better in every way: spiritually, morally, ethically and more deserving of privileges and resources than others. Often, part of the attitude of domination and resentment is followed by the enforcement of the dominant culture on other cultures.

All definitions of culture carry one similarity, the clear polarization between two extremes: be it the 'unequal power' distribution of the Hofstede model, ethnocentrism of the Kraft and Carter model, or Gramsci's description of cultural hegemony. Based on these models, it appears as though polarization leads to an attitude of cultural domination and enforcement of one culture on another.

2.2.4. Impacts of cultural hegemony

There are numerous documented studies throughout history investigating the attitude of domination and enforcement of one particular culture on other cultures (Smith, 1997; Takino, 1998; Van den Berghe, 1967) and the specific impacts of the enforcement on others (Bandopadhyay, 2008; Callister, 2007; Cunningham, 1998; Foley, 2005 & 2006; Keller, 2006; Openshaw & Rata, 2006; Renwick, 1986; Smith, 1985). Particularly in Australia, New Zealand and North America, majority cultures asserted their superiority over minority cultures with dire consequences for the indigenous people. Survival International (17 March, 2011) vividly depicts the impact of cultural hegemony by the picture below.



Figure 10 *Putumayo-Indians in chains. (Hardenburg©. Used With Permission from Survival International).*

Additionally, Survival International reports the following on their website:

30,000 Amazon Indians were enslaved, tortured, raped and starved in just 12 years during the rubber boom, according to a historic report submitted by Irish investigator Roger Casement, 100 years ago today.

Casement was sent by the British government to investigate crimes committed by British-registered rubber giant, the Peruvian Amazon Company. He found, 'The crimes charged against many men now in the employ of the Peruvian Amazon Company are of the most atrocious kind, including murder, violation, and constant flogging'. Agents of the company rounded up dozens of Indian tribes in the western Amazon to collect wild rubber for the European and American markets. In a few short decades many of the tribes were completely wiped out (survivalinternational.org/news/7092).

Furthermore, Keller (2006) explained how Ota Benga, a Congolese pigmie from Africa, was brought to the USA, displayed in a cage in a zoo next to other animals, with a chimpanzee clinging to his upper body, depicting evolution. Putting a human into a monkey cage shows the rating of Ota Benga. So curious were the people to see this 'evolved creature', that zoo attendance dramatically increased. In the New York Times, Keller wrote the following:

Contrary to common belief, Ota Benga was not simply placed in a cage that second weekend in September and put on display. As Dr. Bradford and Mr. Blume point out, the process was far subtler. Since he was already spending much time inside the Monkey House, where he was free to come and go, it was but a small step to encourage him to hang his hammock in an empty cage and start spending even more time there. It was but another small step to give him his bow and arrows; set up a target and encourage him to start shooting. This was the scene that zoogoers found at the Monkey House on the first day of the Ota Benga 'exhibit' (nytimes.com/2006/08/06/nyregion/thecity/06zoo.html?pagewanted=2).



Figure 11 *Ota Benga pictured with a Chimpanzee in a cage in New York Zoo (wildlife conservation society, nytimes.com).*

Cotter (Wednesday May 31, 2006) links cultural hegemony to Darwin's 'Origin of Species' in the following way:

Ota Benga was a real person, an African pygmy brought to the United States in 1904 and exhibited in a cage at the Bronx Zoo in New York as a kind of living illustration for Darwin's 'Origin of Species'. (www.nytimes.com).

In addition to the Ota Benga case, examples of minority cultures exerting their superiority over majority cultures do exist: one such example is the Afrikaner culture (Van den Berge 1967).

2.2.5. Eugenics

Eugenics, the term meaning the survival of the fittest, is a 'science' developed by Darwin's cousin, Sir Francis Galton in 1883, after the rise of the industrial revolution and an elitist status was given to scientists, doctors, economists and the like for inventions during that time. Grigg (2005) views Eugenics as the death of the defenceless and describes Galton's beginnings and beliefs in the following way:

When his father died that same year, he inherited such a fortune that he never again needed to work for a living.... He believed that talent, character, intellect, etc. were all inherited from one's ancestors, as was also any lack of these qualities. Thus the poor were not hapless victims of their circumstances, but were paupers because they were biologically inferior. This was contrary to the prevailing scientific view that all such qualities were due to environment, i.e. how and where a person was brought up. Galton believed that humans, like animals, could and should be selectively bred (creation.com).

Selden (2006) concurs with Grigg and tracks Eugenics back to Sir Francis Galton in Britain in the early 1880s, Furthermore, Selden provides an historic account of Eugenics including tracing it back to the popularization of Eugenics since its imbedding in the American culture in the 1920s and 1930s, where the financial support for Eugenics came from and the inclusion of Eugenics in the Biology textbooks in America:

Financial support for the popularization of eugenics came both from individuals and foundations in America. In 1906, John Harvey Kellogg created the Race Betterment Foundation in Battle Creek Michigan, which sponsored a series of conferences at its sanitarium in 1914, 1915, and 1928. Beginning in 1910, the Eugenics Record Office propagandized eugenics with financial support from Mrs. E. H. Harriman and the leadership of Charles Davenport and Harry Laughlin (Eugenicsarchive.org).

As with all polarization models, if there is the 'fit', there must be a silent 'unfit'. Bergman (2004) spells out the unfit according to Wells, who converted to Darwinism: Amongst the 'unfit' were Jewish, Black, Brown, off-white and yellow people and the mentally ill, alcoholics and criminals.

According to White (2006), Richard Dawkins, the face of evolution, supports Eugenics. Wieland (2006) raises these interesting points about Richard Dawkins:

Professor Richard Dawkins attacks Christians for 'atrocities', but seeks to revive aspects of Hitler's thinking from which the West has resiled for decades... Dawkins himself now says that certain ideas of eugenics may not be that bad after all. In a letter to the editor of the *Sunday Herald* (Scotland), Dawkins says that, while one would not want to be seen agreeing with Hitler, eugenics can be practical and desirable (creation.com).

Beckwith, an associate director of the J.M Institute of Church-State studies, in praising the work of Weikart (2004), powerfully connects Darwinism and Eugenics:

"Richard Weikart's masterful work offers a compelling case that the eugenics movement, and all the political and social consequences that have flowed from it, would have been unlikely if not for the cultural elite's enthusiastic embracing of the Darwinian account of life, morality, and social institutions. Professor Weikart reminds us, with careful scholarship and circumspect argument, that the truth uttered by Richard Weaver decades ago is indeed a fixed axiom of human institutions: 'ideas have consequences' (csustan.edu/history).

The definitions and the disastrous and deadly consequences that Eugenics and Darwinist thinking and ideas had on humans in Germany, suggest that the Apartheid rule that existed in South Africa, may have fallen under the Eugenics definition. Van Den Berghe (1967) wrote generously about Apartheid, a white minority rule, and how it became firmly entrenched over a relatively short period of time, lasting for over 40 years. The results were tragic: segregation and oppression; political, economic and legal discrimination; social and economic impoverishment; widespread physical, sexual and psychological abuse; circulation of ecstasy to promote drug usage and dependency; and chemical and biological warfare against the majority cultures who were non – white. The end result was wide scale deaths (BBC news, 1999; Boston, 2012, Burgess & Purkitt, 2001). Perhaps Apartheid was in line with the Eugenics definition, supported by Dawkins, of the 'survival of the fittest'.

Eugenics with the *elite* embracing of the *Darwinian account of life* and the most of the ruinous impacts of Apartheid, still clearly visible today and projected as the original culture of the

recipients of this oppression, are possibly the most practical example of Kraft and Carter's ethnocentrism and Gramsci's cultural hegemony.

2.2.6. Cultural Hegemony and Ethnocentrism in Education

Cultural hegemony and ethnocentrism are closely related. Where cultural hegemony, as described above, refers to cultural superiority, ethnocentrism, in Robillard (2008), is defined, according to the Oxford English Dictionary as 'regarding one's own race or ethnic group as of supreme importance' and assumes that the understanding of that group is the only valuable understanding (Carignan, Saunders & Pourdavood, 2005). Cultural hegemony and ethnocentrism in education is often done without thought, as the following example from Lingerfelter and Lingerfelter (2003) suggests.

When a teacher commenced her teaching assignment in Yap, based on the evidence at hand, she believed the learners to be dumb, lazy, and unable to learn or do any work. One day she wrote a list of 'things to do' on the board, together with a timeline, then drew a line through the tasks as learners completed it. She fell ill and when she came back to class after a few days, all the tasks were complete with great precision, which shattered all her previously held paradigms on Yap culture.

In support of Lingerfelter and Lingerfelter, Shockley (2008) confirms and quotes numerous authors who concur with ethnocentrism and cultural hegemony in education. Kester (2008) completed a study in Japan and Kentucky and found that, in supposedly homogenous classroom settings, ethnocentrism remained present.

2.2.7. Organizational Culture

In its simplest form, McNamara (2000) views organizational culture (OC) as the 'personality of an Organisation', the traditional way of doing things in an organisation, which conjures up images of continuity. Pfeffer (2006) substantiates the importance of OC in creating a sustainable competitive advantage. Many organisations may seem similar yet every business has its own unique organisational culture. According to Alvesson and Svingsson (2008), organisational culture, during the 1990s, was seen as the most important ingredient for business success. Schein (2004) confirms the importance of OC and developed a deeper model than that of Pfeffer and McNamara.

Similar to culture and classroom culture having different levels, Schein (2004) developed a three level model to describe organizational culture:

- Artifacts, which relate to the visible organizational structures and processes. According to Schein, this is the level of organizational culture that managers and researchers scrutinize and hurriedly draw conclusions on and used to unequivocally express an organization's value.
- Espoused Values: Strategies, organizational goals and philosophies, often documented and displayed in certain areas within organizations.
- Basic underlying assumptions: Managers and researchers generally use the artefacts level as the most important level to draw conclusions and express and organization's value. Schein, on the other hand, uses the all three levels, and believes management should "influence overt behaviour and also attempt to influence self –conceptions, worldviews, and the feeling of employees." (Krause-Jensen, 2010, p. 58).

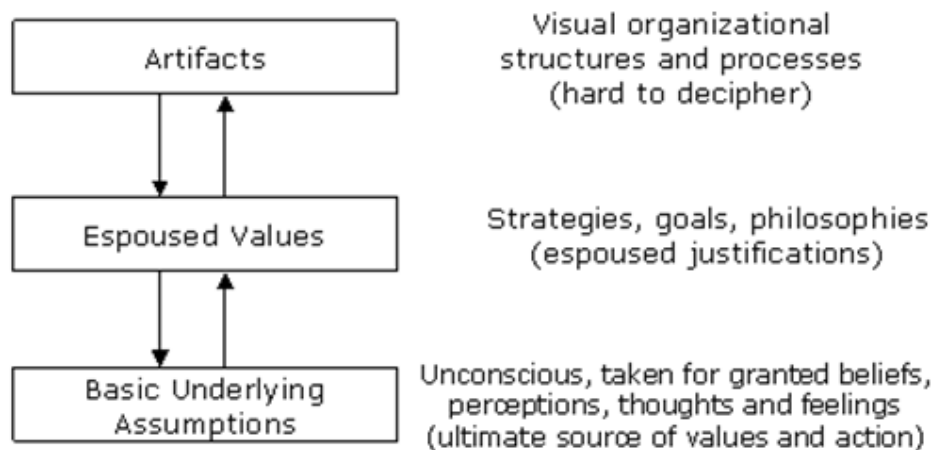


Figure 12 Schein's model of culture (*valuebasedmanagement.net*).

2.2.8. Herd Culture

A further indication that the definition of culture includes polarization is explained by Hajji (2003) citing governmental systems as giving rise to 'herd culture'. Hajji describes herd culture as citizens of a country being treated like cattle, with subsequent loss of individuality and choice, leading to apathy and indifference. The term 'citizens' is subtly and conveniently

changed by the governmental system to 'people' and once firmly entrenched, members of the particular society develop a passive attitude, with a belief that they cannot change, which in turn leads to more and more apathy, and finally to just following commands, as herds do. Kelsey (1999) concurs with Hajji that a subtle change in terminology introduced by the governmental system in New Zealand resulted in loss of individuality and choice. Where Hajji identifies that 'citizens' were changed to 'people', Kelsey vividly describes how New Zealand 'citizens' were transformed into mere 'consumers' by consecutive Labour and National governments from 1984 to 1990, implementing 'economic fundamentalism' and 'structural adjustment policies' never tried anywhere in the world.

In her article: Life in the Economic Test-Tube: New Zealand "experiment" a colossal failure, Kelsey states:

New Zealand is now a deeply divided society. Hundreds of thousands of individuals, their families and communities have endured a decade of unrelenting hardship. The burden fell most heavily on those who already had the least: the Maori, the poor, the sick, women with children, and the unemployed. Their "freedom of choice" was whether to use their scarce resources to buy housing, health and education, or other essentials such as food--and which of these essentials to go without. The government and its affluent supporters talked constantly of the need for stability--but always in terms of the economy, never of people's lives. The strain of constant change fostered uncertainty and insecurity, and made it impossible for people to plan ahead (converge.org.nz).

Both Hajji and Kelsey's explanation conjures up images of control by governments. As education is largely under government control, can education be used by governments as a form of control? Can certain cultures exert domination over others in education?

2.2.9. Education and Culture: The Link

Education and culture are closely connected. The culture of the educational organization, the senior management team, the learners and the teacher all has a direct impact on the classroom, and therefore education. Often the decision makers at the educational organization are the senior management team, and their perspective of decision making, as

described above, is directly connected to their culture. Cultural hegemony and ethnocentrism surface as the senior management team have the power to make decisions, and because they often seem to think, from their view point (ethnocentrism), the decision is correct; they are likely to enforce that decision.

A deeper initial explanation of the word '*education*' is described, followed by the redefinition of the word '*education*'.

Where *Differencebetween.net* describes education as "a process through which a society passes on the knowledge, values and skills from one generation to another" Thomas (2005) describes education as a form of social control in the 12th century, expanding hugely in the 18th century as individuals strived for better jobs during the industrial revolution. A further explanation of how the word '*education*' came about shows that the Romans used the Latin preposition, '*ex*', and combined it with '*ducere*', which means to lead or guide, to form the word '*educare*', which is a verb. Next, the Romans extracted the noun '*educatio*', viewed as the '*drawing out of knowledge*' from someone (Rineberg, 2008). Hence the word education includes guiding or leading and '*passing on*' of values, skills and knowledge.

Webster (2004) stresses how in a postmodernist society a universal definition and purpose of education is even harder, as it must be individually constructed. Hill and Oliver (2008) believe that education is primarily, a '*moral concern for learning*'. In Australia, according to de Lacey (1992), the definition of education changed firstly from general to liberal then to work readiness of learners. The ground-breaking Carrick report concluded that the definition of education had to be broadened to include technical knowledge and expertise (Barrie, 1992; de Lacey, 1992).

In agreement with the changing definition of education in the tertiary sector in Australia, more recently, Hill and Oliver (2008) describe how, in New Zealand, education was transformed into just a marketable commodity, confirming the Kelsey transformative description of New Zealand from '*citizens*' to '*consumers*'. One of the outcomes of the transformation of education was in the area of staff job losses. Extranews reported that at Canterbury University alone, just under 250 staff had to reapply after their jobs were disestablished (2000). This report was in line with the Kelsey (1995) findings of the structural adjustment experiment which resulted in wide scale job losses in New Zealand. Furthermore, the escalation of learner debt, became an important barometer of how

consumerism affected education (Green Party of NZ, 2005), another confirmation of the Kelsey's *citizens transformed to mere consumers*.

Hill and Lee (2008) believe that transforming education into a marketable commodity was a backward step. Hill and Lee (2007) sound a clear warning of the serious consequences that such a transformation holds for education, education scholars and the tertiary education system. To understand a marketable commodity, Moffat (2009) provides insight and explains it as a good which is uniform in quality, having an identical look and that can be produced or sold by different companies at a price, which in turn connects the Hill and Oliver 'marketable commodity' definition of education to the transformation from a 'citizen' to a 'consumer' by Kelsey.

Davis (2007) confirms the connection between education and cultural hegemony by arguing that, rather than being neutral, education was 'shaped by the politics and aspirations' of those who control it (p. 33). Lee and Lee (1992, 1999) place the responsibility of continually choosing what is measurable over what ought to be educational firmly on the policy makers. By quoting the works of several scholars (Freire, 1972; Higginbotham, 1976; O'Hear, 1981; Peters, 1973 & White 1990) Webster (2004) further clarifies the clear connection between culture and education. Peters and Marshall (2004) concur with Davis and Webster that in New Zealand, education was 'undeniably caught up in and a part of culture'.

In Australia, the culture and push of a few parties, namely, Business and Interest Groups, Administrators and Government (BIAG) resulted in major reforms in education that resulted in the removal of artificial barriers between general and vocational education as far back as 1987 (Barrie, 1992; de Lacey, 1992). Regrettably, according to de Lacey and Barrie, academics and educators had very little or no input in any of the reforms. More recently, the use of technology in education led to the subtle introduction of the term electronic learning (*e-learning*), in place of education, and gained momentum (Andrews & Haythornthwaite, 2007; Fancy, 2004; Mersham, 2009). In their editorial on conference paper reviews, Anagnostopoulos and Blelikova (2010) furthered the concept of 'e-learning' and included mobile learning (m-learning) in place of education or at least on a par with education.

Despite the differences in definitions of education and the fact that these definitions change over time, education, and, in particular, formal education, forms a subset of learning (which

is a lifelong process) and is the formalized institutional part of learning (King, Young, Drivere-Richmond, Schrader, 2004) which is strongly connected to culture (Carter, 2006; Davis 2007; Peters & Marshall 2004; Webster, 2004). Although the work produced by BIAG is often poorly researched (Bullen, Morgan & Qayyum, 2009, 2010, 2011; Van Slyke, 2003), the changes made to the New Zealand economy (Kelsey, 1995, 1999) and education without the input from academics and educators (Barrie, 1992; de Lacey, 1992) is very impactful (Davis 2007; Lee & Lee 1992, 1999; Peters & Marshall 2004; Webster, 2003), a backward step (Hill & Oliver 2008) and often lasting.

2.2.3 Technology

While culture refers to a traditional way of doing things and learnt behaviour (Carter, 2006; Glasser, Hiebert, Wagner & Winter, 1976; Hiebert 1999; Hofstede, 1991; Khine & Fisher 2001; Schein, 2004; Waldrup & Fisher, 1997, 2002, 2007), technology, from the dot.com bubble (Brown, 2002) to the management of technology (Davis, 2000; Easton, 1999; Engelbrecht, 2002; Kerr, 2002) is presented as a change agent, which invokes images of constant and forced change (Friedman, 2005; Prensky, 2001a, 2001b, 2010).

In addition to technology being change at a constant, forced rate, Friedman (2005) includes horizontal integration in the change perception of technology, with cross departmental and intercompany collaboration as vital components of constant, forced change. Friedman further claims that billions of people all over the world now have an opportunity to participate and converse with each other, with little or no regard for the digital divide that exists. Romaniello (2005) acknowledges the Friedman understanding of technology and continual change and relates it to the education sector in Spain, in particular Spanish Universities. In addition to the constant change that technology implies, Romaniello points to the importance of a particular area in education, namely organizational culture during the technology implementation phase. As a result, Romaniello developed a conceptual model to highlight the relationship between technology and organisational culture.

Other educational areas that greatly benefitted from educational technologies are distant education (Crosta, 2004) and teacher training (Hammond, Reynolds, & Ingram, 2010). The important question is: is there a link between technology and education, and what research has been done in this regard?

2.2.5. Education and Technology: The Link

With technology being described as changes at a forced, constant rate, Prensky explains how these constant changes polarize teachers and learners (Prensky, 2001a, 2001b, 2010). With the polarization in place, Prensky advocates strongly for the removal of any term referring to education, and replacing it with *edutainment*, which uses video games, including 'shoot to kill' games to educate learners. Prensky then describes how the differences between teachers and learners are 'unbridgeable, and blames the demise of education in the USA on this 'unbridgeable divide'. Prensky and others' preoccupation with technology, and using it as a complete replacement for educators, however, is not new. In the 1930s, the *Technocracy* social movement headed by Howard Scott, replaced politicians with scientists and engineers (Smith 2011), as they believed, like Prensky, that technology can cure anything. Soon after the Second World War, the party disappeared. Where the *Technocracy* social movement focussed on business and politics, Prensky and others focus on education. By focussing on education, Prensky and others establish a clear link between technology and education.

Prensky (2001a, 2001b) uses the concept of change and constant change to describe technology and to usher in the polarization model with TI on one side and technology TN on the other. The main difference between TN and TI, according to Prensky, is the age between learners and teachers. Prensky blames the differences between TN and TI alone for the demise of education in the USA. The TN is described as a generation with different neuro pathways wanting information fast and thriving on instant gratification and rewards; enjoying video games rather than doing any work (Prensky 2001a, 2001b, 2010). The concepts of 'can't go back' for TN and the 'unbridgeable divide' between TN and TI is introduced. In addition to the polarization model, Prensky ushers in the term 'edutainment' to replace teachers, as an introduction to the video games, including 'shoot to kill' games, developed by Prensky to serve TN.

As a strong supporter of the Prensky TI/TN polarization model, Feeney (2005) joined the debate, added more categories to the Prensky model and placed a simplistic yes/no questionnaire on the web to help internet users identify a category of best fit. Prensky and Feeney present the differences between TI and TN as critical, with an urgent change needed for education to continue. Van Slyke (2003) and Bullen, Morgan and Qayyum (2009, 2010, 2011) present a critical review of the evidence supported by the TI/TN polarization model.

Van Slyke agrees that the TI/TN comparison can help educators understand the differences between the learner and the teacher, yet disagrees with Prensky in particular that the solitary reason for the demise of education in the USA is the difference between TI/TN. Both Van Slyke and Bullen et al. condemn change in neuro pathways as stated by Prensky as 'poor research' and 'out of context'. Van Slyke offers the following counter argument:

I find it hard to believe that neurological structures could change to such a dramatic extent from one generation to the next. Yet even if we grant that digital natives think and learn somewhat differently than older generations, we may be doing them a disservice to de-emphasize "legacy" content such as reading, writing, and logical thinking, or to say that the methodologies we have used in the past are no longer relevant. For example, as a technology instructor of pre-service teachers, I found that while most of the younger learners were proficient in using the Web, they could not adequately perform advanced searches or evaluate the validity of the resources they found. Digital immigrants and natives alike are bombarded with vast volumes of information in today's electronic society, which, in my opinion, calls for an even greater emphasis on critical thinking and research skills (technologysource.org).

On their blog dated January 26, 2011, Bullen et al. provides the following information about the poorly conducted educational research on TN/TI:

I thought I had read almost everything that had been written on this issue but I wasn't familiar with the author that Gardner and Aleksejuniene cited to support their claim: Lippincott....What I found was more of the same. No original research but rather the repetition of the unfounded claims made by the usual sources like Prensky, Palfrey & Gasser and Oblinger & Oblinger to support her conclusion that this generation has distinctive learning styles, is fluent with digital technology, and is able to multitask efficiently (netskeptic.com).

Clearly the theory, premise of arguments and claims made by Prensky and supporters of Prensky, purporting 'urgency' and 'educational reform' needs a more human, impartial, unbiased approach underpinned by independent research (Bennett, Maton, & Kervin, 2008). Such research on TI/TN conducted by Hargittal (2010) and Margaryan and Littlejohn (2008) concluded that age is not a determining factor. Three universities in Australia subjected

2,096 learners, aged between 17-26 (Prensky's TN) to a cluster analysis (Kennedy, Judd, Dalgamo & Waycott, 2010). Three major findings were produced:

1. There were clear differences in their pattern of technology use.
2. The individual technology that any given learner uses is difficult to predict.
3. There are a number of variables, other than age, that predict learners' technology experience (p. 10).

Although current proponents of technology want educators and decision makers in education to believe technology is new, history tells a very different story. Archaeologists have continually proven that with the technologies available today, the major historical technological feats would be impossible. Examples date from as far back as 200 BC with the Sakkara object in the National Museum of Egypt (paulzilla.org), the Giza pyramids and its incredible positioning (Hawass & Lehner, 1994, 1997; Zajac 1995; Ryan 2002; Smyth 1877), Noah's ark (Hong, Na, Hyun, Hong, Gong, Kang, Suh, Lee & Je 1990), the unbelievable Mayan observatory (Cardno, 1998; Cramb, 2001) and the sophisticated technology used on ocean liners (Pierce, 2000).

The industrial revolution, after the First World War, used technology to transform the world. The Wright brothers used technology to develop and fly the first known human occupied aircraft. The army used technology to develop pilotless aircraft and air-to-land missiles. In the first trip to the moon, the space ship was fitted with technology. Sir Henry Ford developed the famous model T car using technology. Throughout history, technology has been used and manipulated to reach a goal and serve humans (Brown, 1995).

2.3 THE CLASSROOM LEARNING ENVIRONMENT

The importance of the classroom environment as the heartbeat of education is confirmed by the interests of Business Groups, Interest Groups, Administrators and Government (BIAG) and many researchers. This section explores the demise of the classroom in the USA, Australia and New Zealand, and addresses the polarization model initially introduced by Prensky and researched by others.

2.3.1. Demise of the Classroom Environment in the United States of America

Prensky (2001a, 2001b) outrightly blames technology polarization between teacher and learner for the demise of the classroom environment in the USA. Innumerable research studies and publications confirming the differences between (TI) and (TN) based on age followed Prensky's publication (Frاند, 2000; Howe & Strauss, 2000; Levin & Arafeh, 2002; Oblinger & Oblinger, 2005; Palfrey & Gasser, 2008; Perry, 1996; Prensky, 2001a, 2001b, 2010 & Tapscott, 1999). Weinberger (2005) however, places the blame directly on the interference of BIAG on the education system. Dorman, Fisher and Waldrip (2006) confirms Weinberger's viewpoint and stress how, during the BIAG interference process, teachers have been marginalised and learners completely excluded in learner assessments, an important component of classroom culture.

2.3.2. Demise of the Classroom Environment in Australia and New Zealand

Despite this demise of the education and the classroom learning environment due to the interference of BIAG in the USA, distressingly, according to Dorman et al., 'a similar trend is developing in Australia'(p. 4), confirmed by an ABC television broadcast (2010), and an article in the Sydney Morning Herald (Brown, 2010). In NZ, Kelsey unashamedly points the finger at BIAG for the structural adjustment and colossal failure of the whole NZ economy and stresses that NZ citizens have been turned into mere consumers in the process. Hill and Lee (2007) and Hill and Oliver (2008) lay the blame for the demise of New Zealand education and the 'recasting of education' squarely at the feet of BIAG.

2.3.3. Interference of BIAG in New Zealand – Education System and Health

This interference confirms the desire by the BIAG to continuously and consistently push for control of education and the classroom learning environment. The BIAG have certainly realised the critical nature and importance of the classroom learning environment, and the importance of exercising full control over this key environment of education. No other document spells out the input of BIAG in New Zealand better than the ICT Strategic Framework for Education (Ministry of Education, 2006). This nine page ICT strategic framework sways the educational sector towards BIAG and is a powerful document, as it

covers the 'government goals' for education and the 'education priorities' from early childhood all the way through to tertiary education.

According to this document, the vision of this strategic framework is "to improve learner achievement in an innovative education sector, fully connected and supported by the smart use of ICT" (p. 2). The size of investment in, the purpose and alignment of and the instruction to educational organizations and government agencies regarding the ICT strategic framework is clearly spelt out:

Expenditure in ICT across early childhood, schooling, tertiary institutions, educational organizations and government educational agencies represents a significant investment to the education sector as a whole....The purpose of ICT Strategic Framework for Education is to provide the mechanism to guide and co-ordinate ICT investment towards the government's vision of improved educational outcomes....The framework is aligned with, and supports, the government's E – government and National Digital Strategies and provides the foundation for effective (e)learning practices to be integrated into New Zealand educational practice..... Education organizations and government agencies need to work in partnership if together we are to deliver improved education outcomes, Effective and integrated use of ICT across all parts of the education sector is critical to accomplish this (Ministry of Education, 2006, p. 1).

The author may have, during December 2011, experienced first-hand the '*collaboration*' and '*effective and integrated use*' of ICT and its impact intended for the education sector. On visiting the local hospital of Rotorua, a relatively small town in New Zealand, the researcher noticed the high military style technology driven security that was now, for the first time ever, in place at this small town hospital: most of the hospital reception staff were changed to security personnel; the high technology was immediately visible once one stepped inside the hospital; the hospital would go into automatic 'lock down mode' outside of visiting hours, security cameras were installed throughout the redeveloped wing of the hospital, including down every hallway and in the wards.

Visiting the hospital now felt like visiting a high security prison. None of this information (high military style technology) was alluded to in a speech given by Ryall on the opening of the redevelopment, stage one (\$NZ38 million) of a \$NZ83 million project (29 July, 2011, 11:17 am). Anecdotal evidence suggested that a major part of the redevelopment was awarded to a mayor corporate outside of Rotorua. Further research indicated that Mainzeal, a subsidiary of a multibillion New Zealand company, Richina, with a head office in Auckland, New Zealand, won the contract (nzherald.co.nz, 10 November 2009).

On its website, Richina describes itself as '*Linking China with the World*' (richina.com) – in relation to the Rotorua hospital redevelopment project, there was no reference to high technology military style security on its website, nor on the website of Mainzeal. Mainzeal had a reference of the redevelopment of Rotorua hospital and a picture of it on their website. Still, no reference to high technology military security which is now in place at Rotorua hospital was found. Nor did the NZ Herald newspaper article or the Ryall speech make any reference to it.

The only reference to technology that the Chief Executive Director of Mainzeal, Peter Gomm, made in the newspaper article was with regards to the technical challenges and safety requirements in relation to working in a geothermal area. In addition, on visiting the central kitchen facilities to return some hospital dishes, the kitchen staff informed the author that only dishes are now washed in these well-equipped, large kitchens at the hospital. All meals of patients were prepared in Wellington, the capital of New Zealand, and were flown into Rotorua and the different state hospitals around the country every day. This finding was confirmed by the nurses in charge of the ward and the head security. That BIAG played a significant role in the military style high technology security and that '*sector wide collaboration*' and '*effective integration*' of ICT was being followed, including the cooking of food in the capital of NZ and then air freighted to the different hospitals, was abundantly clear in the health sector. Based on the above research, one can safely assume that the '*sector wide collaboration*' and '*effective integration*' of ICT in the education sector would hold huge financial benefits for BIAG.

“Sector wide collaboration”, according to the ICT Strategic Framework, means:

Sharing strategies, plans, ambitions, aspirations and information openly

- Between and within organizations
- Between New Zealand and appropriate international partners.

Collaboration includes:

- Interagency governance and management of education sector ICT projects
- Establish agency and sector facing hosting of key infrastructure and support
- The development of a virtual education agency (p. 7).

This vision of the ICT Strategic Framework strategy for education follows the proponents of technology model. Although, on paper, it puts the learner in the centre, the implication is that all relationships with human beings in the classroom are removed. In a visual of the ICT Strategic Framework (see Figure 9), the role of the teacher is now cleverly downgraded to a *mere resource outside* the classroom. Casually depicted as ‘educators’, the teacher is now listed second last on a list alongside resources such as libraries, heritage institutions, web services and Kaumatua (Maori elder). Given the number of staff at libraries, heritage institutions, web services and Kaumatua, one can safely assume that the ‘educator’ now has a main focus other than focussing on the learner, in the same way, for example that the Kaumatua is responsible for a whole institution. The same could be said for the librarians: their main functions are not to educate our learners nor focus all their attention on the individual need of every single learner.

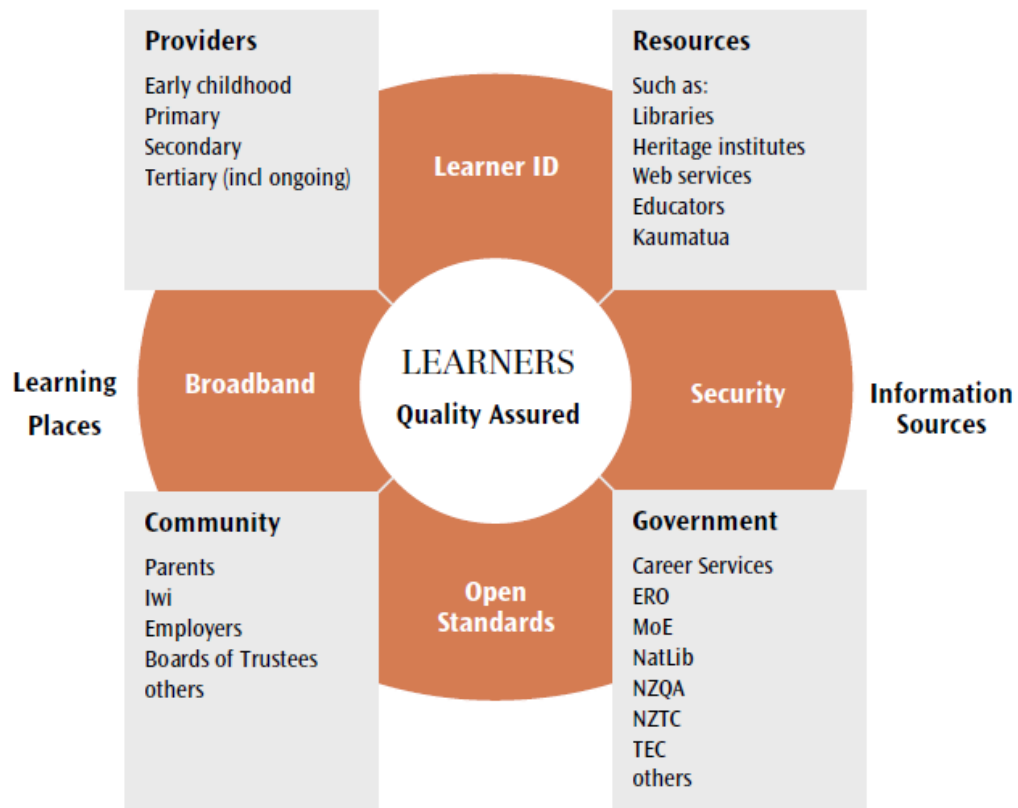


Figure 13 *ICT Strategic Framework 2006-7 (MoE, 2006, p. 7).*

Furthermore, resources like library, heritage institutes web services and Kaumatua, throughout history, have been situated outside the classroom learning environment. A teacher, who historically has always been situated inside the important classroom learning environment, is now relegated to the same resources that were always outside the aforementioned environment. Throughout the ICT Strategic Framework document, there is no explanation of 'Quality Assured' which is placed in the centre with the 'learners'. Kelsey's explanation of New Zealand as 'life in a test tube' (1999) may now have been rolled out to fully encompass the education sector, as this ICT Strategic Framework model has never been tested other than a 'live' rollout to the tertiary education system in New Zealand.

The learner's achievement, according to the ICT Strategic Framework vision, is dependent on being 'fully connected and supported by the smart use of ICT' (p. 2). The learner is skilfully placed inside the learning environment with the words 'quality assured', with broadband, learner ID, security and open standards firmly encircled around it. Whether the 'security' means the same as the 'high technology military style security' now employed at Rotorua hospital is unsure. Learner ID next to security, broadband, open standards appear

to be the most important. Other than words like 'learner centred' and 'sector wide collaboration', there is little explanation of the model. 'Learner centred' is described as

'learner – centred approach means striving to meet learners' differing needs rather than offering a 'one size fits all' system. Individual learner needs must be considered when making decisions about the content, structure, teaching methods, learner activities and support provision associated with any learning activity' (p. 7).

There is nothing in this definition that includes or connects the learner, teacher and other learners. Furthermore, 'One size fits all' is not described. How individual needs will be known without any relationships with the teacher and learners in the classroom are also not addressed. If Prensky and others are to be believed, this decision and a decision 'about the content, structure teaching methods and learner activities 'will be made by the developer of the 'edutainment' games and could include any kind of games, including *shoot to kill* games. Furthermore, the term e-Learning was popularised. During the same time, various paid reports were commissioned by the MOE including the one on e-learning.

The ICT Strategic Framework does specifically mention every system involved in the education of the learner, yet fails to include the teacher and the other learners in the classroom learning environment. Given where the teacher and other learners have been relegated to, and given the historical background of changes made the education sector in Australia (Barrie, 1992; de Lacey, 1992) and NZ (Hill & Oliver, 2008; Hill & Oliver, 2008; Kelsey 1999; Lee & Lee, 1992, 1999), one can safely assume that teachers had minimal, if any input in the ICT Strategic Framework , and that, as history points out, BIAG played a significant role in educational reforms spurred on by the ICT Strategic Framework .

As the culture and cultural background of the learner and teacher form and integral part of the wider society, the push by the BIAG for complete control of the educational environment and therefore the classroom environment is highlighted by de Lacey (1992). By controlling the classroom culture that lies at the very heart of education, and culture forming an integral part of wider society, the BIAG may believe that they can control society. By polarizing the teacher and the learner, the ICT Strategic Framework did not only remove the teacher from the classroom learning environment, but regrettably, subtly introduced (e) learning and removed the word 'education'. The Ministry of Education (MOE) provided a research grant

to the Victoria University. This research grant was paid from a purposely established eLearning research fund. The term E-Learning was popularised in 2006, and Victoria University produced a second research report, which built on a first report. The title of the second report was as follows:

E-Learning Maturity Model (Version Two) - New Zealand Tertiary Institution e-Learning Capability: Informing and Guiding e-Learning Architectural Change and Development (educationcounts.govt.nz).

These reports were funded by the eLearning research fund purposely established by the MOE in New Zealand. This report ushered in benchmarking in this way: 'by taking the ideas of process capability maturity and using them as a foundation for a form of benchmarking' (educationcounts.govt.nz). The removal of any terms relating to education and replacing it with other terminology is thus in line with the thinking of Prensky and others.

2.3.4. Polarization Model: Technology Natives and Technology Immigrants

Although a large body of evidence (Bennett, Maton, & Kervin, 2008; Brown & Czerniewicz, 2009; Bullen, Morgan, & Qayyum, 2009; 2010; Czerniewicz & Brown, 2010; Hargittal, 2010; Jones, Ramanau, Cross & Healing, 2010; Jones, 2010; Kennedy, Krause, Judd, Churchward & Gray, 2008; Pedró 2009; Selwyn, 2008; Van Slyke, 2003) questions and debunks the idea that an unbridgeable divide and an apartheid exists between educators and learners, better termed technology immigrants and technology natives, respectively, and the debate ranges on. This debate in favour of the polarization model certainly carried significant weight as the ICT Strategic Framework 2006-7 indicates.

In the area of Technology Immigrants, Technology Natives and Information Technology, there are numerous documented studies investigating the difference between Technology Immigrants and Technology Natives (Frاند, 2000; Howe & Strauss, 2000; Levin & Arafeh, 2002; Oblinger & Oblinger, 2005; Palfrey & Gasser, 2008; Perry, 1996; Prensky, 2001a, 2001b; Tapscott, 1999); technology as a 'teaching method' (Prensky, 2005); relationship between Information Technology advances and learning styles (Dede, 2005); freedom of information and information access (Lor & Britz, 2005; Kim & Rissel, 2008; Badge et al., 2008); assessments (Ng'ambi, 2008; Pimental & Omar, 2008; Sainsbury & Walker, 2008); the use of

social psychology to motivate online learners (Beenen et. al; 2004); developing of self-efficacy scales (Cassidy & Eachus, 2002); gender and ethical differences (Byers, 2008; Eccles, 2005); gender and culture of computing in applied IT education (Herring, et. al; 2006); learner interactions (Piezon & Donaldson, 2005); workplace learning (Watt, 2008) and participation of all human elements in the education process (Ferrer, Romero, & Albareda, 2005).

Most of these studies place technology at the forefront (Herring, et. al; 2006; Prensky, 2005), make claims about the change in neuropath ways of the brain (Prensky, 2001) polarizes people (Frاند, 2000; Howe & Strauss, 2000; Levin & Arafah, 2002; Oblinger & Oblinger, 2005; Palfrey & Gasser, 2008; Perry, 1996; Prensky, 2001a, 2001b; Tapscott, 1999), and aims to establish technology as the focal point around which education evolves (Dede, 2005; Prensky, 2001a, 2001b; Prensky, 2005). The main purpose of these studies is to force teaching staff to conform to the proponents of technologies and follow like 'herds' (Hajji, 2003; Kelsey, 1999), all stemming directly from Prensky's doubtful claims of major generational differences between TI/TN (2001a, 2001b).

Generation is not the issue, and Bullen, Morgan and Qayyam (2010) confirm this with an empirical study at a post-secondary institution in Canada which found that there are more similarities and fewer differences between technology natives and immigrants. Moreover, that the attack made on technology immigrants is poorly evidenced and without substance. Furthermore, McKenzie (2007) wrote against the technology native and immigrant polarization model and regards the claims (by Prensky, 2001) as 'grandiose', 'unsubstantiated', 'quoting Dr Perry out of context' and 'ignorant' (fno.org).

The state-of-the-art Khipu (Ascher & Ascher, 1981; Ascher, 2005; Cook, 2007; Sanchez, 2009; Von Fange, 1984), the never repeated Giza Pyramid (Ryan 2002; Smyth 1877), impressive Mayan Observatory (Cardno, 1998, creation.com) and the superior design of Noah's ark (Hong, Na, Hyun, Hong, Gong, Kang, Suh, Lee & Je ,1990) are some historical examples that concur with Bullen, Morgan and Qayyam (2010), Van Slyke (2003) and McKenzie (2007) that generation is certainly not the issue.

Furthermore, the fascinating human computer (referring to human beings) that is unparalleled (Safarti, 2003 & Gitt, 2007) is very advanced and intelligent, irrespective of

which generation they are born into. History provides numerous other examples of technological wonders that today's technology will be unable to compete with, which debunks the polarization model of Prensky and others in its entirety. Finally, Brown (1995) makes it abundantly clear that technology has been used and manipulated by humans throughout the centuries. In her book, *Alone Together*, Turkle (2011) concurs with Brown:

We make our technologies, and they, in turn, shape us. So, of every technology we must ask, does it serve our human purposes? - a question that causes us to reconsider what these purposes are. Technologies in every generation, present opportunities to reflect on our values and direction (p. 19).

The importance of the classroom environment as the heartbeat of education, rather than polarization between TI/TN and technology, is confirmed by the interests of BIAG and many researchers, resulting in numerous debates, claims, scholarly research and the building of numerous instruments of measurements to assess classroom environment.

2.3.5. Measuring instruments to assess classroom environment and culture

Researchers such as Dorman, Fisher, and Waldrup (2006), constructed measuring instruments recently to provide an analysis of the integration of five aspects of the *What Is Happening in the Classroom* (WIHIC) and *Students' Perception of Assessment Questionnaire Scales* (SPAQ) with two outcomes scales. Prior to 2006, many other measuring instruments had been developed and used to assess the classroom environment.

According to Waldrup and Fisher (1997), the three dimensional model of Moos has been used to develop various measuring instruments to assess the classroom environment. This three dimensional model includes (1) *Relationship Dimension*, (2) *Personal Development Dimension* and (3) *Systems Maintenance and Systems Change Dimension* (Khine & Fisher, 2003). Fisher and Rickards (1997) describe the Moos three dimensional model as follows:

- Relationship dimensions: "identify the nature and intensity of personal relationships within the environment and assess the extent to which people are involved in the environment and help each other"
- Personal dimensions: "assess personal growth and self enhancement"

- System Maintenance and system change: “involve the extent to which the environment is orderly, clear in expectations, maintains control and is responsive to change” (p. 1).

Examples of measuring instruments based on the Moos *three dimensional model* include the *Learning Environment Questionnaire* (LEI), the *Classroom Environment Scale* (CES), *My Classroom Inventory* (MCI), *Science Laboratory Environment Inventory* (SLEI), and *Constructivist Learning Environment Survey* (CLES). Notwithstanding the success of the above measuring instruments, the culture in the educational setting was not included.

Based on the Hofstede four-dimensional cultural model, Waldrip and Fisher (1997) made a major breakthrough in the connection of culture and the classroom environment by developing and validating the *Cultural Learning Environment Questionnaire* (CLEQ) to include the study of culture in an educational setting. The study of 3,031 science learners in 135 classes at 45 Australian secondary schools showed clear associations between culturally sensitive factors in their learning environment and the learners’ attitude and enquiry towards science. The study suggested that ‘it is possible that the more diverse classrooms’ the more the ‘need for teaching approaches to be varied and individualized to meet individual learners’ learning needs (p. 13). This meant that the teacher could manage the classroom by selecting a range of strategies and instructional approaches to suit the needs of the learner, based on the learner’s profile. The cultural impact of both learner and teacher in the classroom was highlighted.

The findings of Waldrip and Fisher (1997) in Australia were confirmed by Khine and Fisher (2001) during a study at Brunei secondary schools using the WIHIC and the *Test of Science Related Attitudes* (TOSRA). The study found that teachers from different cultural backgrounds had an impact on the classroom environment in line with the Australian study, further confirming the impact of culture in creating a productive environment in the classroom.

Furthermore, Waldrip and Fisher (2002) studied a group of 493 science learners using the *Questionnaire on Teacher Interaction* (QTI) developed by Wubbels and Levy (1993) to describe exemplary teachers. The Australian version of the QTI containing 48 items confirms the importance of interpersonal behaviour in the classroom environment.

With the increase use of technology in education and the classroom environment, Aldridge and Fraser (2003) developed and validated the *Technology-Rich-Outcomes-Focused Learning Environment Inventory* (TROFLEI). The findings indicated the validity and reliability of the TROFLEI across subjects and showed how ICT can be used effectively in the classroom environment.

Waldrip and Fisher (2007) used a modification of the CLEQ and combined it with the QTI to survey 2,176 primary school science learners in classrooms in Western Australia and Queensland. The results were interpreted by using simple and multiple regressions. Importantly, some of the outcomes of this study showed:

Associations between learners' culturally sensitive learning environment and their attitudes and learner understanding of science concepts were found. Regression analysis suggested that more positive learner attitudes are associated with more equitable treatment, competition and congruence between school and home. The development of learner understanding of science concepts also was associated with more equity and congruence (p. 50).

The differences between locations of schools (whether rural or metropolitan) was highlighted, as well as the impact of culture of both learners in the educational environment. Importantly, this study was in line with the findings of the Waldrip and Fisher (1997) study making the connection between the culture of the learner and the teacher in the classroom environment.

Van Petegem and Donche (2006) assessed the learning environment in higher education by using two questionnaires. The first was the *Inventory Learning to Teach Questionnaire* (ILTQ) developed by Oostenheert. The second was an adapted questionnaire of Roelofs and Visser. Van Petegem and Donche conveyed the limitations of using these questionnaires in the following way:

Conducting surveys look for patterns of learning and teaching has the benefit of producing more generalizable and comparable results. However, in carrying out several survey-studies, we also came across limitations. One of these limitations was concerned with the use of self-report questionnaires. We do not know if the answers

of learners, learner teachers and teacher educators also indicate how they really think or act in practice. The other limitation which has an effect on these results is the scope of questioning in the selected questionnaires (p. 118).

Based on these limitations, the longitudinal study completed in this thesis uses primarily qualitative methods, with both qualitative and quantitative methods used in the 2009 survey questionnaires.

2.3.6. Motivation and engagement

Fredricks, Blumenfeld and Paris (2004) highlights the increasing attention given to engage learners in order to address academic achievement and lack of motivation issues. Kearsley and Shneiderman focus on the importance of engagement theory, to motivate and engage learners (1999). This engagement theory is extended to include technology rich environments. The three components namely, relate, create and donate is project, group and real –life based. The research for this study fulfils these criteria:

- During class times, all learners are part of a group
- The real–life experience include a trip to a manufacturing plant, highly reliant on technology
- The case studies for the projects were real companies. One of the students, during overseas travel, was able to skype into the classroom from in front of the company and related her experiences with the company.

Fredricks et al (2004) recognises the multidimensional view of engagement, and discusses three types of engagement; behavioural, cognitive and emotional engagement. There is, however, significant overlapping of the three types of engagement. Fredericks et al summarizes learner engagement:

- Engagement is associated with positive academic outcomes, including achievement and
- and persistence in school; and it is higher in class-rooms with supportive teachers and
- peers, challenging and authentic tasks, opportunities for choice, and
- sufficient structure (p. 87).

Kearsley and Shneiderman (1999) confirm that there is a positive relationship between engagement in class and the achievement of learners. In motivating and engaging young learners, it is most critical that both the teacher and the learner need to be actively involved, both inside and outside the classroom (Kamil, Borman, Dole, Kral, Salinger & Torgesen, 2008). Additionally, Jones (2006), in researching motivation and engagement of young learners, found that 'student engagement in learning is connected to having strong relationships between teacher and students' (p. 10).

Annen, Kramer and Bellwald (2005) completed an explorative study on motivation in the military academy in Zurich using data collected between September 2003 and June 2005 from 132 participants. These authors highlight the difficulty in measuring levels of motivation. An examination of three instruments of motivation, including the assessment of achievement motivation by trained assessors, was used. For achievement motivation

the assessors make their evaluation on the basis of clearly defined behavioural characteristics, e.g. of how much willingness to perform, initiative, commitment, perseverance, persistence and stamina the candidates use to fulfil their tasks(p.3).

They conclude that motivation can be measured using self-assessment of achievement, and that it 'relates to the specific situation in the individual exercises' (p.8).

For this thesis, an adaptation of the Annen, Kramer and Bellwald motivational theory was used (See Appendix 5), focussing on behavioural characteristics which includes 'willingness to perform, initiative, commitment, perseverance, persistence and stamina the candidates' (p.3).

2.4 SUMMARY

The importance of the classroom environment, the use of technology and the culture of both learner and teacher has been emphasised and confirmed. Technology through history has been examined, and the one-sided change of the economy in NZ and now the transformation or redefining of education into nothing more than a marketable commodity has been explored. The connection between the redefining of education, the impact of BIAG, the history of the changing education landscape of both Australia and NZ and the 2006-7 ICT Strategic Framework for Education for NZ that supposedly 'puts the learner in the centre' was made. The concept of culture and how it affects education, technology use and

polarization models, have been highlighted. The perceived fast pace of change of technology including the fads that come and go, although it presents a continual challenge, is a none-issue. Identifying the different tools available to motivate and engage learners, irrespective who they are, seems to be the critical issue. For this study, development of measuring instruments, which include engagement and motivation, was used to assess and analyse the classroom learning environment.

This research is unique in that it addresses the polarization models introduced by interest groups and scholars, then builds on the measuring instruments to test classroom environments by adding a constructivist approach over a period of three years. The sample used in this study is the first year supply chain management learners at a semi-rural tertiary institution in NZ. The research methodology is described in Chapter 3 and includes a field trip, focus groups, case studies, company interviews, the development and testing of questionnaires and the development of software to assist learners in learning difficult supply chain concepts.

CHAPTER 3

METHODOLOGY

Not curiosity, not vanity, not the consideration of expediency, not duty and conscientiousness, but an unquenchable, unhappy thirst that brooks no compromise leads us to the truth

George Wilhelm Friedrich Hegel

3.1 INTRODUCTION

The complexity of the classroom environment and understanding this environment require active learning approaches with a combination of monitoring and interrogation of data collection methods. This combination of empirical and pragmatic study uses as a base, the Prince and Felder six foundational induction learning and teaching model (2006). The research design, implementation and analysis combine both monitoring and interrogation of data collection methods. The combination of both these methods is crucial because the active learning approaches taken seek to combine the two. The research questions, significance and research design used in this study are discussed. Furthermore, the ethical issues taken into consideration before, during and after data collection are elaborated on.

For the purpose of this research, learners doing a course on Supply Chain Management in NZ form the main sample. This longitudinal study was completed over a period of three years and includes 2007, 2008 and 2009 supply chain management learners. Supply Chain Management is a first year university course, usually offered during the second semester of the learner's first year of tertiary study. The interview sample of the organizations consisted of two major employers in NZ within the forestry sector.

3.2 RATIONALE AND SIGNIFICANCE OF STUDY

This section provides the title of this thesis, rationale behind this thesis and concludes with the significance of this study.

3.2.1. Rationale

The title of this thesis is: 'The Development and Evaluation of Innovative Use of Information Technology to Change Behaviour, Motivate and Engage Tertiary Learners to Improve Learning'.

Three major events spurred the conducting of this empirical study: first, the technology polarization between technology immigrants (TI) and technology natives (TN) from the debate sparked by Prensky and pursued by Feeney, Ananthanarayanan, Oblinger and Oblinger, and others; secondly, the availability and access to the classroom environment measuring instruments developed by Waldrup, Fisher and others; and thirdly, the state of the tertiary education sector in NZ in the 2000s after the significant structural transformation of education into a marketable commodity (Hill & Lee, 2007; Hill & Oliver, 2008).

3.2.2. Inducements offered to school leavers

During the same period, tertiary institutions around NZ were offering inducements to encourage school leavers to study at particular institutions. One such inducement, at the institution where the researcher worked, was free fees. With varying interests in further education, many school leavers registered and commenced tertiary study, with a resultant lower average age of learners at the institution where this study was done. Colleagues highlighted the lack of motivation and general disinterest of the learner population that now entered tertiary study. The minimal fulltime teaching staff, left in the tertiary sector, the addition of, and ushering in of the information communication technology (ICT) Strategic Framework , the inducements offered which resulted in the lower average age of learners, their lack of motivation and general disinterest in study, provided an avenue to find ways of motivating and engaging learners in tertiary study.

In this research it is assumed that, if learners and teachers are polarized, the learners' engagement alone will impact on their motivation and engagement in the subject matter, and translate to their performance in the particular subject.

3.2.3. Significance of this study

This study is significant as most of the earlier research studies differentiated between TI and TN on the one hand and on the other hand refer to the different products available to assist

in bridging the gap between Technology Immigrants and Technology Natives, placing technology around the learner. The study described in this thesis is different because a connection is made between the cultural background of the learner and teacher, and then the class culture is connected to organisational culture. Technology is utilised as a tool for the exclusive purpose of engaging tertiary learners in study. Practically, it demonstrates that by connecting the learner and the teacher, learners are motivated and engaged in their own education.

3.3 RESEARCH QUESTIONS

The research questions as presented in Chapter 1 are as follows:

1. Is technology and pre-occupation with technology altogether new?
2. Is there a difference in the way Technology Natives and Technology Immigrants impact on classroom culture (higher learning) and organisational culture?
3. How can the differences be incorporated to ensure successful use of Information Technology in the learning process both at educational institutions and organisations?
4. Does the ability to successfully use technology motivate learners?

3.4 RESEARCH DESIGN

According to Kumar (2005), the purpose of research design can be two-fold:

- identification and/or development of procedures and logistics to undertake study; and
- the importance of the quality in these procedures to ensure their validity, objectivity and accuracy (p. 84).

This empirical study is based on induction as a discovery learning and teaching approach, with a combination of monitoring and interrogation methods used for data collection. This section, to some extent, follows the research design model described by Cooper and Schindler (2001). The sampling design, timeframe, environment, and data collection are

discussed first. Thereafter, the discovery learning approaches applied in this research and the measuring instruments are described.

3.4.1. Sampling design

In this longitudinal study, purposive sampling was used. Purposive sampling is a sampling method that conforms to certain criteria (Cooper & Schindler, 2001). By choosing this sampling method, the researcher judges 'who can provide the best information to achieve the objectives of the study' (Kumar, 2005, p. 179). For the in-class observations, focus groups and the online questionnaire, a particular class of learners was chosen based on the suitability of the subject, the willingness of the respondents to participate and the ease of access. The Supply Chain Management learners formed the sample of this study. For the company interviews, three previously identified major employers were asked to provide a list of names of a mixture of employees based on age and longevity with the company. The sampling design used in this study is a clear example of purposive sampling.

The main threads from the reference group and company interviews were added to some of the questions from the *What Is Happening In This Class* (WIHIC) (Fraser, McRobbie & Fisher, 1996), the *Constructivist Learning Environment Survey* (CLES) (Taylor, Fraser & Fisher, 1997), the *Questionnaire on Teacher Interaction* (QTI) (Wubbels & Levy, 1993) and the *Technology-Rich Outcomes-Focused Learning Environment Inventory* (TROFLEI) Aldridge, & Fraser, 2003). Thereafter, the online questionnaires were tested. The initial testing involved four learners who completed the Supply Chain Management course at another institution. After feedback from this initial testing was obtained, the questionnaire was refined (see Appendix 6).

3.4.2. Timeframe

The full study was carried out over a period of three years, from 2007 to 2009. For the 2007 participants, initially, only monitoring methods of data collection were used. During 2009, a survey questionnaire (see Appendix 6) was administered online. For the 2009 participants, both interrogation and monitoring data collection methods were used over a period of one semester.

3.4.3. Environment – Tertiary Sector and the Technology environment

The tertiary education sector in NZ (2009 figures) consisted of eight universities, 24 polytechnics (Institutes of Technology) and three Whananga (cater for education from an indigenous Māori perspective.). In addition, a few private institutions existed: some for a few years only while a minority had been around for a long time.

The tertiary environment in NZ followed the *test tube* path of structural adjustments, similar to the adjustments made to the NZ economy, which Kelsey describes as a 'colossal failure' (converge.org.nz). Major structural changes were done with minimal or no consultation of teaching faculty working in the tertiary sector at the time. As a result, job losses (teaching faculty) in the sector became endemic. The ICT Strategic Framework was ushered in with haste in 2006, placing the learner in the centre with '*quality assured*' with no explanation what this '*quality assured*' meant. This strategic framework encircled the learner with security, ID, open standards and broadband, while the term '*teacher*' was changed to educator and relegated to a position alongside resources such as libraries, heritage institutions, web services and Kaumatua (Maori elder) (MOE, 2006, p. 7). Together with this strategic framework, a significant investment in technology was made and technology was put forward as the future for tertiary education; a solution for the staff shortages that now existed (which could have been intentionally created, based on the structural changes enforced). Various bodies received funding from the TEC to produce research reports in support of the *eLearning*, as millions of dollars were deliberately and speedily diverted away from the classroom learning environment to create the illusion that eLearning has been around for a long time.

The diversion of funds away from the classroom learning environment by BIAG resulted in substantial job losses. The BIAG put forward the pre-planned technology as the future of tertiary education and as a solution for the carefully orchestrated staff shortages that now existed. The diversion of \$NZ millions from the classroom learning environment, pushing of technology to compensate for the pre-planned significant job losses in the sector, plus the inducement of free fees to school leavers resulted in a lower average age of learners, a lack of motivation and a general disinterest in study. The 2009 Supply Chain Management group thus formed a part of the learner category just described.

Internet access in NZ is either through the educational institutions, company access and/or personal access. A large number of companies and most educational institutions have remote access for their staff and learners, which is extremely beneficial. Technology usage is very high in households, in the educational sector and in companies. The rural/farming

community, by 2009, did not have very good access to the internet or LAN networks, and were thus lagging behind their town counterparts. For instance, a rural/farming community learners or employee may have the latest available technology tools, but due to the problematic internet access may not be able to use technology, which led to the segmentation of ‘townies’ and the ‘rural’ community.

3.4.4. Data Collection Design

After the literature review was completed, it was evident that there was a need to complete primary research in order to fill the identified gap in research. Quantitative data were collected to identify the main themes and focus areas. Once qualitative data were collected through observation, field trip, face-to-face interviews and focus groups, the main themes were extracted. These main themes extracted were used to adapt the WIHIC, CLES, QTI and TROFLEI measuring instruments. Thereafter, a survey questionnaire was developed to gather quantitative and qualitative data. The quantitative and qualitative collection methods are based on the Cooper and Schindler dual model (2001) as shown in Table 2.

Table 2

Method of data collection and communication processes based on Cooper and Schindler model (2001)

Methods of Data Collection	Communication Processes
Prior to collection	Reference Group
Monitoring	Observation, field trip
Interrogation	Face-to-face interviews, focus groups, case study, questionnaires

Table 2 is divided into two columns: the methods of data collection and the communication processes used to collect the data. The behaviour of the learners in the supply chain management class was observed, a field trip organised, and this was followed by focus group sessions and careful analysis of learners’ preferences. Finally, feedback and collation and analysis of the use of technology, a field trip, observations, focus groups and case study as part of the Supply Chain Management course are presented in this thesis. A description of the communication processes used follow.

3.4.5. Reference Group

This study was conducted in the North Island of NZ where 50% of the population was NZ Māori, the indigenous people of NZ. Conscious of the ethical implication of the research as some of the participants were Māori, and the Treaty of Waitangi, which ensured protection of the Māori, a reference group was set up. This reference group consisted of six senior members of the tribe, including academics and the CEO of the tribe. The group was consulted before during and after the study.

As some of the group members were academics, in addition to ethical oversight, ensuring consultation and keeping the study within its initially agreed bounds, input was also provided for the construction of the face-to-face interviews and the online questionnaires. Once the face-to-face interviews focus groups and online questionnaires were completed, the answers were provided to the reference group to ensure that the study was conducted within the agreed boundaries.

At all times during the different data collection stages, the reference group was involved. During the combined field trip, the group involvement was less than during the other data collection stages, as the accompanying lecturer identified as Māori, the reference group was informed, and they were happy for the lecturer to provide oversight on their behalf.

Towards the end of the data collection, after the information was typed up, the reference group was consulted prior to the commencement of the write-up process for this thesis. It is envisaged that the tribe will be presented with a copy of this thesis.

3.4.6. Observation

Observation as a method of data collection has been successfully used in the difference studies where human beings are involved, including patients in an intensive ward (Aitken, Marshall, Elliot, & McKinley, 2011) and a review of action observation was completed where the brain and the motor neuron system and theories were involved (Zentgraf, Munzert, Bischoff, & Newman-Norlund, 2011). During the Aitken et al. study, expert nurses collected data in an intensive care environment using two methods, one being observation. According to Zentgraf et al. 'Action-observation informs us about the roles of the other people in our

environment and allows us to make predication which will guide our own behavioural output' (p. 327).

For this study, participants' observations were carried out in class over a period of three years: 2007 to 2009. Observation started at the first practical session on computers and during the use of a computer game developed in the 1960s, before the case study and the field trip. For the 2009 group, in addition to in-class observation, the behaviour of participants on the field trip and during focus groups was observed. In addition, during the interviews at the company premises, observation was done during the face-to-face interviews, during morning tea and lunch breaks, and on company walkabouts. Observation was carried out in the class over the 2009 semester. For the last group of learners, in addition to the class observation sessions, observation was included during the annual field trip.

3.4.7. Field Trip

Given the broader themes uncovered in the interviews with organizations regarding the impact of TI/TN and technology on organizational culture, the tertiary education landscape and the waning interest of learners in education, the field trip was included as one data collection method. The field trip is an annual excursion arranged for learners during the second half of the Supply Chain Management course. This field trip is to a forestry company which is heavily reliant on technology to perform its core business. The learners are transported by bus to the head office where a senior executive member provides learners with a power point lecture. The purpose of the field trip is to give learners an idea of how supply chains operate in practice. The complete trip takes around three hours from start to finish.

For the purpose of this study, given the profile of the learners, and the observation completed during the first few classroom sessions, a few impacting changes were made to the field trip. First, the field trip was brought forward from the second half of the course to the fourth week, of the course. Secondly, at our request, the company obligingly split the field trip into two parts; one part at the head office where the power point presentation is usually done and the second part at the production plant, about 35 minutes away from the head office. Thirdly, as constructivist and action research approaches were used, the supply chain learners and another group of business learners on a non-degree course, were asked how they felt about a joint field trip.

The concept of a joint field trip was carefully and gradually introduced to both groups. Initially, the degree learners were very apprehensive and the non-degree learners had many questions. By listening to their concerns and allowing them to provide input throughout the planning stage, partake in the finer detail of the trip and use their subject knowledge as part of the arrangement, they were comfortable with the idea of a joint trip. The learners in both groups agreed, and the joint field trip was planned and executed. The final part of the joint field trip plan included an evaluation of the plan, process and the impact of such a trip on both learners and staff. After this evaluation, the second lecturer with her non-degree course, was invited along, after arrangements with the company were concluded to add more learners to the field trip. The trip was finalized early to minimize disruption in the learners' education plan and with the good lead-time to organize the rest of their studies in their private life.

Once learners from both groups showed interest, the organization was contacted, final names and numbers and health and safety briefings were exchanged. The trip took place on March 20, 2009 at 8.30 and was divided into two distinct parts. The first part was a theoretical presentation of the company's supply chain by the supply chain manager in the company offices. The second part was a visit to the manufacturing plant, to see a supply chain in action. A second bus was arranged to ensure that sufficient transport was available between the head office and the production plant. Photographs taken during the plant visit formed an important part of the focus group sessions that followed. By 3 pm the trip was complete and the learners were back at the educational institution.

3.4.8. Face-to-face Interviews

During the second half of 2008, face-to-face interviews were conducted with 12 employees at two corporate companies to establish the main threads and to connect the organizational culture to classroom culture. One of the criteria for selecting companies was the reliance on technology in the daily work environment. During the first half of 2008, contact with the companies was established through the human resource departments and the information sheets were emailed.

Once the company accepted, the criteria for accepting participants were established and sent to the company. The criteria were full time employees, longevity with the company and whether, based on the definition that the researcher provided, employees identified as TI or

TN. One hour interviews were then conducted with the participants at the premises of the respective employers. As soon as the main themes were extracted, the interviews at the particular company were discontinued. While at the company, the observation method was employed to observe the overall conduct of staff, informal groupings, morning tea groupings and the use of office and cafeteria/staff room space. Furthermore, the behaviour towards technology and organizational culture was observed during the face-to-face interviews, and, where possible, the observation was included in the interview questions through prompts. To ensure reliability and validity of face-to-face interviews, a copy of the transcribed information was shared with the participant during informal, onsite tea breaks.

3.4.9. Focus groups

Three focus group sessions were held during semester 1, 2009. The three focus group sessions were held at particular intervals during the semester and ended after the field trip. The purpose of the focus groups was to identify their previous experience and gauge learner perceptions on the value that the field trip, the experience of seniority during the field trip, simulation exercise and case study added to their class room learning experience.

The first focus group was held on the first day in class, the second group was held before and the third after the field trip. Two focus groups sessions were held in 2008 followed by the development of the questionnaire. After every focus group session, the groups were provided with a copy of the data collected. There was no focus group sessions held for the 2007 group.

The observation that was completed during the semester for the 2007 group was noted and with an instruction to discuss the addition of focus groups sessions during the same time that the *beer game* was introduced for the 2008 group.

3.4.10. Case study

Every year, a case study forms part of learners' assessment. All learners on the Supply Chain Management course in the same semester were given the same case study. However, in each year a different case study was used.

The learners were required to:

- Provide an introduction of the company
- Summarise the case and provide the key points
- Provide criticisms (including strengths and or weaknesses) of the case and provide suggestions for overcoming the weaknesses
- Present an integrated view of the article
- Provide one personal application, including any lessons learned
- Demonstrate evidence of team learning, especially overcoming difficulties
- Show evidence of individual learning processes documented
- Write a conclusion.

The case study was done in groups of three to four members, and the learners were allowed to integrate their knowledge gained before the course and during the course. Furthermore, they were allowed to include knowledge gained from any other course. The case study was due around three weeks into the course, well before the field trip. This assessment was divided into two parts: the presentation of the assignment, which was normally due on a Friday morning; the second was written work, normally due on the Monday after the assignment due date, specifically designed so as to allow learners to complete any editing before handing in their assignment.

For the 2007 participants, the case study was the *Top Ten World Class* companies. For this study, a video presentation was used. The video on the *Top Ten World Class Companies* was screened during class time and provided information on who the top ten companies of 2006 were, and what made these companies successful. By replaying the video at any time convenient to them, the participants could gather more information on each of the ten companies in order to prepare for assignment presentation and complete the written work.

The written article, *The Ten Flatteners* by Thomas L. Friedman (see Appendix 1) and a video were given to the 2008 group to analyse. In this case study, Friedman explains how, according to him, the world has become flat, technology is increasing at an increasing space and we are unable to keep up with the changes. He discusses the ten flatteners one by one. In addition, he explains terminology like triple convergence, steroids and horizontal integration. The learners accessed additional information via the internet or library databases to complete this case study.

For the 2009 group, the case study was swapped with the annual supply chain field trip and rescheduled towards the end of the semester, just days before the final assessment, for reasons explained elsewhere in this chapter. The 2009 group was provided with the Zara Fashions case study (Appendix 2). This case study provides a practical demonstration of SCM concepts and how application of these concepts set Zara Fashions apart and helped increase profits and the number of stores while other fashion houses were either struggling to maintain profits or closing down stores.

Before the case study commenced, a focus group was held and the field trip, class participation, previous knowledge shared and the simulation exercise were recalled to refresh the memory of the learners. The learners were asked to use all this information and apply it to the case study. During the class sessions, the case study was incorporated by both the teacher and the learners. This practice ensured that the learners familiarized themselves with the case study and applied some concepts to the class sessions at least one week before they started to analyse the Zara case.

3.4.11 Supply Chain Management (SCC) Game

The MIT *beer game* is a simulation exercise that teaches learners basic supply chain concepts and demonstrates the value of the integrated supply chain management. It was developed in the 1960s and computerized in 1999 by Philip Kaminsky and David Simchi–Levi. The online instructions have been developed by Michael Li and David Simchi–Levi (2002). The SCC *game* was developed by Cecile Hoods and Mathew Skokandich in 2009, after the action observation session of 2007 and the focus group feedback from 2008 and 2009 revealed that; learners were demotivated; and became disengaged in their learning when they were required to play the *beer game* simulation exercise.

The feedback from the focus groups led to the redevelop the beer game. Butler, Dephels and Howell (1995), Nassar-McMillan and Borders (2002) and Nielsen (1999) recommends focus groups when first, clarification is needed for problems faced. Secondly, there is a short time span for collection of ideas and perceptions and thirdly, when creativity is sought after.

3.4.11.1 Focus groups and Supply Chain Management (SCC) Game

Focus groups were scheduled for the 2008 class to: first, seek clarification why learner motivation dropped so dramatically during the *beer game* simulation exercise; secondly, creativity was then needed from the learners to address their concerns; and thirdly, the researcher had a limited time span in which to address the issues and recommendations from the learners.

Focus groups were thus the ideal research method to address the learners' need regarding the beer game, as it fulfilled all the requirements. Once the focus group sessions were completed, the data were analysed. Thereafter, an email was sent to the developers and administration department at Massachusetts Institute of Technology (MIT) regarding the intention of the researcher to develop a new simulation based on learner feedback. Furthermore, the researcher completed the online reply form on the MIT a few times, and still awaits feedback.

3.5 DISCOVERY LEARNING APPROACHES

The pedagogical approach used in this thesis is a combination of discovery research approaches to impact on the behaviour, engage and motivate learners by utilizing IT and other tools to improve learning.

Although discovery learning approaches have been used by teachers for many years, Alfieri, Brooks, Aldrich, and Tenenbaum (2011), after researching many articles, acknowledge the difficulty of arriving at a 'precise' definition. There is, however, an ability during discovery learning, to provide either minimal or intensive guidance. Yet Alfieri et al. sound a warning against discovery approaches, especially when knowledge is poor or insufficient. Renzulli agrees with Alfieri et al. about the dangers of using discovery learning approaches:

....how a focus on thinking skills and creative thinking fell prey to the same types of formulas and prescribed activities that characterized the content-based curriculum which has been criticized so strongly by thinking skills advocates. Even our present

fascination with computers and video discs is, in some cases, turning out to be little more than 'electronic worksheets' (gifted.uconn.edu).

The inductive learning method is a discovery learning approach. Table 3 summarizes the Two Educational Approach Prince and Felder (2006) model for engineering and mathematics.

Table 3

Summary of The two educational approach Prince and Felder model

Teaching and learning Method	Inductive Teaching and Learning	Deductive Teaching and learning method
How it starts	Specifics e.g., observation or data to interpret, case study to analyse, complex problem to solve. Starts inductive, and can move into deductive. Learner centred	Lecture based Teacher centred Teacher is the knowledgeable person. Learner simply absorbs
How are principles used	Need for facts, procedures, etc comes from learner. Learning responsibility starts with learner	To derive mathematical models
What is done to remember	As learner discovers/asks for information, learner learns and takes responsibility for learning. New information fit into existing knowledge structure	Practical examples for homework Test ability in exams
Motivation to learn comes from	Attention paid to WHY Group work inside and outside class Learner questioning/solve problems	Possible future use in curriculum Possible future use in career Little or no attention paid to why

Inductive teaching and learning is learner centred, and sometimes includes deductive teaching and learning. Inductive teaching and learning is based on constructivism, which is an active learning approach. Where the didactical pedagogical approach is a faster approach than the constructivist pedagogical, it does very poorly in engaging learners. For this study, discovery learning and action research approaches were used to gather data. This section describes the constructivist and action research approaches.

3.5.1. Constructivist Approaches

Constructivist teaching includes collaboration between learners, inside and outside the classroom. The learning happens in groups, and learners actively participate in these discussions and information sharing sessions (Prince & Felder, 2006).

Although constructivist theory has increased in popularity, it has been around for a long time. According to Prince and Felder:

Constructivism has its roots in the 18th century philosophies of Immanuel Kant and Giambattista Vico, although some has traced it as far back as the 4th-6thcenture B.C in the works of Lao Tzu, Buddha and Heraclitus. The constructivist view of learning is reflected in the developmental theories of Piaget, Dewey, Bruner, and Vygotsky, among others. *Incognitive constructivism*, which originated primarily in the work of Piaget, an individual's reactions to experiences lead to (or fail to lead to) learning. In *social constructivism*, whose principle proponent is Vygotsky, language and interactions with others-family, peers, teachers-play a primary role in the construction of meaning from experience. Meaning is not simply constructed; it is co-constructed (p. 4).

An example of such a co-construction of meaning can be found in the Holy Bible:

They devoted themselves to the apostles' teaching and fellowship, to the breaking of bread and prayers. Awe came upon everyone, because many wonders and signs were being done by the apostles. All who believed were together and had all things in common: they would sell their possessions and goods and distribute the proceeds to all, as they had need. Day by day, as they spent much time together in the temple, they broke bread at home and ate their food with glad and generous hearts, praising God and having the goodwill of people. And day by day the Lord added to their number those who were being saved (Acts 2: 42-47, New Revised Standard Version).

With the *Supply Chain Management* learners, based on their reasons for engaging in tertiary study, the discovery learning approach was used. For example, in the first class session for the 2009 group, learners were directed to a website and guided to complete a visual, auditory and kinaesthetic (VAK) test. After the VAK test, the learners were asked to share with the rest of the group what their learning style was and under which circumstances they learnt the best. By the end of the class, everybody knew their learning style and the learning style of others. They therefore knew what they had to do to engage their rest of their class mates during a presentation or explanation.

During the second class (2009 group), the learners wanted to know how a particular internet company could use certain selling techniques, including one day sales at prices significantly lower than any of its competitors. As part of the intensive discovery learning approach the learners were asked to first, find an email address and if possible, a name on a website. Secondly, send one email on behalf of the whole class to this particular person. Thirdly, in the introduction of the email the learners were asked to clearly declare that they are supply chain management learners and to name the university that they were studying at and provide some introductory concepts of supply chain management. Fourthly, they were asked the question about lower prices and competitors and let the company know that any additional information was most welcome. By the end of the class session, the learner who sent the request was able to present the answer to their question to the class.

3.5.2 Action Research Approaches

O'Brien (2001) provides a simplistic description of action research as 'learning by doing' (p. 1). By using action research, a systematic study of the problem is followed by intervention, based on a consideration of theory. Action research methodology is a spiralled approach: the problem is identified, a solution is found, if successful, the group of people moves to the next level (O'Brien, 2001). According to Somekh (1995) 'action research methodology bridges the divide between research and practice' (p. 340). Furthermore, Somekh views action research methodology from a broad perspective and highlights three differences between other research approaches and action research:

...the first main difference between action research and other forms of research is that it is carried out by people directly concerned with the social situation that is being researched.....The investigation takes place in the workplace and no effort is made to 'control' the research context of design experiment.(p. 340-341).

...A second major difference is that the findings of action research are fed directly into practice with the aim of bringing about change. This is because, unlike traditional research, the validity of action research does not depend upon measuring the extent and frequency of phenomena over a period of time in order to justify precise (and therefore narrowly defined) statements of cause and effect.... Its aim is

to deepen practitioners' understanding of the complex situations in which they live and work, so that their actions are better informed (p. 341).

...A third major difference is that action research has a highly pragmatic orientation. It recognises that there is a trade-off between the benefits of giving practitioners the central role in research (e.g. they alone have the power and ability to bring about change in the field of action) and the resulting limitations in terms of the time they can devote to research and their lack of certain kinds of specialist knowledge) (p. 341).

For this research, the participatory action research approach was used. The main thrust of this thesis is to use Information Technology to change behaviour and engage and motivate learners. Some examples of participatory action research approaches used during this research follows.

In this study, the researcher was the teacher and the *Supply Chain Management* learners were the participants and there was no 'control group', fulfilling difference number one as described by Somekh.

During 2007, the teacher observed that the learners were unmotivated in the *Supply Chain Management* class during the introduction and use of a computer simulation game. The teacher noted this and identified a solution for the next group of learners. The solution entailed introducing an opportunity for the learners to participate in a focus group discussion regarding the use of computer simulation games at the same time that such computer a game was introduced. Although the 2008 learners experienced a drop in motivation levels, they felt that they could, in the focus group, share the reasons for the decrease. In addition, the decrease in motivation lasted for a shorter period of time. By feeding the findings of 2007 directly into the classroom practice in 2008 to bring about a change in the motivation levels of learners, the second major difference between action research and traditional research is highlighted.

For the 2009 learners, when the teacher observed that learners found it difficult to complete simple tasks on day one, two strategies were immediately followed: first, the teacher used a multimedia projector and personal assistance to guide the learners; secondly, a short focus group was convened in order to allow learners to bring their 'out-of-classroom experiences

into the classroom. Their prior knowledge gained outside the classroom served as a foundation to build future class sessions on and connect existing knowledge with new knowledge. Somekh's third difference between action research and traditional research is satisfied by this example, as the best use of all available tools, including IT tools outside the classroom was used to engage and motivate the participants in tertiary learning.

By employing the action research methodology, both the description of O'Brien and Somekh were fulfilled; IT tools were used to bring about a change in behaviour and the learners who were being researched were impacted upon to motivate them and engage them in their learning. The continuous improvement nature of applying the action research method is illustrated by another example: at the start of the semester, in comparing the 2007 and 2008 group with the 2009 group, there were noticeable differences. In using Action research approaches utilizing IT as one of the tools, by the time that the 2009 group worked on their case study, their motivation and performance levels during the case study was the same level as the motivation and performance levels of the 2007 and 2008 groups.

Discovery learning approaches has been used successfully for many years. In this study, the constructivist and action research methodology was used. The extra care taken as the participants were the researcher's learners, are described under the ethical considerations section of this chapter.

3.5.3 Motivation and engagement

For this thesis, an adaptation of the Annen, Kramer and Bellwald motivational theory was used (See Appendix 5), focussing on behavioural characteristics which includes 'willingness to perform, initiative, commitment, perseverance, persistence and stamina the candidates' (p.3).

3.6 MEASURING INSTRUMENTS

The questions used the company interviews (open ended questions), observation protocols and online (for learner participants) were constructed with the input from the reference group created to address the ethical considerations of this study.

3.6.1 Face-to-face interview questions

The questions for the company interviews were validated by some of the reference group members who were academics and a senior colleague from a different NZ university, who had at least 10 years research experience and who, at that time, was chair of an international technology conference. Included in this testing was the presence of this senior colleague at the first two company interviews. The McNamara guidelines for conducting interviews were used (managementhelp.org). The standardised open-ended technique was chosen to enable faster interviews and simplify analysis and comparison. In preparation for the interview, at every company, a quiet room in the administration building was requested. Once in front of the interviewees, I explained the purpose of the interview and obtained permission to record the interview. Furthermore, confidentiality was addressed and any questions that they had before the interview were answered. As the interviewees were easily identifiable, after the interviews were transcribed and verified, their names were changed to protect their anonymity.

3.6.2 Observation Protocols

The observation protocols were based on the theories of Prince and Felder (2006), Somekh (1995) action research approach, the O'Brien (2001) spiral approach to action research and the motivational theories of Annen, Kramer and Bellwald (2005). The purpose of the action observations were to inform the researcher of the role of the learners, make predictions about and then attempt to modify their behaviour, with the intention of moving to the next spiral, and then repeat the process so that the spiral approach of O'Brien (2001) is fulfilled. The action observation protocol (Appendix 5) states the duration of each observation, a *before*, *during* and *after* observation phase. Part A contains the Key Indicators. The Key indicators were used to develop Part B: Likert type scales, which include the scales for measuring motivation levels (based on the motivational theories of Annen, Kramer and Bellwald (2005). The results from one of the 2007 action observation sessions were used to to construct the 2008 focus group sessions. The last part of the action observation protocol contains a synthesis scale.

3.6.3 Focus groups

The focus group questions for the 2008 group were constructed based on the decrease in motivation levels during the observation session of the 2007 group while they played the *beer game*. The purpose of the 2008 focus group session was twofold: first, to allow learners to provide an avenue to channel their frustrations with the *beer game*; and secondly, to help increase their motivation levels by the simultaneous introduction of the *beer game* and the focus group. Hence, the protocol for the 2008 group was: *their experience on the SCM course; how to motivate learners; any changes or improvements; extreme nature of improvements and considerations that should be taken into account.*

For the 2009 group, three focus group sessions were held. The purpose of focus group one was to confirm their prior knowledge, establish an avenue for group learning and to introduce the existing individual and group knowledge into the classroom before new knowledge could be added. The focus group one protocol thus covered: *daily activities before you started the course; your experience with technology and software applications and what would you like to achieve by the end of this semester.*

Focus group two was held one week into semester 1 before the annual field trip, while focus group three was held immediately after the field trip. While focus group one was to gauge their experiences of prior field trips and explore the concept of *seniority*, the purpose of focus group three was to keep the field trip fresh in the mind of the learner, to consolidate their learning and connect their new and existing knowledge. The protocol for focus group two was: *their experience of field trips; how seniority made them feel; how they felt about junior learners on the same trip and what they would like to see on the field trip.*

Focus group three was related to focus group 2 and happened immediately after the field trip. For focus group three, the protocol covered: *their experience and new knowledge as a result of the field trip; how did they feel with the juniors on the trip and How can they integrate their new knowledge into the classroom sessions.*

The results of these focus groups are recorded in Chapter 4.

3.7. USE OF MEASURING INSTRUMENTS

The following section describes how the data obtained from the face-to-face interviews, online survey questionnaires and focus groups were used.

3.7.1 Face-to-face interviews

Once the face-face interviews were completed, the main themes were extracted using the general inductive approach (Thomas, 2005) to help formulate the survey questionnaires. Thereafter, the main themes were included in the results in Chapter 4. Face-to-face interviews were conducted with twelve employees at two corporate companies. As soon as the main threads were established, some of the information with the input from the reference group was used to adapt the existing *WIHIC*, *CLES*, *QTI* and *TROFLEI* questionnaires. The main threads and the rest of the information were set aside for analysis. For pretesting purposes, four participants based on age and technology use were chosen. The questionnaire was refined and retested on four other participants adhering to the same criteria for reliability purposes. After the retest, the questionnaires were refined and ready for distribution.

The survey questionnaires were posted in line Part B: At the End of year 2008 and in the second semester of 2009. The completion dates for the 2009 group was end of June, 2009. Eight respondents of the 2009 group completed survey. The three athletes on scholarship were not available. Fourteen respondents of the 2008 group completed the survey.

3.7.2 Online questionnaires

The online survey questionnaires were constructed using some of the main themes from the face-to-face interviews, input from the reference group and integrating some of the questions from the *WIHIC*, *CLES*, *QTI* and *TROFLEI* measuring instruments. After constructing the questionnaire, it was tested using four participants (who did not form part of this study), refined and then placed online, ready for use.

3.7.3. Focus groups

For some of the focus groups, the action observation results were included during construction of the protocol to verify what was observed. Furthermore, focus group two was used to guide the learners towards the concept of *seniority* based on the Kearsley and Shneiderman (1999) theory of engagement and motivation.

3.8. MEASURING INSTRUMENTS AND NUMBER OF PARTICIPANTS

The number of participants per year and measuring instrument and how many times the instrument was used is recorded in Table 4 A.

Table 4 A
Measuring instrument and number of participants per year

Instrument	Year	How many	Number of participants
Observations	2007	5	20
	2008	5	18
	2009	5	11
	2009	1	10
Focus Groups	2008	1 (two sessions)	9 per session
	2009	2	11
	2009	1 (two sessions)	5 per session
Company interviews	2008	12	12
Online questionnaires	2009	-	8

3.9. ETHICAL CONSIDERATIONS

Realizing that in research environments such as this, ethical dilemmas could crop up on a day-to-day basis (Morrison, 2006) and conscious of the fact that 50% of the population in the town where the research took place identified as Māori, extensive and continuous consultation with the reference group continued. In particular, the reference group was concerned of the impact of such a study on the Māori population, how it would affect Māori participants on a day-to-day basis and how this information would be disclosed. As such, I had an ethical obligation to fulfil the Māori protocol at every stage and fully inform them of the nature of study, the areas where the study may have an impact on Māori, and how I would ensure that the rights and privileges of Māori are protected throughout the research. During this research, many such challenges and their consequences of decision making was taken into account. For purposes of explanation, the ethical considerations for this thesis are divided into four sections; ethical issues before, during and after the research, followed by a summary of the ethical considerations.

3.9.1. Ethical Considerations before the Research

Providing all the decision makers, especially the reference group, with the required information, allowed them to make informed decisions. Furthermore, it gave them the assurance that the research process was well thought through and would not have any adverse effect on Māori and the rest of the learners under my instruction during the study period. In particular, Kanohi ki te Kanohi or face-to-face meeting is very important to Māori (Rakena & Fisher, 2010), and as a researcher, I had to ensure that this approach was correctly incorporated into the research.

Included in my ethical application was the information letters destined for the learners and the companies involved. The companies provided approval via email. One of the main issues with the companies was the production time wasted as a result of the interviews and the health and safety concerns while I was on site. These concerns were dealt with by the employer setting specific time slots and having access to the interview questionnaire. Furthermore, the first time I visited the worksites, I completed a full health and safety briefing and thereafter signed in and out at reception on every visit. After obtaining consent and providing my supervisor with a copy of the company consent, I had to obtain consent

from the employees. This consent I obtained by first providing information posters to the companies which they posted on their notice boards. If the participants were willing to participate in the research, they forwarded their names to the human resources department or the supply chain manager, who then provided me with the names of the participants. In addition, the participating companies were given assurances of anonymity of the company and participants. In NZ this is of particular importance, as towns and communities are particularly small and companies and employees may worry that their name or location may be identified.

The main concern for the educational institution (my employer) was the safety of the learners, specifically as this study was based on a constructivist learning approach. As a researcher, I needed to demonstrate extra sensitivity and care and had to assure my employer that the learners would not be adversely affected. The information letters for the learners were handled by the research director and only after informed consent was obtained from the learners, was I allowed back in the process. The next concern was the amount of time spent on the research and how it would affect my teaching hours. The fact that this study was from a constructivist and participatory action research approach, meant the learners' time would not be encroached upon. As far as the concerns for the safety of the learners were concerned, it was doubly covered by the ethical approval and the agreement by the reference group to continuously moderate, especially during the focus group and the observation sessions. Furthermore, I obtained ethical approval from my employing institution.

For the online learners, the principle of anonymity was less complex. It was agreed that, after the online survey was developed, the research director would send the learners the link. The questionnaire would be completely anonymous and completing the questionnaire meant they consented. The online questionnaires would be completed after the learners complete the Supply Chain Management course.

3.9.2. Ethical considerations during the Research

Sometimes professionals may think that they have satisfied requirements by following a set of rules (Morrison, 2006). When the participants in a study are the learners in your class, it is critical to ensure that learners are protected and that the interruption in their studies should be minimised. At no stage during the study should the learner feel obligated to participate. It

is for this reason that the moderation by the reference group continued during the period that the research was done. During the observation phase, there was no intrusion as the learners were quietly observed. The focus groups were held on a Fridays at a time when the learners had no other lectures to attend. The last focus group sessions for the 2009 group were held at a restaurant at a time when the learners usually frequented the restaurant. The case study and the computer game were part of the class work and there was no encroachment on any class study time.

For the employers at the work sites, inconvenience was minimized by the researcher going to their work sites and the interview rooms were as close as practicable to their work location.

3.9.3. Ethical considerations after data collection

Once the data collection has been completed, the ethical responsibilities of the researcher shifts to data analysis and interpretation, followed by the publication of the results of the study.

Despite having some background in the area of statistical analysis, I took special care in the application of statistical techniques for the quantitative study. As the samples were small, I avoided using complex statistical techniques. For the qualitative study, I worked closely with a senior colleague who was the Chair of an International Technology research conference. Furthermore, if I needed additional help, I sought professional help.

Since part of my study involves a small sample of supply chain learners, I included high calibre experts at two forestry companies to establish the main themes, validate my findings and to answer the research questions that connect company culture to classroom culture.

After my data had been analysed, it was important to think of what should be done with the data; should I dispose of it immediately or retain it for a period of time, in order to answer some questions regarding the analysis that may arise in the future. Whatever decision I take, it is important that the participants in the research be informed if, in the future, I want to utilize the data or extend my research.

Ethical issues during the write-up are as critical as ethical issues during and before data collection. In particular, I have to ensure that I write what the participants intended when they gave their responses. Throughout the write – up stage, I was careful to place in parenthesis any direct responses from the participants to avoid plagiarism, frequently called ‘academic sin’. I took extreme care right from the onset and was in constant contact with my supervisor throughout the write-up process.

The research report provided for this thesis contain step by step documentation of the objectives, significance, rationale, background and limitations to this study. I outlined the research process followed, including the research approaches used. Furthermore, I defined the sample size, the different measuring instruments, and how it was used. This will enable future researchers to scrutinize the study for either replication or future research opportunities.

All questionnaires were kept safely in my home. Raw data were stored in my home on an external hard drive with personal access through password protection assured. Electronic copies of the raw data were sent to my supervisor for secure storage in his office at SMEC for a period of five years, after which it will be destroyed. Electronic data on my hard drive will continue to be stored securely for this five year period.

3.10 CHAPTER SUMMARY

The research design, methodology and ethical issues related to this study have been discussed in this chapter. The research design and methodology is summarized by the space ship taking off in Figure 14. The research title was conceptualized from the ushering in of technology as the answer to the orchestrated staff shortages which the tertiary sector in NZ was now experiencing; it forms the body of the space ship. A spaceship aptly describes how, when learners are motivated and engaged in tertiary education, they can take-off from the launching pad. The three research questions serve as the launching pad, while the discovery learning approaches serves as the flame. The importance of the reference group is illustrated and the data collection methods and communication processes used to develop and apply innovative methods of use of IT are stated.

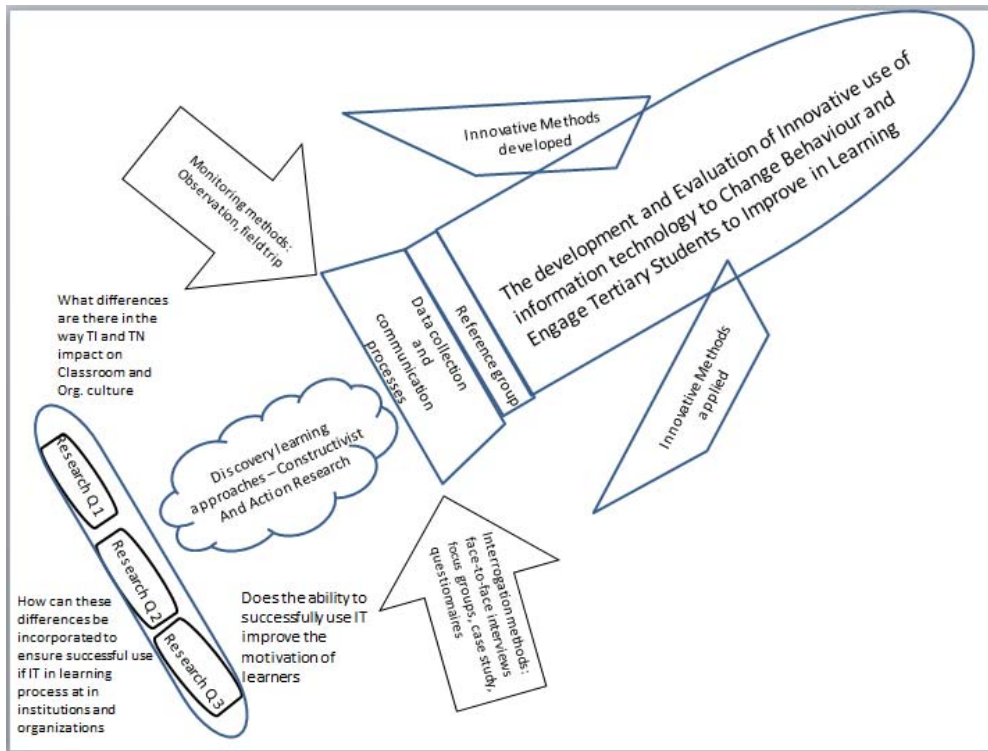


Figure 14 *Diagrammatical representation of the research design.*

CHAPTER 4

PRESENTATION OF OBSERVATIONS AND FOCUS GROUP RESULTS

4.1. INTRODUCTION

The results from the research for this thesis are divided into two chapters. The first section of The heart of this thesis lies in Chapters 4, 5 and 6. Chapter 4 starts answering the research questions by detailing the results of the classroom and companies' action observation and the results of the focus groups. Part of the focus group results was used to redevelop the 1960s *beer game*. Visuals and a description of the comparison of the frames of the *beer game* and the redeveloped game, *supply chain concepts (SCC)*, are in Appendix 7. Chapter 5 completes the answers to the rest of the research questions by presenting the results obtained from the face-to-face interviews and the survey questionnaires. Chapter 4 details the results of the classroom and companies' action observation and of the focus groups. The *SCC game*, developed with the help of some of the focus group results, is documented in Appendix 7. Chapter 5 presents the results of the face-to-face interviews and the online questionnaires. The main intent of the presented results is to answer the research questions presented throughout this thesis. The implications of the results are covered in Chapter 6.

For the 2009 group, all learners were asked to introduce a fellow learner in class. Part of this introduction included their experience in Supply Chain Management (SCM). All learners acknowledged that they had no experience in SCM. After a short introduction of the SCM concepts using words familiar to them, nearly 90% of the class admitted to some degree of involvement in SCM.

4.2 CLASSROOM SETTING FOR ACTION OBSERVATION

In the classroom, 30 computers were arranged in a horse shoe design against the wall almost immediately next to each other. In the middle of the room were tables and swivel office chairs on wheels. In the front of the room was space for the lecturer to teach and observe. If

the lecturer wanted to move around the classroom, there was more than enough space to do so.



Figure 15 *Example of horseshoe design classroom arrangement*
 (Source: *blogs.scholastic.com*)

4.2.1. Action Observation: Participants

The participants for the study were drawn from the SCM course. For action observation, the results are divided into five parts; the first practical session on computers where all learners were provided with computer access during class time; the second during the use and playing of the 1960 computer game in order to complete an online assessment; the third during the development of a simple database as part of the coursework; fourth, during the case study and fifth, before the field trip.

Table 4 B

Number of action observations and activities observed

Action Observation	Activity
Observation 1	Practical session on computers
Observation 2	Use and playing of a 1960 computer game
Observation 3	Development of a simple database
Observation 4	Case Study
Observation 5	Before the field trip.
Observation 6 (2009)	During annual field trip

For the 2009 group, a sixth observation session was done during the annual field trip to the host company headquarters and manufacturing plant. In addition to the observation sessions above, during the focus groups, non-verbal interaction was observed.

For the purpose of this longitudinal study, all learners were given full access to a computer and computer software, internet and email during lecturers and practical sessions. On the first day of class, before approaching the subject matter, learners were asked to introduce each other. The one hour ten minute class session was a mixture of lecture and practical work. Furthermore, learners could choose to work in groups of two or three during in-class practical sessions. On commencement of a practical session, the learners would merely swivel on the chair from the tables in the centre of the room to a computer. After the session, the learner would swivel the chair back to the table.

For all the groups, an initial introductory session was held to familiarize the learners with the format of in class practical. This session included basic internet searches. Software applications were introduced on an overhead multimedia projector with the learners logged on at the computers, simultaneously following step by step.

Table 5

Age group and number of learners per year

Year	Age Group	Number of Learners
2007	24-35	20
2008	24-35	18
2009	18-24	11

For the 2007 and 2008 groups the age group was similar and generally, a younger learner would sit next to an older learner. For the 2009 group, the average age of the learners was much lower due to the circumstances described elsewhere in the thesis, with 24 years being the highest age.

4.3 RESULTS

This section reports on the differences in learner behaviour over a period of three years. All learners were observed for one semester per year and the observations were recorded. Before every task, learners would receive guidance on a multimedia projector. As this study

included action observation, if the learners needed any guidance, the guidance was promptly given. If learners were unable to follow a task at hand, a different route was followed and a practical example provided. Once learners understood and could follow the example, the learner would be guided back to the original task. Throughout this process of deviating from set task and then returning to it, action observation was continued.

4.3.1. First Observation: Practical Session on Computers

The observations for the first practical session during 2007, 2008 and 2009 are compared and contrasted below. The 2009 group was extremely energetic and *bouncing off the walls* the first day in class.

4.3.1.1. Internet and software navigation abilities

For both the 2007 and 2008 group, 50% could navigate the internet well to find information needed to answer simple introductory questions about SCM and software applications. The other 50% were of mixed ages and needed help which was freely given by their peers sitting at the computer on both sides of them. The older learners on the other hand were much slower at navigating the internet; however, the quality of information obtained was very precise.

Table 6

Software and internet navigation abilities

Year	Software and Internet Navigation Abilities
2007	Mixed. 50% could navigate well, but information quality poor. 50% older learners much slower, quality of information precise
2008	Mixed. 50% could navigate fast, but information quality poor. 50% older learners much slower, quality of information precise
2009	Appeared more confident in front of the computer. 100% of learners found it hard to navigate – could click on pop-ups links and widgets

The 2009 group appeared more confident and extremely energetic in front of a computer and during a conversation; it appeared as though their knowledge of internet and software was superior to that of both the 2007 and 2008 group. However, when given a simple task 100% of the learners found it hard to navigate or find any quality information. When a hyperlink,

pop-up or widget appeared on the screen, they were able to click on it successfully. However, they were unable to complete the navigation task.

Furthermore, when this group (2009) was given a simple task, on “How would you search for SCM concepts”? they just shrugged their shoulders and could not perform the function unless the exact search criteria were given. In addition, they asked basic questions about the search criteria like: “Do I use lower or upper case when I type in the search criteria?” Furthermore, the lecturer observed very puzzled looks from 91% of this group, whispering to each other, pulling up of their shoulders, frowning. This group was asked some basic questions on supply chains like “What is needed to successfully run the supply chain?”, “What is needed to run the software applications?”, “What is needed to successfully run the internet”? Two of the learners with a puzzled look on their faces, asked, “Why on earth do we need to know that”?

4.3.1.2. Direction needed: in-class tasks

For the 2007 and 2008 groups, some direction was needed before completing the task and both groups would access peer help first. On three occasions, however, the 2008 group sought lecturer assistance first.

Table 7

Direction needed to complete a task

Year	Direction needed for a task
2007	Some direction needed. If more direction needed, would access peer help first, then lecturer.
2008	Some direction needed. If more direction needed, would access peer help first, but on three occasions when lecturer assistance was sought
2009	Needed direction with every task. Jumped up to see progress of peers then came to lecturer for assistance. Disengaged from time to time

For the 2009 group, learners not only needed direction with every task but were disengaged from time to time. The disengagement was characterised by being restless, extremely high energy levels and sometimes staring into space.

4.3.1.3. Distraction from completing set tasks

The 2007, 2008 and 2009 groups were all easily distracted from completing set tasks(see Table 8). Although both the 2007 and 2008 group was easily distracted either on screen or by any interruption, they would first complete the set task then access their emails or the internet before the next task was given. The moment the next task was given, they would discontinue what they were busy with, complete the task and then revert to reading emails or internet surfing.

Table 8

Distraction from completion of set tasks

Year	Distraction
2007	Easily distracted. Finished task and then accessed internet/emails
2008	Easily distracted. Finished task and then accessed internet/emails
2009	Easily distracted. Had no idea where to start. Started with Q & A. After some guidance, tried task, yet success rate to locate information poor. Access any advertisement or popup before finishing set task

The 2009 group could, with ease, open a software application or internet browser; however, once the software application or browser was opened, they had no idea where to start. Furthermore, Where the 2007 and 2008 group accessed emails and surfed the internet after completion of a task, the 2009 group, once distracted, accessed advertisements, links and pop-ups without completing the set task. As these distractions were very time consuming and caused the 2009 group to lag behind on the first day, the learners were immediately, step by step, guided through completing the online [Visual, Auditory and Kinaesthetic \(VAK\)](#) test.

4.3.1.4. Classroom environment and learning styles

Identification of learning styles was done in the classroom based on the action observation findings for the 2009 group on the first day of class (see Tables 7, 8, & 9). Learners were asked to complete a Visual, Auditory and Kinaesthetic (VAK) online test in class. Once they completed the test, every learner was given an opportunity to share their learning style with

the rest of the class. Furthermore, a session in class was scheduled to explain what their learning style meant.

In two of the questions in the survey, learners were asked to choose one of three categories based on their learning style. The three categories were: auditory learner; kinaesthetic learner; and visual learner. A fourth category: *other*, was added to include for learners who had more than one learning style. The results show that two respondents identified as both kinaesthetic and visual learners. During the analysis phase, these two categories were adjusted to include their responses and the '*other*' category was removed.

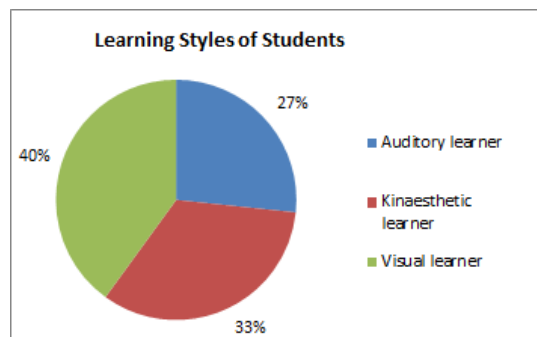


Figure 16 *Various learning styles*

The instruction methods and in-class strategies were adapted to suit the learning style of the learners. Their learning style outcomes, focus group results and in-class observations documented in Chapter 4 resulted in significant changes made to the annual field trip.

The 2009 group of learners needed continuous direction to access the internet purposefully. Firmer boundaries were set to help them complete set in class tasks and to continuously motivate and engage them.

For example, one day one of the group members asked a question about a website that used the one day sale option to sell their stock at reduced price. All the learners could not fathom how this online business operated, how they could source their products at such a low price and yet remain very profitable. Again, the lecturer observed the frowns and puzzled looks, whispering to each other followed. The group appeared to have no understanding that their question could be answered.

Step-by-step guidance from the lecturer resulted in the learner emailing the company directly. The learner loudly consulted the rest of the class, while typing the email, for the email content. A word from one learner would contradict a sentence from another. The look on their faces and the throwing up of hands in the air expressed the difficulty they had in wording a simple email. Once the email was finally written with considerable assistance from the lecturer, the email was sent off.

There were smiles all around the room when the learner received almost immediate feedback from the company. The learner rose from his seat, interrupted the class and proudly and enthusiastically relayed the content of the email. After this incident, the lecturer made a few impacting changes to the field trip for 2009.

4.3.1.5. Preferences for in-class group work

The 2007 group preferred to work individually while the 2008 group preferred to work in groups (see Table 9). On three occasions, however, when mature learners found the practical work difficult, they spontaneously joined a younger learner and, shared the tasks and swapped functions. The 2009 group could not determine whether or not they wanted to work in groups or individually.

Table 9

Preferences for in-class group work

Year	Preference for in-class group work
2007	Preferred to work individually. Thrice the semester mature learners simply joined with younger learners in group. Older learner read instruction, younger learner navigate. During practical, would swap roles. Reverted back to individual work ASAP
2008	Preferred group work. Older and younger learners will work in teams
2009	Indeterminable. Indecisive of whether to work in groups or not

4.3.1.6. Additional Observation: Annual field trip

During the course of the semester the learners go on a field trip to the head office of a local company that is heavy reliant on supply chaining for its day to day operations.

Table 10
Annual field trip changes

Year	Annual Field Trip
2007	Just before the final assessment. Field trip to Head – office – 3 hrs
2008	Just before the final assessment. Field trip to Head – office – 3 hrs
2009	Fourth week of semester. Field trip: All day. Both Head office and manufacturing plant. Non – degree learners included

For both 2007 and 2008, the field trip was scheduled towards the end of the semester, just before the final assessment. For the 2009 group, based on the first in-class observation, the company was consulted and the following changes were made:

- The annual field trip was brought forward to the fourth week of the course;
- A site visit to the supply chain plant was included to demonstrate the practical operation of a supply chain. This addition of a site visit helped the learners build on their existing knowledge;
- A non-degree class was invited on the field trip to give the 2009 group a feeling of seniority;
- Focus groups were added before and after the field trip.

For the 2009 group, the purpose for including the learner’s initial background helped learners:

- better understand the new concepts and make the connections to extend their existing knowledge; and
- connect their existing knowledge to the topic of the day and the concepts learnt early in the course, which, in their case, proved to be a powerful strategy to gain new knowledge.

4.3.2. Second Observation: During the beer game.

During this session, as part of the course, the learners played the *beer game*, a game developed in the 1960s in the USA and computerised in 1999. The purpose of the game was to introduce learners to basic SCM terminology. After playing the game, the learners completed an online assessment which contributed five percent to the learner’s final mark and was a compulsory course requirement. After submission of the online assessment, the learners receive immediate online feedback and results.

Initially, when learners started the course, all groups appeared highly motivated. Table 11 compares and contrasts the motivation levels for the various years. For both 2007 and 2008 groups, their motivation appeared to drop considerably during and after playing the *beer game*.

The drop of motivation levels was noted for the 2007 group. Learners were asked to put their views aside and play the *beer game* with additional guidance. When the 2008 *beer game* session was introduced, a focus group session was introduced simultaneously and scheduled for the Friday immediately after playing the *beer game*.

After completing the assessment task, neither the 2007 nor the 2008 group accessed the game again. Both groups murmured to their peers during class time that they were 'relieved' that 'it was over'.

Table 11

Motivation levels before and after playing the beer game

Year	Motivation levels
2007	High. Dropped significantly during and after beer game. Played game reluctantly. Characterised by general disinterest in the class, large scale absenteeism. Hard to motivate afterwards
2008	High. Dropped significantly during beer game. Increased to previous high levels during and after focus group session
2009	High for short period. Manifested in form of restlessness, asking unrelated questions, continuous open and closing of emails, staring into space. After a learner typed something into another's browser, motivation levels picked up instantaneously

Although the 2009 group appeared highly motivated at the start of class, they experienced a drop in motivation levels soon afterwards. The drop in motivation levels manifested itself in the form of at least half of the group getting up after a minute or two and asking fellow learners unrelated questions, followed by continuous opening and closing of emails when sitting down and staring into space. One hundred percent of the learners tried to play the game for at least five minutes at a time. During that time, frustration showed on their faces. One learner quickly typed something into another learner's browser; that learner typed it in

the next learner's browser, an action that travelled around the room instantly. The frustration disappeared from their faces and it appeared as though the 2009 group mastered the game without further assistance.

On closer observation, 100% of the learners were playing a different game which kept their attention. The one learner, who initially started the game, eagerly showed the lecturer how to play this game, with great satisfaction that he could do so, in less than one minute. This 'newly introduced game' demonstrated a few supply chain concepts; however, the product was hard drugs and strategies on how to avoid the law. The lecturer made it clear that a game promoting such strategies is not allowed in the classroom. Four learners responded in unison: 'then the *beer game* should not be allowed in the classroom either'. The lecturer noted these comments, arranged for a focus group at a local eatery and included some enticements like a free meal to ensure learners played the game and completed the assessment attached to the game in the allotted time.

The lecturer worked, with the learners, through the written instructions for playing the *beer game* in an open forum. While playing the *beer game*, the learners appeared to be struggling to follow the written instructions on the step-by-step guide. They frowned, tried to follow the instructions, and then asked questions of their fellow class mates across the table. When they approached the lecturer, almost simultaneously to once again clarify the written instructions, all learners were taken step by step, for a second time, through the *beer game* with the use of an overhead multimedia projector, followed by individual assistance. Every time they were introduced to a new interface of the game, they looked at each other; laughter reverberated through the room, followed by the shaking of heads. At times, at least 50% of the class would utter some swear words and then quickly apologize. Strikingly, the looking at each other, laughter, shaking of heads was all in unison the moment the *beer game* was opened or another interface/page of the game popped up. Their behaviour appeared as though they were ridiculing the game.

4.3.3. Third Observation: Development of a simple database as part of the coursework

The simple database, for a business of their choice, was developed during in-class and laboratory time as a practical assessment and contributed to the final mark for SCM. Furthermore, the learner has to provide a short written summary of the company, the product and the type of supply chain it employed. Before embarking on the assessment, the

learners follow a step-by-step in class practical exercise led by the lecturer and developed a simple database. During this practical exercise, the learners divide into working groups with a maximum group size of four members and a minimum of three.

For the 2009 group, the maximum number was two members per working subgroup, based on the smaller class size and the observation conducted during previous classwork. During the development of the database in class, groups were permitted to ask others and the lecturer for some assistance. The lecturer was always on hand, and willing to give assistance as required. Invited assistance was given as and when required by groups. Once the development of the simple database was complete, the learner accessed and completed an online assessment, which formed part of the simple database development. In addition, the learners provide the lecturer with a copy of the developed database, company brief and supply chain employed. This assessment is marked and contributes to the learner's final mark for SCM. The following are the observations carried out during the simple database development process.

4.3.3.1. Skilfulness, group processes and communication

The 2007 learners used the instructions provided for the assessment to develop the simple database in groups, while the 2008 group linked up 50:50 in terms of skill with IT and management and direction skill. The 2009 initially appeared very skilful when they accessed their computer and opened the software programme.

Table 12

Skilfulness, group processes and communication

Year	Details
2007	The learners skilful on computer did development, the others read from instruction sheets. Checked groups next to them if they needed help, then afterwards lecturer
2008	Learners skilful on computer automatically grouped with learner skilful in management and direction. Workload shared equally. Communication almost by default. Minimal assistance accessed. Completed in record time
2009	On initial observation, appeared skilful. After accessing software, was unable to do development. Assistance accessed frequently. 24 yr. old contacted her friend via mobile text to help with development

Learners found it difficult to develop the simple database and needed frequent assistance. As the 24 year old in the 2009 group had a friend doing programming at the same tertiary institute, she contacted him via mobile text for assistance.

4.3.3.2. Errors during data base development

Errors while developing databases are not unusual. Table 13 shows the different ways in which every group of learners behaved when there was an error in their database during the development phase.

Table 13

Year vs. Behaviour displayed when errors were made

Year	Behaviour displayed
2007	Difficulty in picking up errors. When error is discovered, Check with any group in room. If unable to resolve, asks for help
2008	Same difficulty in picking up errors as 2007. When error is discovered, the ones skilful on computer listen to learners skilful in direction and management, consults paper plan and then solves error. Accesses lecturer help as last resort
2009	Unable to identify errors. If error identified for them, they cannot understand why the error is there or where it comes from. Even when shown how to fix error, it appears as though groups do not understand; they look puzzled and shrug shoulders

Table 13 shows the marked differences observed in behaviour between 2007, 2008 and 2009 groups. As a result of these differences, the 2008 group completed their development two hours shorter than the allocated hours; the 2007 class needed one more workshop; the 2009 group had to come back for additional sessions, resulting in an extra six hours added to their database development time.

4.3.3.3. Linkages between databases and websites

The linkages between database and internet were continually discussed by the 2007 group. Once the linkages were made, they found it easy to share the linkages with others. For the 2008 group, it appeared as though the linkages were clearly made from the beginning. There was ease of navigation between internet and database development.

Table 14

Year versus linkages made and behaviour when errors were made

Year	Linkages made and behaviour displayed
2007	Linkages continuously discussed in group. Clarified the linkages in the group, if unable, with lecturer. Once linkages were made, shared information with other groups
2008	Linkages appeared clear. Developed database while surfing internet
2009	Initially appeared more skilful than both 2007 & 2008 group and could open software and create a new file. Unable to do anything further. Unable to understand linkages, even after individual group sessions with the lecturer. Surprised look on the faces. Step by step guidance through a second example was necessary

According to table 14, the 2009 group, although able to open and close software and create new files; were able to do little more. The only way in which they gained a bit more information was by being taken through a second practical example.

The 2009 participants spent around six hours extra than the allocated time for the database development compared to the 2008 and 2007 groups. The extra six hours were accommodated through extra sessions after class and during tutorial sessions.

4.3.4 Fourth Observation: During the case study

Every year, a case study forms part of learners' assessment. All learners on the course were given the same study every year, and every year a different case study was used.

The learners were required to:

- Provide an introduction of the company
- Summarise the case and provide the key points
- Provide criticisms (including strengths and or weaknesses) of the case and provide suggestions for overcoming the weaknesses
- Present an integrated view of the article
- Provide one personal application, including any lessons learned
- Evidence of team learning, especially overcoming difficulties
- Evidence of individual learning processes documented
- Write a conclusion.

The case study was done in groups of three to four members, and the learners were allowed to integrate their knowledge gained on the SCM and any other course. This assessment was divided into two parts: The presentation of the assignment, which was normally due on a Friday morning; the case study was due around three weeks into the course, well before the field trip. The second was written work, normally due on the Monday after the assignment due date, allowed learners to complete any editing.

For the 2007 participants, the Case study was the *Top Ten World Class* companies. For this study, a video presentation was used. The video on the *Top Ten World Class Companies* was screened during class time and provided information on who the top ten companies were, and what made these companies successful. By replaying the video at any time convenient to them, the participants could gather more information on each of the ten companies in order to prepare for assignment presentation and complete the written work. Learners watched the presentation in class followed by a question and answer session, before they were allowed to work in their groups. During the question and answer sessions, learners appeared frustrated at times if they did not understand some concepts. After clarification of the concepts, the learners appeared confident to continue.

Their confidence was noticeable by the ease with which each group related to the rest of the class and their own group members. While moving through the groups, issues were discussed and planned, either using pen and paper or using the computer. On inspection and listening to conversations, all subgroups were on track. During the workshop times, learners would meet in their groups to discuss how they will present the case study. Every member of every group was vocal, contributed meaningfully, while the members listening wrote down the contributions and incorporated it into the existing outline for the case study. For the 2008 group, the written article, *The Ten Flatteners* by Thomas L. Friedman and a video was used (see Appendix 1). The learners were allowed to access additional information via the internet or library databases.

The 2009 group used the Zara Fashions case study (see Appendix 2). This case study provides a practical demonstration of SCM concepts and how application of these concepts set Zara Fashions apart and helped increase profits and number of stores while other fashion houses were either struggling to maintain profits or were closing down stores. As explained previously, for the 2009 group, the case study was swapped with the annual supply chain

field trip and rescheduled towards the end of the semester, just days before the final assessment.

Table 15

Observations while learners were doing the case study

Year	Details
2007	Groups remained the same, unless chose to change. Ease of discussion
2008	Groups remained the same. Deliberated in class on how to use technology to illustrate the case study. Hand gestures, notes passed between group members, collaboration clear. The subgroup members with leadership and time management skills clarified some issues with lecturer
2009	Case study rescheduled till after field trip. Deliberated in class and outside. Understood case study well. Built on prior knowledge. Few weeks prior to final examination. Minimal assistance sought from lecturer.

For the 2009 group, because of the rescheduling of parts of the course, the case study was given a few weeks prior to the final assessment. The case study was introduced and a connection was made between their initial knowledge, the database development and the field trip excursion. The 2009 group used the 15 minutes in class time to deliberate, similar to the 2008 and 2007 group. There appeared to be no difference between the confidence levels of the 2007, 2008 and 2009 groups during the in-class deliberations. As the lecturer walked through the subgroups and paused, the chatting with each other was the sharing of SCM concepts learnt in class, from their friends off campus, during the field trip and while in part time employment at various organizations.

4.3.5. Fifth Observation: Before the Field Trip

Table 16 shows the field trip information per year, while Table 17 shows how the students responded in class when informed of the field trip. Every year a field trip (see Table 16) is scheduled to a forestry company in Central North Island that uses a supply chain effectively. The purpose of the field trip is to allow learners to make a connection between theory and practice and show them how to effectively use technology as a tool. Learners were briefed lightly at the beginning of the semester, with more information shared closer to the field trip. The field trip is usually scheduled for a Friday morning just before the final exam. The bus leaves the tertiary institution around 8 am, takes around ten minutes to reach the company

and returns to the tertiary institution by 12 noon. A presentation session is usually held at the company head office, with the Head of the organization addressing the learners. A question and answer session occurs in a relaxed environment, while the learners are enjoying refreshments.

Table 16

Field trip information for every year

Year	Field Trip Information
2007	½ day, head office presentation, scheduled before final assessment
2008	½ day, head office presentation, scheduled before final assessment
2009	Significant changes <ul style="list-style-type: none"> • Head office presentation- morning sessions • Tour of manufacturing plant – rest of the day • Scheduled within first three weeks of course • Non- degree learners included in field trip

For the 2009 group, based on previous in-class observations, learning styles and focus group responses, significant changes were made regarding the field trip (see Table 16). First, the trip was brought forward to the fourth week of the semester. Secondly, a non-degree class was invited on the trip with the SCM learners. Thirdly, the tour lasted the whole day in which the company head office presentation was combined with an afternoon walk-about tour and question and answer session at the manufacturing plant. The purpose of these significant changes was first, to engage supply chain learners and provide them with a practical example of a supply chain; secondly, to expose learners to a manufacturing plant where technology is used effectively; thirdly, to motivate learners to share their knowledge with non-degree learners; and fourthly provide a sense of seniority and responsibility by combining the trip with non-degree learners. The non-degree class was accompanied by their lecturer in a separate vehicle.

Table 17

In-class Observations: Field trip

In Class/group	2007	2008	2009
Information re field trip shared	Affirmative nodding of heads, yet appeared to be in deep thought	Affirmative nodding of heads, smiling. Spent a minute or two discussing the idea with fellow learners.	Faces lit up, very vocal in class. Openly expressed feelings of elation
After field trip announcement	Appointment penned in diaries, explored alternative arrangements for other subject workshops	Often discussed field trip with each other during workshops.	In between tasks, discussed pending field trip and some concepts they did not understand with fellow learners

When the information on the field trip was shared, all groups responded positively, yet slightly differently. Both the 2007 and 2008 group nodded affirmatively. Where the 2007 group appeared to be deep in thought immediately after the information was shared, the 2008 group was smiling and nodding their heads. When the lecturer questioned the 2007 group regarding the 'deep in thought' look, learners explained that they had some dilemma, as other class workshops were booked for the same day. After this revelation, the learners met together in groups to discuss possible alternative arrangements for other workshops. For the 2008 group, although this issue did not arise during the information sharing session, the School of Business lecturers were provided with the date of the field trip.

The 2009 group responded differently to the 2007 and 2008 groups; their faces lit up almost immediately and there was chatter all around the class room. Almost immediately they expressed feelings of elation. When asked whether they knew what the field trip entailed, they appeared puzzled. Immediately the importance of the trip, their roles and their responsibilities during the trip were explained. Part of their responsibilities was to become familiar with supply chain concepts terminology before the trip. They continued to be vocal and elated after their roles and responsibilities were explained.

The rest of the observations that follow were conducted for the 2009 group only.

4.3.6. Action Observation: During Field Trip for 2009

This observation was only included for the 2009 group to ascertain the effect of the significant changes to the field trip. On the way to the head office, the learners appeared excited. There was loud chatter, smiles on their faces and conversations about some supply chain terminology.

During the presentation, the supply chain learners focused mainly on the presenter and the notes taken by the undergraduate class while enjoying some of the treats provided by the company. At some stage during the presentation, the supply chain learners would point with their eyes to the non-degree learner. This observation was noted for inclusion into the focus group session after the field trip.

Table 18

Behaviour of learners during head office and plant field trip – 2009 group

Item	Behaviour of SCM learners
En route Head office	Chatty, smiles, excitement
During head office presentation	Concentrated on speaker and non- degree learners, particularly on non-degree learner notes
En route to plant	Chatted to each other about presentation
Arrival at plant	Jumped out of vehicle, appeared eager, excited, energetic and motivation levels appeared high
During plant tour	Asked questions continually re use of technology. Looked at screens with interest. Continually asked for opportunity to handle technology. With firm oversight 6 learners were allowed to operate live plant. Engaged staff throughout the plant tour
After plant presentation	Took photographs, spoke to operators, managers, explored different other areas of plant, appeared happy, asked questions continually

The excitement and smiles of learners and their willingness to engage with staff at the production plant was significant, especially in the presence of the non-degree learners.

4.4. OBSERVATIONS AT THE COMPANIES

During the face-to-face interviews at the two companies, the researcher observed the environment, interaction between the staff, and general behaviour at work. The company names have been omitted and replaced with Company 1 and Company 2. For ease of display, the observations are shown in two tables; Table 19 (five categories) and Table 20 (four categories).

Table 19

Comparison and Contrast between Company 1 and Company 2

Item	Company 1	Company 2
Environment	Admin Staff A range of single floor free standing buildings park like setting. new building being erected	Admin staff housed in four storey admin building at the security gate, with their own staff room.
Distance from HQ	Plant about 35 minutes away.	Plant on site beyond the security gates with their staff room.
Staff size	Small compared to company 2	Far larger than company
Morning tea/Lunches	staff were either sitting outside under the trees or eating at designated spots in the office area. A new building of substantial size was being erected at the entrance of the driveway.	In the admin building, during morning tea and lunch break, two or three staff members sat in the staff room. Staff generally entered at different times, made a drink/heated up food and went back to desk. Plant staffrooms overflow during morning tea and lunchtime
Interaction between staff	Staff appeared relaxed. Directors and staff worked side by side, shared offices and meals. Once a month on a Thursday all the staff together for morning tea.	Minimal interaction between staff in admin building. Continuous interaction on the plant – engineers, operators and other staff constantly communicating. In IT area there were twelve desks set up with only one staff

Table 20

Comparison and contrast between Company 1 and Company (2 con't)

Item	Company 1	Company 2
General behaviour	Everybody was on first name terms. They appeared helpful to each other.	Staff in admin appeared very busy. Minimal walking around. Very quiet work area. In plant staff very verbal. Most sitting behind desks looking at computer screens
Staff complement	Smaller than company two. Directors part of the day-to-day staff	Considerably bigger than company one. Some Directors were in the administrative building. Directors clearly separated from staff
Plant	Situated off-site	Situated on-site
Security	Report to reception. Signs in and staff member accompanies visitor to the particular office	High visible security. Report to reception, view a Health & Safety video then staff member accompanies visitor to the particular office
IT	IT company on site	One IT person onsite. Staff wait their turn or call an Auckland number and pay for the callout

4.5 FOCUS GROUPS

A focus group is an exceptional tool under the following conditions; when creativity is sought after, when clarification is necessary for problems faced and when ideas and perceptions are required within a short timeframe (Butler, Dephels & Howell, 1995; Nassar-McMillan & Borders, 2002; Nielsen, 1999). As the researcher employed a constructivist approach, it was an ideal instrument to use to gauge the learners' perceptions during the course (2009 group) and for the improvement of the *beer game*.

This section reports on the responses during interactions with the two 2008 focus groups and the five 2009 focus groups. For the 2008 groups, there were nine members per group. As the learners who worked together in a group had a closer relationship, care was taken to split the learners who worked together in a group, as far as practicable. The 2009 group was

smaller than the 2008 groups and not split, except for one occasion, when the group was split was during the focus group sessions at a local restaurant.

The focus group sessions for 2008 were conducted two days after playing the *beer game*. The purpose of these focus group sessions were to:

- provide a learner perspective on the *beer game*; and
- access feedback from learners about the *beer game* that could lead to possible enhancement or overhaul of the game.

4.5.1. Focus Groups 2008

The two focus groups sessions, with learners on the SCM course, were scheduled to gauge their perceptions of the *beer game* exercise. All learners took four subjects during the semester and most learners worked part time. These sessions took place on the Friday after the learners had completed the *beer game* exercise, in order to not encroach on the other subject areas. The lengths of the focus group sessions were 60 minutes each. The classroom with the horseshoe setting was ideal for the focus groups, as the moderator could clearly see all the participants around the table. Group one consisted of five females and four male, while group two consisted of five males and four females. Some knew each other intimately because of in-class group work. As far as practicable, most participants who knew each other intimately, because of in-class group work, were split into different groups.

As the tertiary institution may be easily identified, participants' names have been omitted. They have simply been numbered from participant one to participant nine. The researcher was the moderator and a senior member of the reference group was the co-moderator. Before each focus group session, the participants were warmly welcomed. The purpose of the focus group was explained again and the co-moderator was introduced. The co-moderator opened both focus group sessions with a *karakia*, the Māori word for prayer. After the focus group sessions, the group members were thanked for their participation by the moderator; the co-moderator said a few words of appreciation and closed the focus group sessions with a *karakia*.

Focus Group Protocol

The focus group covered *their experience on the SCM course, how to motivate learners, any changes or improvements, extreme nature of improvements, considerations that should be taken into account.*

4.5.1.1. Results – Group 1

The answers to the focus group protocols for group one is documented below, together with the non-verbal responses. As soon as the time allocation expired, learners were guided into the next question. While this focus group was in session, learners in focus group two were either attending workshops for other subjects or were working in the library.

SCM course experience

Participant one felt she started off well. She made new friends, and enjoyed coming to the class. *I would regard my experience as positive*, participant two answered. *I work in a supermarket, there may be a connection.* Participant three was feeling the same way as participant two. She has a part time job as cashier at a local tourism company.

Participant four stated that *completing the course is my aim, and I am on track.* Before studying the course, he was working at a manufacturing plant in the next town, about 30 minutes' drive. Participant five agreed with participant four, and added that *nothing will deter me.* In partnership with his father, he developed some new entertainment technology that could be set up easily in any town as a fixture, or could be moved from site to site. He was in the process of presenting his business idea to a select group of investors.

Participant six enjoyed the class, as she was a single parent and found the classroom environment very stimulating. She has no television in her home and creates *a stimulating environment for my children to learn and grow.*

I really like SCM and the way it is taught, was participant seven's response. He works most times and needs to manage his time well when he is in the class. Doing in-class practical suits him well and assists him in managing his time.

Participant eight indicated that staying positive helped her at times when she felt demotivated.

We talked it over in class a few times, participant nine, the only learner who had no part time work at the time, said that she commutes at least 45 minutes to the campus, comes in early and leaves late, as she depends on some else's transport. *I really enjoy this course*. All participants nodded their heads in agreement with participant nine.

Participants nodded positively, five participants were smiling with a very positive look on their faces and presented positive body language.

Motivation of learners

Thank you for allowing us input into improving the course, participant one answered. *What a great way to motivate learners*. Participant five nodded in agreement: *I feel if you did not give me this opportunity to provide constructive input, I may have lost motivation all together*. All participants nodded their heads in agreement. *We need to change the beer game*, participant one answered.

Participant four feels the integration of past experiences was a great motivator, and should be maintained. He feels that he was able to draw on his previous experience in technology. *That was a great motivating factor for me and it should continue*.

My good experiences on the course have been turned into a nightmare when you introduced beer game, participant six and seven responded almost in unison.

Your positive attitude has rubbed off on me, participant eight said. *I feel my motivation carries over into other classes, something I did not expect*.

There were still some smiley faces, with only a few grins appearing around the room. Their body language was still positive.

What would you change or improve

Participant one felt the whole of the course motivates learners, except for the *beer game*. Participant six and seven agrees. Since the *beer game*, they felt less motivated. Participant two felt that the availability of the lecturer and personal assistance was a great motivator. *During the beer game though, no amount of personal assistance and availability of the lecturer could motivate me.*

Participant nine agreed that the *beer game* was a let-down and he had to refocus his energies.

Participant four felt extremely motivated, and believes that something needs to happen to the *beer game* to keep the learners motivated. *With my knowledge, I have a few ideas to contribute. A pity that such an inferior game should form part of the course, participant six nodded in agreement with the rest of the participants.*

All participants appeared very eager to participate or contribute to improving or changing the game.

How would you change the game?

Relook the interface, participant five responded. It looks ancient – like a game out of the previous era. Participant six agreed. If I just look at the instruction sheet, it is enough to put me off. Both the instruction sheet and interface of the game makes it look ancient. We are in the modern technology era, this is a tertiary education institution and the subject illustrates use of current technologies.

Participant four viewed supply chain from a manufacturing point of view. We have trucks coming and going all the time, so draw a few trucks on the interface. That will make it visually more appealing, participant nine replied. When I commute here, I see pictures of the environment around me. Why not incorporate pictures? For every facility in the game, draw a picture. I create an environment for my children at home, and do not introduce anything bad. Participant eight expressed that alcohol is a bad thing to introduce into the classroom. It is a poison and its introduction into the class via a game was a bad choice. Do you drink alcohol, she asked the moderator, who replied “no”. Why then are you so committed to send subliminal messages through the beer game? Every single interface of the beer game reminds us of alcohol, doesn't it? She

made eye contact around the room to the rest of the participants who nodded agreeably in her direction.

When participant one sees the icon on her desktop, it reminds her of drinking parties. *I cannot believe you would give anybody a game like that*, as she points to the moderator. *If you give someone poison to drink, do you feel good about it?* Participant two has increased his drinking after playing the *beer game*, until he is totally unsteady on his feet and vomits. His friends tell him of things he did the previous night that he finds difficult to recall.

Participant three recalls how he was tempted to start drinking after playing the beer game. *Does it have to be called the beer game? Throughout this course we have studied other companies that use supply chains very effectively.* Heads nodded around the room.

Participant seven describes how in life one has choices. *What if we could choose the product that can be used in the supply chain? Remember that the purpose of the game is to teach us supply chain concepts, not get us hooked onto beer, is it?* Laughter rang out around the room.

How extreme should the changes be?

Participant three believes as long as the supply chain concepts are taught, the interface changes could be very extreme. *That means the purpose of the game will remain as initially intended.* Participant six creates an environment like no other for her kids. *Other children love to visit. Why not create a game which is appealing to look at, easy to follow, and has help hints at the fingertips. Not only will we enjoy it, others will, too.* With that in mind, participant seven replied, *can we have the same theme running through the game? Pictures on every screen whether it is the help screen or play screen? If we have carte blanche,* participant one was inclined to agree with participant seven. *Pictures will keep us motivated, rather than drag us down. The current game is ancient. It is unsuitable for the current technology age.*

Participant six wants the instruction sheet to be included in the help menu and could be displayed as tips, like with most contemporary software. *That will be an extreme change, would it not?*

When we started developing our technology, we went to the extreme and incorporated a range of things never thought of. Participant four appeared deep in thought as he explained how including the pictures, tips, a help menu which is a continuation interface of the 'new game' may mean extreme. As long as the concepts of SCM are taught, who cares?

All the participants appeared to enjoy this question and wanted to provide more input.

What considerations should be taken into account?

Participant four outlined how the learners were *continually being marginalized in the education system today* and it appeared as though *more and more control was exercised by the administration. Hopefully you can use our input to change something as small, like redesigning the game.* Participant six has noticed the change long ago. She completed some undergraduate courses first, before being admitted on the degree programme. She has a strong belief that *education should be learner centred, not administration centred.* Over the years, she witnessed *learner numbers increasing, lecturer numbers decreasing, learners squeezed into rooms and facilities lacking.*

Participant two explained how he greets the shoppers in the supermarket *with a friendly smile, cash up their goods, takes the money and never sees the shopper again.* This, in his view, is what the tertiary institutions have become; *a supermarket and that is a shame. Learners should be but back in the centre.* Participant three understands and recognizes the environment that participants four, six and two outlined. *When I think of it, it makes me sick on the stomach. We fill in feedback forms every semester, but I do not think our feedback is valued, conditions are becoming undesirable. If you can use our feedback regarding the game to bring positive changes to the game, it will be much appreciated. Our group has talked this topic over many times during our meetings; the learner's comments and input should be valued. The institution has to realize that, we are the reason why they exist. The institution should serve our needs.*

Hopefully our input will result in a better game, a small contribution, but a significant one, participant one nodded in agreement.

4.5.1.2. Results – Group 2

The answers to the focus group protocols for group 2 are documented below, together with the non-verbal responses. As soon as the time allocation for a statement expired, learners were guided into the next statement. While this focus group was in session, learners that were part of focus group one had left the campus, except for one participant, who was reliant on someone else for transport.

Your experience on the SCM course

Participant one is doing tertiary study, because his mother is a lecturer at the institution. He is coping with the course, it is interesting and the concepts are thought provoking.

Participant two enjoys the course as it brings her amongst her peers. She is a single parent and needs some stimulation. Participant seven agrees, *and enjoys the stimulation, too*. She is living with a family (as a homestay) and there are no other young people in the household.

Participant three is an active participant in the class and lives himself out in class – *I just love it*. He is very time bound and comes to class early, completes all his pre reading, but hates it when others, especially his group members, come to class late.

Participant four enjoys the activities done in class, is very vocal and always contributes to discussions around employing technology to drive a business. She lives with her parents who own a consultancy firm, and she is completing her studies to prepare her to work in the consultancy firm.

Participant five can see a supply chain at work, and he thrives in the class. He works part-time for one of the big warehouses in town packing shelves at one of the supermarkets a few hours per night.

Participant six enjoys the full integration of technology and the class examples. He has a special interest in SCM as he is taking Information Technology as a major. Participant eight has been involved with one of the learners in focus group 1 since they conceived the idea and developed their technology to entertain the public. SCM is one of his favourite subjects.

My experience on the course has been awesome.

Participant nine uses her commuting time (two hours every second day) to think through the new content added during the day. This subject has stretched my imagination – *there are so many possibilities and areas that I can explore.*

Motivation of learners

Working in groups is what I would continue to do as it motivates us, while spreading the workload, participant three responded. *As long as every learner does their part. The lecturer is always available for us. We have to do our part,* participant five nods in agreement.

Participant four feels valued. *I enjoy contributing to the course, and that in itself motivates me.* Participant two agrees. *It is easy, around children at home, to feel that there is nothing that one can contribute.*

Participant one now tells his friends outside the institution that he is no longer coming to class just because he wants to please his mother. *I still have a long way to go to motivate myself, but I have made a start.*

I found the classes pretty motivating, but I think I had huge difficulty with the beer game, it may derail me, I think, participant nine responded. Participant four agrees. *I made my opinion known when I played the beer game in class. Everyone knows exactly how I felt about it.*

Participant eight looks at technology slightly differently. *When I look at technology, it has to be functional, in a case of a game; it has to also draw one in, be appealing, pleasurable. Even with my high motivation levels, I did not feel motivated to play the beer game. I simply did it to move onto the next section of the course.*

I have been motivated by my ability to share my knowledge in class, even if it is just basic, participant six acknowledged. *It is especially important to me – I have three more years of technology as a major. This first year will make or break my future.*

Participant two thrives on the in-class practical and group work. *I will certainly continue with this approach. It is also important to me to know that all my previous experiences are acknowledged*

and can be integrated into my learning. And I enjoyed the rest of the class sharing their experiences, too”, participant three added.

What would you change or improve

Participant four made no secret in and outside of class that *I would like to see the beer game gone. She really enjoyed the class, but this game is supposed to teach me important concepts, yet, other than reminding me about beer from start to finish, I learnt little, or at least I think so. Most of the participants nodded in agreement.*

Participant two stressed how she enjoys practical class work. *The beer game is one of those things that lecturers include without thinking about the learner. Just take it out of the course. We already have such a high abuse rate directly related to alcohol, why would you include a game like this? And we see the impact of that first hand in our town, participant four added. We find it difficult to find sober, reliable people to employ in our business. Maybe, instead of just removing the game, why not do something with it?*

I work most nights and see many of the people you refer to, participant five admits and looks in the direction of participant four. I agree with you. Why not simply change the beer game, participant three interjected. Maybe you can use our comments to change the product, change the interface, but keep the concepts. Is that hard to do? The concepts are great, so you can keep that. The beer game looks ancient, is clumsy, hard to learn, and I struggled to play it. The first screen, the results, graphs and even the reports, the whole lot I think.

Participant eight was very frank. *Do you drink alcohol, he asked the moderator, who remembered his friend in the other focus group asking the same question. No, the moderator replied. Why then, do you encourage us to drink by providing this game? Why must it be beer? Participant eight shrugged his shoulders well, I would definitely change it. The beer game was such a let-down, was participant nine’s response. Do you know how often we discussed it in our group? Now I would do something about that. The moderator noted a similar argument from the previous focus group. Keep the concepts; change the game, participant seven put it bluntly.*

How would you change the game?

Make it appealing to the eye. Participant eight recalled how he was involved in the development of his friend's game concept and how successful their product was (his friend was in the other focus group). *When it is displayed in any town, it draws crowds. It should be simple, he added, yet functional.*

Participant two conjured up some vivid images in our mind, *like a moving truck, some pictures of perhaps the manufacturing plant, distributor, warehouse and the retailer. Maybe you can place everything in a circle which can be seen the moment one clicks onto the game. Yes, we have a large warehouse in town, participant five agreed. Go and look at the warehouse to get an idea and take some pictures of it.*

Participant six has a strong belief that, somewhere, somehow, on the console, the customer should be indicated. *It is nowhere in the beer game. Maybe add some dollar signs, participant four exclaimed. That should indicate that funds are leaving the customer and entering the supply chain. We still need to see the costs at a glance though, like with the current game.*

The concepts of the course are very critical to keep, participant one finally started to contribute. For most of the time he stared into space, until he started talking. Did you get some ideas from the other group? I would keep the concepts yes, it would be excellent. I would definitely look at the start of the game, first impressions, you know. Then maybe tend to the other sections like reporting, graphs and help sections. Revamping the game and allowing learners to decide what the product will be would be the best. Participant one kept nodding affirmatively.

Learners appeared very excited and wanted to continue to provide ways to improve the game. The moderator channelled the participants to the next question in order to stay within the time allocation.

How extreme should the changes be?

Just develop a brand new game with the information that we have given you. Participant eight offered to test the new game should the moderator choose to develop it. *The game needs to be*

tested by two key people: someone who knows some of the concepts that should be learnt, and another that has never heard of the subject matter before.

Maybe you should think how long you want learners to be demotivated in class. Participant two never wanted to go home to her children deflated, but she said she did, a few times in fact, during the course of the game.

Participant seven relayed the discussion between her and her homestay parents about the game. Like her, her homestay parents do not drink alcohol. *Why on earth would a non – drinker introduce a beer game*, was their question that she relayed to the focus group participants. Participant seven reasoned that the lecturer may have no say in the matter. *Do you even have the authority to make changes to the game? Keep it simple, allow learners feedback through a simple click, and provide tips – all of this on the game.*

Playing a game should be just that: child's play, and children love playing. Participant nine felt forcing her to continue through the beer game was very torturous. *Do extreme changes, keep all the concepts, and make the game appealing and easy to play.*

What considerations should be taken into account?

The moderator looked at participant six first, then at participant seven to stimulate discussion. *Our class have discussed this at length.* Participant six thinks that classroom activities should be included when budgeting, and the redevelopment of the game may be one of the important activities that should be budgeted for. Participant one explained how his mother, a teacher too, goes to bed late, works long hours over weekend and sometimes holidays to ensure that she includes creative activities in class. *She is, however, constrained by budgets and the administration of the institution, as everything she now does in the classroom is moderated and controlled by administration. In addition, classrooms are now scheduled by administration and if mum develops anything, she has to cart it with her from classroom to classroom.* Participant four uses hand gestures to confirm her agreement. *Before, lecturers could choose their classrooms; put some information on the walls, you know, you see concepts on the classroom walls.* She added that, *while classes are fuller, the learning resources available hardly increased.*

Participant five, six and three have friends at other tertiary institutes. They have noticed the same. *Institutions say that they are learner driven, but learners do not see that.* Participant five explained: *learners in the South Island rallied together against what they termed 'bullying' of learners and the profit motive.*

Participant six believes that learners should be the focal point, and their opinions should be considered and taken on board. Participant seven, eight and nine agreed. *My technology background sustained me thus far and learners should be allowed to contribute to a subject,* participant nine thinks. Participant three agreed. *Although this is a small opportunity to contribute, we really trust that you will take our comments on board.*

4.5.2. Focus Groups 2009

. This section outlines the results of the three focus groups held during semester 1, 2009:

1. The first day of class
2. Before the field trip, one week into the semester
3. After the field trip, three weeks into the semester

Consent for the 2009 study was obtained after the learners registered for the SCM course. A focus group co-moderator was present during the second, third and fourth focus group. There was no co-moderator present for focus group one. Focus group one had to be convened immediately after the first action observation session, thus a co-moderator could not be accessed within such a short period of time.

The ethical approval for the research study allowed for additional focus groups if the benefits to the learners could be proven. Due to time constraints, the first focus group lasted only thirty minutes. The information gathered during focus group one was integrated throughout the semester to connect past experience with new learning. Furthermore, the results of the focus groups provided direction and motivation for the learners. Finally, the results were used as a strategy to engage learners in tertiary education throughout the semester. The daily activities listed in the protocol below remained the same throughout for all the 2009 focus groups.

Focus Group One Protocol

The focus group covered *daily activities before you started the course, your experience with technology and software applications, what would you like to achieve by the end of this semester.*

4.5.2.1. Results

Eleven individuals participated in the focus group. Seven learners were on the free fees arrangement, two were on sports scholarship. The 24 year old and another learner were fee paying students.

Daily activities before you started the course

Participant one was a canoe slalom champion. She was working towards qualifying for the NZ Olympic squad in 2012. Most of her time was spent training either in NZ, Australia or further abroad. She was studying on a full scholarship. Furthermore, she lived more than an hour away from the campus. Her class attendance was therefore, at best, irregular. When in class, she connected well with her group members and was able to complete her group assignments on time. She communicated with her lecturer using email, Skype and personal face-to-face sessions. She attended some in-class practical sessions and focus group one. In her limited spare time, she enjoyed overseas shopping. Her favourite shop was Zara fashions. She owned a website and proudly showed it to the class.

Participant two was a kayaker, on sports scholarship. While doing tertiary study, he was working for a supply chain manufacturer during his free time or during school break. He regularly attends class.

Participant three was a seventeen year old, the youngest learner in the class. He worked at the supermarket after school.

Participant four was a school leaver who won the final school year business competition. Together with participant five, he was accepted at a university away from home. Because of the free fees incentive offered by the institution, the university offer away from home was refused. Both were living with their parents and were good friends. Participant five was a school leaver who 'seized' an opportunity to earn an income by opening a short term business with participant four during his final year at high school.

Participant six lived in a neighbouring town, specialising in forestry. She was working as a supervisor at a supermarket in her town.

Participant seven was a keen golfer with limited work experience.

Participant eight was on a partial sports scholarship. The rest of the funds were made up by the *free fees* arrangement. She competed locally and was always in class. Like participant two, sport, and not study, was her priority.

Participant nine was twenty four years old, and spent a few years working overseas prior to commencing tertiary study. She was a full fee paying student.

Participant ten was a school leaver. After school he looked after his brothers and sisters, as his mother was a single parent doing shift work.

Participant eleven was seventeen years old, slightly older than participant three. He was working as a cashier at one of the supermarkets.

Your experience with technology and software applications

Participant one owned a laptop, a mobile phone and a website. *I use my laptop to answer emails and type my assignments and complete other documents. If I need anything on my website, I email it to a company so that they can update my website. I hardly access the internet, but I do access my website to see whether the updates are done. If I am unable to take photographs or am in an area where I cannot send emails, my website would not be updated for months. Even if I send the email, there are no guarantees that my website would be updated.*

I own my own laptop, phone and digital camera, participant two responded, and I can play a game or two on my phone.

Participant five was eager to share his knowledge of technology. *I own most gadgets like a mobile phone, MP3 player, camera and we have a computer at home. I can play one of the internet games very well. I use my mobile phone to send messages, call my friends and play a game or two. Participant three nearly jumped on the table. I do that, too. Let me see your phone.* In turn, Participant three showed off his state of the art mobile phone with all its different widgets. *How do you work those widgets?* Participant five wanted to know. *I have no clue, participant three responded. They are just there, I don't even use it – 'it's cool' though. I make and answer calls, send and receive text, and then I get all these prompts on my phone to purchase something, or introduce something new.* He hands the phone to participant four who in turn shows it to participant five next to him.

I access the internet, participant four commented, to check my email or 'check out new stuff' – they always let me know first, he chuckles. We have a computer and internet access at home – such good games on it. Plus Participant five showed me a really simple game to play.

Both participant three and participant eleven have access the internet– they enjoyed following the links sent to their emails. *And the popups, man, they are choice.*

Participant eleven remarked that, as a cashier, he accesses some sort of an internet when via the eftpos machine. He has a mobile phone with a camera, laptop and use both the phone and laptop to play games.

Participant six uses the internet at work, as part of a pre-installed programme, to complete some transactions. *When I switch on the computer, the programme opens immediately.* She schedules shifts on the programme, too. *But it looks nothing like the information you asked us to search for,* she giggles. *Yes, I have seen that in our supermarket,* participant eleven remarked, using his hands to illustrate the lines, writing and times on the shift roster.

When I look at the computer or my mobile phone screen for too long, participant ten interjects, *I get headaches. My younger brothers and sisters shares my phone and I sometimes let them play games on it. I like following all the headlines on the internet, have you ever done that before?* he poses a question to his classmates. *I just open my computer, and click on the headline across the screen.* Participant four and five agrees, and think it is *awesome*. Participant five remarks: *Just one click and the headlines are there.*

Participant nine needed more prompting to participate. She shyly and quietly stated that her boyfriend does some programming, and she often plays around with the little programmes that he develops for his assignments. *I have a mobile phone with a camera, too.*

The participants were all eager to talk, were very energetic, bouncing up and down in their seats at times. They were very excited and often talked over each other, using their hands to draw attention. They talked very fast and a few times the moderator asked them to give another person a turn to speak.

What would you like to achieve by the end of the semester

I know that I can 'nail it', participant five indicated. *"I dared participant four to join me in a business that we both knew nothing of, and we succeeded. But the business was a short term one, remember,* participant four laughingly snapped back. *We pulled it off in two weeks and we made a significant profit- from start to finish it lasted three weeks. This course is one semester long,* and his laughter continued.

I have to pass, participant one, two and eight responded almost in unison. *If I fail,* participant one admitted, *I would lose my scholarship. If that happens,* participant five bellowed, *you can just go on the free fees system like us. You left school last year, didn't you?* Participant one nodded affirmatively. *But the free fee deal is only for 1 year,* participant one responded.

Participant five stated that he and participant four would be in trouble with their parents if they did not pass. Participant four reminded the moderator that his mother was known to the moderator as a *strict lady*.

Participant two is torn about of what he wanted to achieve – he needed to improve his kayaking, yet wanted to build on his existing knowledge to pass this course. *I think that my past experience in supply chaining well, I don't know, will it help me, what do you think?.*

There was a slight pause before the rest of the learners answered.

I am just thinking of today, the semester is still long, participant three replied with a huge grin on his face.

Participant ten was contemplating what to say, when participant eleven jumped in ahead of him. *I don't even want to think about the end of the semester, he kidded. Maybe I should just take it step by step. I don't want to get ahead of myself, he smiled. Participant ten slowly started to nod his head. I think you are right, the semester seems so 'loong', stretching the word 'long.*

Participant six was thinking deeply while speaking. *My grades need to be excellent. I want to take a subject during summer school at another university, and SCM is a pre requisite.*

Participant seven and nine had to be prompted again. Participant nine, as quietly spoken as before, was confident that, *if I commit fully to this course, I will top the class by the end of the semester.* The rest of the participants were wide eyed and started laughing. *I am willing to do what it takes,* participant nine continued after the interruption. Her sister was studying too, and they were both high achievers. *If you can do it, I can do it too,* participant five called out from across the table. Participant nine smiled quietly. Participant seven was as quietly spoken as participant nine. *Yes, I think that I should be successful. I know that I have limited work experience, but I can learn.*

These responses were incorporated into the course. The lecturer made a mental note of the experiences in the class, wrote it down after the focus group session and used it to connect the newly introduced concepts with the existing knowledge of the learners.

The last part of lecture one was used to step-by-step familiarise learners with internet searches, software applications and an initial connection between the software applications and the course was made. The next workshop and lecture session started with an affirmation of the learners' existing knowledge and a connection was made with a few new concepts.

Focus Group Two Protocol

Focus group two covered *their experience of field trips, how seniority made them feel, how they felt about junior learners on the same trip, what they would like to see on the field trip*

4.5.2.2. Results

Experience of previous field trips

Participant four felt elated. He looked forward to field trips at high school. *I remember the one to the ski fields, when participant five and I came down the side of the mountain so fast and knocked over another skier. Participant four smiled.* He had great memories of the ski trip. The instructors, the fun and new skills he gained.

Our trip was overseas; I guess you can call it a field trip, participant two reminisced. *We met new people, the plane ride was fun as we all sat together at the back of the plane and received extra treats. I still remember how to build cupboards in record time, and put up a kitset home. It was hard at the beginning, but after repeating it over and over again when we rebuilt a dilapidated school, I can do it almost closed eye.*

Really, that must have been exciting, participant eight commented. *My school trip was to the trout hatchery on the other side of the mountains. I have never seen so many trout in my life. And they were all swimming against the current in the stream. I went there too,* participant three remarked. *We covered three areas in one day; the trout hatchery, the bird park and the cold water springs. You should see how clear the water is when it comes out of the eye of the spring. It looks almost impossible, but the water from the eye forms a crystal clear river. I never realised how much water comes from one eye.*

I have been with my dad to his company, and that was interesting, participant eleven relates. *It is a chocolate factory and the best part was the treat at the end. Yes, I have been to one of those too,* participant ten interjected as he explained his experience to a prawn farm. *They served some delicious prawns afterwards and gave us some drinks for the road.*

Have you been on any field trips the moderator nudged participant nine. *Yes, I have. My sister and I have been into the cockpit of one of the Boeing and watched the pilots swing into action to start the plane, during my overseas trip, although one can't really call it one. They allowed me to take over the controls for a while. After that experience, we went to see a flight simulator, where each of us had a turn at lift off. During my overseas experience I travelled extensively in France and Spain where I joined many excursions.*

How they felt about seniority

I have been a prefect, so I am used to looking after the lower grades, participant three remarked. *I have a baby face, so being the senior provides me with some sense of security.* Participant five snapped that this was only his first year in tertiary. *How can I feel like a senior? We have been seniors at our school,* participant four reminded him. *We directed the school plays and were in charge. It was*

awesome; we could share our knowledge with the new actors. Participant five suddenly lit up. *Yes, you are right – we were in control. It was good to see the younger ones accord us so much respect.* His bout of laughter made the rest of the group laugh, too.

We do that in kayaking all the time, participant two related. *We teach new comers some of the skills we built up during the year. And it gives us a sense of achievement and responsibility when we do that,* participant eight coolly mentioned. Participant seven felt that the responsibility part helped him make good choices. *As a teenager, I need to make a lot of choices when I am away from my teachers or parents. By feeling responsible I know that I have others to consider.*

Participant ten enjoyed responsibility and was used to it. He has been taking care of his brothers and sisters after school until his mother came home.

On my recent travels, I had to take responsibility. If I made the wrong choice, it could cost my life and that of my sister's, participant nine answered quietly but confidently just before the whole group rests their eyes on her. She turns red in the face.

In the role of a supervisor, participant six felt that she always needs to take the new employees knowledge into account and help them along. Participant eleven has to do that too, especially when training new cashiers.

The participants appear happy, talkative and very interested in sharing their experiences.

Taking a junior class on the same field trip

The group was stunned for a while. The wide-eyed gaze was exchanged around the room. With a mixture of shock and surprise, participant three started off this session. *What? I thought we were the juniors. We have only been here for a couple of weeks. I agree,* participant five was the second out of the starting blocks. He recovered quickly. *What if we give it a go – imagine first year tertiary learners being seniors?* Everyone chuckled.

Participant six believed that if the whole class pull together, they may be able to do it. *We can ensure that the juniors could learn from this class.* He uses hand gestures to illustrate his point. Participant four nodded in agreement, wide-eyed. *We need to perhaps learn a few basics really quickly. Maybe we just pretend that we know more than the junior class,* participant seven remarked. *I mean; we could always appear senior, how would they know? We must at least have some extra knowledge,* participant ten smiled. *We have one more week to gain it. Do you think we can do it?*

Both participants two and eight have been in this position before. Participant eight shared how their year was barely starting, new team members would join their squad and expect participant two and

eight to show them the ropes. *This is an exciting challenge*, participant eight expanded. *It is amazing how much you remember if you teach or show others how to do something*. Participant two gives credit to this approach of joining seniors and juniors in an event for his success thus far. Participants nine and eleven nod in agreement. Participant nine has a sister who is two years younger, but her sister has mastered all the skills that participant nine has taught her. She pushed her younger sister and she backs off only when she sees that her sister has extended her limit to a point where she could go no further.

The moderator had introduced a concept that the focus group did not expect. They went from total surprise to settling with the idea and looking forward to be the seniors on the field trip.

What you would like to see on the trip

I have seen a supply chain in action. I am very curious to see how other supply chains operate, participant two commented. *Maybe there is a difference*, he remarked as he pulled up his shoulders. *Our supply chain at work is world class, I think. The operation runs so smoothly, there is minimal wastage, and stock levels always appear to be sufficient. I have never once seen the plant grind to a halt because of lack of stock.*

The rest of the participants were slightly surprised and caught off guard by the knowledge of participant two. I thought you knew just a little bit about supply chains, participant four managed once he gained his composure. *When I realized that I could use my existing knowledge to build on, I realized that I know a bit more*, participant two replied.

Though she travelled extensively, participant nine has never worked in a supply chain environment before. She related how she asked her lecturer to help connect her knowledge and draw a mind map using free software. She then went home, drew the mind map on paper, and day by day connected her existing knowledge with the new knowledge. This continued over the past two weeks. Friends frequently asked her what she was busy with. Although they could not understand the logic behind what she was doing, they noticed how, day by day, how she could incorporate difficult terms into ordinary conversations. *I am looking forward to see a supply chain in action*, she said quietly and confidently, appearing to have lost some of that initial shyness. *I memorized some of the terms, and have written others down in preparation for the trip. Maybe I can try that too*, participant ten remarked. *I am looking forward to see all the machines at work. I would be able to ask some questions and maybe even operate some machines, who knows?*

I wonder how the junior class will behave around us. This is our first field trip for the year and I am expecting to see that the juniors will be in awe and amazement. Participant seven vividly recalled and related a field trip during his final year at high school to a kiwi fruit plant, accompanied by a junior class, more than half the size bigger than his class. For every senior, there were at least seven to eight

juniors. He enjoyed being followed around and clarifying some aspects that the juniors did not understand. The rest of the group giggled for a while.

I always look like a junior, participant three laughed. *Maybe I should follow you around*, he said jokingly. *I think that I want to operate some of the technology*, participant five stated, and shaking participant four lightly after he recovered from his laughing bout.

Maybe they have a control room – I would like to see that, participant six said eagerly. At work she often spent a significant amount of time in the control room as part of her supervisory duties.

I have never seen a supply chain before, participant eight added, clearly showing excitement on her face. This will be my first time. *I do not know what to expect*.

Focus Group Three Protocol

Focus group three covered *their experience and new knowledge added as a result of the field trip, how did they feel with the juniors on the trip, How can they integrate their new knowledge into the classroom sessions.*

4.5.2.3. Results

This focus group session was held after the field trip.

Experience and new knowledge added as a result of the field trip

Participant two said that some of the reasons why he performed certain functions at work were now much clearer. He verbalized the impact that the control room had on him, especially when he remembered that the servers were all set up at the head office, and that most of the control happened remotely. *The presenter at the head office explained the way that the plant was controlled in depth, but it was hard to visualise.* On the way back to the campus, he shared his excitement and amazement of how a *plant that costs in excess of 20 million can be controlled remotely from the head office, with only a few staff at the actual plant!*

The non-degree learners often have ‘jaw dropping moments’ during the manufacturing plant tour, participant five added. The few non-degree learners in his tour party (tour party two of three) mentioned how most of the jobs they were currently educating themselves for, are being performed by technology at this particular plant. *They said that they must now carefully reconsider their study direction after the field trip.*

Participant three was captivated by the small number of staff at the manufacturing plant. He recalled the head office visit and the large number of cars he saw in the car park. *The manufacturing plant car*

park had only four cars in it, he remarked. That was exactly what the non-degree learners alluded to, Participant five explained.

The non-degree learners at the head office fascinated me, participant ten acknowledged. He explained how he, participant five and a few others amused themselves by looking at the notes that the non-degree learners were taking. Every comma, every pause, even some jokes shared by the presenter were noted meticulously. They drew each other's attention to the non-degree learners by using eye movements while pulsating with laughter. The lecturer noticed the laughter and looked around, but participant ten was confident at the time that only a few knew what the joke was.

The many screens in the operator booth captivated participant six. At the supermarket where I work, they have a maximum of two screens. In the operator booth at the manufacturing plant, there were eight screens; two directly in front of the operator and three on each side. The operator allowed her to operate the plant under his direct supervision. I correctly identified the customer, the size that he ordered, loaded, aligned, cut and sent the log through to the shipment dock, ready for the customer to collect while the whole tour party was looking on, she recollected with excitement in her voice.

Participant four was spellbound by the technology that controlled the driver contractors, loads, shipment and access. The explanation of the five different dockets at the head office grabbed his attention, but he could not visualize exactly how that would work in practice. The mobile scanners, electronic pens and seeing the data then transmitted onto the screens thrilled him. I am considering that perhaps, for my next business venture, I should try my hand at technology. Participant five giggled and nodded his head in agreement.

While at the head office, participant eleven viewed the plant and the head office as two completely separate entities; the head office where all the decisions are made and the manufacturing plant where all the decisions are implemented. Two staff members accompanied the learners from the head office to the plant, about ½ hour away by public road. At the plant I had an "aha" moment when I realized that these two senior staff were the human connection between the head office and the plant.

Participant eight had an understanding of technology as far as manufacturing of kayaks were concerned. I am often called to visit the producers to try out different kayaks and to recommend adjustments to improve the kayaks. The presentation at the head office and plant reminded me a bit of my experiences with the kayaks. However, the number of servers, how it was operated, the importance of having suitably qualified information technology (IT) staff on hand should any contingencies occur, and the firm relationship between the head office and the independent IT company that looked after the servers intrigued her.

The IT company existed solely to serve the needs of the head office. If the head office wanted something done and the IT company did not have an immediate solution, a working group was formed

to provide the solutions. This process gave participant eight a *fresh perspective and shifted my thinking; in my previous experiences, the decision makers in IT dictated what could and could not be done.* Participant two felt that participant eight aptly described his experience.

Participant nine made a list of questions to ask her tour guide, and ticked off the questions once it was answered. Participant ten nodded his head, as he was in the same tour party as participant nine. He commented that the non-degree learners indeed appreciated the question and answer sessions on the tour, as the tour guide practically illustrated the answers. The tour party was able to see, touch and experience the answers, and that, he believed, added significantly to the knowledge and enjoyment of that particular tour party. *I felt the tour guide entertained us while we learnt.*

The concepts discussed in class now make a lot more sense to me, although I do have a lot more to learn, participant seven commented. *With my limited work experience, it was quite a challenge for me to connect theory with practice. I guess when I look at the new concepts introduced by this subject I can now link it to the head office presentation and the operation at the manufacturing plant.*

Ad hoc issues raised during the focus group discussion

The question that the moderator penned down about the laughter during the head office presentation, was voluntarily answered by one of the participants, and did not require any further addressing. The impact of the field trip on the non-degree learners was unexpected and unplanned.

Experience and new knowledge as a result of the field trip

Participant two was *unsure* whether it was *new knowledge or the linkage between the classroom concepts and an actual supply chain.*

Participant seven thought for a while and then responded. *I certainly know a lot more now than before I joined this class. Every day in class, I learnt a bit at a time. It is almost as though the 'picture is starting to unfold' for me.*

I planned beforehand what I wanted to know and get out of the field trip, participant nine responded. *The non-degree class was great to have on board. I now know something about their courses too.*

I enjoyed having the responsibility. Having them look to me for answers made me 'dig deep' most of the time, participant ten responded. *I had to read up a few concepts before we went because of them,* he admitted. *I did not want to look dumb.* They expressed that they really enjoyed it and felt valued – this joint trip was a first for them. *At least we did not embarrass ourselves around them,* participant five jokingly proclaimed. He spent many hours before the trip making a list of words with meanings. *I pulled it out of my pocket and had a peep when no-one was looking,* he openly admitted. *Was it your*

list that I picked out of the bin before we came back to the campus? participant four remarked. *Indeed it was, I realized by the end of the trip that I mastered most of the difficult terms,* participant five proudly answered.

We discussed our experiences and the ease with which we learnt on the way back, participant eleven commented, nodding in the direction of participant six. *Maybe the few weeks of preparation before the field trip helped us. We learnt without even knowing.* Participant six agreed. She admitted that she was *still on a high* after her success in operating the plant.

Participant eight reiterated that she now knows that IT has to support the organization. *I have learnt that the IT department should listen to the needs of the organization. It helps the organization look after the customer.*

Integrating the knowledge into the classroom sessions

We can try, participant five jumped in first. *I have not done that before. Hopefully I have a bit more understanding than I had before. The concepts became a little bit clearer when you asked me to remember my past experience. It worked for me over the last three weeks,* participant six was eager to contribute. *I need to practice this way of doing things* participant nine chipped in. *I mean, thinking of something that I do know-it almost feels like I am learning 'by accident'* Participant ten and eleven slowly nodded their heads in agreement.

It will take practice, I think. I will try and remember, participant ten commented. *It is hard to believe in the first day of class that I was so restless and could hardly concentrate,* participant three focussed the attention elsewhere. *Yet, by the time I went on the trip, I concentrated most of the day.* The rest of the participants nodded and smiled. *Yes, who can forget that first day;* participant five appeared to speak for the class while everyone was still reminiscing. *No-one could even focus for a short while,* he said with a bright smile on his face.

It was so 'cool when I stepped into the control room and the manager showed us how everything works. Amazing, participant eight exclaimed. *Yet the servers are all set up at the head office,* she continued, *and I can actually remember it.* It seems like a light switched on *Oh, now I remember day one, so silly, I could not even connect websites to databases – 'pretty dumb', 'I'd say.*

4.6 CHAPTER SUMMARY

During action observation, there were some differences between the 2007 and 2008 group, however, there were very clear differences between the 2007/2008 groups and the 2009 group.

There were varying abilities in navigation and direction to complete a task. The main differences between the 2007/2008 groups and the 2009 groups were the distraction from completing a set task, preference for in-class group work, annual field trip changes, motivation levels before playing the

beer game and skilfulness. In particular, although the 2009 group, on first impression, looked more skilful than the 2007 and 2008 groups, their knowledge was very superficial, they were unable to do basic tasks and could not identify any basic errors made when using technology. By the end of the course, however, at the time they did the case study, there were minimal differences between the 2009 group and 2007/2008 groups.

For the 2007 group, when motivation levels dropped during the playing of the *beer game*, the observation was noted. Based on this observation, when the 2008 group was introduced to the *beer game*, a focus group was introduced simultaneously.

The action observations done at the two companies exposed differences in working environment, varying levels of security, differences in the number of staff, number of IT personnel on site and the interaction between staff members. Where company one were sitting with each other under the trees outside, at company two, minimal admin staff were using the staffroom. Furthermore, the interaction between staff and directors at company one happened seamlessly and everyone were on first name terms, while at company two amongst the administration staff, there was minimal walking around, quiet work areas of interaction, and talking amongst staff. Plant staff at company two though were very verbal, although most were sitting behind computer screens.

The focus group sessions scheduled for the 2008 group, revealed why the students were demotivated while playing the *beer game* and provided an avenue for the students to use their innovative and creative abilities to which led to the development of the *Supply Chain Concepts* game.

Finally, the 2009 group revealed through the focus groups that their knowledge of technology were very superficial, they enjoyed linking prior knowledge and field trip experience with new knowledge in the classroom. Most importantly, they enjoyed intergenerational cross pollination and they felt appreciated, motivated and engaged in tertiary study

CHAPTER 5

RESULTS OF INTERVIEWS AND SURVEY

QUESTIONNAIRES

5.1 INTRODUCTION

This chapter presents the results obtained from the face-to-face interviews and the survey questionnaires.

The main intention of the interviews was to confirm the age differences that always existed between younger and older people; gauge the extent to and whether they are able to learn from each other; ascertain which skills young people bring to the work place; and ascertain which skill older people bring. While the young people bring innovation and creativity, older people bring common sense, expertise, ability to reason, knowledge and skill. The same innovation, creativity, knowledge and skill was transferred to the classroom learning environment and utilized to develop the *SCC game* (see Appendix 7). The main intent of comparing the *beer game* with the newly developed *SCC game* was to further confirm the findings of the organizational interviews in answer to the research questions throughout this thesis.

5.2 FACE-TO-FACE INTERVIEWS

The focus of the face-to-face interviews was to provide an organizational perspective of technology immigrants/natives and IT culture on organizational culture. Six senior staff members at two different companies were interviewed. The criterion for selection of the organization was that the company needed to be heavily reliant on IT and that the staff members had to include both technology natives and immigrants.

5.3 ANALYSIS OF FACE-TO-FACE INTERVIEWS

The general inductive approach was used to analyse the qualitative data gained from the questionnaires. Thomas (2003) explains the general inductive approach as follows:

The primary purpose of the inductive approach is to allow research findings to emerge from the frequent, dominant or significant themes inherent in raw data, without the restraints imposed by structured methodologies. Key themes are often obscured, reframed or left invisible because of the preconceptions in the data collection and data analysis procedures imposed by deductive data analysis such as those used in experimental and hypothesis testing research (p. 2).

As there was no previously known literature on the impact of IT culture on organizational culture, the general inductive approach is particularly suitable as the researcher is not constrained by rigid conceptual frameworks. The general inductive approach allows raw data to be analysed by drawing out the main and dominant themes to partly answer two of the three research questions presented in this thesis. The main themes emerge after a coding process is followed, reducing data from many themes to 3 to 8 dominant themes (Thomas, 2003).

For the analysis of the face-to-face interviews, the five-step Thomas coding process in Table 21 was followed.

Table 21

The coding process for inductive analysis

Initial Read through text data	Identify specific segments of information	Label the segments of information to create categories	Reduce overlap and redundancy among the categories	Create a model incorporating most important categories
Many Pages of text	Many segments of text	30-40 categories	15-20 categories	3-8 categories

Source: Thomas, 2003, p. 6.

According to Thomas, the inductive analyses reduces data from many pages of raw data, to segments of text, then into 30 to 40 categories until finally 3 to 8 categories emerge as the most important categories. A model is then developed incorporating these 3 to 8 categories. Reducing data is a process that needs to be handled with care, as bias and errors could be introduced during this process.

Thomas describes two procedures, namely, consistency checks and stakeholder checks to assess the trustworthiness of the data. A senior colleague from another tertiary institution,

served as the moderator for the coding process. After drawing out the main categories from the research objectives for this study, the senior colleague used a sample of the coded raw data and assigned it to the main categories. These main categories were compared to that of the author and the categories were similar, passing the 'trustworthiness of data' consistency check that Thomas (2003) describes.

There were twelve interviews carried out at two companies; six at each company. All interviewees were senior employees or directors who played a significant role in the operations of the company.

5.4 PROFILES OF INTERVIEWEES

Dion was a Director and Shareholder and employed as the technical manager and has been working at the company for more than 20 years. He was unsure what to identify as in terms of technology native/technology immigrant definition (TN/TI). When Dion started work in the 1970s, the technology at his workplace was already sophisticated.

Claire was the Supply Chain Manager and has worked with the company for at least 10 years. She identified as a technology immigrant.

Luke identified as a technology native and has been with the company for more than 10 years. He is an engineer.

Dale was a New Product and Service Manager and had been with the company longer than 10 years. He was not sure whether to identify as TN or TI, as he had been using technology since he started work.

Ken was in Charge of the manufacturer's group and has been with the company more than 20 years.

Sarah was the HR Manager and has been with the company for more than 20 years.

Beth was the Chemical Sales Manager.

Bryce was a Senior Engineer

Gary was an IT specialist. He started in the Engineering department in 1995, then moved to the IT department. He was 27 years old.

Alexis is a financial controller. She has been with the company around 18 months and identifies as a technology native (TN).

Kelvin works with NZ and Australian clients, and plays a significant role in the supply chain operations. He has been working with the company for over one year and identifies as a technology native, given the definition.

Ben, from the new Product and Service Development has been at the company for more than 10 years. He grew up with computers and he is a user of off-the-shelf software.

5.5 MAIN THEMES THAT EMERGED

The technology immigrants (according to the definition given to them), were unsure what to identify as. The technology natives (TN), although they identified themselves as TN, did not agree with the differences between the two groups. They felt it was not whether they were TN or technology immigrants (TI), but rather whether they were willing to all work together and share their knowledge towards a common goal. All interviewees thought it was a generational gap rather than a technology difference and some were very strong in their statements about TI/TN.

5.5.1 Differences between TI and TN

All interviewees reminded the researcher that technology has been around since the sixties. Dion commented:

Our company has used technology since I graduated in the 1970s. I have been working since the late 70s and we had very sophisticated technology at our company, so I am not sure why there is this distinction. We may not have had all the 'gadgets' they have now, but what we had was certainly very significant.

Bryce was unsure how to answer my question on whether he was a TI or TN, as he thought it was just a *generational issue*, the kind society always had – a difference between one generation and the next, *nothing more, nothing less. I have a huge weather station in my back yard with all the latest technology. I built it, I developed the technology. And you call me a technology immigrant?*

When Ben started working, computers have always been around, yet it evolved over these years, from big machines to smaller ones. He spends most of his time on systems, and when he retires to his office, he looks at the screen, again. This time it is to analyse reports from other machines. Then it is calculations *and when the machine spits out the report, I need to know what it means – and this is critical. We all work together – the younger ones learn off us, we learn some valuable skills from them.*

Kelvin, much younger and in the TN age bracket, had this to say:

I have learnt so much since I came here. At my previous workplace we were mainly youngsters, there was not much learning going on and I only found that out once I came here. Since I came here, the people here are so skilful, and they are more than happy to share their knowledge. There is a, what I call, 'cross sharing' of everything. I have never picked up so much of useful skill and knowledge in such a short space of time. Having different generations working together and being welcomed to share and partake in every area is what I enjoy most.

Claire feels that, according to the definition and description provided, she is a technology immigrant.

I sit around the table with the IT companies, they know what I want and they deliver. Is there a difference between us? Of course there is – I am an accountant and they are IT specialists. They cannot do my job and I cannot do theirs, and that is all it boils down to. They bring something to the table and I bring something. They contract to us, so I tell them what we want, and, if there is no solution off the shelf, we work together to provide a solution. When we have the solution, we all celebrate – does not matter whether some are younger and others older.

5.5.2. Changes in Knowledge and Skill

All interviewees felt that there was a change in knowledge and skill from the employees of 'now' and the employees of 'then'. Employees of now were *losing the knowledge and skill*. Bryce says that *working on a plant is not merely a matter of pressing buttons*. He gave this example of huge wastage of product and the high costs associated with it for their company:

I have seen today's operator that you call 'TN' in action on the plant – to me it is just the usual generation issue, lack of experience maybe. There is a control button that says 'valve open or valve close'. At the required time, the operator will press the button to open a valve. If the control continues to show 'valve close' when it should show 'valve open', the operator will keep pressing the control button. Instead of getting out of the chair and walking into the plant to have a look at the valve and where the product by now lies waste throughout the plant, the operator continues to force the control button from 'valve close' to 'valve open'. No common sense used or no thinking on the side of the TN. A TI would know the sound of the machine, if a 'valve open' button is pressed and the control does not open the valve, the TI will put their head out the door, survey the plant and see that the valve is malfunctioning. All that knowledge and skill that was always evident with TI, is just not there anymore, and that is a huge concern.

Kelvin does not think it is a TN/TI matter.

The younger people definitely bring innovation, looking at things in a different way, and I am one of them. We bring lots of fun, too. On a more serious note, I think it boils down to personality. I prefer to share my skills around, and am happy to pick up skills from others. Do I know more than the guys that have been around here for a long time? Heck, no. Where I come from we were only young people – I had no idea how little I know. I really had to adapt to how they do things here and I had to learn all the systems here. They have so much skill – they can just look at something and say, wait a minute, Kelvin, I think something is not quite right. I still do not know everything. I do think that I as a TN in your language, adapt easier, but I do not think it depends on whether a person is a TN or TI. I think different types of technology have been here a long time – everybody adapts really well to technology here, irrespective of whether they are TN or TI. I really think it is a question of personality and willingness to learn from others.

Dion explained how, for their line of work, a considerable amount of data are *crunched* by the *black box*, the statistical software that they use at their company.

*What you term TNs all have this in common at our workplace: When the information comes out on the 'other side' of the black box, they accept it as the truth and present that in their reports. They cannot tell that the answer that the black box 'spit out' is wrong. They expect the IT to do all the work **and** make the decisions for them. Where TIs looks at what comes out on the other side of the 'black box', they can say; 'wait a minute, something does not look right'. TNs just cannot do that, no matter how hard we try. We take more than 18 months to 'bash' all the bad habits out of them that they come with from university – it is hard work, I kid you not. I simply call it experience and inexperience – that's all that it boils down to. What worries me is the confidence with which they accept everything the black box spits out – almost like they have turned off their thinking.*

As a TN, Luke feels that:

IT is wrongly used to make decisions while problems are pretty obvious if we just would get up and walk through the plant. IT is not there to make a decision, that's the role of our brain. Those who are mostly seeing this (relying on machines to think for us) are the instrument mechanics. The person behind the screen will press a button and assume something is happening that should happen. If it does not, they call the IT people. On closer inspection, you will actually notice the real problem is not the IT – something very obvious has gone wrong on the plant. If the person just got up and had a look at the plant, 95% of the time they would be able to pick up what has gone wrong, because it is very obvious!! We all have a brain – we should use it to think, make decisions. And common sense, we all have it – let's use it!

Ben says that:

It is a fallacy that young people do things quicker. Think for example of a screen. A younger person may think they are smart and want to change things around to make the screen look interesting. Because of the lack of skill, they may find out that they seriously stuffed things up, and that is two whole weeks later – can you imagine that in production time!! They impacted on something else very important and had no idea that they did. An older person

would have been able to tell right from the start. Different skill base, you see. So now you have two things: production time and product wastage, plus computer call out time. Loosing skill is a very costly affair, and, the quicker fallacy? Everything always has two sides and that is no fallacy! In our discipline, it is getting the job done and done well.

Dale commented that the:

Disadvantage is that the operators loose the skill of what is going on. They just believe what the computer tells them. The system has become so complex, only specialists seem to have a vague understanding of let's say how the control loops on the paper machine works. Our environment requires strict discipline. You cannot just go by what a computer tells you. That is why we have knowledge and skill, and a brain to think!

Alexis thinks there is one important difference between TN and TI. *I think TI are really knowledgeable and brings that knowledge to the organization.*

Ken's input was as follows:

There are positive and negative effects with what I call the younger generation and those of us who have been here for a while. They often play games and do other things which wastes the company's time. They do know technology and can use it really well though, even if they do not always understand. And herein lies the problem: I can see things going wrong long before they do. And that does not come by just looking at buttons and a screen – it is called 'expertise'.

5.5.3. Remote Work and How it Affects Organizational Culture

All interviewees admitted that there have been significant changes in the location that they worked from. Dion, Claire, Dale, Ken, Ben and Alexis commented that their offices used to be closed offices, then temporary partitions followed by complete open offices. Now they can simply access their work and download everything remotely, irrespective of where they are. Now they can work from outside their offices – *employees no longer needed to drive into head office every day*, Claire said. Dion mentioned that

it may mean spending less time with the family, for work is 'intruding' which is very, very sad- families and relationships should be the most important. There are benefits that go with it, like not spending all that time in traffic, becoming less stressed behind the wheel. Our engineers love that, and they do not have to worry to go to the plant and then travel all the way back to head office to download the information. They can now do it in the 'bush' where ever they are. And some will just call in and say; 'today I am working from home'.

Sarah, the HR manager, in particular commented extensively on remote work and organizational culture:

Our company has wide and diverse business across New Zealand as well as across other countries. Sometimes we had employees that started in a role that crosses all our sites and they may have been with us for three to six months, and I have never seen them once. But I have been interacting with them several times on the email because when they arrive at their desk, you are told 'these are the people you are to communicate with and here are their email addresses. So, yes, we have no personal contact – but we do communicate through email and other means.

In addition, she added:

All of our senior management staff have cell phones where they can receive and answer emails, but I do not have one of those. So any time of the day or night they will be receiving emails and that is so sad – they never get a chance to 'switch off' or spend time with their families. All their attention is on work. And they are expecting me to do the same – answer their emails any time of the day or night. I have to keep reminding them that I have to go into work to answer their emails. Then they have cards that can get them on the company network where ever they are, any time, any place. My managers can receive signed contracts or contact us and say how much pay they want for that staff member. It does not matter where that manager is during the day; they know that they can get on with a part of their work. I can schedule meetings on outlook calendars, and I can ask them to lock it in their diaries immediately and I can control that well.

Dale says that he can dial in from home and start and stop a pump from anywhere, for example, from home or from a motel room if I am travelling.

Ben feels that the organizational culture is affected by working remotely:

When I use the company laptop, I can do anything from home or anywhere. I can access those machines I talked about earlier, analyse data, carry huge amounts of data over, put it through the system and then interpret it. I can do all of this from home or anywhere for that matter. But it does come at a cost. I lose touch with those I work with, and of course, here at home, it impacts on my family—the more time I spend on work at home, the less time I spend with the family. I guess I lose out both ways: colleagues at work and family at home. Relationships suffer, you know.

He shrugged his shoulders and further remarked: *and now that they removed all our company get togethers, well...I guess...We no longer have an opportunity to meet together for things other than work. You see what I mean? Relationships suffer.*

5.4.4. Changes in the Way Communication Happens at Work

All interviewees felt that there has been a significant shift in the way organizations communicate. The value of email was recognised. The face-to-face communication was highlighted as a skill that work places were fast losing.

Sarah confessed that she now *lived and breathed out of her computer. It's as if my computer keeps calling me.*

Ben says they now rely on computers fully for everything:

Talking to people face-to-face is much easier, but now we sit there in front of our computers, and, when mail pops up, we read it. The good thing is that you get an almost immediate response. So if I need to get something done, I send an email, and get an almost immediate reply. The culture has changed. People sit in front of machines and this is now the communication medium – the machines – the machine relationship. Here is another fallacy – the less contact you have with people the more productive you are. Here, at our organization, you are viewed as 'smart' if you use the machines for communication with human beings. Face-to-face contact has been reduced drastically. Our company is no longer people orientated, which is sad, and with that, relationships are out of the door.

Kelvin felt that email:

Sped up communication, but also slowed it down in many ways. Email contact for me is crucial. It opened up communication lines, especially in my case, where my customers are elsewhere. Yet telephone and face-to-face contact is used less and less now. People hid behind email and generally, bad news come via email. They cannot say things face-to-face on the phone, so use email. We still need to sit around the campfire and talk things over. Then we can email from that point. Emails cannot pick up tone, and relationships are suffering. One can read email in so many different ways. I think it creates 'silo thinking'. Camaraderie is no longer there.

Gary experiences loneliness at work:

My office used to be full. Look at all the empty workstations – there are twelve, and I am the only one left in this whole department. My colleagues are in Auckland, three hours away. They contact me by email. They support many here and at other sites across the network remotely- that's the nature of our systems now. Other than email, I have very little contact with others. All our 'get togethers' after work have now been discontinued, cancelled by the company. I have very little face-to-face contact with others. I guess systems mature. I am always by myself now. I sometimes meet with others on their sites which is at least an hour away, if there is a 'get together', otherwise I am mainly alone.

Dale sees the changes as a problem:

Now the problem we have here is the IT department used to be quite big and you could go to them with a problem. You could go to them and talk, but they have been reduced, basically almost non-existent. I think there are only one or two people? I am not even sure, I know one to whom I can go and say I have a problem. If the computer goes on the blink you, well, before, you could go to the help desk. If you want to email, the 'thing' has gone down, and you can't send an email. Or you could call them and say the computer has gone on the 'blink'. Now they are in Auckland, and you have to pay for every call.

Bryce has seen all the changes as he has been with the company for some time:

People are starting to lose the ability to communicate face to face, email is overused. You know, someone sends you an email, no greeting, and nowadays, no address like: Hi Bryce. They just go straight into the issue. Almost like they are speaking to a robot: 'Tut,tut, tut, that's the message', and then you must be quick with an answer- a type of control, I think.

Alexis says:

Communication is mainly via email. Many people work away from the office these days, and I can easily contact my boss via email. She can check over my work and send things back to me. Even if it is in her own time. I guess she will let me know if she does not like what I am doing. She has not complained yet, although I feel a bit guilty at times, I guess. But it helps me get on with my work, you know.

Ken explains how email communication has made an impact in his department:

It has changed from where the 'big boss' sends a message to the 'little boss', and by the time it gets down the line it is diluted. Now when you look at emails from the 'big boss', it is passed through more accurately. A huge difference for us! But I have heard and seen that people email those sitting beside them, and they text as well! I prefer face to face or on the phone. Lastly I would email. I don't know that email is overused – it depends on how busy people are. Email is not always well understood and I think people tend to hide behind emails nowadays. They won't tell you face-to-face, but they will send you these horrible emails.

Dion, as a director, feels the impact the most:

Email is an integral part of what I do. Would I go away from email? No, as a business tool, definitely not. Is there an overuse, have people changed the way they do things? ABSOLUTELY, people have forgotten how to communicate, how to get people to do things, which is a skill you get only from face-to-face contact. Do people use email inappropriately? And I will give you my view here – YES THEY DO, AND VERY MUCH SO. Would I get rid of it? NO, it is far too useful...Well look, I like beer, if I drink too much, it affects me badly.....The advantages of email far outweigh the downside. The downside can be dealt with.

Do we get too much email? We can all say that but how many people leave their email on during the day because they want to get the next message? The worry, AND BIG WORRY FOR ME is that people are losing their ability to communicate face-to-face. That is tragic.

Dale explains that, 13 years ago when he joined the company:

Everyone was people orientated. We went up to somebody's office and had a 'yarn' to them – you had face-to-face contact and that contact has been reduced dramatically. It is considered smart to basically use electronic media. Everything seems to be like that in other business areas here as well; it seems like everything is specifically geared to have less and less contact with people. They consider it to be more efficient. Yes, it has changed. Is it for the better? That's the multimillion dollar question – it could be very deceiving. Our directors now sit in the same building as our admin staff. They walk pass the staff members, and no-one even knows them, and they don't know their staff. But they email us all the time.

Beth is in sales and email has unlocked many difficulties for her.

My customers can get hold of me any time, and the turnaround times are much quicker. I get to know what they need and they know what we can or cannot do for them-this is important. I can use electronic medium to communicate with the plant, see how much of stock we have, it is endless. Do I have face-to-face contact – and I am the guilty one here. I guess I can pick up the phone at least and talk to production. Most of my clients though, I contact via email – much cheaper. I do attend meetings sometimes, but here, face-to-face are happening less and less. Maybe we are all concentrating on our KPI's.

Sarah has heard it all. As HR manager:

I hear and see that there is no longer that ability to talk. And people do it less and less. They send an email, straight down to business. Instead of talking to each other when they pass, they go back to their desk and send the email. People do not even greet each other anymore, and that is sad. Even the email has a heading, then the message, and they expect others to do exactly that, too. No hi, hello, how are you doing. Just straight onto business. Our ability to manage, consult with and talk things over is slipping. And now that most of our staff can access work from

anywhere, ...Machines, machines, IT, IT, less and less people contact, even the family is now affected. And they expect all of us to be the same way. We need to seriously look at that.

5.5.5. The Place of IT in the Organization

All interviewees explained that IT took an important role in their organization, and the fact that it is not necessarily all good. *We depend fully on IT, says Dale, but it is not very visible.* Dion said that *we chew so much of data, we could not do without IT.*

Claire explained the importance of IT in their organization as follows:

The scale of the business we have is that a few people deal with a lot of transactions. For dockets alone, we process 8 000 per month. When we first started and were cutting high volumes, it was 16 000 per month. We could not just do that with the human resources we have at the moment, so IT is very important. I know the technical department are constantly modelling the forest, to see the impact of different management regimes, to value it, and for other reasons. If they did not have applications running on the IT infrastructure, they could not do that work. Well, they could not do it as many times and be as responsive and flexible as they are now.

Dale believed that:

The company has manoeuvred itself in a very dangerous situation where we rely entirely on the computer systems. The computer system goes down, and we just sit there. You can only say we do not know what to do then. People have lost the ability to communicate with each other any other way, so we just sit there, and wonder... what do I do next?

Kevin works with a supply chain, with different systems, and *what I do, is 100% dependent on the systems working. So IT is very important to me.*

Ben says that:

We have become so computer orientated and the system is so complex, it relies entirely on experts/specialists. When I need something, I cannot do it myself. I need to go to a specialist.

I try and tell him what I need, he tries to interpret what I need – can you see the complexity of it all? He sometimes gives me what he thinks I need and I have to say, no, I did not mean that. And then he has to try and interpret what I mean, again. So, yes, IT has become very important – more important than people – relationships are suffering. Even our off site get togethers are no longer. IT first, people do not feature.

5.5.6. Work Issues Dominate Private Time

All interviewees indicated that work issues dominate private time, and that employees are always 'on'. Sarah, the HR manager put it this way:

So any time of the day or night they will be receiving emails and that is so sad – they never get a chance to 'switch off'. And they are expecting me to do the same – answer their emails any time of the day or night. I have to keep reminding them that I have to go into work to answer them....The team concepts disappear and people work in silos, and anytime.

Claire feels that for their kind of work *it is important to work anytime*. Luke explained that:

work issues now even dominate your private time as you are reachable now. They can basically contact us now 24/7. Everyone has everybody else's contact details. If you go out with your family, they can contact you where you are.

Dale expressed himself in the following way:

People are spending more and more of their own time on work.

Alexis is aware that she:

Eats into my boss's time when she is at home, but she does not seem to mind. She answers me really quickly.

Dion sees the:

Ability to work from home as an advantage.

Bryce and Matthew both explained that staff can work from anywhere anytime.

Ben comments now that:

'IT is not visible', although it controls more of our life, in that we can work from anywhere now. Yet, if we have a problem, we are seen as a nuisance. They are slow to respond, even if we have an urgent need, especially off site. That is why youngsters take things in their own hands – they fix things, wherever they are, you know. They take the system apart, so desperate are they to work. Yes, they are not supposed to do it. However, we only have one person now. So, let's say you are somewhere and have a deadline and the system does not work, they take it apart. If you get it right, that's o.k. but even then, they should not be practicing on our company systems – but what can we do? Do we get the time we spent working at home back? Never. Do we eat into our family time – the answer is, yes. Maybe another fallacy – Accessing work from everywhere is smart and the company gets more done. I would say it is handy – but you stay switched on all the time. Our family time, time with friends, everything has changed drastically; less and less face-to-face contact, more machine contact, even from home.

The strongest statements about IT culture and organizational culture were made by Beth:

We always have to do what we are told by IT when we have a problem. They force us to follow what they want us to do. And people here now hardly talk to each other – emails even if the person is next to you. So is IT culture and organizational culture connected to each other – I will say yes, and very strongly so.

5.6 SURVEY QUESTIONNAIRES

The survey questionnaire consisted of 20 questions; Six questions covered the demographics of the respondent; which included two question on learning styles; four questions on their knowledge of *Supply Chain Management*; and ten questions on the classroom learning environment, including an assessment of the teacher and classroom strategies employed. These questions were based on a five point Likert scale. There were two different types of Likert Scale questions:

- 1 = strongly disagree, 5 = strongly agree and 3= neither agree/disagree. In the analysis phase, the *strongly disagree* and *disagree* categories were combined; the *neither agree/disagree* were left unchanged; and the *agree* and *strongly agree* categories were combined. A final three point scale was formed: *strongly disagree/disagree*, *neither agree/disagree* and *agree/strongly agree* scale.
- 1= almost never, 5 = very often and 3 = sometimes. In the analysis phase, the almost never and seldom categories were combined to form *almost never/seldom*; the *sometimes* category remained unchanged; and the *often* and *very often* category was combined to form *often/very often*. A final three point scale was formed: *almost never/seldom*, *sometimes* and *often/very often*.

Where there were no responses in a particular scale, when displaying the results, that particular scale was removed. Where there were some responses and no responses (null responses) in the particular scale, the scale is displayed and the null values replaced by a hyphen. The survey questionnaires were completed by eight learners. The three learners on sports scholarships were away from campus with all the other sport scholarship learners and did not complete the questionnaire.

The survey questionnaires was developed using a combination of the main threads from the reference group, the company interviews and some of the questions from *WIHIC*, *CLES QTI* and *TROFLEI*. Once the questionnaires were constructed, it was tested by four students who did not form part of the study sample. After refining, the questionnaire was placed online for a period of one week. The survey questionnaires included both qualitative and quantitative methods, which may address some of the concerns of Van Petegem and Donche (2006).

5.6.1. Gender of the Participants

Table 22 shows that the gender base was equal: 50% male and 50% female.

Table 22

Gender of Participants

Gender	Percentage	Responses
Male	50.0	4
Female	50.0	4
Total responses:		8

5.6.2. Age Group of the Participants

As indicated in Table 5 of this thesis, the results below show that the average age of the learners in 2009 were low; 62 % were below 20 years.

Table 23

Age Range of participants

Age Range	Percentage	Responses
Below 20 years	62.5	5
20 to 29 years	37.5	3
Total responses:		8

5.6.3. Work experience of the participants

Despite the low average age of participants, only 12.5 % had no formal work experience. This finding is to be expected as it is in line with the trend in NZ that most school aged children are involved of some formal work outside of school hours.

Table 24

Work Experience of participants

Years	Percentage	Responses
None	12.5	1
Less than 5 years	62.5	5
More than 5 years	25.0	2
Total responses:		8

5.6.4. Academic qualifications prior to this course

This is a critical question to ask of first year learners. In NZ, some secondary schools allow learners to take some tertiary subjects while at completing their secondary school qualification. Some of these subjects include a range of short course options. This result shows that there was one other learner besides the 24 year old, who participated in and was successful at some tertiary study.

Table 25

Academic qualifications of participants

Qualification	Percentage	Responses
Form 6 or below (NZ)	12.5	1
Form 7 (NZ)	62.5	5
Tertiary qualification	25.0	2
Total responses:		8

5.6.5. Technology Native or Immigrant

The participants were given a definition of TI/TN. Based on that definition, participants made their choice. The respondent who chose the *other* category explained this category as *somewhere in between*.

Table 26

Participants identifying as TI/TN or other

Item	Percentage	Responses
Technology Native	87.5	7
Technology Immigrant	0.0	0
Other	12.5	1
Total responses:		8

Other = somewhere in between

Despite identifying as TN, the action observation documented in Tables 6 and 7 confirmed that these respondents, although identifying as TN, had very superficial knowledge of technology. Furthermore, the finding this superficial knowledge supports and confirms the company face-to-face responses that younger employees had superficial skill and needed to be part of intergenerational cross pollination to ensure transference of important knowledge and skill.

5.6.6. Ability to Use Technology

In this category, respondents rated their ability to use technology as good, very good and excellent (Table 27). However, the observation results show that, although they appeared confident and knowledgeable in their use of technology, they could do little else other than confidently moved from the tables to the computers, switched the computer on, and opened the internet browser. These findings support that of the face-to-face company respondents

(Section 5.5), younger people and older people have varying levels of knowledge and cross pollination is desired by both groups to ensure technology cross pollination. This finding is a confirmation, in part, of the first day in class observation (see Table 6, 7, & 8). Where, initially, learners appeared confident and able to use technology but observation results showed otherwise.

Table 27

Participant rating of ability to use technology

Ability to use technology	Percentage	Responses
Good	25.0	2
Very good	62.5	5
Excellent	12.5	1
Total responses:		8

5.6.7. Comparison of Knowledge of Concepts of Supply Chain Concepts

Figures 16 and 17 show the level of knowledge of participants before and after completion of the *Supply Chain Management* course. Participants were asked whether their prior knowledge of eleven major concepts (see Appendix 4) was excellent. 25% agreed or strongly agreed that they had an excellent knowledge of these eleven concepts, while 75% either strongly disagreed or disagreed. Thereafter, they were asked to rate their understanding of supply chain concepts by the end of the course. Where only 25 % of the participants agreed of strongly agreed that they had prior knowledge to Supply Chain concepts(Figure 17), by the end of the course, 100% of participants either agreed or strongly agreed that the greatly improved their knowledge and understanding of the eleven concepts (Figure 18).

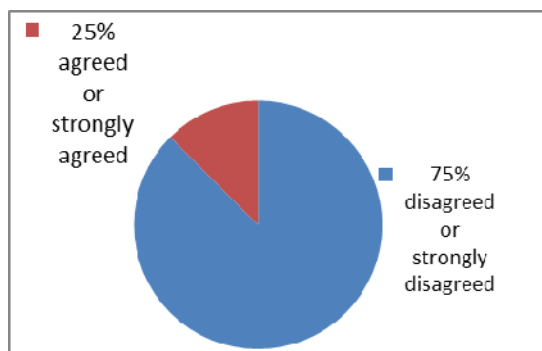


Figure 17 Excellent knowledge prior to supply chain concepts class

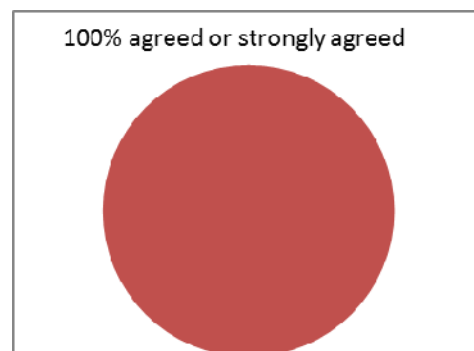


Figure 18 Knowledge after Supply Chain concepts class

The following question asked the respondents, who admitted to excellent prior knowledge (25%), to explain the extent of this knowledge. The responses of the two participants who admitted to prior knowledge are outlined in Table 28.

Table 28

Exact written responses to excellent prior knowledge of concepts

Respondent 6	<i>none really just that retailers need suppliers</i>
Respondent 7	<i>Use some of the above in regards to my employment. Supply Chain Mgmt and Inventory Stock etc. were very helpful while working in a supermarket</i>

Given that respondent number six admitted to *none really* prior knowledge, the results were recalculated and reflected in Figures 19 and 20. Only 12.5% agreed strongly to prior knowledge about supply chain concepts. By the end of the course, 100% agreed to knowledge of supply chain concepts.

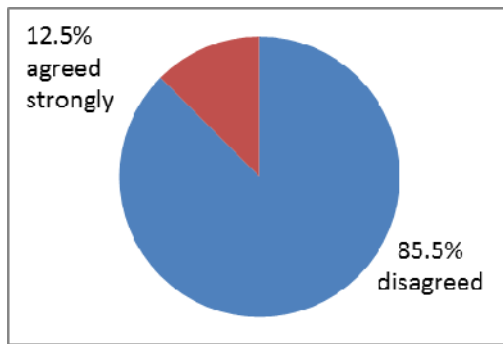


Figure 19 *Excellent knowledge prior to supply chain concepts class*

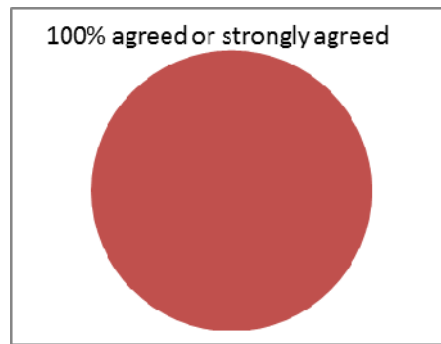


Figure 20 *Knowledge after Supply Chain concepts class*

5.6.8. Comparison of gender and how respondents felt when entering tertiary study

Participants were asked to describe how they felt when they entered tertiary study. For the 2009 group this was particularly important, as observations tabled in Chapter 4 showed that they were easily distracted, unable to concentrate on the first day in class, and displayed only superficial knowledge of technology.

This question allowed respondents to write down their feelings on commencement of tertiary study in relation to *fear of the unknown*. Table 29 shows feelings ranging from *excitement* to *nervous* to *awkward* to *lost*. There were no significant gender differences in the

way the participants responded. Both male and female respondents were nervous and excited. One female felt *awkward* while another felt *taken aback by the content*.

Table 29

Comparison by gender and feelings on entering tertiary study

Respondent No	Gender	Feelings when entering tertiary study
1	Female	a little taken aback by the content.
2	Female	Awkward at first
3	Male	kinda nervous because I didn't know anybody at the time
4	Female	Excited about the academic challenges that faced me
5	Male	Excited and looking forward to it
6	Male	Lost
7	Female	Nervous but excited
8	Male	Interested, eager to learn

The responses in Table 29 may have been part of the reason why the 2009 group initially was easily distracted and needed significantly more guidance and attention in class.

5.6.9. Classroom and other learning experiences on the course

Participants were asked to choose from a range of options (see Figure 21) to provide their learning experiences on the Supply Chain Management course. Furthermore, they were provided with an option to describe their choice in words.

Negative statements were alternated with positive statements, and the participant could decide how many options they wanted to choose. One respondent chose a negative statement and provided an explanation for that choice.

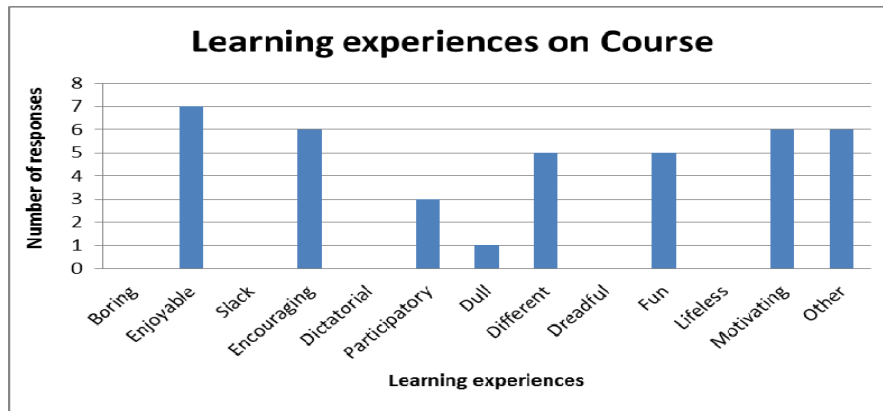


Figure 21 Learning experiences on course

Some of the respondents described their experiences in words:

Enjoyable: The lecturer made the course a lot easier for the school leavers because she explained it to us in a different way.

Participatory: The lecturer made us do things and see things to help us learn better.

Fun: the course was never boring it was always good fun and the learners could not wait for that class.

It was a uniquely different class which I thoroughly enjoyed. It was at the same time both serious yet fun and enjoyable. It was one of those experiences that you didn't want to end.

enjoyable= I had a positive happy class and tutor. Participatory= we all got involved in all aspects. Encouraging= when we were confused or felt like giving up our tutor helped us to understand and not let us give up. Different= compared to my other papers such as accounting, it needed a lot more creative thinking. Motivating= i feel is the same as the encouraging.

The one respondent who chose a negative option 'dull' provided the following explanation:

The course was very encouraging, motivating, fun and enjoyable because it made it easier to learn the content etc. However it was a bit dull towards the end but I think it was due to having so much fun in the beginning.

These responses point towards a positive atmosphere created in class for the duration of the course and confirm that creativity from the teacher is needed to establish such an atmosphere. Furthermore, the *dullness* is clarified as having '*too much fun in the beginning*'.

5.6.11. Classroom Environment and Field Trip

This question gauged the relationship between the field trip, which was external to the classroom experience, and the classroom learning environment. The learners were asked questions relating to the inclusion of the field trip as part of the course. The questions were about the field trip and their experience, relationship to supply chain management and the handling of the knowledge gained on the field trip. The 1 to 5 Likert Scale ranging from *strongly disagree* to *strongly agree* was used and during the analysis stage category 1 and 2 and categories 4 and 5 were combined to form three categories. The answers to the questions were then separated and divided into main themes:

- Relationship between Supply Chain Management and field trip
- Post field trip: how lecturer handled field trip knowledge
- Their experience on the field trip

One learner answered *strongly disagree* for all questions. Question 20 allowed participants to provide additional comments. This particular learner commented:

I really enjoyed the course and thought the lecturer was great! I have never before had a teacher who is so passionate about teaching and so willing to go out of her way to help. My response to Question 14 (question relating to the field trip) is because I did not attend the field trip

Based on the comment to question 20, the *strongly disagree* response was removed before analysing the data. As there were no other responses in the *strongly disagree/disagree* and the *neither agree/disagree* category, only the responses to the *agree/strongly agree* category are tabulated. Furthermore, although a debrief session was held with a combination of the degree and non-degree students, only the non-degree students formed a part of this study.

5.6.11.1. Experience on the field trip

Five questions related to the respondents' experience on the field trip and are recorded in Table 30.

Table 30

Respondent's experience on the field trip

Question	Agree/ Strongly agree
I had fun on the field trip	7
I was given the opportunity to ask questions on the field trip	7
I enjoyed the field trip	7
I had the opportunity to refer back to the field trip during class sessions	7
The field trip helped me understand the theory of supply chain management	7

The above responses show that the learners had a positive experience on the field trip; that the field trip was referred back to in class; and that the field trip helped in the understanding of difficult concepts.

5.6.11.2. Post field trip

The three post field trip questions and responses are recorded in Table 30

Table 31

Post trip questions and responses

Question	Agree/Strongly agree
The lecturer held a debrief session after the trip and Students understood more about Supply Chain after the trip	7
The lecturer clarified difficult concepts after the field trip	7
The lecturer kept the field trip fresh in my mind	7

These results show that, after the field trip, the students were able to recall the learning on the field trip and that the learning was brought into the classroom through clarification of difficult concepts and keeping the field trip fresh in the mind of the students.

5.6.11.3. Field trip and Relationship to Supply Chain Management course

This category consisted on nine questions and relates to the value of the field trip to the Supply Chain Management course. The responses to these nine questions are recorded in Table 32.

Table 32
Respondent's experience on the field trip

Question	Agree/ Strongly agree
Helped me understand difficult concepts	7
Able to integrate the knowledge gained on the field trip	7
The field trip adds value to the course	7
I strongly recommend field trips as a vital part of this course	7
Referred back to the field trip during class sessions	7
Helped me understand the theory	7
Ability to share my knowledge during class discussions	7
Ability to apply the knowledge gained after the field trip	7
Key to understand difficult concepts	7

The responses show that the learners enjoyed the field trip and it added value to their educational experience. Furthermore, that the teacher integrated the learning of the field trip by bringing that *out of the classroom* learning experience into the classroom and making it a pivotal part of the classroom learning environment.

5.6.12. Classroom Environment and Groups

This section gauges the learners' perception of the classroom environment regarding participation and groups. The emphasis on this question was on *how often* the practice took place. The *almost never* to *very often* Likert Scale ranging from 1 to 5 was used and then reduced to *three category scale*. Where there were no responses in a particular category scale, the whole category was removed. Results on perception of lecturer input in classes and class participation in groups are included in this section. The null values have been removed and replaced by a hyphen.

5.6.12.1. Perception on Lecturer's role regarding class and group participation

Respondents were asked five questions on their perception of the lecturer's role regarding class participation and group learning, with the emphasis on *how often* the practice took

place. 100% of the respondents felt that the lecturer encouraged classroom participation, group participation and encouraged consideration of others ideas and feelings in the group. While 87.5% of respondents agreed that the lecturer often encouraged them to do the work required, 12.5% responded sometimes.

Table 33

Lecturer: class participation and group learning

Questions	Sometimes	Often/ very often
The lecturer encouraged me to participate in classroom discussions	-	8
The lecturer encouraged me to do the work required	1	7
The lecturer encouraged group participation	-	8
Group participation enhanced my learning	-	8
Learners were encouraged to be considerate of other people's ideas and feelings in the group	-	8

5.6.12.2. Learners perception of class and group work

Respondents were asked ten questions on their perception of class participation and group learning, with an emphasis on *how often* the practice took place. 100% responded that often or very often they participated, discussed, solved problems, incorporated field trip, used technology and enjoyed group participation in class. The one respondent that sometimes had fun while learning in groups was the same respondent who earlier stated:

The course was very encouraging, motivating, fun and enjoyable because it made it easier to learn the content etc. However it was a bit dull towards the end but I think it was due to having so much fun in the beginning.

This response may suggest that the respondent chose 'sometimes', as the levels of fun at the beginning of the course was not at the same level as towards the end of the course. This suggestion was confirmed as 100% responded that they 'almost never or seldom' disliked working in groups.

The responses on *choosing a partner for group work* confirm findings during action observation (see Table 9) that the 2009 group was indecisive of whether to work in groups or not. That 100% of respondents felt that the field trip was incorporated during group sessions in class is confirmation of incorporating learning into the classroom. That learners were able to make a

connection during their recently acquired knowledge on their field trip suggests that discovery approaches have been successfully utilised.

Table 34
Learners perception of class and group work

Questions	Almost never/ Seldom	Sometimes	Often/ Very Often
The learners discussed their classwork in groups	-	-	8
The learners often participated in groups	-	-	8
Learners enjoyed the group atmosphere in class	-	-	8
Group participation enhanced my learning	-	-	8
Learners chose their partners for group work	2	4	2
I had fun while learning in groups	-	1	7
I disliked working in groups	8	-	-
Learners used technology while working in groups	-	-	8
Field trips were incorporated during group sessions in class sessions	-	-	8
Learners solved problems in groups	-	-	8

These results show that, with sufficient guidance, interest and correct approach, discovery learning approaches can be used successfully to increase knowledge and understanding of learners.

5.6.13. Classroom environment and technology use in classroom

This section gauges the learners' perception of the classroom environment regarding the use of technology in the classroom. Like the section on classroom environment and groups, these questions emphasised *how often* the practice took place. The *almost never* to *very often* Likert Scale ranging from 1 to 5 was used and reduced to a three category scale as previously explained. Where there were no responses in the scale, the scale is not displayed. Where there was some responses, the scale is displayed and the null values replaced by a hyphen. Results include the learner's perception of the lecturer use of technology in the classroom and individual/group use of technology in the classroom. The null values have been removed and replaced by a hyphen.

5.6.13.1. Learner's perception of teacher's use of technology in classroom

The respondents felt that the lecturer often used, demonstrated with, and alternated the practical use of technology with theory. When asked a negative question on the impact of

the use technology in the classroom, the learners answered that it *almost never/seldom* (50%) or *sometimes* (50%) inhibited their learning. The respondents who answered *seldom*, were the same respondents who answered that adding technologies to the classroom made the sessions more interesting. Furthermore, these respondents (see Table 35) answered that their use of technology has increased significantly.

Table 35
Teacher’s use of technology in the classroom

Question	Almost Never/Seldom	Sometimes	Often/ very Often
The lecturer used technology in the classroom	-	-	8
The lecturer demonstrated the use of different technologies	-	-	8
During the lecture, we do a bit of theory and then a bit of practical	-	1	7
Using technology during class sessions inhibited my learning	4	4	-
Adding technology to lecture sessions made the class more interesting	-	1	7

There was one negative question included and the students were able to express whether the use of technology in the classroom had a negative effect on their learning. Fifty percent of respondents agreed that the use of technology sometimes inhibited their learning. This finding may be linked to Table 8 which showed that students were easily distracted by advertisements and pop-ups while using technology in class. Furthermore, it may confirm student responses during the focus group session results in 4.5.2.1. under *your experience with technology and software applications* where respondents admitted to owning some technology gadgets, but their knowledge was limited to playing games or accessing widgets.

5.6.13.2. Classroom environment, teacher and learner interaction

The respondents admitted to being able to explore and use technologies in the classroom learning environment and that their use of technology significantly improved. Furthermore, 75% responded that they would almost never or seldom learn more without technology in the classroom, while 25% responded that they sometimes would have learnt more without using technology in the classroom.

Table 36

My use of technology in classroom

Question	Almost never/Seldom	Sometimes	Often/very Often
I was allowed to explore different technologies	-	1	7
I was given access to special software or technology programs to aid my learning	1	1	6
I was allowed to use technology in the classroom	-	-	8
I would have learnt more without technology in the classroom	6	2	-
My use of technology has improved significantly	-	1	7

5.6.14. The Classroom Environment, Culture and Technology

This section outlines the key role that the teacher and student play in creating and impacting on classroom culture. Chapter 2 outlines the importance and impact of the different cultures on others. As both the student and the teacher come from a different culture, the two cultures meet and come to the fore in the classroom. In addition, the culture of those who develop technology influences and impacts the type of technology, what the technology contains and how that technology is used in the classroom. If technology is used in the classroom at the exclusion of the teacher (teacher removed to outside the classroom), one must remember that the culture of the developer of the technology continues to impact and play a key role in the classroom and cultural hegemony can easily be exerted over the student, who may be completely unaware of what is happening until cultural hegemony has been fully entrenched. The historical impact of cultural hegemony has been debilitating, abusive, destructive, and often led to death.

5.6.14.1. Culture that teacher created in the classroom

The responses in Table 37 show that the teacher created an environment where learning styles, expectations and teaching styles were combined to maximize student learning.

Table 37

Culture created in the classroom

Question	Almost Never/Seldom	Sometimes	Often/ very Often
The lecturer encouraged the students	-	-	8
I was given an opportunity to express what I expected from the lecturer	-	1	7
The lecturer expressed what she expected from me	-	-	8
The lecturer adapted her teaching style to my learning needs	-	-	8
The lecturer stretched my thinking	-	-	8
If I did not understand, I could ask the lecturer to clarify	1	-	7
The difficult practical sessions were done in class	-	-	8
The lecturer was willing to explain a concept a few times over	-	-	8
The lecturer created an atmosphere that allowed me to maximize my learning	-	-	8
The lecturer adapted her style of teaching based on my feedback	1	-	7

5.6.14.2. Impact of a positive classroom culture on the student

The classroom is by no means a vacuous environment, and the classroom culture created has an impact on student performance. Table 38 show that, not only does a positive classroom have an encouraging, motivating and engaging effect on the student; it spills over into other subjects and motivates students to engage and increase their performance in those particular subjects. This finding is in line with the anecdotal evidence from other staff members that students were performing better in their subjects compared to the beginning of the semester.

Table 38

Student's response and felt impact to culture created in the classroom

Question	Almost Never/Seldom	Sometimes	Often/ very Often
The students set goals as to what they want to attain	-	2	6
I was able to build on my existing knowledge	-	-	8
The lecturer encouraged me to do well	-	-	8
There was a positive atmosphere in class	-	-	8
My confidence grew as the semester progressed	-	-	8
My positive attitude gained during this class help me achieve in my other subjects	1	-	7
I was able to relate theory to practical	-	-	8
I was able to contribute meaningfully to class discussions	-	1	7
The lecturer often used practical examples to explain difficult concepts	-	-	8
The environment in the classroom enhanced my learning	-	-	8
The lecturer worked hard to create an atmosphere in the classroom that was conducive to learning	-	-	8
I could use practical examples and relate it to class work	-	-	8

5.6.15. Addressing Fear and the Turning Point

This qualitative question asked participants to explain, if there was fear connected to tertiary study, to explain how the fear was allayed. Furthermore, they were asked to explain their turning point and what made the differences for them. MSYS or MSYS 111 is the way the *Supply Chain Management* course is listed on the University Academic Systems.

Their responses were as follows:

- Less members in the class meant a much less intimidating learning environment; we could ask questions and discuss subjects freely in class to gain better understanding. Good teaching.

- The fear decreased a lot, I had done previous tertiary study. However what helps and always does is when the lecture is positive and very encouraging it make it so much easier

- fear of failing was erased

- I did not fear tertiary study, but rather was unsure of how I would cope, not having studied for two years. The lecturer encouraged me and gave me confidence. She was a key factor to my success in this course

- The fact that the lecturer was very helpful and wants to help you in any way

*- Getting to know people and another version of myself. I am now more confident because of tech including the MSYS111 class. If it weren't for the lecturer and **that** class I would most likely still be shy and keeping to myself but because of her great personality and teaching styles i have opened up more and I am enjoying studying even more.*

- When I first went into MSYS I wasn't sure what the subject was even about and neither did some of my class mates, we asked our tutor to explain what the paper was actually about and what the content was and she filled us in completely and everyone was happy

These responses show that technology alone, cannot be accredited to the success of changed behaviour, motivation and engaging of tertiary students to improve learning. Furthermore, the responses show that a range of techniques and tools, including field trips, case studies, action observation and technology tools were used to create a classroom culture that motivated and engage students to perform in tertiary study. Furthermore, that creating such an environment has a positive impact and is conducive to changed behaviour, motivation and engaging of tertiary students.

5.6.16. Recommendation and Additional Comments

This qualitative question asked students whether they would recommend this course to others and why they *would/would not* recommend this course to others. Their responses are listed below:

- I will recommend this course to anyone because the group work and discussions mean you retain more knowledge of the course work, while at the same time being fun.

- I will recommend this course to anyone as it opens your eyes to different job opportunities and most of all the lecture is very helpful

- I would as learning is made easy

- I do

- Yes I would. This course is interesting, challenging and relates very much to our everyday lives. It was enlightening and I think overall, useful information to have.

- I would recommend this course because it is very good to learn how things get done and that supply-chaining is everywhere!!

- I would definitely recommend it. It is a great paper to study and the class that i have learnt the most in so far!

- I fully recommend it, it makes so many other papers easy to understand and it helps you to understand how a lot of businesses work as there is so much supply chaining these days and also everyone uses information systems.

- Overall course content and lecturer were great.

- Mean course, has been my favourite paper thus far. Ya da best.

All respondents answered that they would recommend the course for various different reasons. Some of these reasons included: the content of the course; the linking of this subject with other subjects, everyday life, opportunities available and with the working world outside the classroom; the classroom culture that resulted in ease of learning; the amount of knowledge learnt on this course; and the pivotal role of the teacher played in the classroom. These final recommendations and comments are particularly important as the initial action observations and focus group sessions documented in Chapter 4 pointed to a general lack of motivation, disinterest in study for various reasons, including the free fees arrangement, lack of knowledge and engagement for the 2009 group.

5.6 CHAPTER SUMMARY

The results presented in this chapter show first, that there is a change in organizational culture because of IT culture. Furthermore, interviewees did not see any significant difference between younger and older people, other than the usual differences between younger and older people that always exist. Furthermore, they worked together well and shared ideas. Interviewees (who were younger people) were all of the opinion that, based on their previous experiences, should younger people work alone, they will not be as knowledgeable, teachable and skilful as when older people work with them. What became clear was how skills and knowledge, face-to-face communication and common sense was impacted on by technology, and how such important skills are in danger of being lost.

The comparison of the frames of the *beer game* and the *SCC game* (see Appendix 7) showed the impact and contribution that learners can make to their education if they are motivated while learning. Learners' learning can be impacted on, and there is a significant relationship between the lecturer and the learner, which cannot be replaced by using IT alone.

The answer to all the research questions at the simplest level is yes. This study emphasises the importance of learning environment and organizational culture and the impact it has on learners and employees alike. There is a very strong feeling that organisational culture is impacted by IT culture. Furthermore, younger people bring with them an innovation that could be harnessed to the benefit of the workplace or the educational institution. The *SCC game* (see Appendix 7) is a great example of the innovative and creative ideas that young people bring if their creativity and innovation is harnessed.

CHAPTER 6

DISCUSSION

What experience and history teaches us is that, if only people, educational organizations, companies and governments are willing, they can learn from history and act on the principles deduced from it. This learning hinges on but two words: 'if only'. One such learning from history is the use of technology. Like all other tools available to the teacher, technology can successfully be manipulated and integrated effectively for use in the classroom learning environment

Cecile Hoods

6.1 INTRODUCTION

An important implication of the findings of this thesis is that cultural hegemony and polarization models leading to preoccupation with, for example, technology, such as introduced by the proponents of technology including Prensky and others, is not new (see Chapter 1). Chapter 2 points out how, often, this preoccupation, led to the destruction and death of human beings, in line with Beckwith's 'ideas have consequences'. Technology, including sophisticated technology, always has had a place throughout history. By adopting a fairer and more realistic approach of educational tools such as technology, field trips, case studies, computer simulations and 'seniority strategies', this thesis is more realistic about the use of technology.

Additionally, this thesis confirms that education should be at the forefront, rather than technology. Furthermore, that more similarities than differences exist between different age groups and that different age groups enjoy intergenerational relationships and cross pollination of ideas. The importance of face-to-face as a communication medium is confirmed and the willingness of all generations to use email and other modern technologies is highlighted. Learners, like employees, similarly enjoy using modern technologies in the classroom. Moreover, learners thrive in the face-to-face classroom learning environment where strategies are adapted and various tools are used to suit their learning needs. Technology, as one of many available tools, can be used to motivate and engage learners in tertiary study.

That the classroom learning environment has changed is recognised. However, the demise of the classroom requires rigorous research and attention should be focused on the continuous changes conceived by, discussed amongst, prepared for, strategized on behalf of and at the exclusion of teachers and academics and ushered into the education sector by BIAG.

The aim of the work presented in this chapter is to showcase the development and evaluation of innovative use of information technology to change behaviour and engage tertiary learners to improve in learning by answering the three research questions presented in this thesis:

1. Is technology and pre-occupation with technology altogether new?
2. Is there a difference in the way Technology Natives and Technology Immigrants impact on classroom culture (higher learning) and organisational culture?
3. How can the differences be incorporated to ensure successful use of Information Technology in the learning process both at educational institutions and organisations?
4. Does the ability to successfully use technology motivate learners?

In answering the three research questions above, this thesis outlines that TN or TI is not the issue, but rather that society, for generations, has always had younger and older people and that some differences and similarities between them always existed. Moreover, despite the similarities and differences existing for generations, the similarities have been significantly more than the differences. Furthermore, older and younger people acknowledge and treasure the differences, enjoy each other and continuously learn from each other. Furthermore, in New Zealand (NZ), technology has been around the workplace since the 1970s and older people have experienced and developed technologies for many years. Therefore, in this thesis, TN is replaced by the words: younger people and TI replaced by the words 'older people'.

Both similarities and differences between younger and older people can be incorporated both at organizations and at educational institutions. Through adopting various strategies in the workplace and in the classroom, including technology cross-pollination, action observation, harnessing creativity there is transference of experience, expertise, knowledge and skill between younger and older people.

By adapting various strategies to suit the learners, this thesis show that successful use of technology and other educational tools like case studies, field trips and, in particular action observation, can motivate learners in the classroom.

The educational tools used in the classroom in this thesis include case studies, field trips, recognition of prior learning, use of simulation games and action observation. The most important strategy used in the organizations is cross pollination of knowledge, expertise, skill and technology. Moreover, learners thrived in the learning environment created, their motivation spilt over to other classes, and, their experiences were summed up by the following statement:

It was a uniquely different class which I thoroughly enjoyed. It was at the same time both serious yet fun and enjoyable. It was one of those experiences that you didn't want to end.

Through firm evidence, this thesis presents an alternative to the idea of Prensky that technology is altogether new and should be ushered into the classroom with 'incalculable urgency'. With this view in place, the Ministry of Education (MOE) technology model ought to be reconsidered and replaced by a model developed democratically through sector wide collaboration of teachers, parents and learners, rather than a dictatorial approach of the MOE in collaboration with BIAG, deciding what is good for the sector.

Furthermore, the link between classroom and organizational culture is established. By linking organizational culture with classroom culture, the impact of IT culture on organizational culture and classroom culture is recognized.

This chapter is arranged in the following order: first, discussion on the findings on technology through the ages and concepts inextricably linked to the classroom learning environment; secondly, elaboration on the findings at the organizations interviewed and the longitudinal study in the classroom; and finally, a suitable education model is developed and proposed based on the findings of this study.

6.2 INTEGRATED DISCUSSION OF FINDINGS

This thesis clearly highlights the fallacy that technology is 'altogether new' and that terminology distinguishing between technology immigrants and technology natives. Khine (2006, in Khine and Fisher) support the view of Brown (1995) that, throughout history, technology was adapted and submitted to serve human needs. The views of Brown and Khine are incorporated and this thesis adopts a much broader and more realistic approach to technology use; one which takes into consideration that elaborate technologies existed in years gone by; that some forms of technology exists today; that the technology of today is not altogether 'new' and that some has been around for centuries, in many cases, in more sophisticated form.

Furthermore, that similarities and differences between people, whether younger or older, continue to exist between educational institutions and in organizations. In organizations, the similarities and differences are acknowledged and utilized to ensure organizational success and life-long learning.

As throughout history, because of the significant similarities that continue to exist between generations, this thesis demonstrates that the teacher has been remarkably successful in ensuring cross-pollination of ideas and educating learners who fitted in a different generation.

This thesis furthermore adds to the body of knowledge by extending an empirical study to include organization culture. By including organizational culture, this thesis connects the classroom culture to the organizational culture. Finally, in this thesis a more representative educational model is developed and proposed.

6.2.1 Sophisticated Technology

Writing that can be traced back to the cradle of civilization, developed more than 2,000 years ago is still being used today. The rock paintings, carvings, bone and ivory engravings, painted pebbles and pictorial symbols are proof that sophisticated tools and communication devices and technology have been around for centuries. One example of such sophisticated technology is the Khipu or Quipu, used by the Inca people to rule the huge empire of Peru.

Not only was the Khipu a highly sophisticated communication device and an accounting tool, it also had the ability to record and store large amounts of data, in the same way that databases are used today. After the destruction and wide scale burning of Khipu, researchers and scholars, for more than 500 years, used theories to prove that the Inca people were '*merely primitive*' people who could neither read nor write (see Chapter 1). To the contrary, the Inca people were most sophisticated, and, as Chapter 1 points out, they governed large areas with great success; used different forms of communication, stored vital information in databases and was accredited for developing and using the first bronze internet most successfully. Despite the Spanish attempt to destroy the Khipu after invading Peru and discovering that their acts have been recorded and stored in the Khipu, the Khipu was later utilized by many other nations, including Australia, Egypt, China and Melanesia.

The pyramids of Egypt, fully described in Chapter 1, are another technological marvel. Perhaps the Pride of the pyramids and amongst the largest structures in the modern world, the Great pyramid of Giza, built with Super Natural help, can never ever be repeated, unless it is completely destroyed. This magnificent colossal pyramid measures 13.6 acres at its base and is visible from the moon. Yet, the feature that makes the Great pyramid of Giza so unique and causes all its other characteristics to pale into insignificance is its incredible location and positioning according to the graphical depiction of Smyth: The Great pyramid in the Centre, at the same time at the border of Lower Egypt, neatly carving the whole world into four equal parts (world-mysteries.com.)

If Leedskalnin is to be believed, by using the secrets of the pyramids, he single-handedly, over a period of 28 years, created a landmark tourist attraction, still used in Manhattan today. His creation has, like the pyramid of Giza, never been repeated again.

The Mayan observatory, similar to the observatories in the world today, again displays ingenuity, advanced technology, superior knowledge and skill of the ancient world.

How is it possible that human beings of the ancient world could provide such an amazing engineering and technological feat many thousands of years ago? Such an accomplishment would only be possible if one accepts the fact, based on irrefutable evidence, that human beings, for many centuries, were exceptionally advanced in their thinking, their technology, their engineering and with creative minds could conceive, develop and manipulate elaborate

technology to serve their needs.

6.2.2. Flight Technology

Although the Wright brothers have been credited with being the first to succeed with a manned aircraft, Egypt boasts a find in the National Egypt Museum dating back to 200 BC in the form of the Sakkara object, found in the tomb of Pa-di-Imen. Struck by the similarity between the tail of the Sakkara object and that of the Space craft hanging outside the museum, Cranston said:

After looking at the object and reading its information, I walked out of the room, looked up, and immediately noticed "Space Ship One" hanging from the ceiling in the main entrance. That is when it struck me. I grabbed my camera and made photos of Space Ship One, then I went back and took photos of the replica of the Sakkara Object. The "tails" of both craft are identical!!! (www.coasttocoastam.com).

6.2.3. Ocean Liner Technology

From Noah's Ark and the ten vessels built between 3 BC and 7 BC, listed by Pliny the Elder (ad 23–79), is proof that ancient ships were reliant on very sophisticated technology.

Noah's ark boasted superior design, and one of the ten vessels listed by Pliny the Elder, cites Alexander the Great as the inventor with up to ten banks, while the Ptolemies are accredited with three ocean liners: the smallest up to twelve banks, the next vessel up to thirty banks and the third, up to forty banks. In addition, history shows that these ocean liners were not built to serve as models, but to sail the oceans.

6.2.4. Computing Technology

With the continuous pre-occupation with 'new technology' and 'fads' in technology that come and go, the Antikythera Computer, discovered in a Greek shipwreck under the sea for about 2,000 years, places today's 'sophisticated technology' firmly in perspective.

Only recently, a computer has been developed to track the motions of the stars. Comparatively, the Antikythera Computer points to a very sophisticated people: the

superior science, mathematics, engineering and technology of the Hellenistic era. The Economist (September 19, 2002) explained the Antikythera Computer in the following way:

.....in which around 30 separate gears can be distinguished, led the late Derek Price, a science historian at Yale University, to conclude that the device was an astronomical computer capable of predicting the positions of the sun and moon in the zodiac on any given date. A new analysis, though, suggests that the device was cleverer than Price thought, and reinforces the evidence for his theory of an Ancient Greek tradition of complex mechanical technology (pp. 75-76).

So significant was this high scientific technological find that estimates of Greek science may have to be revised. In order for any such device to have existed for at least 2,000 years, one has to accept that in order to build such complex technology, humans in that era were exceptionally intelligent and equal, if not superior, to the intelligence displayed by humans today.

The human computer is fascinating and has incomprehensible storage ability: according to Safarti (2003) and Gitt (2007), 1/5th of a teaspoon of Human DNA can store more than a trillion CD's worth of data. In addition, Gitt made this remarkable statement:

If we are stretching out the material of a pinhead into a wire with the same thin diameter as a DNA molecule it would have a length more than 30 times around the equator (Gitt, W, 1997. p. 6).

Compare that with a computer developed by scientists with significant resources for over a decade, which still to basic to have any practical application, one can understand why, through the ages, human beings were able to develop and use technology to serve their needs.

6.2.5. Pre-occupation with Technology

This thesis confirms that pre-occupation with technology is not new. More recently, the *Technocracy Social Movement of the 1930's*, led by Hodgson, a supporter of Veblen and Darwinism, existed for a short while, and replaced all politicians with scientists and engineers, believing that technology and science was invincible. This party was short lived,

but the destruction it left was significant. The major difference between some researchers who strongly support technology and the polarization model in the current era and the *Technocracy Social Movement* is that the former focus on the tertiary education landscape, while the latter focussed on politics and business in the 1930s.

Despite the considerable damage that this party left in its wake, around 80 years later, the preoccupation has once again surfaced, and particularly in New Zealand (NZ). This preoccupation with technology in NZ education is particularly important, as NZ implemented wide scale structural adjustments to its economy with devastating effects (Kelsey, 1995). These structural adjustments were experimented with on a 'live economy'. Despite the impact of the structural adjustments on the economy, the MOE ushered in the Information Communication Technology (ICT) Strategic Framework in the 2000's including the education system from early childhood through to tertiary. This model, firmly removed teachers from of the classroom and relegated them to the same level as heritage organizations, librarians, etc., has some similarities to the structural adjustments to the NZ economy; it has never been tested and refined elsewhere, and, if the devastation to the NZ economy is anything to go by, the impacts will very similar.

6.2.6. Acknowledging Ancient Technologies

By acknowledging the existence of technology of years gone by, we augment our understanding of technology as a useful tool, alongside other tools such as case studies, field trips, experiments and observation and include it in implementation strategies for teachers to create an effective learning environment in the classroom. Furthermore, the so-called *sophisticated technology* is put into perspective, especially as technological feats such as the

By recognizing that the effectiveness in the classroom depends on successful implementation of strategies by the teacher in order to serve the learner, Khine and Fisher (2001) support the view of Brown (1995) that, throughout history, technology was adapted and submitted to serve human needs. The views of Brown and Khine and Fisher are incorporated and this thesis adopts a much broader and more realistic approach to technology use; one which takes into consideration that elaborate technologies existed in years gone by; that some forms of technology exists today; that the technology of today is not altogether 'new' and that some has been around for centuries, in many cases, in more sophisticated form.

Researchers therefore constructed measuring instruments to evaluate the success and the effectiveness of implementation strategies in classroom environment. Waldrip and Fisher (1997) and Dorman, Fisher and Waldrip (2006) constructed various such measuring instruments based on the Moos three dimensional model: (1) relationship dimensions, (2) personal dimensions and (3) systems maintenance and system change. This three dimensional model of Moos excludes the culture in the classroom learning environment.

Yet a classroom environment cannot exist without taking into account the culture of both the learner and the teacher. Where the cultural background of both the learner and the teacher affect the classroom directly, the culture of the educational organization impacts on the classroom indirectly.

6.3 TECHNOLOGY THROUGH THE AGES

Chapter 1 commences with the importance of today's scholars casting their attention back into history to ascertain which type of technologies have been available through the ages. The findings show undisputed historical evidence, clearly documented, that are consistent with very sophisticated technology used since ancient times.

6.3.1. Fallacy: Differentiating Between Technology Immigrants (TI) and Technology Natives (TN)

For the purpose of this thesis, TN are described as *born in an era with computers, laptops, mobile phones, IPODS and other communication devices around them*. TIs are the polar opposites of TNs. This description presupposes that TNs are more advanced in their knowledge and use of technology. However, this thesis suggests that, in both organizations and in the classroom, this presupposition is not quite true. Learners in the classroom, although they appeared very confident around technology, had limited knowledge on how to use these technologies, as Tables 5 and 6 pointed out. In the longitudinal study from 2007 to 2009, the 2009 group who mostly identified as TN, were the least able to understand, use and manipulate technology at the beginning of the course. Their concentration levels were lower than that of 2007 and 2008 learners and they were unable to understand basic questions involving technology. Furthermore, the 2009 learners revealed the following regarding the use of technology that they are surrounded with:

Oh, now I remember day one, so silly, I could not even connect websites to databases – ‘pretty dumb’, ‘I’d say

I use my laptop to answer emails and type my assignments and complete other documents. If I need anything on my website, I email it to a company so that they can update my website. I hardly access the internet, but I do access my website to see whether the updates are done. If I am unable to take photographs or am in an area where I cannot send emails, my website would not be updated for months.

I own my own laptop, phone and digital camera.... and I can play a game or two on my phone.

I own most gadgets like a mobile phone, MP3 player, camera and we have a computer at home. I can play one of the internet games very well. I use my mobile phone to send messages, call my friends and play a game or two.

How do you work those widgets?..... They are just there, I don’t even use it – ‘its cool’ though. I make and answer calls, send and receive text, and then I get all these prompts on my phone to purchase something, or introduce something new.

We have a computer and internet access at home – such good games on it.

When I switch on the computer, the programme opens immediately... But it looks nothing like the information you asked us to search for...

My younger brothers and sisters shares my phone and I sometimes let them play games on it. I like following all the headlines on the internet, have you ever done that before?

I just open my computer, and click on the headline across the screen.

These statements confirm the observation findings that TN may know about most technologies, however, their knowledge about it and ability to operate it is very superficial. Yet learners in the class found it easy to differentiate between TI and TN, while staff at

organizations found it problematic, and, most times, impossible to fit themselves into a TI/TN category.

All staff have worked with technology and are aware that technologies have been in use in the workplace, according to them, from about the 1960s. When accepting a 'category of fit', they clarified that the choice was made based on the researcher's pre-defined categories. Older employees found it more difficult to find a 'category of fit', as, since the start of their working lives, they were surrounded by technology in the workplace. Some of the comments included:

Our company has used technology since I graduated in the 1970s. I have been working since the late 70s and we had very sophisticated technology at our company.

I have a huge weather station in my back yard with all the latest technology. I built it, I developed the technology. And you call me a technology immigrant?

Younger employees found it easier to identify as TN, yet was quick to point out that they learn significantly from older people who has been with the organization for a long time:

Having different generations working together and being welcomed to share and partake in every area is what I enjoy most.

The younger learners in the classroom, who clearly identified as TN, appeared confident when asked to access technology. When asked to rate their ability to use technology (Table 27), 75% rated their ability as very good or excellent. Their knowledge of technology, specifically for the 2009 group, although it appeared superior, on observation, was in fact very superficial, as clearly stated in Tables 6 and 7. They needed more, assistance, more guidance, more direction and deeper explanation of basic terminology which older learners had no difficulty in understanding. Furthermore, they were easily distracted from completing a task (Table 8).

6.3.2. Similarities and Differences between Younger and Older Learners

This thesis shows that people are, in most ways, similar, yet in other ways, very different. This finding confirms the way human beings have always been - yet some intergenerational differences do exist, and have existed through the ages. Some of the similarities identified is having fun, relaxing, inquiring about something you do not know, helping others, the need to be accepted and liked, using technology for a particular purpose, sharing ideas, tea breaks and meal times, enjoying others company (Table 19 & 20), learning from each other and relishing the feeling of seniority. Respondents put it this way:

We bring lots of fun, too.

Since I came here, the people here are so skilful, and they are more than happy to share their knowledge.

I think TI are really knowledgeable and brings that knowledge to the organization.

We all work together – the younger ones learn off us, we learn some valuable skills from them.

Table 9 shows that, for the 2007 and 2008 groups, all learners in the classroom were happy to work independently or join with other learners, swap roles and work in teams. The 2009 group, although, initially indecisive on whether or not to work in groups, Table 34 shows that they enjoyed the classroom group work experience. The learners described what their experiences meant in words:

The course was very encouraging, motivating, fun and enjoyable because it made it easier to learn the content etc. However it was a bit dull towards the end but I think it was due to having so much fun in the beginning.

Fun: the course was never boring it was always good fun and the learners could not wait for that class.

It was a uniquely different class which I thoroughly enjoyed. It was at the same time both serious yet fun and enjoyable. It was one of those experiences that you didn't want to end.

Participatory= we all got involved in all aspects.

On previous experience with seniority, the 2009 group commented:

We directed the school plays and were in charge. It was awesome; we could share our knowledge with the new actors.

We teach new comers some of the skills we built up during the year. And it gives us a sense of achievement and responsibility when we do that.

On my recent travels, I had to take responsibility. If I made the wrong choice, it could cost my life and that of my sister's.

It is amazing how much you remember if you teach or show others how to do something.

An unexpected outcome of seniority was that the 2009 learners became more focused on the subject matter, voluntarily studied the concepts and even kept notes in their pockets during the excursions. In addition to the similarities above, the differences acknowledged and identified are personality differences, differences in level of skill, technology knowledge, experience, creativity and innovation:

I think it boils down to personality. I prefer to share my skills around, and am happy to pick up skills from others.

I have seen today's operator that you call 'TN' in action on the plant – to me it is just the usual generation issue, lack of experience maybe.

Then it is calculations and when the machine spits out the report, I need to know what it means – and this is critical.

What you term TNs all have this in common at our workplace: When the information comes out on the 'other side' of the black box, they accept it the truth and present that in their reports. They cannot tell that the answer that the black box 'spit out' is wrong.

The younger people definitely bring innovation, looking at things in a different way, and I am one of them.

The learners in the classroom put it this way when asked for creative and innovative ways to improve the computer simulation game:

We have trucks coming and going all the time, so draw a few trucks on the interface. That will make it visually more appealing.

When I commute here, I see pictures of the environment around me. Why not incorporate pictures? For every facility in the game, draw a picture. I create an environment for my children at home, and do not introduce anything bad.

What if we could choose the product that can be used in the supply chain? Remember that the purpose of the game is to teach us supply chain concepts.

Why not create a game which is appealing to look at, easy to follow, and has help hints at the fingertips.

can we have the same theme running through the game? Pictures on every screen whether it is the help screen or play screen?

The issue is thus not one of differences in the way that different generations impact on the classroom and organizational culture. That more similarities and differences exist between younger and older learners is confirmation of the Bullen, Morgan and Qayyam (2010) empirical study done at a post-secondary institute in Canada.

In addition, this thesis moves beyond the educational sector to connect classroom culture and organizational culture by extending an empirical study to include both the classroom and organizations. Furthermore, the creativity and innovation of learners in the classroom were channelled and accepted to make significant improvements and develop the *Supply Chain Concepts* game.

6.3.2.1. Incorporation of intergenerational differences and technology cross pollination

This thesis recognizes, in Chapter 5.1.1., that some intergenerational differences do exist. These intergenerational differences can, however, be successfully addressed through cross pollination of knowledge, skills, use of common sense and technologies that with polarization models would be improbable to occur.

Nevertheless the teacher-learner and organizational communication evidenced by this thesis clearly show that the number of intergenerational similarities far exceeds the differences. Tables 12 and 13 shows some intergenerational similarities and differences.

In addition to the confirmation that some generation gap and intergenerational cross pollination do exist in organizations, this thesis suggests that intergenerational cross pollination at companies are highly desirable; *it is the wish of employees, managers and directors.*

Since I came here, the people here are so skilful, and they are more than happy to share their knowledge. There is a, what I call, 'cross sharing' of everything. I have never picked up so much of useful skill and knowledge in such a short space of time.

They contract to us, so I tell them what we want, and, if there is no solution off the shelf, we work together to provide a solution. When we have the solution, we all celebrate.

I prefer to share my skills around, and am happy to pick up skills from others. Do I know more than the guys that have been around here for a long time? Heck, no.

We take more than 18 months to 'bash' all the bad habits out of them that they come with from university – it is hard work, I kid you not. I simply call it experience and inexperience – that's all that it boils down to.

6.3.2.2. Key Performance Indicators and the connection with intergenerational differences

Notwithstanding that, intergenerational cross pollination is as highly desirable in the workplace and also in the tertiary classroom by both younger and older people (see Chapter

5, Sections 5.5 and 5.6). In organizations, in the absence of older people, younger people do not acquire as much knowledge and skill. Younger people thrive in an environment where the older generation is present and they are exposed to experience and learn skills over a short period of time. Similarly, older people learn from younger people; both happily co-exist side by side with continuous intergenerational cross pollination of ideas, creativity, knowledge and skills.

Furthermore, organizations are aware that key performance indicators (KPI) have been individualized and impact on the extent to which intergenerational cross pollination occurs. As intergenerational cross pollination is not expressly stated in the KPIs, the employees are mindful that their performance are not be measured by it. This recent focus on KPIs has reduced the intergenerational cross pollination, yet it is still present, enjoyed and, most importantly, desired by all levels in these organizations:

Then it is calculations and when the machine spits out the report, I need to know what it means – and this is critical. We all work together – the younger ones learn off us, we learn some valuable skills from them.

Since I came here, the people here are so skilful, and they are more than happy to share their knowledge. There is a, what I call, ‘continuous sharing’ of everything. I have never picked up so much of useful skill in such a short space of time. Having different generations working together and being welcomed to share and partake in every area is what I enjoy most.

This thesis is in contrast to Prensky’s and others claims of ‘change in neuro pathways of the brain’ including ideas of forcing ‘new’ technology into the classroom with an inexpressible resolve; the strong thrust to first polarize the teacher and the students and then advocate strongly for the ‘removal of the teacher’, neglecting to mention that he himself falls under his TI description, and therefore, by definition, he should be ‘removed’ or made *obsolete*; the ‘incalculable urgency with which video games, under the banner of *edutainment*, which includes ‘shoot to kill’ video games, are ‘ushered’ in; technology transforming ‘any poor performing, disinterested student’ into a ‘vibrant, well performing, interested genius (Prensky, 2001a & b).

Maddux and Cummings (2004) bring some balance by issuing a stern warning against 'poorly researched technology', the 'exorbitant cost' and the 'destruction that it brings' to the education sector.

6.3.3.3. Cross-pollination of ideas, experience, knowledge and skill

This study found that, in both organizations and in the classroom, younger and older people enjoy working together and enjoy sharing their skills and knowledge, as Chapter 4 in this thesis points out. Importantly, younger people who previously worked in an environment where no older people worked recognised that they learnt less in such an environment.

In contrast, where both younger and older people are present, there is recognition of cross pollination of knowledge, ideas and skill. They welcome their differences, the ideas everyone bring and the fact that they can share and partake at the same level. They are happy to learn from one another, and, although the learning takes time, the results are satisfying. Experience and skill of older people is contrasted with technology knowledge of younger people. Younger people may know technology and may be able to use it well; they do, however, need the skill, expertise and experience of older people to ensure that their knowledge is well utilized to the benefit of the organization.

There is a control button that says 'valve open or valve close'. At the required time, the operator will press the button to open a valve. If the control continues to show 'valve close' when it should show 'valve open', the operator will keep pressing the control button. Instead of getting out of the chair and walking into the plant to have a look at the valve and where the product by now lies waste throughout the plant, the operator continues to force the control button from 'valve close' to valve open'.

They have so much skill – they can just look at something and say, wait a minute, Kelvin, I think something is not quite right. I still do not know everything. I do think that I as a TN in your language, adapt easier

What you term TNs all have this in common at our workplace: When the information comes out on the 'other side' of the black box, they accept it as the truth and present that in their reports. They cannot tell that the answer that the black box 'spit out' is wrong.

In addition, the learners that went on the field trip relished the opportunity to learn from others in the workplace, when presented with the opportunity:

I correctly identified the customer, the size that he ordered, loaded, aligned, cut and sent the log through to the shipment dock, ready for the customer to collect while the whole tour party was looking on...

I am often called to visit the producers to try out different kayaks and to recommend adjustments to improve the kayaks. The presentation at the head office and plant reminded me a bit of my experiences with the kayaks.

The classroom highlighted the findings above; the young people may appear comfortable around technology which could easily be mistaken as knowledge and skill. Classroom observations, however, pointed out this fallacy; a distinction is drawn between being comfortable around technology on the one hand, and knowing how to use and optimizing technology on the other.

Therefore, in the classroom and in organizations, intergenerational learning should be recognized, as the gains made through intergenerational cross pollination in this thesis is significant. The innovation and creativity displayed in the classroom, which lead to the development of the *supply chain management* game, is a clear example of intergenerational cross pollination. Furthermore, most learners have continued on to do amazing feats, spurred on by the initial intergenerational cross pollination from their teachers.

6.3.3.4. Loss of skill and knowledge

Organizations, especially people in positions of authority, recognize and emphasised knowledge and skill base loss at various levels of the organization. With all the constant focus on technology, some even recognize that the knowledge and skill base is no longer there. This revelation is confirmed in their comments:

I have seen today's operator that you call 'TN' in action on the plant – to me it is just the usual generation issue, lack of experience maybe. There is a control button that says 'valve open or valve close'. At the required time, the operator will press the button to open a valve. If the control continues

to show 'valve close' when it should show 'valve open', the operator will keep pressing the control button. Instead of getting out of the chair and walking into the plant to have a look at the valve and where the product by now lies waste throughout the plant, the operator continues to force the control button from 'valve close' to valve open'. No common sense used or no thinking on the side of the TN. A TI would know the sound of the machine, if a 'valve open' button is pressed and the control does not open the valve, the TI will put their head out the door, survey the plant and see that the valve is malfunctioning. All that knowledge and skill that was always evident with TI, is just not there anymore, and that is a huge concern.

Where TIs looks at what comes out on the other side of the 'black box', they can say; 'wait a minute, something does not look right'. TNs just cannot do that, no matter how hard we try.

Those who are mostly seeing this (relying on machines to think for us) are the instrument mechanics. The person behind the screen will press a button and assume something is happening that should happen. If it does not, they call the IT people. On closer inspection, you will actually notice the real problem is not the IT – something very obvious has gone wrong on the plant. If the person just got up and had a look at the plant, 95% of the time they would be able to pick up what has gone wrong, because it is very obvious!!

Disadvantage is that the operators loose the skill of what is going on. They just believe what the computer tells them.... Our environment requires strict discipline. You cannot just go by what a computer tells you. That is why we have knowledge and skill....

6.3.3.5. Creativity and innovation versus knowledge, experience and skill

It is accepted at both the organizations and in the classroom that, where older people bring knowledge, experience and skill, younger people bring innovation and creativity. In particular, in this thesis, the redevelopment of a business simulation game, now called the *supply chain concepts* game is directly accredited to the creativity and innovation of younger people.

However, the creativity and innovation of younger people must be recognized and harnessed to ensure continued productivity and positive contribution to the organization.

Where creativity and innovation is not harnessed, the acts of younger people can, unknowingly, result in significant damage, which could be costly for organizations:

A younger person may think they are smart and want to change things around to make the screen look interesting. Because of the lack of skill, they may find out that they seriously stuffed things up, and that is two whole weeks later – can you imagine that in production time!! They impacted on something else very important and had no idea that they did. An older person would have been able to tell right from the start. Different skill base, you see. So now you have two things: production time and product wastage, plus computer call out time. Loosing skill is a very costly affair, and, the quicker fallacy?

I am often called to visit the producers to try out different kayaks and to recommend adjustments to improve the kayaks. The presentation at the head office and plant reminded me a bit of my experiences with the kayaks.

6.3.3. Information Communication Technology

6.3.3.1. Longevity of technology

That technology has been around in organizations in NZ for many years is confirmed through this thesis. Furthermore, individuals develop technology, irrespective of their age.

I have a huge weather station in my back yard with all the latest technology. I built it, I developed the technology. And you call me a technology immigrant?

There is recognition, though, that technology evolved over the years since the 1960s and that there are now more *gadgets* available. Furthermore, there is an acknowledgement that, within the workplace, more and more time is spent individually looking at computer screens and on individual key performance indicators, and less time spent on group activities. One senior executive concedes that she now *'lives and breathes'* out of her computer.

6.3.3.2. Using email as a communication tool

Both the younger and older generation use email as a preferred communication tool at organizations, including tertiary organizations. The companies specified that, sometimes, email can be overused. Although email is regarded as being *'overused'*, there is unanimous

acceptance that email makes communication much easier, and will, at least for now, remain as an integral part of organizational communication.

All of our senior management staff have cell phones where they can receive and answer emails...

Talking to people is much easier, but we sit there in front of our computers, and, when mail pops up, we read it. The good thing is that you get an almost immediate response. So if I need to get something done, I send an email, and get an almost immediate reply.

Email contact for me is crucial. It opened up communication lines, especially in my case, where my customers are elsewhere.

It has changed from where the 'big boss' sends a message to the 'little boss', and by the time it gets down the line it is diluted. Now when you look at emails from the 'big boss', it is passed through more accurately. A huge difference for us!

The observation at one of the companies confirmed the overuse of email, in that two youngsters emailed each other rather than just 'popping' their head around the divider between their two work spaces. Furthermore, some highlighted the anomaly of two colleagues sitting next to each other – separated by only a divider, and texting to each other:

.....But I have heard and seen that people email those sitting beside them, and they text as well!

Do people use email inappropriately? And I will give you my view here – YES THEY DO.

A similar sentiment was shared about texting – that, while part of a conversation, younger people may text someone inside the room while communicating with that same person face-to-face.

6.3.3.3. Negative impact of email as a communication tool

The negative impact of email as a communication tool was widely commented on:

People hid behind email and generally, bad news come via email. They cannot say things face-to-face on the phone, so use email. We still need to sit around the campfire and talk things over. Then we can

email from that point. Emails cannot pick up tone, and relationships are suffering. One can read email in so many different ways. I think it creates 'silo thinking'.

Talking to people is much easier, but we sit there in front of our computers, and, when mail pops up, we read it.....The culture has changed. People sit in front of machines and this is now the communication medium – the machines. Here is another fallacy – the less contact you have with people the more productive you are. Here, at our organization, you are viewed as 'smart' if you use the machines for communication with human beings.

Email is not always well understood and people tend to hide behind emails nowadays.

.....Yes, it has changed. Is it for the better? That's the multimillion dollar question – it could be very deceiving

6.3.3.4. Flexibility of Communication

Interestingly, at organizations, both generations enjoy the flexibility of being able to communicate from anywhere, anytime. In addition, the ability to cut across the formal organization structure and receive messages directly from senior management indicates that email and other modern technology exceed the traditional communication boundaries.

It has changed from where the 'big boss' sends a message to the 'little boss', and by the time it gets down the line it is diluted. Now when you look at emails from the 'big boss', it is passed through more accurately.

My colleagues are in Auckland, three hours away. They contact me by email.

...communication is mainly via email. Many people work away from the office these days, and I can easily contact my boss via email. She can check over my work and send things back to me.

Furthermore, organizations agree that modern communication technologies are opening up more communication possibilities, especially working 'away from work'.

...there are benefits that go with it, like not spending all that time in traffic, becoming less stressed behind the wheel. Our engineers love that, and they do not have to worry to go to the plant and then

travel all the way back to head office to download the information. They can now do it in the 'bush' where ever they are. And some will just call in and say; 'today I am working from home'.

On the advantages of flexible communication respondents had this to say:

Our company has wide and diverse business across New Zealand as well as across other countries. Sometimes we had employees that started in a role that crosses all our sites and they may have been with us for three to six months, and I have never seen them once. But I have been interacting with them several times on the email

...Then they have cards that can get them on the company network where ever they are, any time, any place. My managers can receive signed contracts or contact us and say how much pay they want for that staff member. It does not matter where that manager is during the day; they know that they can get on with a part of their work. I can schedule meetings on outlook calendars, and I can ask them to lock it in their diaries immediately and I can control that well.

When I use the company laptop, I can do anything from home or anywhere. I can access those machines I talked about earlier, analyse data, carry huge amounts of data over, put it through the system and then interpret it. I can do all of this from home or anywhere for that matter.

IT is not visible'..... in that we can work from anywhere now.

Learners in the classroom enjoy flexible technology too. While they are in the classroom, they can receive texts, view and answer emails and connect with their friends on chat facilities.

6.3.3.5. Impact of Technology on office layout

Not only does technology open communication; this thesis confirms that it indeed opens up offices. Offices have been significantly changed; from closed offices to temporary partitions and now open plan offices. Because of communication technology, they do not, however, need to sit in the office any longer to do their work.

.....dial in from home and start and stop a pump from anywhere, for example, from home or from a motel room if I am travelling.

Many people work away from the office these days.....

6.3.3.6. Impact of technology on organizational culture and family life

There is an admission that the change from closed offices, to partitions, to open plan offices to working away from work has impacted on organizational culture. An IT professional admits that he feels lonely at work:

Furthermore, there is a definite realization in organizations that the separation between personal life, work life and family life is in jeopardy, which was a great concern to all:

.....eats into my boss's time when she is at home, but she does not seem to mind.

Do we get the time we spent working at home back? Never. Do we eat into our family time – the answer is, yes. Maybe another fallacy – Accessing work from everywhere is smart and the company gets more done. I would say it is handy – but you stay switched on all the time. Our family time, time with friends, everything has changed drastically; less and less face-to-face contact, more machine contact, even from home.

.....it may mean spending less time with the family, for work is 'intruding' which is very, very sad-families and relationships should be the most important. But there are benefits that go with it, like not spending all that time in traffic, becoming less stressed behind the wheel.

In addition to affecting home life, the relationships at work suffer as a result of constantly being 'out of the office':

When I use the company laptop, I can do anything from home or anywhere. I can access those machines I talked about earlier, analyse data, carry huge amounts of data over, put it through the system and then interpret it. I can do all of this from home or anywhere for that matter. But it does come at a cost. I lose touch with those I work with, and of course, here at home, it impacts on my family-the more time I spend on work at home, the less time I spend with the family. I guess I lose out both ways: colleagues at work and family at home.

6.3.3.7. Technology and face-to-face communication- the connection

This thesis strongly connects technology with face-to-face communication.

Here, at our organization, you are viewed as 'smart' if you use the machines for communication with human beings.

Organizations believe that email and some useful technologies as business tools, are extremely useful and here to stay. Furthermore, email and other technologies were portrayed in a positive light.

Email without face-to-face contact, though, was not recommended:

We still need to sit around the campfire and talk things over. Then we can email from that point. Emails cannot pick up tone, and relationships are suffering. One can read email in so many different ways. I think it creates 'silo thinking'. Camaraderie is no longer there.

Talking to people is much easier, but we sit there in front of our computers. The culture has changed. People sit in front of machines and this is now the communication medium – the machines. Here is another fallacy – the less contact you have with people the more productive you are.Face-to-face contact has been reduced drastically. Our company is no longer people orientated, which is sad, and with that, relationships are out of the door.

There is a real danger though that email and the useful technologies may be used as walls to hide behind. Discussions, negativity and words that will never be spoken face-to-face, are now communicated via email. Even though email and other communication technologies allow for more flexibility and versatility, there is a strong belief and concern that face-to-face communication skills are slipping, and, in some instances, it is recognised that this skill has already been lost.

And people here now hardly talk to each other – emails even if the person is next to you.

So, yes, IT has become very important – more important than people – relationships are suffering. Even our off site get togethers have been stopped. IT first, people do not feature.

Everyone was people orientated. We went up to somebody's office and had a 'yarn' to them – you had face-to-face contact and that contact has been reduced dramatically. It is considered smart to basically use electronic media. Everything seems to be like that in other business areas here as well; it seems like everything is specifically geared to have less and less contact with people.

Furthermore, face-to-face communication is recognized as a critical element of relationship building, which is vital in the management of an organization, including getting others to do what needs to be done:

....have people changed the way they do things? Absolutely, people have forgotten how to communicate, how to get people to do things, which is a skill you get only from face-to-face contactpeople are starting to lose the ability to communicate face to face.....

....Yet telephone and face-to-face contact is used less and less now.They cannot say things face-to-face or on the phone, so use email

Face-to-face communication in the classroom remains highly appropriate, desirable and engaged and motivated the learners in the classroom, as their learning experiences in Figure 21 attests.

6.3.3.8. Connection between IT culture and organizational culture

A strong connection was made between the changing organizational culture as a result of IT culture:

..... The culture has changed. People sit in front of machines and this is now the communication medium – the machines. Here is another fallacy – the less contact you have with people the more productive you are. Our company is no longer people orientated, which is sad, and with that, relationships are out of the door.

We always have to do what we are told by IT when we have a problem. They force us to follow what they want us to do.

Yet, if we have a problem, we are seen as a nuisance. They are slow to respond, even if we have an urgent need, especially off site. That is why youngsters take things in their own hands – they fix

things, wherever they are, you know. They take the system apart, so desperate are they to work. Yes, they are not supposed to do it. However, we only have one person now. So, let's say you are somewhere and have a deadline and the system does not work, they take it apart. If you get it right, that's o.k. but even then, they should not be practicing on our company systems – but what can we do?

6.3.3.9. Unexpected additional findings

Employees who are not engaged with their own or other generations, experience feelings of loneliness and do not feel as 'part' of the organization as the rest. Furthermore, when comparing working with their own generation to working with other generations, the younger people confirm that there is a significant difference in the extent of knowledge and the skill they gain in intergenerational work places.

The learner's input into the development of a simulation tool, the *supply chain concepts game* is one such amazing feat. Learners felt valued and free to share their creativity, ideas and knowledge. The information sharing by the learners led to the successful development and testing of the *supply chain concepts game*, within a record time period. Furthermore, the willingness of the teacher to include learners in their learning, while allowing them to think, explore and share in the knowledge build up process, far exceeds what is possible without teachers present, as the Prensky polarization model suggests. Knowing that their knowledge and contribution is valued motivate learners to engage and make a significant contribution to their own learning and the learning of others within the class room learning environment.

The outcomes of this thesis illustrate that education which allows intergenerational cross pollination of ideas, knowledge, skills, common sense and face-to-face communication should be in the forefront, with technology as one of the tools that could be used in the classroom learning environment. Furthermore, the ability of teachers to motivate learners in the class room learning environment is clearly demonstrated and the superficial knowledge that exists with the younger learners entering institutions of higher learning is real.

Organizations significantly inputs into the knowledge of new employees fresh from the higher learning environment, and employers' value learners that can think, share their knowledge, be creative and use their common sense. Often, these skills surface after an

intensive 14 month period. By practicing the skills employers value in the tertiary classroom learning environment, the learner has less adaptation to do in the workplace.

In organizations, like in the tertiary classroom learning environment, workers thrive on working closely with generations other than their own, confirming that there are more similarities than differences between generations. These outcomes are markedly different to the polarization model ushered in by Prensky, a model which, throughout history, has proven to be destructive and debilitating; completely favouring some, while harshly dealing with others.

6.3.4. Successful Use of IT Improve the Motivation of Learners

By understanding and harnessing the power of simple available IT applications such as excel, the millions of dollars spent on technology can be more productively applied elsewhere or invested in new opportunities, especially in the education sector, which is heavily dependent on tax payer dollars. This thesis highlights the effective use of powerful functions in existing technology and the ability of organizations to work with IT teams to ensure that the power of such easily accessible technologies are harnessed to the benefit of the organization. Emphasis is placed on the interpretation of data, which is one of the skills transferred through intergenerational cross pollination in the workplace.

Throughout this thesis, IT, alongside other tools such as connecting new learning with pre-existing knowledge, case studies, keeping recent experiences fresh in the mind of learners, field trips, showing an interest in and learners, experiencing seniority and allowing learner input into the course, were successfully utilized. Despite the significant age difference and level of technology knowledge of the 2009 group compared to the 2008 and 2007 groups, the final outcome of learner results at the end of the semester was similar for all groups. The strategies adopted include

- adjustment of the course to suit the needs of the learners.
- When the learners were demotivated in 2007 after playing a computer game, the teacher noted the stage in the course where the demotivation set in, developed a strategy for the next year and implemented that strategy with great success.
- As part of the implemented strategy and intergenerational cross pollination, the 2008 learners used an opportunity during a focus group session to recommend

significant changes to the *beer game*, that would, in their opinion, engage and keep learners motivated.

- Furthermore, learner motivation increased after the focus group and they felt 'heard' and were able to contribute significantly to their learning and the learning of future learners.
- The 2009 group initially received significantly more guidance than both the 2007 and 2008 groups, as they were much younger. In addition, their technology knowledge was very superficial when they commenced the course.
- When the motivation levels of the 2009 learners dropped, firm guidelines were given in class and continued assistance was always available.
- From the survey questionnaire results in Figure 21, it was clear that the learners enjoyed the class and was motivated by the use of technologies in the classroom learning environment
- Furthermore, that this engagement in tertiary learning and motivation spilt over into other classes that the same students were enrolled in.

On completion of the semester, there was no difference in the way in which the 2009 learners used and manipulated technology and their performance levels compared to the 2007 and 2008 learners. So strong was their motivation that they discussed their enjoyment during break times over a drink. Furthermore, anecdotal evidence from fellow colleagues pointed to improved levels of motivation and performance in other subjects. This was an unexpected very welcome outcome.

These findings lay a foundation for an interactive model

6.4 EDUCATION, CULTURE AND TECHNOLOGY

Although the culture of both the learner and the teacher affect the classroom directly, another important culture, namely, that of the educational organization affects the classroom indirectly. This indirect impact cannot be underestimated, as critical decisions are made at organizational level, not at classroom level. The culture of the educational organization, in turn, is impacted on by the culture of the Business and Interest Groups, Administrators and Government (BIAG). In addition to acknowledging the impact of the culture of BIAG on the educational sector, this thesis highlights the considerable damaging impact that polarization

models, including cultural hegemony and herd culture inflicted on other cultures throughout history. By highlighting history and being mindful of the disturbing impacts, including the loss of millions of lives through the implementation of polarization models, the same destruction and ruinous results can be avoided in the future.

In particular, within the education sector and in organizations, polarization models do exist. In the education sector, these models have led to continuous definition and redefinition of the term 'education', as Chapter 2 points out. By removing the teacher from the classroom, polarization models are still present in the classroom. Developers of technology are certainly TI, as this research points out. There is a fallacy in believing that TI should be totally removed, as these developers of technology are TI themselves.

This thesis highlights and argues that, instead of the TI/TN polarization model, companies and students desire and firmly support intergenerational cross pollination of ideas, knowledge and skill. Furthermore, that there is a connection between organizational culture and IT culture. The role of technology as a tool is emphasized in the classroom learning environment.

Yet learning is much more than education, which refers to the formalized part of learning (Khin, Young, Kelley, & Drivere, 2004). In this thesis, the learning that occurred outside the classroom is brought into the classroom to enrich and maximize learning. As the culture of the learner and the teacher forms such a critical part of the classroom learning environment, including a model like the Hofstede four dimensional cultural model in research relating to education and the classroom learning environment is critical.

6.4.1. Including a Cultural Model in Educational Research

One such study where researchers, in an educational setting, based their measuring instrument on the Hofstede cultural model was the *Cultural Learning Environment Questionnaire* (CLEQ) constructed and validated by Waldrip and Fisher (1997). The findings of this study confirmed the importance of acknowledging the culture that both the learner and the teacher bring to the classroom. This acknowledgement allows the teacher to select various strategies and approaches based on the needs of the learner. The Khine and Fisher

study in Brunei (2001) confirmed that the culture of both the learners and the teacher have an impact on the environment created in the classroom.

This thesis documents the satisfying and far-reaching impact that teaching strategies had on the 2009 learners. After initial action observation sessions in 2009, compared to 2007 and 2008, significant impacting changes were made to a field trip as shown in Table 16. These changes are highlighted below:

- The field trip was brought forward from the end of the course to the third week of the course
- In addition to the morning Head office session, a second session was scheduled at the manufacturing plant of the same organization
- Non-degree learners were invited on the trip to provide a sense of '*seniority*' for the degree learners
- Two buses were used to transport the learners
- The degree and non-degree learners were intentionally divided into three different groups during the tour of the manufacturing plant

The main purpose of the change in strategy was to motivate and engage learners in tertiary learning. By changing the strategy, the teacher recognises that there is some difference in the way that younger people impact on classroom culture. Furthermore, the teacher can incorporate these differences in the way younger people impact on the classroom to ensure successful use of technology as one of many tools in the learning process. Because the learning process extends outside the classroom learning environment and the education sector, this thesis included organizational culture outside the formal educational setting.

In this regard, this thesis highlights the findings within organizations that there are more similarities than differences between younger and older people. As explained in Sections 6.3.1 and 6.3.2 below, there is acknowledgement that there are differences between younger and older people.

Furthermore, younger and older people enjoy working together; they thrive in such an environment and organizations desire to have such an environment. More importantly, young people highlighted the tremendous difference in the amount of knowledge gained in

an organization where there are only younger people compared to an inter-generational work place.

6.4.2. Connecting cultural, education and technology

In addition to cultural dimensions, Aldridge and Fraser (2003) included the use of technology in the classroom by developing and validating the *Technology-Rich-Outcomes-Focused Learning Environment Inventory* (TROFLEI). As well as validating and showing the reliability of this instrument, the effective use of information communication technology (ICT) in the classroom was highlighted. However, these instruments developed and validated thus far by these researchers were mainly of a quantitative nature.

The limitations of such quantitative studies were highlighted by Van Petegem and Donche (2006). In this thesis, the highlighted limitations have been addressed, as the longitudinal study in this thesis uses mainly qualitative methods, including action observation to help change behaviour, as explained in Chapter 3. For the 2009 group, both quantitative and qualitative methods were used.

The rest of this chapter provides an integrated discussion of the findings of the face-to-face interviews at companies including the observations at these companies, the action observation results, the focus group sessions and findings of the online questionnaire. Next, a discussion of the redeveloped software and education models follow. Finally, a model, based on the findings of this thesis is revealed. Every part of this model is discussed. Thereafter, the designed model is compared with another model to determine the effectiveness of the new model.

6.4.3. Open Classroom

According to the open classroom (see Figure 22), the teacher in the tertiary environment has a range of educational tools available, including technology tools. Some tools are available inside the classroom, while other tools are outside the classroom learning environment. Building and maintaining strong relationships with the learners forms the foundation of the classroom learning environment. With this foundation in place, learners feel free and safe to recall and utilize their previous experiences, share their present experiences, and learn from

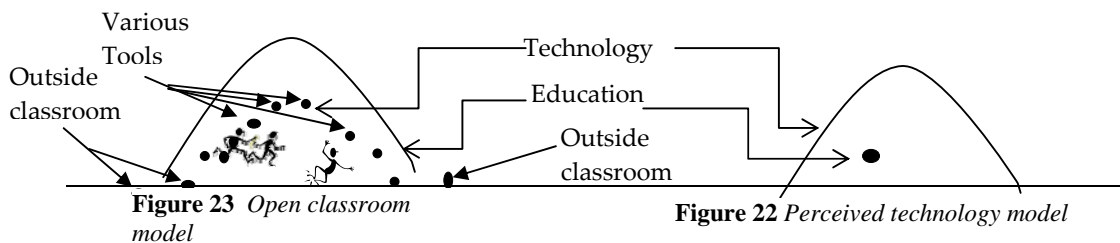
each other and the teacher. New experiences are discussed in the classroom and there is a willingness to bring and explore information from outside organizations into the classroom. The available tools are chosen, used and adapted at any time to engage and motivate learners. Knowledge from outside the classroom is introduced to ensure the learner continues to make connections between existing and new learning. The latest experience is kept fresh in the mind of the learner as new concepts are added.

6.5 TOWARDS AN INTERACTIVE EDUCATION MODEL

The open classroom suggested in this thesis is starkly different from that of the proponents of technology. A visual presentation and a discussion of both these models follow.

6.5.2 The Open Classroom Model

This model (Figure 22) allows for prior learning and knowledge to be brought into the classroom. In addition, all new knowledge gained outside the classroom environment is drawn back into the classroom. The purpose of both these techniques is to enrich the classroom learning environment, connect past, present and any learning outside the classroom with the classroom learning environment.



6.5.1 Perceived Technology Model

The model developed in this thesis to represent the proponents of technology is based on the numerous scholarly and other publications as well as the scramble of administrations and others in charge of education to use technology as a replacement for the self-orchestrated haemorrhaging of staff from the tertiary sector. The technology model in Figure 21 shows an educational environment that is completely enclosed by technology. Education becomes the only tool that technology uses. Face-to-face communication is lacking, as the polarization model advocated by Prensky removes the teacher from the learning environment and the technology provides all the learning.

The impact of both these two models on the classroom learning environment is illustrated separately: Figure 24 illustrates the motivational classroom learning environment and figure 25 illustrates the proponents of technology classroom learning environment.

6.5.2. The Motivational Classroom versus the Proponents of Technology Classroom Model

For learners in the tertiary education environment to engage with education, they need to be motivated in the classroom. This section first describes the motivational classroom learning environment. Thereafter, a model of the 'proponents of technology' classroom environment is developed and discussed.

6.5.2.1. The motivational classroom learning environment

As a result of the richness in educational tools, including technology, strong relationships with other learners and the teacher, cross pollination amongst learners and the teacher occurs continuously. The teacher uses the educational tools to continuously motivate and engage learners in the classroom learning environment (see Figure 24).

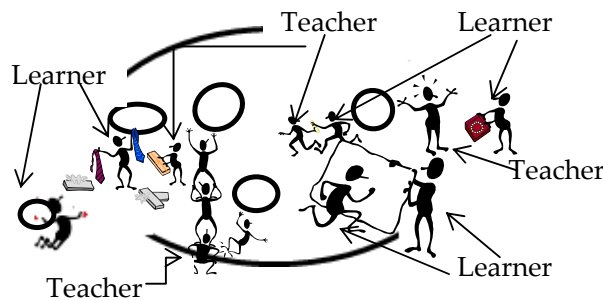


Figure 24 *Motivational classroom learning environment.*

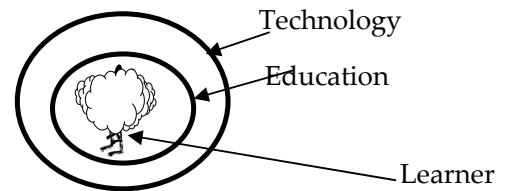


Figure 25 *Perceived technology classroom learning environment*

Because a strong relationship foundation exists, if learners are unsure, they are free to ask. If learners do not understand concepts or an exercise, they are taken a step back, the knowledge is shared, and they are allowed to move towards their goals at their own pace. Cross pollination of learning takes place between the learners and the teacher. Should the teacher require additional innovation and creativity in a particular area, for example, during the development of the *supply chain concepts game*, the learners volunteer the information needed to enhance their own learning experience, the teacher's knowledge and consequently the future learning experiences of others. In addition, cross pollination continues between learners during group work and class work. Learners feel free to share ideas amongst each other, assist each other where needed, allow learners with knowledge in particular areas to work from their areas of strength, while watching others who are better at particular tasks.

6.5.2.2. The proposed technology classroom learning environment (TCLE)

Based on the work of the proponents of technology, Figure 23 has been developed. In Figure 23, the learner is perceived to be placed inside an enclosed circle with technology as the major educational tool. The teacher has been removed and the CLE is now an open one, with freedom of access for developers, IT staff, administrators and others, who no longer need the permission of the teacher to access the learner directly. Although the learner has a learner ID, the developers, IT and web resources staff, administrators and others, through the IT department, can access the learner directly. Any reference to *education*, based on the work and ideas of Prensky and others, is removed, and *edutainment* becomes the focal point. The learner plays games, including *shoot to kill games*. The technology and games become education, the medium of instruction is technology, the interaction is with technology, and, if there is any human interaction, the interaction is remote. If the learner requires assistance, somebody, of whom the learner has no knowledge of and may have never met, answers the learner. Even if the learner has met the person, there is no guarantee of whether the person answering and the person the learner met is the same person. Furthermore, whether the person is qualified to teach, the learner or the parent paying for the education may never know. Finally, and more dangerously, the person answering the learner may be a sexual predator using technology as an opportunity to stalk his/her prey. A help file may be the next available solution.

Under the control of individuals or companies, some having a financial interest in the technology and the educational sector, Figure 25 show that the learner is left in a cloud of confusion, with nowhere to turn. This outcome is markedly different from that of Figure 24, where relationships form the foundation of the classroom learning environment and an open education model allows learners to use tools inside and outside the classroom to aid learning. In Figure 23, the developer/technology owner has little interest in the education of the learner, while the learner is left to build a relationship with the technology. Face-to-face communication that organizations see as critical skills for their employees to have is not cultivated nor encouraged. Furthermore, although it appears as though young learners know more about technology, this thesis found that the knowledge is superficial, at best. Currently, organizations spend around 14 months training young people to think. These young people are fresh from university and proficient in face-to-face communication, a skill that employers desire. In a cloud of confusion (Figure 23), learners not only lose valuable thinking skills (the technology may direct them along a particular path that may be

destructive, as only the learner and the technology occupies the educational space), but they lose one of the most valued forms of communication: face-to-face communication.

This thesis points to the importance of face-to-face communication (findings of face-to face interviews in Chapter 5 and main points repeated at the beginning of Chapter 6) in building relationships. Figure 24 allows learners to draw on existing relationships and build new ones in the classroom learning environment. The range of tools available enriches the learner's experience and equips learners with important skills needed in organizations in the future.

6.6 PROPOSED STRATEGIC EDUCATION MODEL (SEM)

This thesis reveals and proposes the following strategic educational model for the whole of the tertiary education sector, from early childhood through to tertiary. An explanation of the two major concepts, democracy and communism, which has a direct impact on freedom of choice and expression in education, follow. Thereafter, the strategic education model (SEM) is presented, followed by an explanation of the different parts of this model. The SEM is based on the principles of democracy, including democracy in education.

6.6.1 Democracy and Communism

As this model is based on a democratic governance model, it is critical to first differentiate between democracy and communism. The major difference between democracy and communism is freedom of choice.

In a communist country, the state, through the government, is a major role player and seeks to control every part of society, including an individual's ability to make choices, as all individuals belong to the government. Power and decision making comes from the state down to communities, individuals, parents and children; and is enforced through various governmental or government appointed bodies. In education, for example, the government decides what is to be taught, who it should be taught too and who the suppliers will be.

In addition, the government controls how many can be educated in which direction they can be educated. The parents have little or no say in the education, as the government has absolute say over the child, young adult and the parents. Furthermore, there is no free speech and students and parents are very limited in what they can say. There is generally

one universal education system that is enforced from the government on to the people. They have no input. Teachers have to accept what they are allowed to teach. The curriculum, resources etc. are pre-prepared and the teacher picks up resources, prepares the lesson/lecture based on the resources provided and delivers the lesson/lecture. There are no choices: if children, parents, teachers and communities do not follow, there are consequences including financial or resource withdrawal punishment. There is absolute control by government, government agencies and others appointed by government to exercise control.

There is minimal consultation and negotiation. Whatever the government decides is communicated, in a controlled environment, to the people, all the way through to communities, families, parents and children, mostly on a need-to-know basis. All media, including television, newspapers, internet, advertising and other mass media are controlled by the state through government, government agencies and organizations/businesses loyal to spread the message of the government; the message is often called propaganda.

Democracy is the polar opposite of communism. Democracy, in simple terms, is rule by the people for the people. In a democratic country, the family forms the nucleus and decision making commences at that level. Freedom of speech is having the ability to make choices without penalties (financial, withdrawal of resources and punishment) from the state through the government or its agencies. In education, parents decide for example what education they want for their children, when the learners are able to, joint decision making occurs. Learners and parents decide in which direction they want education to occur. Communities have the ability to make decisions and then communicate decisions through open forums through to government. Decision making thus occurs at the grassroots level. All tax payers including parents, teachers and communities have the right to decide how their taxes will be used. The government is formed through democratic elections and the citizens of a country, who are the tax payers, are directly represented in the government. If the representative needs to make a major decision, the will of the people represented should be expressed. In a democracy, it is common practice for representatives to first consult and negotiate with the people and then relay the wishes of the people to the government. The principles of democracy thus includes consultation and negotiation, participation in decision making from the grassroots up, freedom of speech, choice without punishment and more than one education system.

Education is owned by the people, and not by the state as in the case of communism. In education, for example, the parents, child (who is called a learner or student in the formal education structure) and teacher, therefore, should play a major role in decision making. The parents, because the child participating in education belongs to those parents (and not to the state as in the case of communism), is at the core of the child's learning, including learning in the formal education structure, which forms a minute part of lifelong learning. The parents have the ability to choose which education system they want for their children. Unlike the education environment under communism, there is more than one education system in a democracy, and the parents and child have the right to choose which education they want for their child. Should the parent and child choose a different education system, under a democracy, they have the freedom to choose without any penalties attached to their choices. The teachers, who may be parents themselves and part of a whanau (direct family), hapu (extended family) and Iwi (community), have a crucial role to play in decision making within the formal education setting.

Government education agencies and administrators, within a democracy, are obliged to listen to the parents, children and teachers, as, in a democracy, there is freedom of choice and decision making takes place at grassroots level and communicated upwards.

As the community and the family unit, which includes the parents, forms the core of decision making in a democracy, which is the polar opposite of communism, the parents, learners, teachers and the community thus forms a critical part of the nucleus of the formal education environment-the *classroom learning environment*.

6.6.2. STRATEGIC EDUCATION MODEL (SEM)

The SEM is based on democratic governance and consists of two main parts:

1. Classroom Learning Environment
2. Environment indirectly connected to the Classroom

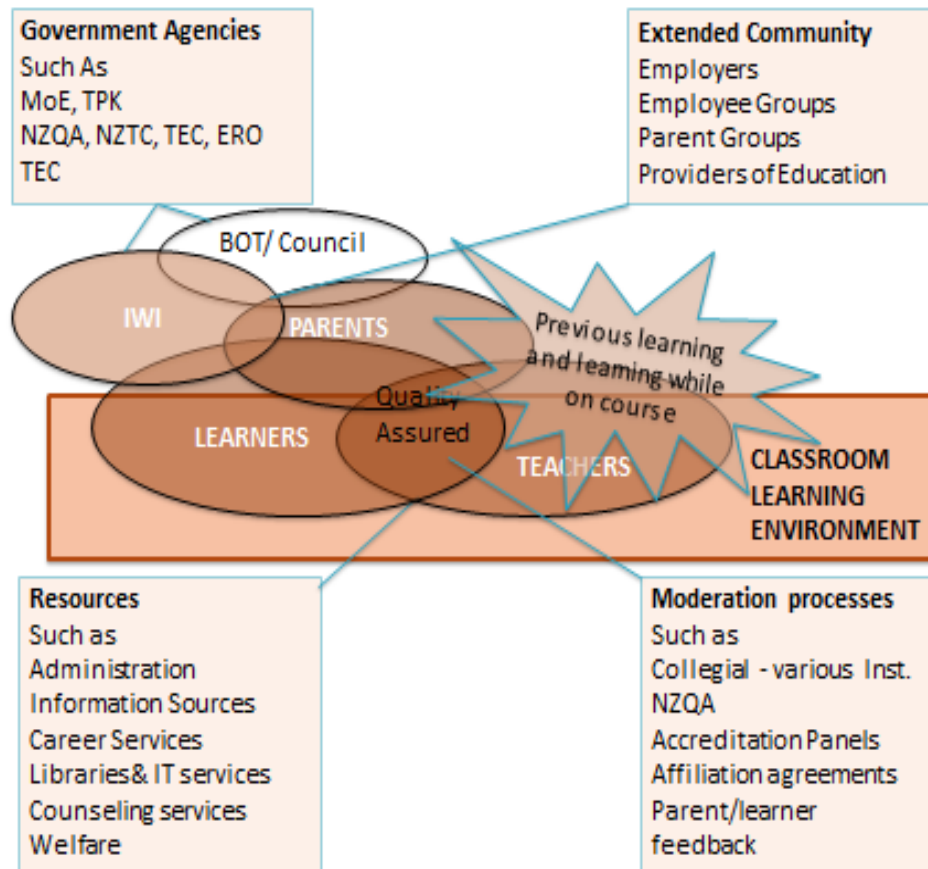


Figure 26 Strategic Education Model (SEM).

6.6.2.1. Classroom Learning Environment (CLE)

The classroom learning environment (CLE) forms the nucleus of the formal education system. The learner and the teacher form important and often lasting bilateral relationships and are the core of the CLE. In order for this bilateral relationship to start, grow and flourish, ethical issues are decided on, trust is built, respect is earned and an environment conducive to learning is established. Learning is through cross pollination: the teacher learns from the learner and vice versa. Both the teacher and the learner bring previous experiences into the CLE.

The learner and teacher, therefore, do not operate in a vacuum. The learner comes from parents and the learner, parents and teacher form a part of an Iwi, the wider community of people. The teacher, learner, parents and Iwi forms part of the *Quality assured* in the classroom. *Quality assured* links the CLE and the environment outside the classroom through resources and moderation processes. In New Zealand, The Board of Trustees forms the link

between the CLE and external agencies such as government agencies, employer groups and providers of education through the Iwi and the parents. Direct access to learners in the CLE is reserved for teachers and parents. The Iwi has ease of access to the CLE through the parents. Any other access to the learners is by expressed permission only. This is of critical importance, as, during the time that the learners are entrusted by the parents to the teachers in the CLE, their safety is paramount. The teacher thus have a critical role to play in the CLE: in addition to building trust, earning respect and cross pollination of learning, the teacher must create an atmosphere of safety and security in the classroom learning environment. When the safety of the learner is threatened, the parents and the Iwi have the right to immediately address those safety and security issues. To assist if further clarification of the SEM, the different subsets of the CLE namely, learner, teacher, parents, Iwi and quality is explained. Although these subsets can be interpreted individually, in the context of the SEM, the subsets should be interpreted as part of a greater set.

Learners

The learners bring into the classroom learning environment with their own culture, directly influenced by their parents and their Iwi (wider community). Furthermore, they bring previous experiences; prior and continuous learning experiences while part of the class into the formal classroom learning environment. The learner learns from the teacher and from the rest of the students in class. Together with their parents, they should have a significant share of the decision making on what happens in this important environment, as they are entrusted into the care and are served by the teacher in that environment. The learners share their knowledge with the teacher and vice versa.

Teachers

Every teacher forms part of the Iwi and bring their own culture, prior and continuous learning into the classroom. The role of the teacher in the CLE is critical: the teacher has direct access to the learner; uses strategies and tools to motivate and engage the learner; ensure the safety and security of learners in the classroom; and builds trust and respect. The teacher learns from and imparts knowledge to all the learners in the classroom. The teacher tailors their teaching to serve the needs of the learner. The teacher acknowledges prior learning, especially learning through parent, family supervised and friends accompanied

and supervised experiences and excursions. Additionally, the teacher recognises and accepts knowledge gained while the learner is on the particular course.

Parents

The parents form an important part of the CLE, as they are the primary persons involved in the education of their child (called learner in the formal education environment). As the parent, learner and teacher are linked through the Iwi (wider community) and sometimes even through hapu (extended family) or whanau (direct family), this link is depicted in Figure 27. The child was conceived and brought up by the parents with the help of the rest of the family members, the hapu (extended family) and the Iwi (wider community). In the formal education setting, based on Figure 27, the parents and, the hapu and the Iwi, have the right to decide what their child should learn, how it is being taught and from whom the child is receiving the education. The whanau (family) hapu (extended family) and the Iwi (wider community) have a direct link to the CLE as the parents form the nucleus of Figure 27. As the teacher forms part of the wider community and may even form a part of the whanau or Hapu, they are included either under Iwi, hapu or whanau.

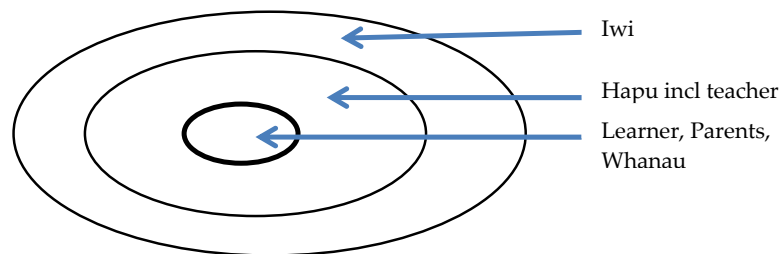


Figure 27 *Linking the learner, parents, teacher, whanau and Iwi*

Figure 27 depicts the CLE as an integral part of the wider community to which both the learners and the teacher belongs. With the Iwi, the parents link into the Board of Trustees/ Council at educational institutions.

Quality

The teacher serves the learner and the parents inside the CLE, and reports externally to the CLE to the administration of the educational institution. Furthermore, the teacher is external to the CLE **actively** linked to subsets such as:

- Moderation processes, which includes
 - direct feedback from parents and learners
 - liaising and cross pollination of ideas with colleagues at the same institution
 - liaising and cross pollination of ideas with peers at other institutions
 - serving on subject focussed regulatory bodies like NZQA
 - providing information to accreditation panels
 - providing input into affiliation agreements
 - continuous improvements, especially of specifically identified areas

- Curriculum development which includes
 - Subject review committees
 - Academic review committees
 - Peer review panels cross institutionally
 - Choice of material which should be used in the classroom

- Direct input into which systems and resources should be made available through IT, library and heritage and information services
 - educational institutional level
 - At regulatory authority level through Iwi and parents

- Part of a multidisciplinary team that looks after the learner through
 - Counselling services
 - Welfare services

As the administration including the senior administration team, IT and library and heritage serves the CLE

- Continuous evaluations of these services should be done by the
 - teachers

- parents
 - learners
- The senior administrators, IT and library and heritage services should
 - acknowledge the feedback
 - explain what would be done in well performing and poor performing areas
 - continuously report back to teachers, learners and parents to ensure that performance is monitored
 - Senior Administrators continue feedback to Council/BOT

The teacher, learner and parents, through the Iwi, report the performance of the senior administration team to the Board of Trustees/Council. This process ensures that the principles of democracy are upheld, there is continuous improvement of services to the CLE and complete transparency, one of the fundamental principles of democracy, is adhered too. Furthermore, democratic processes will safeguard and ensure informed decision making.

Previous and current learning experiences

Prior learning and knowledge is cherished and utilized to enrich and enhance the CLE. Differences in learning and knowledge are recognized and celebrated. Experience and knowledge is shared amongst the learners and between the teacher and the learners. The prior learning and knowledge is utilized to connect to new or difficult concepts. Furthermore, knowledge and experience gained outside the CLE while on the course is brought back into the CLE to enhance understanding, create new knowledge and add to existing skill.

6.6.2.2. Environment indirectly linked to the classroom learning environment (ICLE)

The environment indirectly linked to CLE consists of Iwi, the Board of Trustees/Council, moderation processes, resources, government agencies and the extended community. As the CLE does not exist in a vacuous environment the ICLE is closely linked to the CLE through the teacher, the parents and quality assurance.

Iwi

The Iwi represents the wider community and is the direct link between the teacher and the Board of Trustees/ Council at educational institutions. Figure 27 shows how the Iwi is linked with the nucleus, the parents. Some of the BOT/Council members are often part of the Iwi, in that they are members of the wider community. This link ensures that the Board of Trustees/Council serve the CLE.

Board of Trustees (BOT)/Council

The BOT/Council is responsible for the governance of the educational institution and is the body that the senior administration team reports to. It is widely accepted that management forms a part of the pillars of good governance. In addition to the senior administrator's report, the BOT/Council will, through the Iwi and the parents, have direct feedback on the performance of the senior administration team and can more clearly access their performance and develop methods to improve performance. Rather than just bystanders or listeners, the Iwi is transformed into an information agent that ensures the feedback of the teachers, parents and learners, who are served by the senior administration team, is heard. This clarity and development of performance measures will ensure good and transparent governance, critical to democracy.

Government agencies

Government agencies are connected to the CLE through the BOD/Council and through the Iwi, who ensure that the wider community, including the teacher, learner and parents are involved in decision making that affects the CLE. Past experiences, knowledge and information is shared to ensure that the financial and other resources are used wisely to the benefit of the CLE. Wastage of much needed tax payer financial resources are limited. Before any major decisions or changes in the education sector are made, consultation and negotiation by the Iwi through road shows will ensure that communities participate fully in the negotiation and consultation process. This process of consultation and negotiation ensures collaboration of the all communities, which fosters a spirit of collaboration and co-operation. There is an assurance, through this process, that major strategic decisions are what the people long for and desire. Finally, the process of road shows through the Iwi,

consultation, negotiation and collaboration strengthens and reinforces the relationship between the people, the CLE and the government. With such a process in place, transparency, a requirement for good governance in a democracy, is assured and interference by BIAG is minimized.

Extended Community and Resources and Moderation Processes

The extended community through employers, employee groups, unions, parent groups and providers of education is directly connected to the classroom learning environment through the Iwi, BOT/Council and parents. The administrators work with the parents or through the parents with the learner to enrol and register the student. Any results from students are relayed to administration at the institution by the teacher. Quality is assured through moderation processes described under Section 6.5.2.1: *Quality*. The feedback from the learner and the parent is part of the *quality assured* process. The feedback is incorporated by the teacher, feedback provided directly by the teacher to the parent and the learner in a supportive atmosphere, conducive to learning.

The SEM fulfils the principals of democracy, is student centred, ensures that CLE is reinstated as the focal point in the education sector where learning is individualized to suit the learner, the learner can thrive, be engaged and motivated to perform well. An acknowledgement of past experience knowledge and skill and transporting and sharing it in the CLE, ensures a foundation is laid to build trust, respect and new knowledge. The acknowledgement of past experiences and learning accumulated in and outside the home confirms intergenerational cross pollination and the importance of the role that the teachers, parents, whanau, hapu and Iwi plays in lifelong learning. Quality is assured through rigorous processes which connect the CLE and the environments external to the CLE, which includes inter-collegial, interdepartmental, inter-institutional, across institutional, community and therefore sector wide collaboration. This sector-wide collaboration is student centred and ensures that the educational activities are focussed on and to the benefit of the learner and that quality is assured. More importantly, with quality assurance through sector wide collaboration, significant financial resources are refocused back on the CLE, which ensures a CLE which is well-resourced and concentrated on the learner.

There is sector wide intergenerational crosspollination and sharing of expertise and good practice; both the administration of the institution and the teacher thrives in an environment conducive to continuous accumulation and sharing of knowledge; cross-pollination of ideas, skills and expertise further increases human capital; creativity and innovation is continually fostered and shared; which, in turn, ensures continuous nurturing and growth, lifelong learning and further collegial, institutional, cross institutional and community wide collaboration and a thriving, vibrant and enabling educational sector.

6.6.2.3. Impact of the environment created by SEM

In such an environment created by the SEM, there is inclusion, recognition, acceptance, celebration of and respect for cultural diversity, which significantly reduces any bullying, abuse and disrespect that is currently typified and experienced in the education sector. The SEM ensures that cultural hegemony that the BIAG so readily exerts on the current education sector leaving it disconnected, lifeless and drained of much needed human capital, skill, knowledge and expertise, has little chance of flourishing and impacting. Sector wide connection, consultation and negotiation and collaboration are continually assured, fostered, and there is freedom of choice.

The critical part that the parents, the whanau, hapu and Iwi, BOT/council and government agencies should play in the education of the learner is embedded, sector wide collaboration and connection is continuous, while financial resources are pointed at CLE, ensuring a vibrant, financially and otherwise well-resourced thriving CLE.

6.8 FUTURE RESEARCH OPPORTUNITIES

During the course of this thesis, the following five future research opportunities have been identified. First, the highlight of this thesis is that TI/TN is definitely not responsible for the demise of the classroom learning environment. This highlight is based on the interviews conducted at the organizations, the action observations in class, the various focus groups conducted and the survey administered to the 2009 group. The literature reviewed for this thesis points to the continual interference of BIAG in the Classroom learning. Additional urgent research, specifically of a qualitative nature, is imperative to support the literature review on the real reason for the demise of the classroom learning environment over the

years. What are the changes that have been brought about in the educational environment by BIAG over the years? Were these changes significant? Were there any research studies done before and after these changes? If there was, what did it show? If no research was done, why not? This calls for a longitudinal study from the time that impactful changes were made in the education sector to date. Was there any financial gain for any BIAG? What was the monetary value of this gain?

Secondly, the structural adjustments made to the live NZ economy are well documented. Further research opportunities exist to compare and contrast the circumstances which led to the structural adjustments to the NZ economy and the NZ educational sector. What does sector-wide collaboration really mean? What does the example of collaboration in the case of the Rotorua Hospital, NZ, highlighted in this thesis, mean to the education and other sectors? How do the meals cooked for hospital patients in Wellington, NZ and airfreighted to the various hospitals throughout NZ fit with collaboration and integration? What are the real costs involved in such an operation? What is the role of major conglomerates like Richina and Air NZ, in the various sectors, including the education and health sectors in NZ? What benefit are these major conglomerates to the classroom learning environment, other than MOE diverting huge amount of education dollars from the classroom towards these major conglomerates? What immediate financial benefit is there for towns and city residents in the outsourcing of major developments in the education, health and other sectors to such conglomerates? Employment opportunities are always cited; what are the financial benefits compared to the short term contracts that such conglomerates make available to a few residents in the particular town or city?

Thirdly, this thesis claims that simple technologies such as Microsoft Excel have significant and powerful functionality. The finding is based on the interviews conducted at the two major companies and the observation at the manufacturing and production plants during site visits. A possible research opportunity to add further substance to this assertion exists to study other organizations that use the higher functions of Microsoft Excel. How do these simple technologies impact on the education and training of staff? What exactly are the benefits of using such simple, readily available technologies? What are the costs compared to more sophisticated technologies that give organizations the same results as these simple technologies? These costs should include dollar costs, obsolescence and tacit costs involved

in utilizing these readily available technologies compared to technologies touted as 'more sophisticated'.

Fourthly, on the subject of cost, this thesis points out that millions of dollars are spent on modern technologies, including technologies in the educational sector. The real cost to the educational sector is unknown. Judging from existing literature, my personal experience for over ten years in the tertiary sector in New Zealand and the total cost of new technologies, it would seem that a more direct, independent investigation of the full cost and benefits of modern technology to the education sector are justified. Included in these investigations should be the entire cost of training, usage, obsolescence, maintenance and replacement of such technologies. Furthermore, the time period until obsolescence of technology should be factored into this calculation, as most textbooks and literature refers to technology as 'constant change' and 'near term benefits'. These terms reduce the word 'investment', so readily used by the proponents of technology, to short-term expenditure rather than long-term investments. Finally, there should be an investigation into exactly who the real owners of the companies and developers of such technologies and the conglomerates are.

Fifthly, this thesis claims that a relationship exists between IT culture and organizational culture, and that organizational culture is changing as a result of the IT culture. This study included two major businesses in the central North Island of New Zealand. The study area of the relationship between IT culture and organizational culture, however, appears to be relatively new, as limited literature is available on this subject. Therefore, a further interesting avenue of research would be to investigate the full extent to which IT culture impacts on organizational culture in other organizations. The next step then would be the development of a complete model that can be tested. Once the model is tested, the impact of IT culture on organizational culture can lead to predictions in a new, but potentially ever growing field of study, making a notable contribution to the organizational cultural change process.

6.9 CONCLUSION

History, though widely documented, is often ignored by proponents who claim that their concepts, ideas and technology as sophisticated or new. This thesis confirms that 'new' and

'sophisticated' technology, in many cases, much more sophisticated and in some cases, today's technology can never surpass, it has been around for thousands of years.

Furthermore, that the computer has been around for over 2,000 years, had been confirmed by De Price with the find of the Antikythera, a device that was able to track solar positions. This find is of particular significance, as today's society only recently managed to create a computer to track the solar system. Chapter 1 confirms that technology has been around for centuries in very sophisticated and often never to be repeated form.

In addition, as Chapter 2 points out, polarization and cultural hegemony has, throughout history, been around, be it in the form of Darwinism, Eugenics and Apartheid. Sadly, cultural hegemony has led to the destruction, of many human lives. In commenting on Weikart's (2004) book, Beckwith starkly reminds us that 'the truth uttered by Richard Weaver decades ago is indeed a fixed axiom of human institutions: 'ideas have consequences'' (csustan.edu/history). Despite the fact that in countries and continents including Germany, Australia, New Zealand, Africa, North America and South Africa the effects of polarization and cultural hegemony is still undoubtedly visible today, this thesis indicates that polarization and cultural hegemony is still as active as it was in the past, popularised and thrust into the forefront by the proponents of technology, such as Prensky and others, and BIAG.

Preoccupation with technology (see Chapter 1) by the technocracy social movement, under the leadership of Hodgson, a firm supporter of Veblen and Darwinism, resulted in the replacement of politicians and business people with scientists and engineers (1930s). This party *frazzled* out after the Great Depression. The major impact on society and subsequent exorbitant costs of the *technocracy* social movement, another reminder of Beckwith's "ideas have consequences", is known and has been well documented. A major difference between the technocracy social movement and modern proponents of technology is that the former's structural adjustments took aim at business and politics, while the latter structural adjustments, as the ICT Strategic Framework points out (Chapter 1 & 2), is focused on the education sector and, as section 2.3.3 points out, part of the health sector.

Structural adjustments and polarization in NZ are not new. Kelsey (1995) confirms the structural adjustments commenced in the late 1980s. One such structural adjustment and polarization, an experiment on a *live* NZ economy, had disastrous impacts. Kelsey intensely and vividly describes the destructive structural adjustments to the NZ economy, which was

carried out in New Zealand from 1986, which transformed New Zealand citizens into *mere* consumers. Despite the poor outcomes of the economic structural adjustments, the education sector, in NZ, under the influence of BIAG, orchestrated the changes in the education sector on the back of the ICT Strategic Framework.

Structural adjustments and reform in the educational sector is not. De Lacey (1992) explained how these reforms accompanied a change in the definition of education. New Zealand followed the redefinition of education, paving the way for educational adjustments and reform. Hill and Oliver (2008) explained how education in New Zealand was transformed into a *mere marketable commodity*, confirming Kelsey's description of transformation of New Zealanders from citizens to *mere* consumers. By 2000, in the tertiary education sector, job losses were widespread. In addition, private educational organizations mushroomed everywhere as education dollars were channelled to this sector, and often existed for a very short period of time. The funding models for the tertiary sector were not spared, changing from funding 'bums on seats' to 'contestable funding' to 'investing in a plan'. By 2006, the tertiary education sector was nearly on its knees: Continuous restructuring, redundancy, bullying and abuse of teaching staff, saw staff haemorrhaging from the sector. To remedy the intentionally-orchestrated haemorrhaging of well qualified staff, BIAG 'scrambled' to push technology into the spotlight.

Around the same time, pre-occupation with technology saw the littering of the publication arena with articles touting technology as the route that education should take. It was during this time that Prensky ushered in the polarization model, which, as this thesis shows, was supported by others, despite inadequately researched statements and unsubstantiated claims. Proponents of technology with the polarization model as a cure for staff haemorrhaging, had the classroom learning environment now firmly in its sight.

This thesis debunks the idea that technology should encompass education and that the teacher should be removed out of the classroom, while technology alone educates the young generation.

In leading up to the development of SEM, two models have been constructed (see Figures 22 & 23) based on the findings documented in this thesis: First, The open classroom model showing the effectiveness of developing peer and intergenerational relationships and secondly, the perceived technology model, based on the literature reviewed regarding technology and the Prensky polarization model. Thereafter, the motivational classroom

model is compared to the perceived technology classroom learning environment technology model (Figures 24 & 25). These models have been described, compared and contrasted.

Finally, this thesis proposes, introduces and explains the Strategic Education Model that sanctions the intergenerational cross pollination of knowledge, skills and ideas, sought after by organizations, in both business and education alike. The CLE is highlighted and explained in detail as collaboration and connection, fostered through participation of the learner, teacher, parent, Iwi, BOD, government agencies and other organizations. Quality is assured from the CLE, through to institutional level to inter institutional and government agency level. Relationships are established, cherished and enhanced. Bullying and abuse are addressed cultural hegemony and polarization is removed and the attention and financial resources are focused on the CLE, where it rightfully belongs.

The limitations are stated and future research opportunities, specifically in the area of research on the real demise of the CLE in the USA, Australia and New Zealand, total cost of technology, comparison of higher functions of widely available software like Excel to that of expensive technology and the impact of IT culture on organizational culture is identified.

In today's classroom environments, we certainly have an intimate knowledge of the past and the disastrous impacts that some of the structural adjustments had, in particular, on humans, destroying life. For centuries, we see a continuous repetition of the past. Even scholars are sucked in to help cover up the past. Yet, there is an opportunity to give much needed life, in particular to the education sector which plays such a pivotal role in a society.

Cecile Hoods

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8. APPENDICES

APPENDIX 1: FRIEDMAN CASE STUDY

Ten flatteners

Friedman defines ten "flatteners" that he sees as leveling the global playing field:

- **#1: Collapse of [Berlin Wall](#)**--11/89: The event not only symbolized the end of the Cold war, it allowed people from other side of the wall to join the economic mainstream. (11/09/1989)
- **#2: [Netscape](#)**: Netscape and the Web broadened the audience for the Internet from its roots as a communications medium used primarily by 'early adopters and geeks' to something that made the Internet accessible to everyone from five-year-olds to ninety-five-year olds. (8/9/1995). The digitization that took place meant that everyday occurrences such as words, files, films, music and pictures could be accessed and manipulated on a computer screen by all people across the world.
- **#3: [Workflow](#) software**: The ability of machines to talk to other machines with no humans involved. Friedman believes these first three forces have become a "crude foundation of a whole new global platform for collaboration."
- **#4: [Open sourcing](#)**: Communities [uploading](#) and collaborating on online projects. Examples include open source software, blogs, and [Wikipedia](#). Friedman considers the phenomenon "the most disruptive force of all."
- **#5: [Outsourcing](#)**: Friedman argues that outsourcing has allowed companies to split service and manufacturing activities into components which can be subcontracted and performed in the most efficient, cost-effective way.
- **#6: [Offshoring](#)**: The internal relocation of a company's manufacturing or other processes to a foreign land in order to take advantage of less costly operations there.
- **#7: [Supply chaining](#)**: Friedman compares the modern retail supply chain to a river, and points to [Wal-Mart](#) as the best example of a company using technology to streamline item sales, distribution, and shipping.
- **#8: [Insourcing](#)**: Friedman uses UPS as a prime example for insourcing, in which the company's employees perform services--beyond shipping--for another company. For example, UPS repairs Toshiba computers on behalf of Toshiba. The work is done at the UPS hub, by UPS employees.
- **#9: [In-forming](#)**: Google and other search engines are the prime example. "Never before in the history of the planet have so many people-on their own-had the ability to find so much information about so many things and about so many other people", writes Friedman. The growth of search engines is tremendous; for example take Google, in which Friedman states that it is "now processing roughly one billion searches per day, up from 150 million just three years ago".
- **#10: "The Steroids"**: Personal digital devices like mobile phones, iPods, personal digital assistants, instant messaging, and voice over Internet Protocol ([VoIP](#)).

Triple convergence

In addition to the ten flatteners, Friedman offers "the triple convergence," three additional components that acted on the flatteners to create a new, flatter global playing field.

1. Up until the year 2000, the ten flatteners were semi-independent from one another. However, around the year 2000, all the flatteners converged with one another. This convergence could be compared to [complementary goods](#), in that each flattener enhanced the other flatteners; the more one flattener developed, the more leveled the global playing field became.

Zara Case: Fast Fashion from Savvy Systems

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INTRODUCTION

The poor, ship-building town of La Coruña in northern Spain seems an unlikely home to a techcharged innovator in the decidedly ungeeky fashion industry, but that's where you'll find "The Cube", the gleaming, futuristic central command of the Inditex Corporation (Industrias de Diseño Textil), parent of game-changing clothes giant, Zara. The blend of technology-enabled strategy that Zara has unleashed seems to break all of the rules in the fashion industry. The firm shuns advertising, rarely runs sales, and in an industry where nearly every major player outsources manufacturing to low-cost countries, Zara is highly vertically integrated, keeping huge swaths of its production process in-house. These counterintuitive moves are part of a recipe for success that's beating the pants off the competition, and it has turned the founder of Inditex, Amancio Ortega, into Spain's wealthiest man and the world's richest fashion executive.

Zara's operations are concentrated in La Coruña and Zaragoza, Spain. A sampling of the firm's designs, and "The Cube", as shown on the firm's websites.

The firm tripled in size between 1996 and 2000, then skyrocketed from \$2.43 billion in 2001 to \$13.6 billion in 2007. By August 2008, sales edged ahead of Gap, making Inditex the world's largest fashion retailer. While the firm supports eight brands, Zara is unquestionably the firm's crown jewel and growth engine, accounting for roughly two-thirds of sales². While competitors falter, Zara is undergoing one of the fastest global expansions the fashion world has ever seen, opening a store a day and entering new markets worldwide – 68 countries so far. The chain's profitability is among the highest in the industry. The fashion director for luxury goods maker LVMH calls Zara 'the most innovative and devastating retailer in the world'.

Zara's duds look like high fashion, but are comparably inexpensive. A Goldman analyst has described the chain as "Armani at moderate prices", while another industry observer suggests fashions are more "Banana Republic", prices are more "Old Navy". Offering clothing lines for women, men, and children, legions of fans eagerly await "Z-day", each Zara location's twice weekly inventory delivery that brings in the latest designs. In order to understand and appreciate just how counterintuitive and successful Zara's strategy is, and how technology makes all of this possible, it's important to first examine the conventional wisdom in apparel retail. To do that we'll look at former industry leader – Gap.

GAP – AN ICON IN CRISIS

Most fashion retailers place orders for a seasonal collection months before these lines make an appearance in stores. While overseas *contract manufacturers* may require hefty lead-times, trying to guess what customers want months in advance is a tricky business. In retail in general and fashion in particular, there's a saying: inventory = death. Have too much unwanted product on hand and you'll be forced to mark down or write off items, killing profits. For years, Gap sold most of what it carried in stores. It was led by a man with a radar-right sense of style. Micky Drexler, the iconic CEO who helped turn Gap's button down shirts and khakis into America's uniform. Drexler's team had spot-on tastes throughout the 90s, but when sales declined in the early part of this decade, Drexler was left guessing on ways to revitalize the brand and he guessed wrong – disastrously wrong. Chasing the youth market, Drexler filled Gap stores with miniskirts, low-rise jeans, and even a much-ridiculed line of purple leather pants. The throngs of teenagers he sought to attract never showed up, and the shift in offerings sent Gap's mainstay customers to retailers that easily copied the styles that Gap made classic. The inventory hot potato Drexler was left with crushed the firm.

Gap's same-store sales declined for 29 months straight. Profits vanished. Gap founder and Chairman Dan Fisher lamented "It took us 30 years to get to \$1 billion in profits and two years to get to nothing". The firm's debt was downgraded to junk status. Drexler was out and for its new head, the board chose Paul Pressler, a Disney executive who ran theme parks and helped rescue the firm's once ailing retail effort.

Pressler shut down hundreds of stores, but the haemorrhaging continued, largely due to bad bets on colours and styles. During one holiday season, Gap's clothes were deemed so off-target that the firm scrapped its advertising campaign and wrote off much of the inventory. The firm's model of drawing customers in via big-budget television promotion had collapsed. Pressler's tenure saw same store sales decline in 18 of 24 months.

A Fortune article on Pressler's leadership was titled "Fashion Victim", *BusinessWeek* described his time as CEO as a "Total System Failure", and Wall Street began referring to him as DMW for Dead Man Walking. In January 2007, Pressler resigned, with Gap hoping its third Chief Executive of the decade could right the ailing giant.

Contract Labor: Lower Costs at What Cost?

Then, of course there are other problems with outsourcing production. Conventional wisdom suggests that leveraging cheap contract labour in developing countries can keep cost-of-goods low. Firms can lower prices and sell more, or maintain higher profit margins – all good for the bottom line. But there's an ugly downside to contract manufacturing in the apparel industry, sweatshop labour. Global competition among contract firms has led to race-to-the-bottom cost-cutting measures. Too often, this means that in order to have the low-cost bid, contract firms skimp on safety, ignore environmental concerns, employ child labour, and engage in other ghastly practices. Despite the fact that Gap audits contract manufacturers and has a high standard for partner conduct, the firm has repeatedly been taken to task by watchdog groups, the media, and its consumers when reports exposed unacceptable work conditions that Gap failed to catch. This includes the Oct. 2007 video showing Gap clothes made by New Delhi children as young as 10 years old in what were described as 'slave labour' conditions. Gap isn't alone; Nike, Wal-Mart, and many other apparel firms have been tarnished in similar incidents. Big firms are big targets and those firms that fail to adequately ensure their products are made under acceptable labour conditions risk a brand-damaging backlash that may turn off customers, repel new hires, and leave current staff feeling betrayed. Today's manager needs to think

deeply not only about their own firm's ethical practices, but also those of all of their suppliers and partners.

DON'T GUESS – GATHER DATA

Having the wrong items in its stores hobbled Gap for nearly a decade, but how do you make sure stores carry the kinds of things customers want to buy? Try asking them. Zara's store managers lead the intelligence gathering effort that ultimately determines what ends up on each store's racks. Armed with handheld personal digital assistants (PDAs) to gather customer input, staff regularly chat up customers to gain feedback on what they'd like to see more of. A Zara manager might casually ask: What if this skirt were in a longer length? Would you like it in a different colour? What if this v-neck blouse were available in a round-neck?

Another level of data gathering starts as soon as the doors close. Then the staff turns into a sort of CSI in the forensics of trend-spotting, looking for evidence in the piles of unsold items that customers tried on but didn't buy. Do there seem to be any preferences or disappointment in cloth, color, or styles offered among the products in stock? PDAs are also linked to the store's point-of-sale (POS) system, showing how garments rank by sales. In less than an hour, managers can send updates that combine the hard data captured at the cash register combined with insights on what customers would like to see. All of this valuable data allows the firm to plan styles and issue re-buy orders based on feedback rather than hunches and guesswork. The goal - to improve the frequency and quality of 'sense making' for the design & planning teams.

DESIGN

Rather than create trends by pushing new lines via catwalk fashion shows, Zara prefers to follow with designs where there's evidence of customer demand. Data on what sells and what customers want to see goes directly to "The Cube" in La Coruña, where teams of some 300 designers crank out an astonishing 30,000 items a year versus 2,000-4,000 items offered up at big chains like H&M (the world's third largest fashion retailer) and Gap. While H&M has offered lines by star designers like

Stella McCartney and Karl Lagerfeld, as well as celebrity collaborations with Madonna and Kylie Minogue, the Zara design staff are mostly young, hungry Project Runway types fresh from design school. There are no prima donnas in “The Cube”. Team members must be humble enough to accept feedback from colleagues, as well as share credit for winning ideas. Individual bonuses are tied to the success of the team, and teams are regularly rotated to cross-pollinate experience and encourage innovation.

MANUFACTURING & LOGISTICS

In the fickle world of fashion, even seemingly well-targeted designs could go out of favor in the months it takes to get plans to contract manufacturers, tool up production, then ship items to warehouses and eventually to retail locations. But getting locally targeted designs quickly onto store shelves is where Zara really excels. In one telling example, when Madonna played a set of concerts in Spain, teenage girls arrived to the final show sporting a Zara knock-off of the outfit she wore during her first performance.

The average time for a Zara concept to go from idea to appearance in store is 15 days vs. rivals who receive new styles once or twice a season. Smaller tweaks arrive even faster. If enough customers come in and ask for, say a round neck instead of a “v” neck, a new version can be in stores with in just 10 days¹⁶. To put that in perspective, Zara is *twelve times* faster than Gap, despite offering roughly ten times more unique products! Contrast this with H&M, where it takes three to five months to go from creation to delivery – and they're considered one of the best. Other retailers need an average of six months to design a new collection and then another three months to manufacture it. VF Corp (Lee, Wrangler) can take 9 months just to design a pair of jeans, while J. Jill needs a year to go from concept to shelves. At Zara, most of the products you see in stores didn't exist three weeks earlier, not even as sketches. The firm is able to be so responsive through a competitor-crushing combination of *vertical integration* and technology-orchestrated coordination of suppliers, just-in-time manufacturing, and finely-tuned logistics. While H&M has 900 suppliers and no factories, nearly 60% of Zara's merchandise is produced in-house, with an eye on leveraging technology in those areas that speed up complex tasks, lower cycle time,

and reduce error. Profits from this clothing retailer come from blending math with its data-driven fashion sense. Inventory optimization models help the firm determine how many of which items in which sizes should be delivered to stores during twice-a-week shipments, ensuring stores are stocked with just what they need.

Outside the distribution center in La Coruña, fabric is cut and dyed by robots in 23 highly automated factories. Zara is so vertically integrated, the firm makes 40 percent of its own fabric and purchases most of its dyes from its own subsidiary. Roughly half of the cloth arrives undyed so the firm can respond as any mid-season fashion shifts occur. After cutting and dyeing, many items are stitched together through a network of local cooperatives that have worked with Inditex so long they don't even operate with written contracts. The firm does leverage contract manufacturers (mostly in Turkey and Asia) to produce staple items with longer shelf lives, such as t-shirts and jeans, but this volume accounts for only about 1/8th of dollar volume. All of the items the firm sells end up in a 5 million square foot distribution center in La Coruña, or a similar facility in Zaragoza in Spain's northeast. The La Coruña facility is some nine times the size of Amazon's warehouse in Fernley, Nevada, or about the size of 90 football fields. The facilities move about 2.5 million items a week, with no item staying in-house for more than 72 hours. Ceiling-mounted racks and customized sorting machines patterned on equipment used by overnight parcel services whisk items from factories to staging areas for each store. Clothes are ironed in advanced, packed on hangers, with security and price tags affixed. This means that instead of wrestling with inventory during busy periods, employees in Zara stores simply move items from shipping box to store racks, spending most of their time on value-added functions like helping customers find what they want. Efforts like this help store staff regain as much as three hours in prime selling time.

Trucks serve destinations that can be reached overnight, while chartered cargo flights serve farther destinations. The firm recently tweaked its shipping models through Air France-KLM Cargo and Emirates Air, so flights can coordinate outbound shipment of all Inditex brands with return legs loaded with raw materials and half-finished clothes items from locations outside of Spain. Zara is also a pioneer in going green. In Fall 2007, the firm's CEO unveiled an environmental strategy that includes the

use of renewable energy systems at logistics centers including the introduction of biodiesel for the firm's trucking fleet.

STORES

Most products are manufactured for a limited production run. While running out of bestsellers might be seen as a disaster at most retailers, at Zara the practice delivers several benefits. First, limited runs allow the firm to cultivate the exclusivity of its offerings. While a Gap in L.A. carries nearly the same product line as one in Milwaukee, each Zara store is stocked with items tailored to the tastes of its local clientele. A Fifth Avenue shopper quips "At Gap, everything is the same", while a Zara shopper in Madrid says "you'll never end up looking like someone else".

Upon visiting a Zara, the CEO of the National Retail Federation marveled "It's like you walk into a new store every two weeks". Second, limited runs encourage customers to buy right away and at full price. Savvy Zara shoppers know the newest items arrive on black plastic hangers, with store staff transferring items to wooden ones later on. Don't bother asking when something will go on sale, if you wait three weeks the item you wanted has almost certainly been sold or moved out to make room for something new. Says one 23-year old Barcelona shopper "If you see something and don't buy it, you can forget about coming back for it because it will be gone".

A study by consulting firm Bain & Co. estimated that the industry average markdown ratio is approximately 50%, while Zara books some 85% of its products at full price. The constant parade of new, limited-run items also encourages customers to visit often. The average Zara customer visits the store 17 times per year, compared with only three annual visits made to competitors. Even more impressive - Zara puts up these numbers with almost no advertising. The firm's founder has referred to advertising as a "pointless distraction". The assertion carries particular weight when you consider that during Gap's collapse, the firm increased advertising spending but sales dropped. Fashion retailers spend an average of 3.5% of revenue promoting their products, while ad spending at Inditex is just 0.3%. Finally, limited production runs allows the firm to, as Zara's CEO once put it "reduce to a minimum the risk of

making a mistake, and we do make mistakes with our collections". Failure rates of the chain's product line are reported to be just 1 percent, compared with the industry average of 10 percent.

While stores provide valuable front-line data, headquarters plays a major role in directing instore operations. Software is used to schedule staff based on each store's forecasted sales volume, with locations staffing up, say at peak times such as lunch or early evening. The firm claims these more flexible schedules have shaved staff work hours by two percent. This constant refinement of operations throughout the firm's *value chain* has helped reverse a prior trend of costs rising faster than sales. Even the store displays are directed from "The Cube", where a basement staging area known as "Fashion Street" houses a Potemkin village of bogus storefronts meant to mimic some of the chain's most exclusive locations throughout the world. It's here that workers test and fine-tune the chain's award-winning window displays, merchandise layout, even determine the in-store soundtrack. Every two weeks, new store layout marching orders are forwarded to managers at each location.

Technology ≠ Systems. Just Ask Prada

Here's another interesting thing about Zara. Given the sophistication and level of technology integration into the firm's business processes, you'd think that Inditex would far outspend rivals on tech. But as researchers Donald Sull and Sefano Turconi discovered, "Whether measured by IT workers as a percentage of total employees or total spending as a percentage of sales, Zara's IT expenditure is less than one-fourth the fashion industry average". Zara excels by targeting technology investment at the points in its value chain where it will have the most significant impact, making sure that every dollar spend on tech has a payoff. Contrast this with high-end fashion house Prada's efforts at its flagship Manhattan location. The firm hired the Pritzker Prize-winning hipster architect, Rem Koolhaas, to design a location Prada would fill with jaw-dropping technology. All items for sale in the store would sport with RFID tags. Walk into a glass dressing room and customers could turn the walls opaque, then into a sort of combination mirror and heads-up display. By wirelessly reading the tags on each garment, dressing rooms would recognize what was brought in and make recommendations of matching accessories, as well as

similar products that patrons might consider. Customers could check inventory, and staff sporting PDAs could do the same.

A dressing room camera would allow clients to see the front and back view side-by-side as they tried on clothes. It all sounded slick, but execution of the vision was disastrous. Customers didn't understand the foot pedals that controlled the dressing room doors and displays, with reports of some fashionistas disrobing in full view, thinking the walls went opaque when they didn't. Others got stuck in dressing rooms when pedals failed to work, or doors broke, unable to withstand the demands of the high-traffic tourist location. The inventory database was often inaccurate, regularly reporting items as out of stock even though they weren't. As for the PDAs, staff reported that they "don't really use them anymore" and that "we put them away so tourists don't play with them". The investment in Prada's in-store technology was also simply too high, with estimates suggesting the location took in just one-third the sales needed to justify expenses.

The Prada example offers critical lessons for managers. While it's easy to get seduced by technology, an information system is actually made up of more than hardware and software. An IS also includes data used or created by the system, as well as the procedures and the people who interact with the system. Getting the right mix of these five components is critical to executing a flawless information system rollout. Financial considerations should forecast the return-on-investment (ROI) of any such effort (i.e. what will we get for our money and how long will it take to receive payback?). And designers need to thoroughly test the system before deployment. At Prada's Manhattan flagship store, the effort looked like tech chosen because it seemed fashionable rather than functional.

MOVING FORWARD

The holy grail for the strategist is to craft a sustainable competitive advantage that is difficult for competitors to replicate. And for nearly two decades now, Zara has delivered the goods. But that's not to say the firm is done facing challenges. Consider the limitations of Zara's Spain-centric, just-in-time manufacturing model. By moving all of the firm's deliveries through just two locations, both in Spain, the firm remains hostage to anything that could create a disruption in the region. Firms often hedge risks that could shut down operations - think weather, natural disaster, terrorism, labour strife, or political unrest - by spreading facilities throughout the globe. If problems occur in northern Spain, Zara has no such fall-back.

In addition to the operations vulnerabilities above, the model also leaves the firm potentially more susceptible to financial vulnerabilities as the Euro has strengthened relative to the dollar. Many low-cost manufacturing regions have currencies that are either pegged to the dollar or have otherwise fallen against the Euro. This means Zara's Spain-centric costs rise at higher rates compared to competitors, presenting a challenge in keeping profit margins in check. Also a concern - rising transportation costs. As fuel costs continue to rise, the model of twice-weekly deliveries that has been key to defining the Zara experience becomes more expensive to maintain. Still, Zara is able to make up for some cost rises by increasing prices overseas (in the US, Zara items can cost 40% or more than they do in Spain). Zara reports that all North American stores are profitable, and that it can continue to grow its presence, serving 40-50 stores with just two US jet flights a week³⁵. Management has considered a logistics center in Asia, but expects current capacity will suffice until 2013. A center, say in the maquiladora region of northern Mexico, may also be able to serve the US markets via trucking capacity similar to the firm's Spain-based access to Europe, while also providing a regional center to serve growth throughout Latin America, should the firm continue its Western Hemisphere expansion.

Rivals have studied the firm's secret sauce, and while none have attained the efficiency of Amancio Ortega's firm, many are trying to learn from the master. There is precedent for contract firms closing the cycle time gap with vertically integrated competition that own their own factories. Dell (a firm that builds its own PCs while

nearly all its competitors use contract labor) has recently seen its manufacturing advantage from vertical integration fall as the partners that supply rivals have mimicked its techniques to become far more efficient. In terms of the number of new models offered, clothing is actually more complex than computing, suggesting Zara's value chain may be more difficult to copy. Still, H&M has increased the frequency of new items in stores, Forever 21 and Uniqlo get new looks within 6 weeks, Renner, a Brazilian fast fashion rival, rolls out mini-collections every two months, and Benetton, a firm that previously closed some 90 percent of US stores, now replenishes stores as fast as once a week.

Finally, firm financial performance can also be impacted by broader economic conditions. When the economy falters, consumers simply buy less and may move a greater share of wallet to less stylish but even lower-cost offerings from deep discounters like Wal-Mart. Zara is particularly susceptible to conditions in Spain, since the market accounts for nearly 40 percent of Inditex sales. Global expansion will provide the firm with a mix of locations that may be better able to endure downturns in any single region.

Zara's winning formula can only exist through management's savvy understanding of how information systems can enable winning strategies. It is technology that helps Zara identify and manufacture the clothes customers want, get those products to market quickly, and eliminate costs related to advertising, inventory missteps, and markdowns. A strategist must always scan the state of the market as well as the state of the art in technology, looking for new opportunities and remaining aware of impending threats. With systems so highly tuned for success, it may be unwise to bet against "The Cube".

Tech for Good: The Fair Factories Clearinghouse

The problem of sweatshop labor has plagued the clothing industry for years. Managers often feel the pressure to seek ever lower costs and all too often end up choosing suppliers with unacceptably poor practices. Even well-meaning firms can find themselves stung by corner-cutting partners that hide practices from auditors or truck products in from unmonitored off-site locations. The results can be tragic for

those exploited, and can carry lasting negative effects for the firm. The sweatshop moniker continues to dog Nike years after allegations were uncovered and the firm aggressively moved to deal its problems. Nike rival Reebok (now part of Adidas) has always taken working conditions seriously. The firm even has a Vice President of Human Rights, and has made human dignity a key platform for its philanthropic efforts. Reebok invested millions in developing an in-house information system to track audits of its hundreds of suppliers along dimensions such as labour, safety, and environmental practices. The goal in part was to identify any bad apples, so that one division, say sporting goods, wouldn't use a contractor identified as unacceptable by the sneaker line. The data was valuable to Reebok, particularly given that the firm has hundreds of contract suppliers.

But senior management realized the system would do even more good if the whole industry could share and contribute information. Reebok went on to donate the system and provided critical backing to help create the non-profit Fair Factories Clearinghouse. With management that includes former lawyers for Amnesty International, Fair Factories (FairFactories.org) provides systems where apparel and other industries can share audit information on contract manufacturers. Launching the effort wasn't as easy as sharing the technology. The U.S. Justice Department needed to provide a special exemption, and had to be convinced.

the effort wouldn't be used by buyers to collude and further squeeze prices from competitors (the system is free of pricing data). Suppliers across industries now recognize that if they behave irresponsibly, the Fair Factories system will carry a record of their misdeeds, notifying all members to avoid the firm. As more firms use the system, its database becomes broader and more valuable. To their credit, both Gap and Nike have joined the Fair Factories Clearinghouse.

APPENDIX 3: MAJOR CONCEPTS IN SUPPLY CHAIN MANAGEMENT

An Information System

Supply Chain Management

Supply Chain Integration

Inventory Stocking Points

Inventory Stocking Points

Decoupling

Bullwhip Effect

Information, Cash & Material Flows in a Supply Chain

Ten Flatteners of the World

Information Systems Planning

Project Management

APPENDIX 4: SAMPLE INTERVIEW PROTOCOL

**Questions for interview on impact of technology
Natives/Immigrants on IT culture – Impact of IT culture on
organizational Culture**

Note: Respondents can work outside the IT department within a or within the IT department of the organization

Interviewer: Mrs Cecile Hoods, accompanied by Peter Sun, Waikato University for first four interviews, thereafter, by myself

Interviewees: Experts pre-selected by the HR department at two large corporates. Could work inside/outside IT dept. Respondents are both male and female selected based on knowledge of IT.

Key words: Technology Natives, Technology immigrants, organizational Culture, IT culture, cultural change.

Note: Respondents can work outside the IT department within a or within the IT department of the organization

Protocol based on : McNamara guidelines for structured open-ended questionnaires. Keep a note pad to make short notes, especially when interviewee says something and interviewer needs clarification or want to probe.

Organization: _____

Interviewee (Title and Name): _____

Interviewer: _____

All participants have already received information sheets on the purpose of the interview.

Prior responding to the three main questions outlined below, each respondent will be asked to provide a few personal background information relevant to this study. As far as possible, allow the interviewee to do most of the talking. Probe if necessary. If interviewee mentions something important, note it down and clarify before going on to a next question/sub question.

Introduction Protocol

Greet and thanks followed by introductions. *To facilitate our note-taking, I would like to audio tape our conversations today with this Dictaphone. I will record your permission. For your information, only my supervisor and I will be privy to the tapes which will be eventually destroyed after they are transcribed. A reminder that the information sheet explains:*

- *All information will be held confidential,*
- *Your participation is voluntary and you may stop at any time if you feel uncomfortable, and*
- *I do not intend to inflict any harm.*

I have planned this interview to last no longer than one hour. During this time, I have few questions that I would like you to give your honest responses to. If time begins to run short, it may be necessary to interrupt you in order to push ahead and complete this line of questioning. Thank you for your agreeing to participate. Do you have any questions before we start this interview?

Question 1: Background

Can you please record your name and give me some background on yourself i.e how long have you been here and what position do you hold?

Probe: This is a critical question; so, *if not sufficient information on position held, ask: what is your title?*

Interviewer: *Check note pad: Any answer to probe? Keep note of any other interesting change or body language.*

Question 2: Technology natives/ immigrants and electronic gadgets

Explain to them the definition of TI/TN. The difference between Technology natives – Born in an era with computers, laptops, mobile phones, IPODS and other communication devices around them - Technology immigrants the opposite – if they have a question, let them ask it first

- *Can you describe to me the extent you immerse yourself and the extent to which you are comfortable with information technologies?*
- *Probe: Both in work place and at home*

Interviewer: *Check note pad: Any answer to probe? Keep note of any other interesting change or body language.*

Question 3: This question is around IT in your workplace

- *Do you work in the IT dept in your organization Yes/No*
- *How long have you worked around IT in your workplace? How long in your present position*
- *Do you work in groups and how are those groups constructed?*

- Probe: what type of people/skill is required to form a group
- Describe to me/us your role in your department
 - **Probe, if necessary** – how important is IT to you in your workplace
- How long at your previous workplace?
- How were groups put together there?

IF NO

- Tell me/us about your role in your organization
- In which way does IT affect you in your workplace
 - **Probe** – how important is IT to you in your workplace

Interviewer: Check note pad: Any answer to probe? Keep note of any other interesting change or body language

Question 4: This question is around the influence of IT on organizational culture

Short explanation In its simplest form, organizational culture is the personality of the organization.

- How has IT changed the way you do business
- What impact does IT have on Organizational culture
- What significant difference has Technology Immigrants/Natives made to your department and organization
- What about the previous org. you worked for?
- Think of IT Dept and your current organization, what, if any influence does the IT dept have on the organizational culture?

Probe if necessary if these questions are not answered or if answers are unclear.

Interviewer: Check note pad: Any answer to probe? Keep note of any other interesting change or body language and observe environment at the company, making notes.

THANKS

Thank you so much for your time and for taking part in this research. At the moment, is there anything else that you would like to

add? _____ Here are my contact details in case you think of anything else that you want to add.

Thank you once again for your time. I do have your contact details and I will contact you once I have typed the recorded information so that you can check whether everything is the way you meant it to be. Are you O.K. with that? Thank you once again. It was great meeting you, I really appreciate your time.

Interviewer: After interview, before next one, go through notes, clarify some, add additional info if necessary.

APPENDIX 5: SAMPLE OBSERVATION PROTOCOL

Classroom Action Observation Protocol

Integration of tools to engage and motivate students in learning

Observer: Mrs Cecile Hoods
Action observation participants: Supply Chain students.
Years: Three Years: 2007, 2008, 2009
Number of action observations: Five
Additional action observations: A sixth one added for the 2009 group.
Protocol based on : Prince & Felder, Somekh and O'Brien.
Measurement of Motivation theories and
Keep a pad at the desk to make short notes, if possible, during the action observation sessions. Otherwise, do it afterwards.

Note for Observer: The focus of each action observation is the activity that the learner is given and how the learner works through it. Thereafter, a questionnaire to measure what was observed follows. Only fill in the parts of the questionnaire that applies

Action Observation 1: This session is a practical one while learners are working on the computer. *Throughout session, observe body language, tone, emotions, motivation and add to running notes*

What to Observe with activity 1: internet navigation abilities, software navigation, levels of motivation. In particular, keep running observation notes on how, when, who, what?

Duration : 15 – 30 mins

Observation as : Pairs/groups

Date:

Number of Participants

After session: Complete questionnaire

Before Action Observation 1:

- First class, so ensure all students have computer access
- Have in class lesson plan
- Date, time
- Theme for that particular class.
- Make sure all computers are working
- Ensure overhead is working, white board markers

- Make list of internet sites for that day, plus activities scheduled in class
- Just before observation, decide whether learners are going to do group work – if so, balance numbers, let them divide into groups
- Prepare for any intervention that is needed
- Study the protocols for activity 1 & 2.
- Bring this protocol which includes a questionnaire section
- Prepare what it is that the learners need to look up on the internet
- let learners move into groups

Part A: Key indicators: During Action Observation Activity 1: If you can observe all these activities, do so. Specifically note, after introducing the lesson for the day, and giving activity 1, how students:

React when asked to divide into groups - how

- Do they do so immediately and what was their emotions like? Happy, sad, indecisive?
 - Do they start talking immediately? Organizing themselves, who will do what?
- If indecisive, ask if they need some assistance, and how they would like to be assisted. Observer could provide based on need, for example, a team activity, learning each other's names, or any assistance that the learners ask for to help divide them into groups.
- How do they deal with group work
 - Dependent on age? Expertise?
 - Who gets a turn when?
 - Any intervention needed if they do not know how to deal with the group work?
 - Provide intervention, then continue observation
- Keep running observation and intervention notes, plus outcomes
 - Were they more decisive?
 - What are their emotions like?
 - Do they start talking to each other immediately?
 - Do they organize themselves
 - If not, help them organize themselves by asking questions about who would do what in the group
 - Who would go on the computer first, who would read the notes
- What was their knowledge about internet, software
 - Before accessing the internet?
 - Do they appear confident/not confident?
- Access and work their way around the internet – navigating, searching
- How well can they navigate? Search?

- Were they slow? Fast?
- Energy Levels: energetic, lethargic
- In terms of age,
 - Which group is quicker
 - Which group is slower
- Look at the quality of information they found? Poor? Good?
- Whole class good quality information? Do nothing
- If struggling, how many? Age difference? Groups? Individuals?
 - How do they react?
 - What do they struggle with
- If a group or two find poor quality information, does any group need help?
- Find out what help they need, probe, question. If unable to find, assist.
- If poor, ask some questions.
- If whole class poor, stop class, clarify, ask some questions, break activity into smaller step, show example on overhead, then let learners follow, while observing. Move to the next step and let learners do it by themselves, observe and making running observation notes. Continue until activity complete
 - Do they need extra help on next step? What, if any, help do they need?
- How do learners in front of the computer? Confident, not confident?
 - Do they go directly into activity?
 - Was there any difficulty? If so, what was it?
- What are the learner's emotions while they are working?
 - If negative, do they need any support, encouragement – if yes, provide it
 - If positive, provide encouragement that will keep it positive

Part B: At the End of activity 1- Include Motivation

- Review notes
- You documented what occurred in this observation session above. In this end of activity section, you are asked to use that information, as well as any other pertinent information to measure, amongst other things, the motivation of learners.
- Rate each of a number of key indicators from 1 (poor/low) to 5 (to a great extent/high) in five difference categories by circling the appropriate response. Any one session is not likely to provide evidence for every single indicator;

use 6, "Don't know" when there is not enough evidence for to make a judgment. Use 7, "N/A" (Not Applicable) when you consider the indicator inappropriate given the purpose and context of the session. Similarly, there may be entire rating categories that are not applicable to a particular session.

- Note that you may list any additional indicators you consider important in capturing the essence of this session and rate these as well.
- Use "Ratings of Key Indicators" (Part A) to inform "Synthesis Ratings" (Part B) and indicate in "Supporting Evidence for Synthesis Ratings" (Part C) what factors were most influential in determining your synthesis ratings. Section Two concludes with motivation ratings
- Add to running observation and intervention notes

1. Organizational skills:	1	2	3	4	5	6	7
2. Reaction when asked to divide into groups							
a. Happy	1	2	3	4	5	6	7
b. Sad	1	2	3	4	5	6	7
3. Energy levels before they started navigation	1	2	3	4	5	6	7
4. Energy Levels during navigation	1	2	3	4	5	6	7
5. Energy levels after navigation	1	2	3	4	5	6	7
6. Confidence level:	1	2	3	4	5	6	7
a. Before navigating internet	1	2	3	4	5	6	7
b. Confidence level once navigating internet	1	2	3	4	5	6	7
5. Quality of information before intervention	1	2	3	4	5	6	7
6. Quality of information after intervention	1	2	3	4	5	6	7

7. While working:

a. Support needed	1	2	3	4	5	6	7
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b. Encouragement needed	1	2	3	4	5	6	7
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8. Motivation:

a. Willingness to perform	1	2	3	4	5	6	7
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b. Perseverance	1	2	3	4	5	6	7
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c. commitment	1	2	3	4	5	6	7
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d. Persistence when performing task	1	2	3	4	5	6	7
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e. Using initiative							
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What to Observe with activity 2: Task completion, direction needed, focussed on task. In particular, keep running observation and intervention notes on how, when, who, what?

Duration : 15 – 30 mins

Observation as : Pairs/groups

Date:

Number of Participants

Part A: Key indicators: During the Action Observation 1 activity 2: Specifically note, after introducing the activity 2, and giving the activity, how much

- Direction is needed
- Who do they ask direction from
 - Teacher
 - Peer
 - Peer and Teacher
- Which order first:
 - Peer, teacher
 - Peer Teacher peer?
 - Teacher, peer
 - Teacher, peer, teacher

- When they do the task
 - Are they focussed/easily distracted
 - Could they complete a task, then do something else
 - If not
 - At which stage do they start something else
 - Is there any intervention needed to get learner to focus on task
 - If No, intervention is not needed for whole class
 - then provide intervention for that group or the particular student, and start the observation cycle with that student again- provide an example first, let group/student follow, then let group or student do it by themselves while observing
 - If Yes, discontinue the whole class session, decide what the intervention would be then
 - Intervene by using the most appropriate tool for learner so that they can focus on task
 - If another intervention is needed, provide it then
 - Observe to see if students were able to cope with the activity by themselves
 - If still unable to focus, use additional tools, e.g boundaries, then relax boundaries as learner becomes more focussed
 - Are learners able to continue classwork outside class hours
 - If yes, provide work
 - If no, rearrange class activities so that work can be done in class.
- Are they focussed or easily distracted
 - Do they need any intervention to help with distraction
 - What was the distraction

- How easily were they distracted
- If so, record intervention, and outcome afterwards
 - Are they more focussed or
 - Do they need more assistance – if so, intervene to get them back on track
 - Keep running notes
- Provide Running observation and intervention notes.

Section B After Action Observation 1: Activity 2:

1. Organizational skills:	1	2	3	4	5	6	7
2. Direction needed	1	2	3	4	5	6	7
3. Reaction when asked to divide into groups							
a. Happy	1	2	3	4	5	6	7
b. Sad	1	2	3	4	5	6	7
4. Energy levels before they started navigation	1	2	3	4	5	6	7
5. Energy Levels during navigation	1	2	3	4	5	6	7
6. Energy levels after navigation	1	2	3	4	5	6	7
7. Confidence level:							
c. Before	1	2	3	4	5	6	7
d. Confidence level after	1	2	3	4	5	6	7
5. Quality of information before intervention	1	2	3	4	5	6	7

- Store for transcription purposes

Action Observation 2: Use and play of 1960 computer simulation game

Action Observation 2: This session is another practical one while learners are playing the game on the computer. *Throughout session, observe body language, tone, emotions and add to running notes*

What to Observe: Specifically note, **this is a 1960s game, so** after introducing the game **how they respond, how they follow the notes, ability to keep them engaged/motivated, emotions, focus.**

Duration : +/- 30 – 45 mins

Observation as : Pairs/groups

Date:

Number of Participants

Before Action Observation 2:

- Go through notes of observation 1. Is there anything that you need to take note of?
- Make a note, and take it with to class
- Theme for that particular class.
- Make sure all computers and computer simulation game is working
- Prepare for any intervention that is needed
- Let learners sit in groups at the beginning of class.
- Give all learners a copy of the game instructions
- Show how to play the game on the overhead projector
- Then let the students try

Part A: Key indicators: During Action Observation 2:

How do they respond when they saw the game on the overhead, were they

- Interested, disinterested, engaged, disengaged, motivated, not motivated?
 - If interested, motivated, show them how to play the game
 - Ask them questions
 - While playing the game, observe each group at their computer
 - Are they enjoying it?
 - Is there any intervention needed?
 - If disinterested, unmotivated, try and use some motivation strategies, eg. Focus on this task, as soon as it is finished, we will move onto another interesting one

- How do they respond?
 - Show them how to play the game
- How do they react to the game instructions?
 - Do they find it easy to follow?
 - Do they read it through first
 - When they tried to follow it, were they able to? If not, intervene, discuss and answer questions
 - If still unable to play the game, show them step by step
 - Then observe while they play
 - Ease with which they play the game
 - Was there any comments, if so, document what it was, was it audible.
 - What do they do during the practical simulation session
 - After assessment task based on the game, do they
 - Access it again (for this, access IT records, as students may have accessed it outside class) – do they access it again, if so, how many times?
 - How do they express themselves afterwards?
 - Amongst each other, to the teacher? Was it audible?
 - If still unable to motivate them, are there any other enticements? Use those strategies
 - Is there a change in motivation levels?
 - If yes, and students are playing the game, observe how they play it and their emotions while playing
- If motivated to play the game, walk around the room and establish how far they are in playing it
 - Nearly finished, or just at the start, or in the middle?
 - Any intervention needed? Provide intervention if needed, and then observe any
 - Emotions
 - Are they progressing
 - Are they focused
- Are they easy to motivate, hard to motivate.
- Keep running observation and intervention notes, plus outcomes
 - What are the learner’s emotions while playing the game overall? What was class atmosphere like?

1. Interest in game:	1	2	3	4	5	6	7
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2. Ability to follow game instructions	1	2	3	4	5	6	7
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3. How react to game instructions							
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a. Interested	1	2	3	4	5	6	7
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b. Not interested	1	2	3	4	5	6	7
<hr/>							
4. Energy levels before they start playing	1	2	3	4	5	6	7
<hr/>							
5. Energy Levels during game play	1	2	3	4	5	6	7
<hr/>							
6. Energy levels after game play	1	2	3	4	5	6	7
<hr/>							
7. Confidence level:							
<hr/>							
a. Before	1	2	3	4	5	6	7
<hr/>							
b. During							
<hr/>							
c. Confidence level after	1	2	3	4	5	6	7
<hr/>							
5. Quality of information before intervention	1	2	3	4	5	6	7
<hr/>							
6. Quality of information after intervention	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
<hr/>							
7. While working:							
<hr/>							
a. Support needed	1	2	3	4	5	6	7
<hr/>							
b. Encouragement needed	1	2	3	4	5	6	7
<hr/>							
8. Motivation:							
<hr/>							
a. Willingness to perform	1	2	3	4	5	6	7
<hr/>							
b. Perseverance	1	2	3	4	5	6	7
<hr/>							

c. commitment	1	2	3	4	5	6	7
d. Persistence when performing task	1	2	3	4	5	6	7

End of Action Observation 2:

- Review notes
- Attach any evidence
- Are there any other changes or interventions need – write these down
- Add to running observation and intervention notes

After Action Observation 2:

- Review observation and intervention notes.
- Ensure activities where help was given, is written down
 - How do they respond to help?
 - How do they do during the next step? Was there any additional intervention required?
 - When was intervention needed
 - How was intervention done
 - Was intervention successful/unsuccessful
 - Able to do next steps on their own
 - Get the results needed
- Summarize the observation and intervention notes
- Was there any difference from year to year?
- Any urgent changes that needs to be made – document and make the changes as soon as possible
- Are there any interventions to be carried forward to another observation session or alternative plans/arrangements that need to be made?
- Store for transcription purposes

Action Observation 3: Practical in class exercise and Development of a simple database

Action Observation 3: This session is practical. First the learners follow on the overhead, while they develop the database on their computer, then they, during practical sessions, develop their own database as a business solution.

What to Observe: How they follow the step by step exercise in their groups, communication, skilfulness, if errors occurred, linking database with websites

Duration : 25 - 35 mins

Observation as : Pairs/groups

Date:

Number of Participants

Before Action Observation3:

- Go through notes of observation 1 and 2. Is there anything that needs to be taken note of?
- Make a note, and take it with to class
- Test this session before class time in classroom, to ensure database programme is working
- Make sure all computers has database software on it
- Prepare for any intervention that is needed
- Let learners sit in their work groups at the beginning of class
- Upload the complete exercise onto the internet
- Show learners how to develop a simple database
- Then let the students try

Part A: Key indicators: During Action Observation 3:

How do they respond when they saw the database programme on the overhead and when they opened it on their screens?

- Do they
 - Ask any questions, if so, what type of questions
 - When it was answered, were they satisfied/dissatisfied
- During the class database development exercise
 - Do they ask for any assistance
 - Was it done
 - In groups or individually?
 - Was every group member engaged
 - Do the whole class need assistance, or just a group
 - Ask them questions
 - What was their skills level during the exercise?
 - Do they ‘appear skilful’ and were they really skilful?
 - If not, what was the difference
 - Intervention, then afterwards
 - Was there a difference in their level of skill
 - If yes, were they able to share it and how?
 - Who do exercise, who read instructions,
 - Were they alternating tasks
 - Asking questions – who do they communicate with when they had questions?
 - each other

- From the lecturer
 - How was communication and Who was communicating during the database development
 - Frequent, infrequent, developer, rest of the members
 - Do groups of learners find it
 - Easy to develop database
 - Difficult
 - Frequent questions from each other
 - Elsewhere
 - Lecturer – what was the intervention
 - How do they progress after the intervention
 - How intense was the intervention
 - What type of questions do they ask
 - After they receive the assistance
 - Do it change, was it the same
- Were they able to spot an error? Do they recognise that there was an error?
- If they found that they had an error in developing database
 - How do they respond? Who do they ask for help?
 - Do they access lecturer? At which stage?
- How do they respond once assisted with the error/s
- How often do they need help with the same errors?
 - How do they react when errors were seldom, or when it was frequent?
- Linkages
 - Are they able to make any linkages automatically between
 - Websites and databases
 - If not, what intervention?
 - After intervention, are they able to make the linkages?
 - How intense the intervention?
 - Focus
 - Do they focus only on task or
 - Do they do a few things at the same time
 - How successful with single focus/multi focus
 - Time taken to understand linkages
 - With intervention
 - Without intervention
- Confidence levels
 - Same, better, lesser than during observation 1 & 2

Part B: At the End of Observation 3:

- Review notes

1. Ask questions:	1	2	3	4	5	6	7
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2. Satisfaction with answer	1	2	3	4	5	6	7
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3. How react to database instructions

a. Interested	1	2	3	4	5	6	7
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b. Not interested	1	2	3	4	5	6	7
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4. Energy levels before	1	2	3	4	5	6	7
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5. Energy Levels during	1	2	3	4	5	6	7
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6. Energy levels after	1	2	3	4	5	6	7
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7. Confidence level:

a. Same as	1	2	3	4	5	6	7
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b. Better than	1	2	3	4	5	6	7
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c. Less than	1	2	3	4	5	6	7
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5. Ability to pick up errors	1	2	3	4	5	6	7
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6. Error rate	1	2	3	4	5	6	7
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7. linkages made:	1	2	3	4	5	6	7
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a. Before intervention	1	2	3	4	5	6	7
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b. After Intervention	1	2	3	4	5	6	7
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8. Motivation:

a. Willingness to perform	1	2	3	4	5	6	7
b. Perseverance	1	2	3	4	5	6	7
c. commitment	1	2	3	4	5	6	7
d. Persistence when performing task	1	2	3	4	5	6	7
e. Ability to focus before	1	2	3	4	5	6	7
f. Ability to focus after	1	2	3	4	5	6	7

- Attach evidence
- Compared to previous observations, any change – write these down
- Add to running observation and intervention notes

After Action Observation 3:

- Review observation and intervention notes.
- Ensure where intervention was needed, is written down
 - How do they respond to help?
 - How do they do during the next step? Was there any additional intervention required?
 - When was intervention needed
 - How was intervention done
 - Was intervention successful/unsuccessful
 - Able to do next steps on their own
 - Get the results needed
- Summarize the observation and intervention notes
- Any urgent changes that needs to be made – document and make the changes as soon as possible
- Are there any interventions to be carried forward to another observation session or alternative plans/arrangements that need to be made?
- Store for transcription purposes

Action Observation 4: In-class Case study

Action Observation 4: This session is a case study. Learners were given case study at the beginning of the semester, and their attention was drawn to it during the week before it was discussed in class.

For the 2007 and 2008 groups, case study was given at the same time during the semester. For the 2009 group, the case study was deferred until close to the end of the semester.

What to Observe: deliberation about case study, confidence levels, what the class discussions entailed, was the connection with databases, websites and previous classwork made

Duration : 25 - 35 mins

Observation as : Pairs/ Group

Date:

Number of Participants

Before Action Observation 4:

- Go through notes of observation 1, 2 and 3. Is there anything that needs to be taken note of?
- Make a note, and take it with to class
- Ensure videos are working on all computers and on overhead
- Prepare any intervention, if possible, before hand
- Ensure lighting levels for screening video is correct
- Learners are all focused on big screen in classroom
- If 2009 group does not see the connection between case study and rest of the course, make it clear to them, and keep running notes on what was done

Part A: Key indicators: During Action Observation 4:

How do they respond when they see the video and case study notes in class? Ask questions relating to the case

- Does it seem as though they
 - Read the case before
 - They are able to answer questions
 - They have questions that they need answered
 - Group deliberation in class
 - Good, poor, average
 - Intervention needed
 - Group deliberations after intervention
 - Confidence levels
 - High, low, average
 - Intervention needed

- Confidence levels afterwards
 - During group discussions
 - What are they discussing
 - What is their emotions like
 - Happy sad, jovial
- Linkages
 - Are they able to make any linkages automatically between
 - Case study and practical work and field trip (for 2009 group)
 - If not, what intervention?
 - After intervention, are they able to make the linkages?
 - How intense the intervention?
 - Compared to previous observation sessions
 - Time taken to understand linkages
 - With intervention
 - Without intervention

Part B: Part B: At the End of Observation 4:

- Review notes

8. Ask questions:	1	2	3	4	5	6	7
9. Satisfaction with answer	1	2	3	4	5	6	7
10. How react to database instructions							
a. Interested	1	2	3	4	5	6	7
b. Not interested	1	2	3	4	5	6	7
11. Energy levels before	1	2	3	4	5	6	7
12. Energy Levels during	1	2	3	4	5	6	7
13. Energy levels after	1	2	3	4	5	6	7
14. Confidence level:							

d. Same as	1	2	3	4	5	6	7
e. Better than	1	2	3	4	5	6	7
f. Less than	1	2	3	4	5	6	7
5. Ability to pick up errors	1	2	3	4	5	6	7
6. Error rate	1	2	3	4	5	6	7
7. linkages made:	1	2	3	4	5	6	7
a. Before intervention	1	2	3	4	5	6	7
b. After Intervention	1	2	3	4	5	6	7
8. Motivation:							
a. Willingness to perform	1	2	3	4	5	6	7
b. Perseverance	1	2	3	4	5	6	7
c. commitment	1	2	3	4	5	6	7
d. Persistence when performing task	1	2	3	4	5	6	7
e. Ability to focus before	1	2	3	4	5	6	7
f. Ability to focus after	1	2	3	4	5	6	7

- Attach evidence
- Compare to previous observations, any change – write these down
- Add to running observation and intervention notes

After Action Observation 4:

- Review observation and intervention notes.
- Ensure where intervention was needed, is written down
 - How do they respond to help?
 - How do they do during the next step? Was there any additional intervention required?
 - When was intervention needed
 - How was intervention done
 - Was intervention successful/unsuccessful
 - Able to do next steps on their own
 - Get the results needed
- Summarize the observation and intervention notes
- Any urgent changes that needs to be made – document and make the changes as soon as possible
- Are there any interventions to be carried forward to and integrated into other tools/class or tutorial sessions or alternative plans/arrangements that need to be made?
- Store for transcription purposes

Action Observation 5: Prior to field trip to a Forestry Company that significantly relies on technology for its operations.

Action Observation 5: This session takes place before the learners go on a field trip to a nearby forestry company. This trip is usually scheduled towards the end of the course. For the 2009 group, this trip was brought forward to the beginning of the course, as part of action observation, based on the findings of Observation 1, learning styles and early focus group responses.

What to Observe what transpired in class when information is shared about the field trip, what transpired after field trip announcement.

Duration : 10 - 15 mins

Observation : individual/group

Date:

Number of Participants

Before Action Observation 5:

- Finalize field trip with company
- Finalize arrangements for transport complete
- Necessary consents obtained from School of Business
- Consent forms ready and taken to class
- Bring interesting information/slides/videos about company to class

Part A: Key indicators: During Action Observation 5:

- How do they respond when information about field trip is shared
- What do they do immediately after information is shared
 - What emotions do they display
 - Happy, sad, neutral
 - Body language?
 - Do they ask questions
 - Clarifying questions, safety questions, etc
 - Are they
 - Quiet, thinking it through
 - noisy, talking to each other, excited
 - If they are talking
 - What are they talking about
 - Do they ask for
 - Additional information
 - Clarification
 - Intervention needed
 - Confidence levels afterwards
 - Are they talking
 - In groups
 - Across the classroom to others
 - Happy sad, jovial
- After announcement
 - Did they discuss it in other supply chain management sessions/tutorials
 - Did they ask any questions
 - If so, what about?
 - Would they go on the trip
 - Any reasons why/why not?
 - Any intervention needed? If yes, what intervention
 - Any change? Would they go after intervention
 - If not, why

Part B: At the End of Observation 5:

- Review notes
-

15. Ask questions:	1	2	3	4	5	6	7
16. Satisfaction with answer	1	2	3	4	5	6	7
17. How react to database instructions							
a. Interested	1	2	3	4	5	6	7
b. Not interested	1	2	3	4	5	6	7
18. Energy levels before	1	2	3	4	5	6	7
19. Energy Levels during	1	2	3	4	5	6	7
20. Energy levels after	1	2	3	4	5	6	7
21. Confidence level:							
g. Same as	1	2	3	4	5	6	7
h. Better than	1	2	3	4	5	6	7
i. Less than	1	2	3	4	5	6	7
5. Ability to pick up errors	1	2	3	4	5	6	7
6. Error rate	1	2	3	4	5	6	7
7. linkages made:	1	2	3	4	5	6	7
a. Before intervention	1	2	3	4	5	6	7
b. After Intervention	1	2	3	4	5	6	7

8. Motivation:

a. Willingness to perform	1	2	3	4	5	6	7
b. Perseverance	1	2	3	4	5	6	7
c. commitment	1	2	3	4	5	6	7
d. Persistence when performing task	1	2	3	4	5	6	7
e. Ability to focus before	1	2	3	4	5	6	7
f. Ability to focus after	1	2	3	4	5	6	7

- Attach evidence
- Compared to previous observations, any change – write these down
- Add to running observation and intervention notes

After Action Observation 5:

- Review observation and intervention notes.
- Ensure where intervention was needed, is written down
 - How do they respond after intervention?
 - When was intervention needed
 - How was intervention done
 - Was intervention successful/unsuccessful
 - Get the results needed
- Summarize the observation and intervention notes
- Any urgent changes that needs to be made – document and make the changes as soon as possible
- Are there any interventions to be carried forward to and integrated into other tools/class or tutorial sessions or alternative plans/arrangements that need to be made?

- Store for transcription purposes

Action Observation 6: During field trip. This observation was for the 2009 group only.

Action Observation 6: This session takes place during the field trip to a nearby forestry company to ascertain whether the significant impactful changes made as a result of previous observation and focus group sessions made a positive difference to the engagement and motivation levels of the learners

What to Observe: Behaviour in bus en route to head office, during the presentation at head office, en route to manufacturing plant, arrival at plant, during plant tour, after plant tour

Duration : 1.30 – 2 hrs

Observation : individual/group

Date:

Number of Participants

Before Action Observation 6:

- Finalize the other class of students who would accompany the SCM students
- Finalize transport for other class complete
- Necessary consents obtained from School of Business for other class

Part A: Key indicators: During Action Observation 6:

- How do they act in the bus en route head office
 - Energy levels, any questions
- During presentation at head office
 - Where was their focus
 - Any questions asked
 - Engaged, not engaged
- En route to plant
 - In the bus, how did they act
 - Emotions, any questions
 - what were they doing
 - quiet, conversational, what type of conversations
- On arrival at plant
 - Energy levels, facial expressions
 - Conversations, if any
 - Questions if any on arrival
 - Do they ask for
 - Additional information
 - Clarification
 - Intervention needed
 - Confidence levels afterwards

- During plant tour
 - Listening, talking, and asking questions?
 - Engaged, not engaged
- After presentation at plant
 - Quiet, talkative, who with,
 - Did they ask any questions
 - If so, what about?
 - Conversations, if any
 - What, who with?
 - Any other activities?

Part B: At the End of Observation 6:

- Review notes

1. Ask questions:	1	2	3	4	5	6	7
2. Satisfaction with answer	1	2	3	4	5	6	7
3. How react to database instructions							
a. Interested	1	2	3	4	5	6	7
b. Not interested	1	2	3	4	5	6	7
4. Energy levels before	1	2	3	4	5	6	7
5. Energy Levels during	1	2	3	4	5	6	7
6. Energy levels after	1	2	3	4	5	6	7
7. Confidence level:							

a. Same as	1	2	3	4	5	6	7
b. Better than	1	2	3	4	5	6	7
c. Less than	1	2	3	4	5	6	7
5. Ability to pick up errors	1	2	3	4	5	6	7
6. Error rate	1	2	3	4	5	6	7
7. linkages made:	1	2	3	4	5	6	7
a. Before intervention	1	2	3	4	5	6	7
b. After Intervention	1	2	3	4	5	6	7
8. Motivation:							
a. Willingness to perform	1	2	3	4	5	6	7
b. Perseverance	1	2	3	4	5	6	7
c. commitment	1	2	3	4	5	6	7
d. Persistence when performing task	1	2	3	4	5	6	7
e. Ability to focus before	1	2	3	4	5	6	7
f. Ability to focus after	1	2	3	4	5	6	7

- Attach evidence
- Compared to previous observations, any change – write these down
- Add to running observation and intervention notes

After Action Observation 6:

- Review observation and intervention notes.
- Ensure where intervention was needed, by whom, is it written down
 - How do they respond after intervention?
 - When was intervention needed
 - How was intervention done
 - Was intervention successful/unsuccessful
 - Get the results needed
- Summarize the observation and intervention notes
- Any urgent changes that needs to be made – document and make the changes as soon as possible
- Are there any interventions to be carried forward to and integrated into other tools/class or tutorial sessions or alternative plans/arrangements that need to be made?
- Store for transcription purposes

C. Synthesis Rating: Before intervention

1	2	3	4	5
Internet navigation was extremely poor				Internet navigation was extremely good
Software Navigation abilities were extremely poor				Software navigation abilities were exceptional
Learners were not motivated at all				Learners were very motivated

D. Supporting Evidence for Synthesis Rating

C. Synthesis Rating: After intervention Activity 1:

1	2	3	4	5

Internet navigation was extremely poor				Internet navigation was extremely good
Software Navigation abilities were extremely poor				Software navigation abilities were exceptional
Learners were not motivated at all				Learners were very motivated

D Synthesis Rating: Activity 2:

1	2	3	4	5
Total inability to complete task/s				Excellent completion of task/s
Reliant on teacher and peers for step-by-step direction				No direction needed. Executes tasks well
Unable to focus on any task at hand				Fully focussed on task/s at hand
No motivation, lack of energy				Highly motivated, energetic

E Synthesis Rating: Observation 2:

1	2	3	4	5
Completely Unresponsive				Responds well
Complete inability to follow the notes.				Ability to follow notes and execute instructions from notes
Unable to focus on any task at hand				Fully focussed on task/s at hand
Completely Disengaged from game				Entirely engaged
Emotions are that of sadness, lack				Emotions that of contentment,

of energy, lethargic look				fulfilment and vibrate
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F: Synthesis Rating: Observation 3

1	2	3	4	5
Total lack of communication				Communicates well with peers and teacher and asks for assistance
Unable to do most basic tasks or identify any errors				Very skilful and can identify errors immediately
Unable to visualize or understand any link between databases and Websites				websites and databases immediately linked
Unable to motivate, low interest and appears lethargic				Easy to motivate, always interested in next step, very energetic

G: Synthesis Rating: Observation 4

1	2	3	4	5
No partaking in any in-class deliberations				Fully engaged in in-class deliberations
Displays a general lack of confidence				Exceptionally confident while discussing case study
Unable to link case study, databases and Websites				Immediate link made between case study, databases and websites
Unable to motivate, low interest and appears lethargic				Easy to motivate, always interested in next step, very energetic

F: Synthesis Rating: Observation 5

1	2	3	4	5
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Lack of attention and no emotion or interest shown when information was shared about trip				Responded enthusiastically and fully engaged and interested in the information about the trip
After field trip announcement, remains uninterested				Exuberant, elated about announcement
Low motivation levels				Highly motivated

Any Supporting Evidence for Synthesis Rating

APPENDIX 6: ONLINE QUESTIONNAIRE

Tertiary: Learning, Technology and Classroom Culture
Participant Information Sheet

My name is Cecile Patricia Hoods. I have been teaching the course eCommerce and Supply Chain Management, a first year University Paper, at since 2005. I am currently completing a piece of research related to technology, organizational culture and education for my Doctor of Philosophy (PhD) at Curtin University of Technology, Australia.



Aims of the project:

The primary goal of this research is to add to existing knowledge on Information Technology Culture and Classroom Culture.

Throughout this research project, your privacy would be ensured and no reference will be made to you personally. Your data will only be used for the purpose stated above. The results of this research may be used for conference presentation, publication purposes and could form part of a thesis. Your interview records will be freely available to you at all times. The findings of the project will be available in the library and via electronic journals.

Consent to Participate

Your involvement in the research is entirely voluntary. By completing this questionnaire you consent to being a participant in this research.

Confidentiality

The information of personal details such as name and address is not required in this questionnaire. In adherence to university policy, the collected data will be kept in a locked cabinet for seven years before it is destroyed.

Further Information

This research has been reviewed and given approval by Curtin University of Technology Human Research Ethics Committee (Approval number). If you would like further information about the study, please feel free to contact me on or by email:..... Alternatively you can contact my supervisor Prof. Darrell Fisher on or email:

Thank you for your involvement in this research. Your participation is greatly appreciated.

A: This part of the questionnaire is to collect some data about yourself, including your learning style.

1) Your gender?	
Male	

Female	
--------	--

2) Your age group?	
below 20 years	
20 to 29 years	

3) Your work experience?	
None	
Less than 5 years	
More than 5 years	

4) Your highest academic qualification prior to this course?	
Form 6 or below (NZ)	
Form 7 (NZ)	
Tertiary qualification	

5a) My learning style?	
Auditory	
Kinaesthetic	
Visual	
Other	

5b) The other learners' learning style?	
Auditory	
Kinaesthetic	
Visual	
Other	

<p>6) Technology Natives: are described as individuals who have been surrounded by the internet and technology gadgets like computers, electronic games, cell phones, Ipods.</p> <p>Technology Immigrants: are described as individuals who have not grown up surrounded by the internet and technology like computers, electronic games, cell phones, Ipods.</p> <p>Do you identify as</p>	
Technology Native	
Technology Immigrant	

Other:

B: This part of the questionnaire is to collect some data about your knowledge and usage of technology.

7a) How do you rate your ability to use technology prior to the course?	
Good	
Very good	
Excellent	

7b) How do you rate your ability to use technology after the course?	
Good	
Very good	
Excellent	

7c) Comments about your responses to Q 7a & b?

8) Which Technology related subject/s have you completed at Tertiary level prior to this course?

9a) This question is about the type of technology devices you own. You may tick more than one box.	
Laptop	
Computer	
Ipods	
GPS	
Mobile Phone	
Vodem	
Other	

9b) This question is about the different types of technology communication tools that you have used and were familiar with before you started this class . You may tick more than one box.	
Email	
Blogs	
Wiki's	

Podcasts	
Online video	
Other	

9c) This question is about the different types of technology communication tools that you have used and became familiar with **during the Supply Chain Management class**. You may tick more than one box.

Email	
Blogging	
Wiki's	
Podcasting	
Online Video	
Other	

10) Choose words to describe most aptly the type of student you are. You may tick more than one box. For every choice you make, write what you mean by your particular choice.

Hardworking	
Committed	
Easy-going	
Slack	
Enjoy group work	
Loner	
Lazy	
Never interact	
Write down the options you ticked and what it means by it.	

C: This part of the questionnaire is about your experience while doing the supply chain management course

11) Choose words to describe your learning experience on the supply chain management course that you just completed. You may tick more than one box. For every choice you make, write what you mean by your particular choice.

Boring	
Enjoyable	
Slack	
Encouraging	

Dictatorial	
Participatory	
Dull	
Different	
Dreadful	
Fun	
Lifeless	
Motivating	
Fell asleep	
Write down your word choice and what it means to you	

12a) These questions are about your uses, knowledge and understanding of progress in Information Technology (IT) **BEFORE** you started the Supply Chain Management Course

Please indicate your level of agreement with the following statements, using the following scale:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neither Agree/Disagree
- 4 = Agree
- 5 = Strongly Agree

I had an excellent knowledge and understanding of

	1 Strongly Disagree	2 Disagree	3 Neither Agree/Disagree	4 Agree	5 Strongly Agree
What An Information System is					
Supply Chain Management					
Supply Chain Integration					
Inventory Stocking points					
Decoupling					
Bullwhip effect					
Information, Cash & Material flows					
Ten Flatteners of the world					
Information Systems Planning					
Project Management					

12b) If you answered agree or strongly agree to any of the questions above, outline your knowledge of these concepts.

--

12c) These questions are about your uses, knowledge and understanding of progress in Information Technology (IT) **AFTER** you completed the Supply Chain Management course

Please indicate your level of agreement with the following statements, using the following scale:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neither Agree/Disagree
- 4 = Agree
- 5 = Strongly Agree

I had an excellent knowledge and understanding of

	1 Strongly Disagree	2 Disagree	3 Neither Agree/Disagree	4 Agree	5 Strongly Agree
What An Information System is					
Supply Chain Management					
Supply Chain Integration					
Inventory Stocking points					
Decoupling					
Bullwhip effect					
Information, Cash & Material flows					
Ten Flatteners of the world					
Information Systems Planning					
Project Management					

12d) If you answered agree or strongly agree to any of the questions above, outline your knowledge of these concepts.

--

13 a) This question is about the relationship between the field trip during this course and supply chain management.

Please indicate your level of agreement with the following statements, using the following scale:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neither Agree/Disagree
- 4 = Agree
- 5 = Strongly Agree

	1 Strongly Disagree	2 Disagree	3 Neither Agree/Disagree	4 Agree	5 Strongly Agree
Including a field trip during the course helped me understand difficult concepts					
Students were given an opportunity to ask					

questions during the field trip					
The field trip helped me understand difficult theoretical concepts					
A debriefing session after the field trip					
I integrated the knowledge gained on the field trip outing into my course					
I believe field trips add value to technology related courses					
I strongly recommend field trips to be included as a vital part of technology related courses					

13 b) This question is about how the lecturer used the knowledge you gained after the field trip.

Please indicate your level of agreement with the following statements, using the following scale:
1 = Strongly Disagree
2 = Disagree
3 = Neither Agree/Disagree
4 = Agree
5 = Strongly Agree

	1 Strongly Disagree	2 Disagree	3 Neither Agree/Disagree	4 Agree	5 Strongly Agree
The lecturer held a debrief session after the trip and Students understood more about Supply Chain after the trip					
The field trip was kept fresh in my mind					
The lecturer clarified difficult concepts after the field trip					
In class, we referred to the field trip during discussions					

13 c) This question is about your experience on the field trip

Please indicate your level of agreement with the following statements, using the following scale:
1 = Strongly Disagree
2 = Disagree
3 = Neither Agree/Disagree
4 = Agree
5 = Strongly Agree

	1 Strongly Disagree	2 Disagree	3 Neither Agree/Disagree	4 Agree	5 Strongly Agree
The field trip helped me understand difficult concepts					
Able to integrate the knowledge gained on the field trip					

The field trip adds value to the course					
I strongly recommend field trips as a vital part of this course					
Referred back to the field trip during class sessions					
Helped me understand the theory of supply chain management					
I was able to share my knowledge during class discussions					
I was able to apply the knowledge gained during the trip, after the field trip					
The trip was key to my understanding of difficult concepts					

13 d) This question is your experience immediately after the field trip

Please indicate your level of agreement with the following statements, using the following scale:
1 = Strongly Disagree
2 = Disagree
3 = Neither Agree/Disagree
4 = Agree
5 = Strongly Agree

	1 Strongly Disagree	2 Disagree	3 Neither Agree/Disagree	4 Agree	5 Strongly Agree
I was given the opportunity to ask questions about the field trip					
I enjoyed the field trip					
I had the opportunity to refer back to the field trip during class sessions					
The field trip helped me understand the theory of supply chain management					
I integrated the knowledge gained on the field trip into my course					

14) This question is about your experience with the lecturer with regards to class participation and group learning in the classroom environment

Please indicate your level of agreement with the following statements, using the following scale:
1 = Strongly Disagree
2 = Disagree
3 = Neither Agree/Disagree
4 = Agree
5 = Strongly Agree

	1 Strongly Disagree	2 Disagree	3 Neither Agree/Disagree	4 Agree	5 Strongly Agree

The lecturer encouraged me to participate in class discussions					
The lecturer encouraged me to do the work required					
The lecturer encouraged group participation					
Group participation enhanced my learning					
Learners were encouraged to be considerate of other people's ideas and feelings in the group					

15) This question is about your perception of **how often, from your point of view**, class participation and group learning took place in the supply chain management class

Please indicate your level of agreement with the following statements, using the following scale:
1 = Almost Never
2 = Sometimes
3 = Seldom
4 = Often
5 = Very Often

	1 Almost Never	2. Sometimes	3 seldom	4 Often	5. Very Often
The learners discussed their classwork in groups					
The learners often participated in groups					
Learners enjoyed the group atmosphere in class					
Group participation enhanced my learning					
Learners chose their partners for group work					
I had fun while learning in groups					
I disliked working in groups					
Learners used technology while working in groups					
Field trips were incorporated during group sessions in class sessions					
Learners solved problems in groups					

16) This question is about your perception about the classroom environment and the lecturer's use of technology in the classroom.

Please indicate your level of agreement with the following statements, using the following scale:

1 = Almost Never 2 = Sometimes 3 = Seldom 4.= Often 5. = Very Often					
	1 Almost Never	2 Sometimes	3 seldom	4. Often	5. Very Often
The lecturer used technology in the classroom					
The lecturer demonstrated the use of different technologies					
During the lecture, we do a bit of theory and then a bit of practical					
Using technology during class sessions inhibited my learning					
Adding technology to lecture sessions made the class more interesting					
The lecturer used technology in the classroom					
The lecturer demonstrated the use of different technologies					
During the lecture, we do a bit of theory and then a bit of practical					
Using technology during class sessions inhibited my learning					
Adding technology to lecture sessions made the class more interesting					

17) This question is about your perception about the classroom environment and your use of technology in the classroom environment.

Please indicate your level of agreement with the following statements, using the following scale:
1 = Almost Never
2 = Sometimes
3 = Seldom
4.= Often
5. = Very Often

	1 Almost Never	2 Sometimes	3 seldom	4. Often	5. Very Often
I was allowed to explore different technologies					
I was given access to special software or technology programs to aid my learning					
I was allowed to use technology in the classroom					

I would have learnt more without technology in the classroom					
My use of technology has improved significantly					

18a) This question is about your perception of the classroom environment and the atmosphere in the classroom

Please indicate your level of agreement with the following statements, using the following scale:
1 = Almost Never
2 = Sometimes
3 = Seldom
4 = Often
5 = Very Often

	1 Almost Never	2 Sometimes	3 seldom	4. Often	5. Very Often
The lecturer encouraged the students					
I was given an opportunity to express what I expected from the lecturer					
The lecturer expressed what she expected from me					
The lecturer adapted her teaching style to my learning needs					
The lecturer stretched my thinking					
If I did not understand, I could ask the lecturer to clarify					
The difficult practical sessions were done in class					
The lecturer was willing to explain a concept a few times over					
The lecturer created an atmosphere that allowed me to maximize my learning					
The lecturer adapted her style of teaching based on my feedback					

18b) This question is about your perception about the students' response to the atmosphere in the classroom

Please indicate your level of agreement with the following statements, using the following scale:
1 = Almost Never
2 = Sometimes
3 = Seldom
4 = Often
5 = Very Often

	1 Almost Never	2 Sometimes	3 seldom	4. Often	5. Very Often
The students set goals as to what they want to attain					
I was able to build on my existing knowledge					
The lecturer encouraged me to do well					
There was a positive atmosphere in class					
My confidence grew as the semester progressed					
My positive attitude gained during this class help me achieve in my other subjects					
I was able to relate theory to practical					
I was able to contribute meaningfully to class discussions					
The lecturer often used practical examples to explain difficult concepts					
The environment in the classroom enhanced my learning					

19a) Did you have any fear when you entered tertiary study? Yes/ No.

19b) Explain what your answer in q.19a means:

- If you had fear, how your fear was allayed during the supply chain management course.
- If no, explain what you mean

19c) Based on your answer in q.19b, What was your turning point and what made the difference for you?.

20) Explain why you would/would not recommend this course to others

Thank you so much for your participation.

APPENDIX 7: COMPARISON OF BEER GAME WITH THE SCC GAME

The MIT *beer game* is a simulation exercise that teaches learners basic supply chain concepts and demonstrates the value of the integrated supply chain management. It was developed in the 1960s and computerized in 1999 by Philip Kaminsky and David Simchi–Levi. The online instructions have been developed by Michael Li and David Simchi–Levi (2002). The SCC *game* was developed by Cecile Hoods and Mathew Skokandich in 2009, after the action observation session of 2007 and the focus group feedback from 2008 and 2009 revealed that; learners were demotivated; and became disengaged in their learning when they were required to play the *beer game* simulation exercise.

The feedback from the focus groups led to the redevelop the beer game. Butler, Dephels and Howell (1995), Nassar et al. (2002) and Nielsen (1999) recommend focus groups when first, clarification is needed for problems faced. Secondly, there is a short time span for collection of ideas and perceptions and thirdly, when creativity is sought after.

Focus groups were scheduled for the 2008 class to: first, seek clarification why learner motivation dropped so dramatically during the *beer game* simulation exercise; secondly, creativity was then needed from the learners to address their concerns; and thirdly, the researcher had a limited time span in which to address the issues and recommendations from the learners.

Focus groups were thus the ideal research method to address the learners' need regarding the beer game, as it fulfilled all the requirements. Once the focus group sessions were completed, the data were analysed. Thereafter, an email was sent to the developers and administration department at Massachusetts Institute of Technology (MIT) regarding the intention of the researcher to develop a new simulation based on learner feedback. Furthermore, the researcher completed the online reply form on the MIT a few times, and still awaits feedback.

This section of the study provides the incorporation of the results of the learner focus group to develop the *supply chain concepts simulation game*. A short introduction of both the *beer game* and the SCC *game* is provided. Thereafter, a comparison of the main frames of the *beer*

game and the newly developed *SCC game* follow. Where there are two different frames displayed next to each other, the first frame is of the *beer game* and the second frame, the *SCC game*. Reference is made throughout this section of how the innovation and creativity of the learners were incorporated to develop the *SCC game*.

The beer game consists of two files: one help file and the other the *beer game*. Learners simply click on the *beer game* file and the game is available to play. The *SCC game*, on the other hand, is an executable file with a 'dot' msi (.msi).extension that can easily be added to a website or emailed to the learner. The game takes under 5 seconds to install on a computer.

Icons seen on Desktop Immediately After Installing the Games



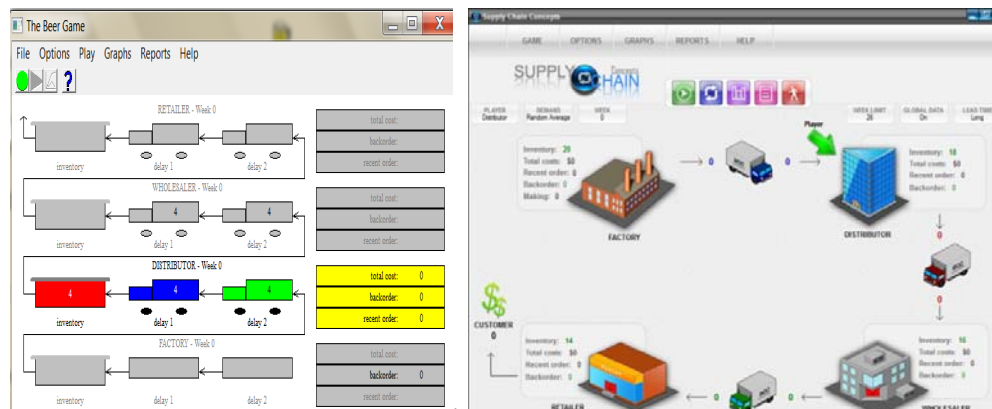
Once the *beer game* is installed, a beer mug appears on the task bar and the first frame appears on the screen, ready for the gamer to start. The beer cup that appears on the task bar at startup and throughout the game was highlighted in the focus group as a subliminal message. In the *SCC game*, the *SCC* icon now appears instead of the beer cup. Once the game is installed, a blue short cut icon with two white arrows (as displayed above) is automatically placed on the on the desktop. As soon as the learner clicks on the short cut, a welcome screen appears. This screen (Frame 1) indicates to the learner where to provide feedback after playing the game. This function can be turned off by unchecking the 'show at startup box on the left in the dialog box' at the bottom of Frame 1.



Frame 1: First screen after clicking on icons on desktop

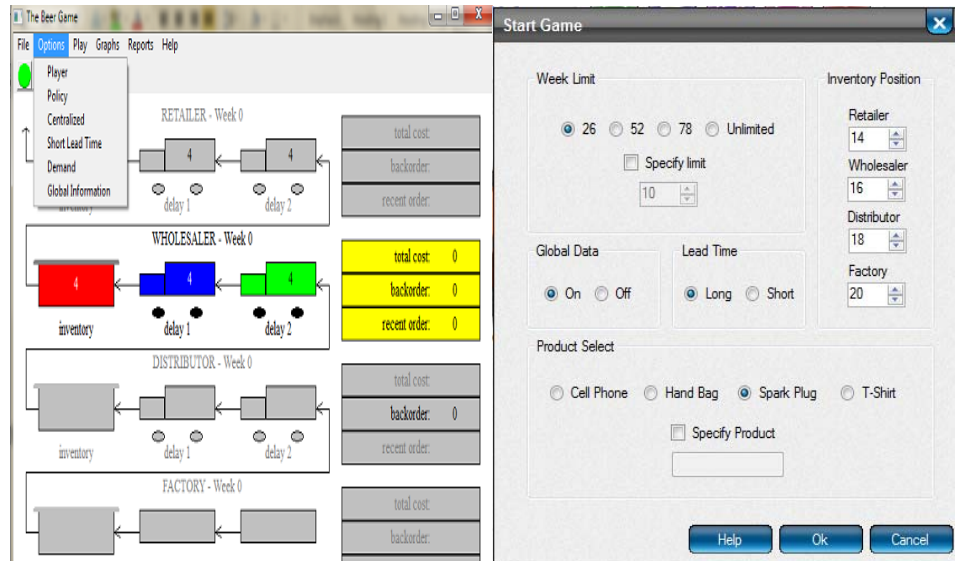
The running heading of *beer game* can be seen on the top left hand side of the screen (Frame 1a). This frame shows the linear nature of the beer game with the retailer, wholesaler,

distributor and factory depicted by trucks, while the customer is not displayed, other than a grey arrow that point upward to the left on the first row (retailer).



Frame 1a: First screen (beer game), second screen SCC

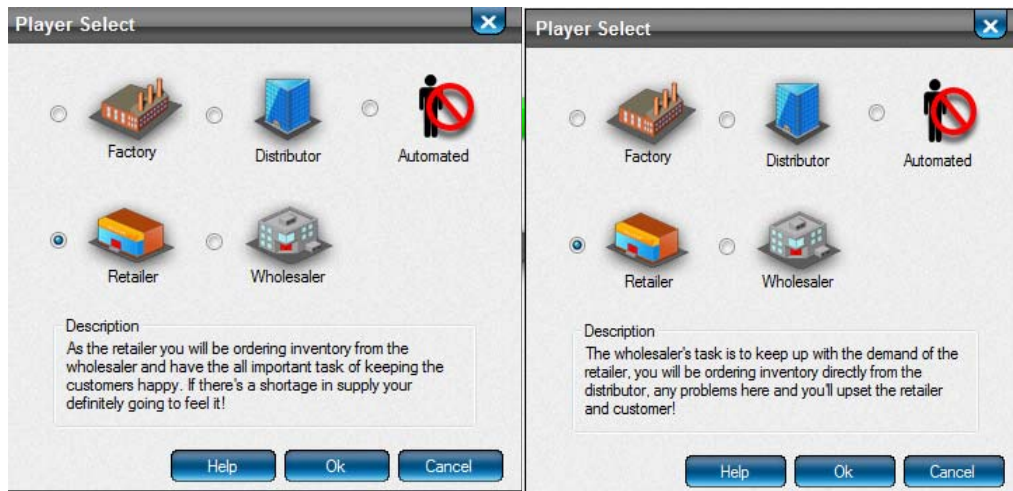
The SCC *game* in Frame 1a displays the changes requested by the learners; that the console of the game should be changed and be made more pleasant to look at; that pictures of every facility, e.g. wholesaler, retailer, distributor and factory; the trucks are displayed. Furthermore, that in between each facility trucks, similar to the ones currently used on the road, should be displayed; the customer's role is added and clearly illustrated by green dollar signs on the console; the player is indicated by a green arrow; the running heading is *supply chain concepts* and can be seen on the top left of the screen, above the menu. All the information in the *SCC game* can be seen at a glance on Frame 1a. At the top of Frame 1a, just under the supply concepts logo almost in the centre, is a tool bar running across from the left to the right side of the game, displaying all the settings in different colours; green, blue, purple, pink and red.



Frame 2: Ability to choose the product

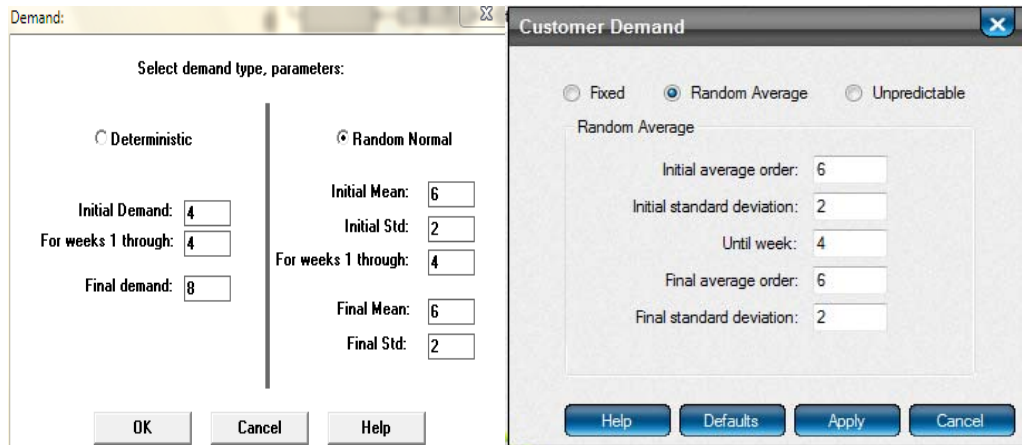
With the *beer game*, as Frame 2 shows, there was no ability to choose the product. As explained previously, this was a very significant point that the learners raised, as they felt that the *beer game* sent 'subliminal messages' in that they were forced to play a game constantly looking at the 'full beer cup' icon on the task bar and a running heading of *beer game* at the top of the console.

With the *SCC game*, learners have a choice as to which product forms their supply chain (see frame 2); cell phone, hand bag, spark plug or choose any other product by checking the 'specify product' box, for example, if they wanted beer, they could type in *beer*. Furthermore, every time a learner wanted to select *week limit*, inventory position, lead time or global information on the *beer game*, they had to go to the menu bar and from the drop down box select one option, choose the option they preferred and then go back to the options bar again, from the drop down box choose another option and so forth (see frame 2). This backwards and forwards to set an option were part of what learners termed 'very clumsy'. With the *SCC game*, all options are visible at a glance (Frame 2) and can be set on one screen, addressing the 'very clumsy' nature of the beer game: the learner can choose any week limit, starting at 26 weeks through to unlimited; specify a week limit by checking the 'specify limit' and scrolling down to select the number of weeks; the inventory position can be set for retailer, wholesaler, distributor and factory; global data can be set either 'on' or 'off'; and either the 'long' or 'short' radio button can be selected for lead time.



Frame 3: Hovering Function

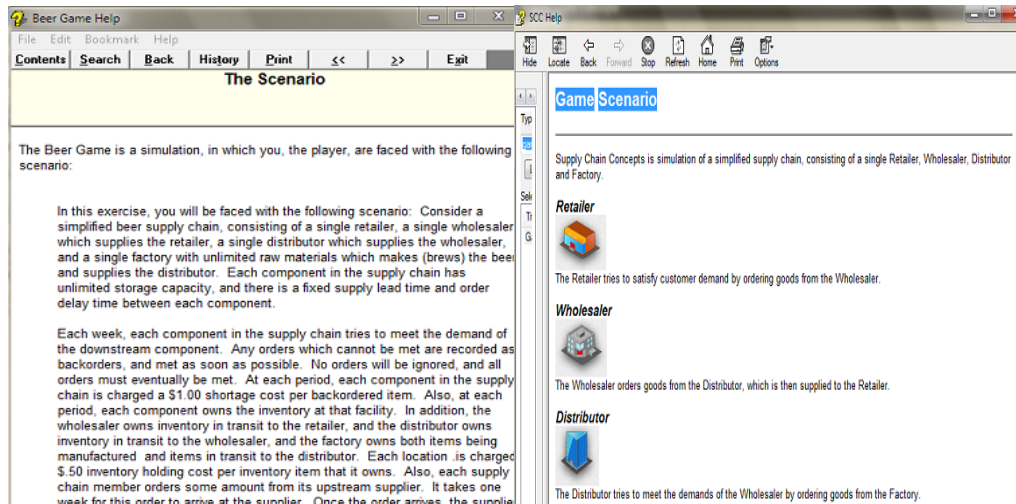
Frame 3 displays two frames from the *SCC game* to illustrate what happens if a player hovers over the retailer or the wholesaler. The player select screen first displays a picture of the different facilities and the automated function. Once hovering over the particular facility of the automated function, a description of the facility appears (see Frame 3). Towards the bottom of Frame 3 three functions are displayed, namely 'Help', 'OK' and 'Cancel'. If the learner is unsure of what to do at this stage of the game, the learner simply clicks on the 'help' option. This option takes the learner directly into the main 'help menu' part of player selection. Within the player select console in Frame 3, the player thus has every opportunity to access the help menu, choose a facility or cancel. Once the player cancels, the player is taken back to the main console in Frame 1a, with all facilities displayed. With the *beer game*, the learner had to 'close/cancel' the player select screen, access the 'help menu' and then search for the 'player select' screen. In Frame 3 every facility is displayed with the same look and feel as the initial console in Frame 1a.



Frame 4: Demand Type Parameters

Frame 4 shows that, for the *beer game*, there are only two demand type parameters to choose from namely 'deterministic' and 'random normal'. The default demand parameter is 'random normal' and the values for both 'random normal' and 'deterministic' parameters are displayed. Once the radio button next to 'deterministic' is checked, the parameter changes from 'random normal' to 'deterministic'. Irrespective of which parameter is chosen, though, the values of both 'deterministic' or 'random normal', can be altered, which may confuse the learner. If the learner is unsure what deterministic or random normal means, Frame 4 shows that the help menu for the *beer game* can be accessed directly from this screen. With the *SCC game*, as Frame 4 depicts, in addition to the 'random normal'(shown as 'random average' in the *SCC game*) and deterministic' (shown as 'fixed' in the *SCC game*),there is an 'unpredictable' option added. This option allows for random generation of demand. This is a critical option, as often, in a real supply chain, the quantity demanded cannot be predicted in advance by the supply chain members.

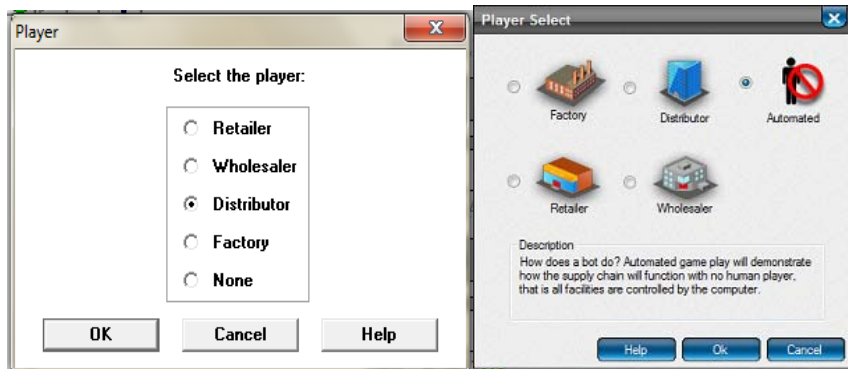
Frame 4 depicts 'Random average' is the default setting for the *SCC game*. Every time the parameter is changed by clicking on the radio button, only one set of values can be altered, which avoids confusion as to which option was chosen by the learner. Furthermore, at any time during the selection, if the learner is unsure what the terminology means, like the *beer game*, the help menu of *SCC game* can be accessed without leaving this screen. The 'help menu' option on the different screens features throughout the *SCC game*. If the learner entered the incorrect values, the default option can be selected to return to the pre-set values.



Frame 5: Help File

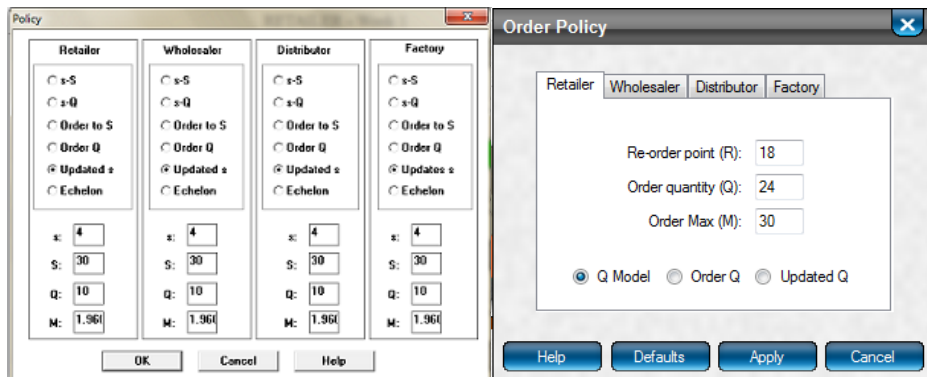
The help file of the *beer game* depicted in Frame 5 is mainly text. The explanation is 'long winded' and explains the game scenario in three paragraphs. The menu tabs in the help file, include 'print', 'back' and 'forward' arrows, 'history', 'search', 'content' and 'exit' option. The help file of the *SCC game* depicted in Frame 5, on the other hand, follows the same theme as the *SCC game* console. Every facility is illustrated by a graphic of that facility, with minimal written explanation. After the introduction of each facility, the game scenario is introduced in two short paragraphs. The general theme and the same graphic display are followed throughout the whole game, irrespective which frame is accessed. The menu bar is displayed by graphics with written words underneath it. In addition to the tabs and search functions of the *beer game* menu, the *SCC game* has a 'stop', 'locate', 'hide' and an 'options' tab.

In addition, the running heading of *SCC* supports the look and feel throughout the whole game, and every screen, including the 'help' screen, displays this heading, while with the *beer game*, even if the look and feel is different, the running *beer game* heading is displayed on every screen.



Frame 6: Selecting a player for the Game

Frame 6 shows that the *beer game* has a linear look and the player can select any facility. With the *SCC game*, the look and feel of the *SCC game*, depicted on every screen, is maintained. Furthermore, for every facility, when hovering over that particular facility, a short written explanation appears, to remind the player what each facility means.

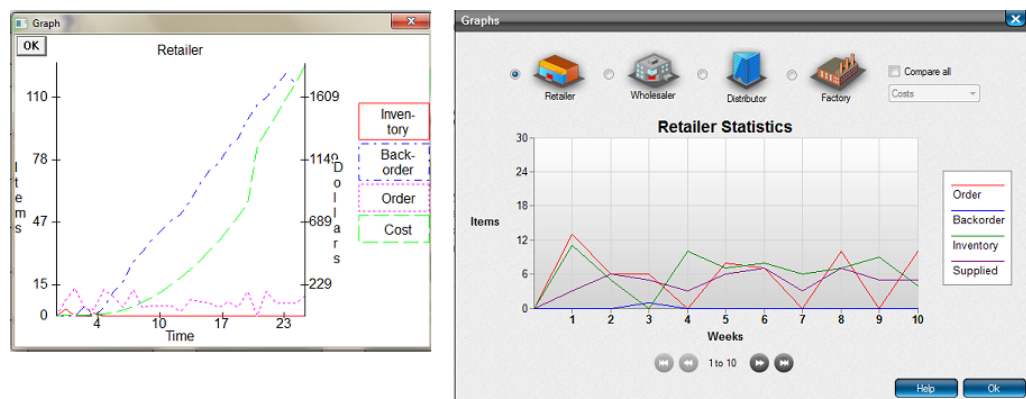


Frame 7: Selecting a Policy

When clicking on the Policy tab under the *'options'* menu (see Frame 7), the *beer game* presents a range of options which could be very daunting to a new player, especially as, in the beginning, the learner does not yet know all the supply chain concepts. For the *SCC game*, when clicking the *options* menu, *'order policy'* appears and can immediately be chosen as an option. As depicted by Frame 7, every facility (retailer, wholesaler, distributor and factory) has six different options to choose from: three options listed and the other three horizontally displayed. After choosing one of the policies for a particular facility (for every facility a policy can be chosen), the values for that policy must be typed in. If the player needs help, the *'help'* function, like with all the other screens, can again be accessed from this screen. Instead of policy on the top left of the screen, the *SCC game* displays order policy.

This is an import change as the heading is clear and prevents any doubt that the player may have when this screen is accessed.

Furthermore, On the SCC 'order policy' screen, there are four tabs representing the four facilities namely the retailer, wholesaler, distributor and the factory. The re-order point, Order quantity and order maximum is set individually for every facility. Once the quantities for one facility is set, for example, retailer, the wholesaler tab is chosen, the quantities are set until all tabs have been accessed and quantities have been set. While setting the quantities for each facility, one of three models (Q model, Order Q and Updated Q) can be chosen. For every facility, a different order model can be chosen. The three models of the SCC game depicted in Frame 7 replace the need for a screen with the four facilities and six linear options of the beer game. In addition, Frame 7 of the SCC game provides the player with options which are clearer and less daunting than the beer game-yet the functionality remains the same.

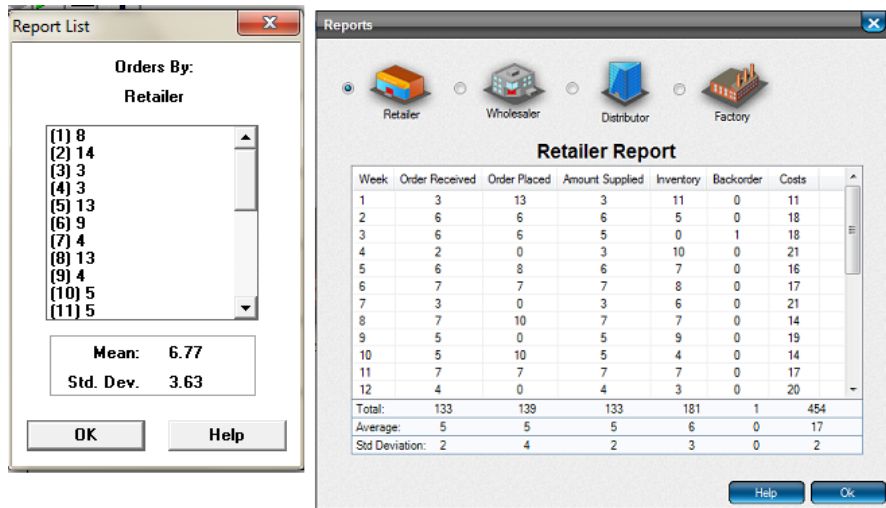


Frame 8: Graphs

With the beer game, as Frame 8 clearly shows, white space is significant when viewing the graphs. This particular graph of the beer game displays the retailer statistics over a period of time. If another facility's graph is needed, then the player needs to exit the retailer graph, click on the graphs menu and select the facility.

Frame 8 of the SCC game carries the same theme of the entire game over into the graphs menu, so that the familiar look and feel remains. The picture and radio button for every facility is thus displayed on the screen and, should the player want to view another facility's graph, the radio button for that facility is simply checked and that particular graph is

displayed. Therefore, once the graphs menu is accessed, the learner does not have to exit again to access another facility's graph. In addition, there is an ability to compare the graphs of the facilities to each other.



Frame 9: Report Format - Retailer Statistics

When accessing the report menu (see Frame 9), the player has a choice as to which report will be displayed. For the *beer game*, the report menu is linear and shows the week and the orders for that week. Below the week and orders for that week, the standard deviation and the mean for the order period is shown. The report format for the *SCC game* provides a more detailed categorised report, including the orders received, orders placed, amount supplied, back orders and costs. At the end of every column, the total for every category is calculated. Furthermore, the mean and standard deviation for each category is displayed under the total row. Should the player need a report on any other facility in the supply chain, a simple click on the radio buttons for that particular facility (graphically displayed with the same look and feel as the other screens) will provide the information.

APPENDIX 8: FOCUS GROUP PROTOCOLS

FOCUS GROUPS: 2008

Focus group number: _____
Year _____
Moderator: _____
Co- Moderator: _____
Date of focus groups: _____
Session number: One _____ Two _____

Two sessions held: 9 students per session

Purpose: To provide students with

- **an avenue to vent their frustration**
- **an opportunity to use their creative skills with regards to the *beer game***

Focus: Beer game

- *their experience thus far on the SCM course*
- *what can be done to motivate them – regarding the beer game*
- *any changes or improvements*
- *extreme nature of improvements*
- *which considerations should be taken into account.*

Moderator: Remember take along:

- **Recorder**
- **Pen**
- **Spaces are left in between questions to jot down something if needed**

Arrange room beforehand, seating, horseshoe, moderator sits at the top of the horseshoe in the U – part, and co-moderator sits to the left of the moderator at the start of the U - part.

At start of Session:

Thank you for agreeing to participate in this group exercise. I already received your personal information from you when you provided written consent to participate in this PhD study. In addition, the results from this focus group may lead to improvements of this course and possible publication in journals. During the information session, I explained that, for ease of transcription and in order for me to concentrate on what you say; I will be recording this session. From time to time I might jot down something that I may want to ask you more about. Please allow me to introduce the co-moderator who will spend this session with us. He/she will just sit in to ensure the ethics obligation is met, as explained during the information session. I will ask you about your experience on the course thus far. Based on the observation in class, I would also like to know what motivates you, your feelings about the beer game and any ideas or recommendations that you have regarding it. As arranged beforehand, this session will take no longer than 1 hr. I may, from time to time, put you back on track to ensure we keep within that hour. Do you have any questions before we start?

A: Personal information collected prior to the focus group

1. What is your age? _____ (years)

2. Gender: female male
3. Marital status _____
4. Live with family, who? _____
5. Where do you live? _____
6. Who do you live with _____
7. How do you travel here every day? _____ with whom?
8. Past Experience?
9. What are your interests, hobbies?

10. What is your highest level of education/qualification?

11. Do you work after classes, weekends and what kind of work?

12. Any other interesting information that you want to share

B: Student's responses to the beer game

1. Think of your experience thus far on the course. How would you describe it?

2. If they did not mention it yet, probe: How would you describe your experience with the beer game

3. (If they do not provide the information needed, probe). You play an important role in your education. What can be done to get you fired up again? (If more probing is needed,) what can be done to the beer game to motivate you

4. (If improvements changes not mentioned yet, probe). Consider the beer game. Can you see any changes/improvements?

5. (Probe, if necessary). How extreme should these improvements/changes be

6. Which considerations do you think should be taken into account?

That brings us to the end of this session. Thank you very much for participating in this focus group and for contributing towards improvement. As agreed, you are free to get a copy of this information. You do have direct contact with me if there is any other information that you would like to know about regarding this project.

FOCUS GROUPS: 2009 Session 1

Focus group number: _____
Year _____
Moderator: _____
Co- Moderator: _____
Date of focus group: _____

One session only: 11 participants

Purpose: to obtain information so that learning could be connected to past experience

- **And be used to engage students in their learning**

Focus: Connect learning, engage students

- *Daily activities before you started the course*
- *Experience with technology*
- *Experience with software applications*
- *What would you like to achieve by the end of this course.*

Moderator: Remember take along:

- **Recorder**
- **Pen**
- **Spaces are left in between questions to jot down something if needed**

Arrange room beforehand, seating, horseshoe, moderator sits at the top of the horseshoe in the U – part, and co-moderator sits to the left of the moderator at the start of the U - part.

At start of Session:

Thank you for agreeing to participate in this focus group. I already received your personal information from you when you provided written consent at registration to participate in this PhD study. In addition, the results from this focus group may lead to possible publications in journals. During the information session at registration, you were explained that, for ease of transcription and in order for me to concentrate on what you say; I will be recording this session. From time to time I might jot down something that I may want to ask you more about. Please allow me to introduce the co-moderator who will spend this session with us. He/she will just sit in to ensure the ethics obligation is met, as explained during the information session. I will ask you about a few questions about what you did before you enrolled on this course, how much you know about technology and software and what where you would like to be by the end of this semester. As arranged beforehand, this session will only take 30 minutes of your time. I may, from time to time, put you back on track to ensure we keep within the 30 minutes. Do you have any questions before we start?

A: Personal information collected prior to the focus group

1. What is your age? _____ (years)
3. Gender: female male
4. Marital status _____

5. Live with family, who? _____
 6. Where do you live? _____
 7. Who do you live with _____
 8. How do you travel here every day? _____ with whom?
 9. What are your interests, hobbies?

 10. What is your highest level of education/qualification?

 11. Do you work after classes, weekends and what kind of work?

 12. Any other interesting information that you want to share

- 1. B: Student's responses connecting learning and engaging in the course**
1. Before you started this course, can to tell me what you did to fill your day?

 2. If necessary, probe: on a daily basis, what did you do?

 3. This question is about technology. What experience using technology do you have

 4. Anyone involved in developing tech? If yes, probe: what exactly did you develop? What does it look like? What is it used for?

 5. What type of software have you worked with? For how long?

6. Think about the end of the semester. What do you hope to achieve? Probe, if necessary, do you have any goals that you would like to achieve by the end of this semester?

That brings us to the end of this session. Thank you very much for participating in this focus group and for contributing towards improvement. As agreed, you are free to get a copy of this information. You do have direct contact with me if there is any other information that you would like to know about regarding this project.

FOCUS GROUPS: 2009 Second

Focus group number: _____
Year _____
Moderator: _____
Co- Moderator: _____
Date of focus groups: _____

One session: 11 students per session

Purpose: To gauge their previous experience of field trips so that they can prepare themselves, make them comfortable with the idea of juniors on the trip

Focus: Field trip pre

- *their experience of field trips*
- *how seniority, in the past, made them feel*
- *juniors on the trip-how do they feel*
- *what would they like to see.*

Moderator: Remember take along:

- **Recorder**
- **Pen**
- **Spaces are left in between questions to jot down something if needed**

Arrange room beforehand, seating, horseshoe, moderator sits at the top of the horseshoe in the U – part, and co-moderator sits to the left of the moderator at the start of the U - part.

At start of Session:

Thank you for agreeing to participate in the second focus group session. I already have your your personal information and written consent to participate in this PhD study. As you are aware, the results from this focus group may be used for publication in journals. During the information session, as before, I would like to record this session, so that I can concentrate on what you say. Again, from time to time I might jot down something that I may want to ask you more about. You have been introduced to the co-moderator, Mrs....., as she works here at this institution, so, when she arrives she will sit in the empty seat. This session is about the forthcoming field trip and I would like to gauge how you would feel if another class joins us on the field trip. As arranged beforehand, this session will take no longer than 1 hr. I may, from time to time, put you back on track to ensure we keep within that hour. Do you have any questions before we start?

A: Personal information collected prior to the focus group: this information has already been gathered.

B: Student’s responses to the field trips

1. In today’s session, I would like you to think of field trips that you have been on before. Can you share your experiences ?

1. If probe is necessary: Your schools or clubs that you belong to, did you ever go to activities outside the school/club ?

2. Have you ever had other groups with you that were younger than you?

3. (Probe, if necessary). Or did you have a system, at the school or club, where you held a position, or where you were given some authority? Probe, if necessary: Think in terms of your class, school – were you class captain, prefect or group captain(sports or club)?

4. How did that make you feel? Probe, if necessary: Did you enjoy it/not enjoy it? Why?

5. How would you feel if another class went with us?

6. Can you share any experiences of going with another group?Probe if necessary: How did it make you feel?

7. There is a big possibility that a junior class will accompany us on the field trip. How will you handle that?

8. The company that we are going to specializes in forestry and technology plays a significant role in their operations. Is there anything that you would like to see?

9. We will first visit the head office about 10 minutes from here. Is there anything in particular that you would like them to address?Probe, if necessary: Is there anything that you would specifically like them to talk about?

10. After the head office, we will go to the manufacturing plant, about 35 minutes away. Have you been to a manufacturing plant before? What are the types of activities/specific things that you would like to see about their operations?

This is a very important trip, as you will see the practical part of the operations. Do you have any questions or is there something else that you would like to discuss?

That brings us to the end of this session. Thank you very much for participating in this focus group and for contributing towards improvement. As agreed, you are free to get a copy of this information. You do have direct contact with me if there is any other information that you would like to know about regarding this project.

FOCUS GROUPS: 2009

Focus group number: _____
Year _____
Moderator: _____
Co- Moderator: _____
Date of focus groups: _____

One session: 10 – on student did not come on field trip, due to prior sport engagement

Purpose: Debrief after the field trip and to help them recall and make the terminology and experience memorable, so that they can think of it when in class

Focus: Field trip post

- *their experience of this field trip*
- *new knowledge gained*
- *juniors on the trip-how do they feel now?*
- *How can they integrate knowledge in classroom.*

Moderator: Remember take along:

- **Recorder**
- **Pen**
- **Spaces are left in between questions to jot down something if needed**

Arrange room beforehand, seating, horseshoe, moderator sits at the top of the horseshoe in the U – part, and co-moderator sits to the left of the moderator at the start of the U - part.

At start of Session:

Thank you once again for agreeing to participate in the third focus group session. I already have your personal information and written consent to participate in this PhD study. As you are aware, the results from this focus group may be used for publication in journals. As before, I would like to record this session, so that I can concentrate on what you say. Again, from time to time I might jot down something that I may want to ask you more about. You know the co-moderator, just in case you see another person coming into the room. You have now completed your field trip and I would like to gauge how you feel now, both about the trip and about the junior class joining us. As arranged beforehand, this session will take no longer than 1 hr. I may, from time to time, put you back on track to ensure we keep within that hour. Do you have any questions before we start?

A: Personal information collected prior to the focus group: this information has already been gathered.

B: Student's responses to the field trips

1. In today's session, I would like you to think of the field trip. What new knowledge have you gained on the trip?

2. Probe, if necessary – would you like to share that knowledge with the group?

3. Now about the juniors that went with you on the trip. How did that make you feel?

4. (Probe, if necessary). Are there any particular things about having them on the trip that you would like to share with the group?

5. Now let's get back to your experience on this trip and the knowledge that you gained. How do you think you can apply it in class?

6. Is there anything in particular that stood out for you?

7. Probe: Think about the theory we completed in class. Is there anything that you could connect with what you saw and experienced on the field trip?

8. If there is one thing that you will remember about the trip, what will it be?

9. Think of your previous field trips: what was similar and what was different?

That brings us to the end of this session. Thank you very much for participating in this focus group and for contributing towards improvement. As agreed, you are free to get a copy of this information. You do have direct contact with me if there is any other information that you would like to know about regarding this project.