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Knowledge Sharing in an Emerging Industry Cluster:
A Saudi Arabian Case Study

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Declaration

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

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

Signed: _____ Aliah Zafer _____

On: 05/04/2017

DEDICATION

I dedicate this thesis to my parents, Hanaa and Mohammed and to my beloved family.

Acknowledgements

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List of Abbreviations

CU: Cluster University.

ECA: Economic Cities Authority.

ED: Economic Developer.

GCC Countries: Gulf Cooperation Council Countries.

HCA: Human Capital Authority.

HMF: Horizontal Manufacturing Firms.

ICP: The Industry Collaboration Program.

ICT: Information and Communications Technology.

PCS: Port Communication System.

QMS: Quality Management system.

SA: Saudi Arabia.

SAGIA: Saudi Arabian General Investment Authority.

SAM Cluster: Saudi Arabian Manufacturing Cluster.

V: Vertical Actor.

List of Special Terms

(Bai'ah): Allegiance

(Hajj): An annual Islamic pilgrimage to Mecca

(Ikhtilat) Mixed gatherings of males and females

(Sharia): Islamic Law

(Zakat): Religious Tax system in Islam

Abstract

This research study represents one of the first systematic investigations on the topic of Knowledge Sharing in an Emerging, government-driven Industry Cluster in the Saudi Arabian (SA) context. The research uses the Value Added Web (VAW) (Brown et al. 2007) framework as an analytical tool to classify the key actors, links, interactions and nature of their strength in the Saudi Arabia Manufacturing Cluster (SAM Cluster). The SAM Cluster is a new emerging cluster located in an economic city, developed and led by Saudi Arabia General Investment Authority (SAGIA). The key actors who participated in the study are categorized into lateral actors including: SAGIA leading the sole regulator of the cluster that is the economic cities authorities (ECA). It is also leading subdivisions that are the human capital authorities (HCA); the main economic development agency (ED) and the Cluster University (CU). The horizontal actors include six Manufacturing Firms (HMF). The vertical actors include the seaport and one logistics and warehouse vertical firm (V1).

The aim of this research is to examine the impact of clustering on facilitating knowledge sharing activities in the context of the Gulf Cooperation Council (GCC) countries. One principal research question and four supporting objectives were created. The objectives were developed based on a supporting framework and theories (i.e., VAW framework and the sources of influence conferred by proximity). The theoretical framework underpinning this research "factors influencing knowledge sharing in an emerging cluster" was developed and partly adapted from the research conducted by Mitchell, Burgess and Waterhouse (2010) and from past empirical findings. The factors examined in the research are: absorptive capacity, Knowledge of expertise location, inter-organisational trust, social capital, and accessibility. The influence of these factors on generating effective knowledge sharing processes and mechanisms is examined in the research study.

A qualitative approach was undertaken to address the research questions. The data were gathered using documentary analysis and semi-structured interviews with people in key managerial positions representing different actors in the cluster. Multi- source data (i.e., analysing documents of different actors) were utilised for triangulation purposes. The questions were developed in different formats depending on the actors interviewed. The documentary analysis includes financial reports, presentations for investors, fact sheets, flyers, brochures, official email messages, and conference reports. Interviews were conducted with 39 participants representing lateral, horizontal and vertical actors in the cluster including

government officials, owners, managers and engineers. The participants were either interviewed face-to-face or by using Skype or phone.

The findings emerging from this research indicate that the leadership and dominant roles of lateral actors is highlighted in the SAM cluster in its developmental stages. Lateral actors, especially the government, are responsible for leading, controlling, developing the cluster and supporting the collaborative cluster activities, thereby, enhancing the mechanisms and processes of knowledge sharing. Some possible explanations for the lateral actors' dominant role and the dependence of horizontal actors for guidance and leadership are discussed. The importance of the proximity of these actors, infrastructure and services in the SAM cluster was confirmed with this research. The findings also provide evidence that the use of the VAW as an analytical tool is important in studying knowledge sharing within industry clusters during early stages of development.

The results of this research indicate that knowledge sharing activities implemented in the cluster through lateral actors facilitate the development of dynamic social capital in the cluster as a result of proximity, personal interaction, informal and formal mechanisms. Due to the fact that the cluster itself is still developing, there are few horizontal and vertical actors at this stage of development. The research findings indicate that all of the actors in the cluster have developed synergies and a collective vision, resulting in a common business purpose, shared norms and values for the SAM cluster. The potential of generating bridging capital in the cluster results from the leading and dominant role of the lateral actors who link actors that ordinarily would not be linked. This thesis makes several contributions in terms of theory, conceptual understanding, methods and policy development. These contributions are discussed in detail in chapter seven along with the identification of the research limitations.

Chapter 1: Introduction

1.1 Background

"My first objective is for our country to be a pioneering and successful global model of excellence on all fronts, and I will work with you to achieve that". **King Salman Bin Abdulaziz Al Saud –Custodian of the Two Holy Mosques** (Saudi Vision 2030 plan 2016, 5).

This research examines how knowledge sharing is facilitated within an emerging, government-directed manufacturing industry cluster based in Saudi Arabia (SA). Existing research around industry clusters to date has focused on regional development and growth. Clustering is emphasized by most innovation policies at both the national and regional levels as being a major contributor to competitive and economic success (OECD 1999, 2001). Industry clusters are conceptualised as a value-adding amalgamation of the contributions of various actors who are within proximity of one another (Brown et al. 2010; Brown et al. 2008, 2007). However, the question of the mechanisms through which proximity adds value to cluster members remains unresolved (Gnyawali and Srivastava, 2013; Bell et al. 2009; Brown et al. 2007; Knoben and Oerlermans 2006). Although there is evidence that the effectiveness of a cluster and the capacity of its actors to innovate can be improved by knowledge creation, the influence of clusters in the facilitation of knowledge sharing during the initial stages of cluster development is in need of further exploration (Ibrahim and Fallah 2005; Malmberg and Power 2005). This thesis seeks to bridge the gap in research by examining what role emerging clusters that are driven by government play in knowledge sharing. The development of cluster-based policies represents an attempt to guide the economy towards greater industry diversification and job generation in emerging economies such as Saudi Arabia (Amin 1999). As Rosenfeld (2002b, 5) observes, "Conceptually, industry clusters have become the sine qua non of economic development policy in many parts of the world." This study relies on Porter and Stern's (2001) understanding of clusters as the broadest assortment of types of specialised industry localisations. Synonymous terms for clusters that are frequently found in the scholarly literature include industry district, industry cluster, and regional cluster (Maskell 2001; McDonald and Vertova 2001; Simmie and Sennett 1999). In an earlier work, Porter (1998, 1999) describes a cluster as "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities." Gordon and McCann

(2000) highlighted that the mere proximity of a firm facilitates cost reductions, knowledge sharing, and access to capital infrastructure. There are, however, other factors in the industry clusters that are required for knowledge sharing and enhancing competitive advantage (Connell and Voola 2013). Porter (2001, 15) defines a cluster as a "geographical concentration of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions in a particular field that compete but also cooperate." This is a foundational understanding used in the current research. Steinle and Schiele (2002, 850) observe that clusters are formed through a "process of development of locally rooted value-creating systems" that drive wealth-creation within a region, primarily through creating a competitive advantage for the region via the export market. Porter (2000) concludes that when competing firms cooperate, they create a stronger entity that will better attract customers, suppliers, skilled labour, and complimentary service providers into one geographic region. Diverse activities can help attain higher productivity with access to knowledge, external resources, and industry-wide competitive advantage (Dahl and Pederson 2004).

Industry clusters display three dimensions: networking within entities, networking among companies and institutions, and providing geographical proximity. Khan and Ghani (2004) explain that the geographical dimension pertains to accumulating firms in local proximity. Networking refers to the relationships structured among entities companies within the cluster; institutional networks are the alliances, both formal and informal, and between business and governmental organisations in the cluster (Cuervo-Garcia et al. 2008). According to Coleman (1990), institutional alliances and networks contribute to the development of social capital. Moreover, clusters possess a set of tangible assets including infrastructure, and intangible assets including technology and knowledge. Additionally, the institutional elements of training, research, and public administration centers behave in an interconnected manner within geographic proximity.

Gordon and McCann (2000) maintain that the mere proximity of firms facilitates cost reductions, knowledge sharing, and capital infrastructure access. There are, however, other factors in industry clusters that are required to create an environment of knowledge sharing and competitive advantage improvement (Connell and Voola 2013). To date, it appears that evidence demonstrating extensive knowledge sharing processes in clusters and improved economic performance has been inconclusive (Cortright 2002). Waits' (2009) analysis of a US cluster in Arizona, found that clusters support organizational development and service

delivery in the involved firms. Cortright (2002) argues that the creation of knowledge processes differs from area to area and is influenced by regional culture and institutions.

There has been limited research to date in the context of the GCC countries as to the factors facilitating cluster creation and growth. Also missing in the research is an understanding of how clusters facilitate knowledge sharing to achieve competitive advantage and economic development goals (Migdadi 2009; Yeo and Marquardt 2013; Yeo and Gold 2014). In this context of emerging industry clusters, an important issue is how the strategic support of knowledge varies among clusters as it relates to local institutions, policies and collaborative activity (Al-Alawai et al. 2007; Al-Adaileh and Al-Atawi 2011; Migdadi, 2009; Yeo and Marquardt 2013). For instance, Al-Adaileh and Al-Atawi (2011) examine the role of the knowledge exchange (KE) practices within the case of the developing Saudi Telecom Company (STC) as a representation of the Saudi Arabian context.

The present study advances the understanding of how knowledge sharing takes place in an emerging industry cluster and its potential impact on economic development. The research is innovative because it examines cluster specifically in a new economic city; secondly, it examines an emerging cluster in the early stages of development; thirdly, the cluster under study is driven and organised through the central government; and finally, the cluster forms part of a structured industrial district within a hub of similar manufacturers.

1.1.2 The Importance of Industry Clusters

Marshall (1920) introduced the concept of industry clusters as describing locally-owned and smaller firms grouped together in order to make decisions on investments and production (McDonald and Vertova 2001; Parto 2008). According to Markusen (1996), a district is a stable community with a strong local cultural identity and shared expertise in the industry. A business network, on the other hand, is described as a group of firms maintaining ongoing relationships, leading to collective learning and innovative processes (Giuliani and Bell 2005). Connell and Voola (2013) note that participating in a business network enables firms to carry on economic activities to generate sales and profits, including joint production, marketing, exporting and exchanging information all in support of reducing the risks and costs associated with new products and services. This study focuses on identifying mechanisms and industry relationships within industry clusters. Knowledge creation, acquisition, dissemination, and sharing are important aspects of the knowledge management literature that are incorporated into this research study (Richardson 2013).

Researchers note that an important reason for establishing an industry cluster is for broadening economic horizons and providing employment opportunities (Delgado, Porter, and Stern 2015). Rapid technological advancements are among factors that encourage small and medium-sized enterprises (SMEs) to expand their activities in the global marketplace (Fang, Liang, and Jia 2011). Eisengerich et al. (2012) posit that this process is supported through knowledge sharing among institutions as a way of stimulating competitive advantage and regional economic development.

1.1.3 Industry Clusters Support Knowledge Sharing

Cummings (2003, 1) defines knowledge sharing as the means by which "organizations obtain access to its own and other organization's knowledge." Clustering presents a situation of both collaboration and competition, and horizontal and vertical integration within the same industry. As a result of this duality, clustering is likely to assume a significant role in improving the knowledge sharing activities and competitive advantage of firms participating in the cluster (Connell, Kriz, and Thorpe 2009). Cross-organisational knowledge sharing can help create, promote and sustain competitive advantage (Chandran 2004). Successful industry clusters can also provide access to efficient, effective, inexpensive, and specialised means of production, including specialised knowledge (Arikan 2009). What is implied in cluster development is that the firms' success is interrelated as they rely on shared resources. When firms reduce transaction costs through sharing knowledge, this improves their competitiveness, enables them to experience enhanced growth, create jobs and contribute to regional wealth (Dreier, Mollenkopf, and Swanstrom 2001). Collaboration in emerging industry clusters is essential because it can facilitate efficiency and the full potential of the cluster (Dai and Zang 2014). Das and Das (2011) argue that there should be coordinating processes to manage knowledge sharing within clustered industries.

In developing economies like Saudi Arabia and the United Arab Emirates, industry clusters are becoming an important policy tool to facilitate the diversification and development of the economy. The European Commission notes that knowledge sharing in clusters creates a more productive environment for competitive advantage and for stimulating economic growth (Arun 2015 citing European Commission 2006). Initiatives are undertaken by global institutions, including the Organization for Economic Cooperation and Development (OECD) and the World Bank have played a significant role in developing industry clusters (Gretzinger

and Royer 2014). These institutions aim to find a successful industry cluster and support the participants in generating and sharing knowledge (Guo and Li 2012).

The contemporary marketplace emphasizes communication between organisations and within an organisation (Hunter 2013) which implies that knowledge sharing between these firms is important. Moreover, new approaches for sharing knowledge among firms in clusters to enable competitive advantage are needed for example knowledge relating to logistics, media and marketing (Jinyang 2015; Kesidou and Snijders 2012).

1.2 Research Questions

This research examines knowledge sharing mechanisms in an emerging and government-controlled cluster in a Saudi Arabian economy. The research focuses on two aspects of industry clusters: 1) the extent to which an emerging industry cluster organises and supports knowledge sharing mechanisms, and 2) how, through clustering, proximity may influence knowledge sharing processes and exchange among the cluster firms. The following research question forms the basis of this study: How does clustering support knowledge sharing in an emerging, government-directed industry cluster in Saudi Arabia?

Sub research questions include the following:

1. How does the value-added web analytical framework of cluster analysis apply in an emerging, government-driven industry cluster?

2. Who are the key actors that support knowledge sharing in the cluster?

3. How does knowledge sharing happen within the cluster?

4. What are the barriers to knowledge sharing?

5. What are the lessons and implications from the research for government policy on clusters?

The research questions are driven by theories and types of knowledge, the main actors in the Saudi Arabia Manufacturing (SAM) cluster, and barriers to knowledge sharing in the cluster. Given the focus of the study, the research examines how proximity may contribute to the development of social capital aspects including bonding and bridging capital. It also examines the absorptive capacity of clustered firms, including a firm's ability to identify and assimilate knowledge. It examines the building of knowledge of locational expertise, inter-organisational trust, accessibility and the reduction of barriers to knowledge sharing (Brown

et al 2007, 2010; Connell and Thorpe 2012; Mitchell et al. 2010). Martin and Sunley (2003, 7) note the following concerning clusters:

> "The mere popularity of a construct is by no means a guarantee of its profundity. Our argument here is that seductive though the [cluster] concept is, there is much about it that is problematic, in that the rush to employ "cluster ideas" has run ahead of many fundamental conceptual, theoretical, and empirical questions."

Therefore, it is argued that the potential benefits of knowledge sharing in industry clusters should be empirically studied to inform public policy development. This research examines an emerging cluster located in the Western Region of SA to provide context and an understanding of the knowledge sharing processes within this developing cluster.

1.2.1 Research Design

This project involves qualitative data-collection techniques within the cluster. The value adding web framework (Brown et al. 2007) is used to map the cluster actors and identify the different participants in the cluster. Through the analysis of documentary evidence, together with semi-structured interviews with key actors in the cluster, the research examines the development of knowledge sharing mechanisms, and considers the facilitators and obstacles that are present in the knowledge sharing process.

The main foundation of this research is the constructivist epistemology which is the extent that reality is created by the observer by giving meaning to what she observes. In that regard, there is no objective truth as all phenomena are subject to interpretation by the observer (Guba and Lincoln 1998). The researcher used qualitative methods, which comprised interviews, case study, and documentary analysis. This approach includes interviews using semi-structured questions. These questions are based on reviews of the literature, a number of predetermined questions, and specific research issues. The questions were asked in a systematic and consistent order; although there was a degree of freedom given to the interviewees (Berg 2004).The interviewer sometimes added or deleted probes to the interview questions between subsequent subjects (Berg 2004).

The researcher interviewed 39 participants comprising different horizontal, vertical, and lateral actors on both the web and firm levels of the SAM cluster. Some of the interviews were transcribed, but some were not due to the participant's wishes. The detailed information about participants is discussed more in Chapter Four of this thesis. The results were coded and analysed using Nvivo 10 (Creswell 2003). Data were categorised by the major important

themes of the study. Case study results were compared and contrasted both at the firm level and between firms and web levels of the SAM cluster. Moreover, relevant cluster literature and industry documents inform the study. These documents include public records, cluster-specific and firm-specific documents, and other documents provided by the regulator (ECA) regarding business and cluster strategies. Since the study involved investigating the role of knowledge sharing within industry clusters in Saudi Arabia, the participating interviewees were chosen carefully to ensure that they are representative of the region. Besides the case study, interviews and documentary analysis of the SAM cluster were used as a source of data collection for this study. Different sources of electronic and hard copy documents from all of the participating actors were organised and analysed in order to enrich the process of data analysis. Government reports, Investor Relations Presentation s, annual progress reports, magazine, brochures, newsletters, and official websites and company profiles were analysed as part of this process.

The process of data collection took place in different stages in late 2013 and early 2014. Therefore, the collected data represented a snapshot of the SAM cluster during each period of time. At the web level, interviews were conducted with the cluster directors, managers of partner relations and cluster facilitators. The researcher used the cluster managers and facilitators to distribute invitation emails to cluster firms to ask if representatives would participate in the study. At the firm level those people who were interviewed for the study included CEOs, owners, managers, and Human Resource (HR) managers, and other relevant employees. This allowed for data comparison within the cluster. The key positions were interviewed and are described in detail in the methodology chapter of this thesis.

Once organized and transcribed; the interview data were analyzed using the Nvivo 10 software package (Jones 2007). Consequently, in addition to analysing the findings from each actor, the researcher utilized the search and compare node ability of Nvivo10, which helped to identify key areas related to the relevant research issues and factors in the SAM cluster (Nvivo 10 2012). In accordance with the Australian Code for the Responsible Conduct of Research, data will be stored securely at Curtin University for a minimum of five years after publication (Australian Code for the Responsible Conduct of Research 2007). Such practices also protect the legal rights of the candidate and others.

Curtin University provided all of the facilities and essential resources necessary to conduct the research, including computer, printer, photocopier, voice recorder and scanner access; and

Nvivo software. In addition, the Saudi government, which is the sponsor of the researcher's scholarship along with Curtin University, provided a special fund for travel and accommodation for data collection. There are four phases to the research design. Stage 1 includes planning and designing the research in light of the theoretical foundations. Stage 2 examines the literature on clusters and knowledge sharing in order to locate this research. Stage 3 includes developing the research methods attached to the research process. Stage 4 evaluates the evidence from the cluster research and considers its implications.

1.3. Contribution of the Research

This research contributes to the extant literature on the role clustering plays in knowledge sharing in an emerging government driven cluster is in five specific areas:

(1) The criticality of the role of lateral actors (the government, the economic developer and the university) in planning, developing and implementing the process of leading, guiding, and supporting people in the cluster because of the newness and emerging nature of the cluster.

(2) The role of proximity and co-location of horizontal firms and important lateral actors, and their collective knowledge and expertise. Proximity promoted by government agencies facilitates the absorptive capacity of actors, encourages trust building through shared norms and values, and provides access to valuable tangible and intangible resources including knowledge sharing.

(3) The strong and direct relationships between lateral and horizontal actors (the firms) that facilitate knowledge sharing at the web level.

(4) The limited engagement of horizontal actors in the process of knowledge sharing networking (bonding capital) resulting in reluctance to share know–how due to lack of trust in the exchange between actors. The immaturity of the cluster can be a factor that inhibits the development of networks and knowledge sharing mechanisms. This is due to the horizontal actors being overly dependent on lateral actors in facilitating the process of knowledge sharing, which impedes the development of social capital between the horizontal actors. It also creates a challenge for horizontal actors' sustainable knowledge sharing activities in the future.

(5) Due to the immaturity of the cluster, there are few vertical and horizontal firms at a

mature stage of cluster development. As a result, many of the links are external, rather than internal to the cluster and are mediated by the lateral actors.

This thesis makes important contributions given that a large portion of recent research has been focused on ontological investigation, description, categorisation, and conceptualisation of knowledge sharing in clusters (Brown et al. 2010; Knoben and Oerlermans 2006). This research provides an explanation of the underlying assumptions and causes for this by synthesising research from diverse research streams such as public policy, economic geography, entrepreneurship, social network theory, institutional economics, and human resource management. The thesis responds to the lack of in-depth research on knowledge sharing within emerging clusters, specifically in SA and the Gulf Cooperation Council (GCC) countries in general (Caniëls and Romijn 2005; Ibrahim and Fallah 2005; Malmberg and Power 2005). Moreover, applying the value-added web analytical framework of cluster analysis (Brown et al. 2007) in an emerging, government-driven industry cluster adds a new dimension to existing research on industry clustering.

There have been policy-driven processes to promote innovation and knowledge sharing in clusters around Saudi Arabia (Yeo and Gold 2014). Understanding factors influencing knowledge sharing in the country can enhance learning in other GCC countries' emerging clusters. Moreover establishing emerging industry clusters can create productive relationships and garner collaboration among industry and government entities. This serves to extend cluster membership by disseminating information concerning the benefits and challenges of knowledge sharing.

Another important contribution of this research is in identifying the type of knowledge present in emerging industry clusters, which clarifies the economic linkages between firms and their boundaries (Xu and Wang 2015). Strengthening the internal and external communications among firms within the cluster is achieved through learning about vertical and horizontal clustering processes that support knowledge exchange. Although interest in knowledge sharing research in the GCC countries has been growing in recent years (e.g., Al-Alawai et al. 2007; Migdadi 2009; Yeo and Marquardt 2013), little research to date has critically analysed the knowledge sharing mechanism used within extant clusters (c.f., Abdul-aziz and Lee 2007; Al-Adaileh and Al-Atawi 2011; Mohamed et al. 2008). As the focus of this thesis is on an emerging, government driven cluster, it is proposed that the results can be generalized to other GCC countries where there is government control and leadership in

regional and cluster development (Qatar, Kuwait, United Arab Emirates, and Oman). These countries have similar culture, religion, and traditions to SA. Previous studies examining the role of industry clusters in promoting competitive advantage focused on the whole Arab world in general based on cultural and other similarities. On the same basis, this study may also be replicated outside the Arab world in order to generate comparative data.

1.4. Outline

Chapter Two outlines the context for this research by presenting an overview of Saudi Arabia's country structure, background on the cluster region, and background on the main actors within the SAM cluster including the Saudi Arabian Government Investment Authority (SAGA) and other government entities and the economic developer (ED). Chapter Two also provides an overview of the university located within the same region of the cluster, and the main seaport as the main vertical actor and a main source of competitive advantage for the SAM cluster. This research is guided by two important theoretical components of industry clusters and knowledge sharing. Therefore, Chapter Three reviews literature that is relevant to industry cluster formation and development in general. Related issues such as cluster lifecycles, emerging clusters, and the role of government in leading clusters are also reviewed. Chapter Four details the methodological issues and choices related to the research, the research design, preliminary study, interview process (see Appendix B for questions), documentary analysis, reflective practices, data analysis, and validations. An overview of the participating firms is also presented in the same chapter.

This research uses the value added web framework (Brown et al. 2007) to identify the cluster actors and to identify the different participants in the cluster. Thus, Chapter Five details the background of the case study of the SAM cluster and the findings from 39 participant interviews and from document analysis at the web level. Chapter Five also sets out the findings from participant interviews and from document analysis at the firm level. The focus of the data analysis is to examine knowledge sharing mechanisms in an emerging and government-driven cluster in a Saudi Arabian economy. Through this chapter, the voice of participants is revealed as they share their ideas, opinions, and experiences regarding knowledge sharing within the cluster. The different mechanisms and processes that support knowledge sharing in the SAM cluster are presented. Finally, the barriers to knowledge sharing are identified.

After presenting the participants' voices in a manner that captures the essence of meanings relating to knowledge sharing, Chapter Six presents the significance of the findings and a formal discussion that integrates the research results with the literature. This enables a deeper understanding of the role of clustering towards the support of knowledge sharing in an emerging industry cluster in SA. Chapter Seven concludes the thesis with a summary and outlines lessons and implications for government policy. The limitations of the study are also outlined and possible areas of future research are identified.

1.5 Limitations

The comments provided by the participants and their insights regarding knowledge exchange in SA are retrospective and through this qualitative methodological approach, limitations to the generalizability of the findings are unavoidable. The findings, however, provide a deeper understanding of knowledge sharing concepts from different perspectives and wider views of emerging clustering. Context-dependent findings may provide opportunities for generalizations through other similar views regarding the topic being investigated (Bryman 2004). In the case of this thesis, there is a gap in the literature regarding emerging industry clusters in SA.

Collecting data from different actors of the SAM cluster, conducting only 39 interviews is a limitation as given time and resource constraints, not all participants and key actors in the cluster could be interviewed. In addition, the research was conducted at one point in time, providing a 'snapshot' of the knowledge sharing processes in the studied cluster. As indicated, this is an emerging and immature cluster. Consequently, the number of participants as well as the size and complexity of the cluster will increase, and as such the nature of the challenges and mechanisms associated with knowledge sharing will also change over time.

Chapter 2: Research Context

2.1 Introduction

This chapter commences with an outline of the general background about Saudi Arabia (SA) in order to build a context for the research. First, a brief discussion of the national context of SA is presented. This is followed by coverage of the country's history, politics, demographics, religion and culture, as well as an overview of the economy, foreign direct investment, tax rates and labour and employment market. This is followed by a presentation of the background of the regional economic cities and the advent of industrial cluster programs in order to situate the study within the emerging manufacturing cluster of an economic city.

2.1.1 National Context of Saudi Arabia

Redding (2005) suggests that one must have an appreciation of a country's structure, including its history, politics, culture, and geography, in order to develop a thorough understanding of the institutional parameters for societal linkages.

SA is a sovereign Arab Islamic state with Islam as its official religion, and it declares the Quran and Sunnah as their constitution (Ministry of Foreign Affairs 2015). It is a hereditary monarchy; the state has control over all resources, including oil; laws are in accordance with sharia principles; unions and industrial action are illegal. Saudi Arabia has the largest reserve of crude oil in the world with an estimated 200 million barrels and the government plays a dominant and active role in shaping the country's economy (Ministry of Economy and Planning 2006).

2.1.2 History of Saudi Arabia

The kingdom of Saudi Arabia was founded by Ibn Saud in 1932 after uniting four regions into one state (CIA Factbook 2013). Before the discovery of oil resources in SA, it was considered a poor country, and its major revenue was generated through pilgrimage (Hajj): an annual Islamic pilgrimage to Mecca. Agriculture was the second revenue source for SA, but its contribution was minimal because of large areas of desert (El Ghonem 1998). After oil was discovered in 1938, SA became one of the biggest oil producing countries (CIA Factbook 2013). The discovery of oil had a profound impact on the national economy of SA and on national living standards.

While oil boosted national growth it has dominated the economy resulting in an economy that was entirely dependent on oil. Since the 1970s, the government of SA has launched programs to overcome the oil dependency. The diversification programs included the establishment of six new cities with modern infrastructure that includes railroads, power stations, seaports, and refineries (Saudi Arabian Monetary Agency 2016). The government invested heavily in education, and in 2005 they planned to ensure the enrolment of five million children in elementary and secondary schools, a substantial increase from the half million students in elementary and secondary schools in 1970 (Ministry of Higher Education 2012). The government also increased the health budget with new hospitals leading to a fourfold increase in the number of hospitals that were operational in 1970 (Central Department of Statistics and Information (CDSI) 2013).

SA joined the World Trade Organization (WTO) on 11 December 2016 (WTO website 2016) and it was determined to remove the barriers of trades, reduce agricultural support subsidies, and remove non-tariff protection measures (CIA Factbook 2013). After joining the WTO membership, SA was open to foreign trade and investment. SA modernised the banking industry through the development of banking institutions and insurance companies. The communications sector was modernised through expansion of telecommunications infrastructure (Saudi Arabian Monetary Agency 2016). The government of SA faces new challenges because of falling oil prices in the face of high population growth and increasing expenditure on health, education, and utilities for the populace (Ministry of Economy and Planning 2006; Park 2016).

2.1.3 Geography of Saudi Arabia

SA covers almost two million square km of land (Index Mundi 2012a) and is divided into five major provinces namely: Central, Western, Eastern, Southern, and Northern provinces (see Figure 2.1).

Figure 2.1: Map of Saudi Arabia

Source: Maps of the world (2016).

A major portion of the country consists of desert, semi-desert, and shrubland. Major cities in the country include Riyadh, the capital, which is located in the central province of SA. Mecca and Al-Medina, are both in the western province. Al-Dammam city is known for its role in the oil production industry; this city alone holds one-fifth of the world's oil reserves and it is located in the Eastern province (AlFaraj 2008).

2.1.4 Population of Saudi Arabia

General Authority for Statistics (2016) indicates that the total population of Saudi Arabia was 31 million in August 2016, including 13.4 million immigrants. Data also shows that there was rapid growth of the population of SA since the 1950s when there were only three million people in the whole country and the population growth rate is currently three percent per year. This was one of the highest population growth rates in the world. Table 2.1 shows the population distribution by gender, age groups and nationality for 2015. It is clear that the largest number of people fall between the ages of 35 and 39. Two-thirds of Saudi's population is under the age of 30 years old. Data also shows that 37 percent of Saudi nationals are 14 years old or younger (Table 2.1). The Pew Research Centre (2011) shows that 60 percent of the total population is 30 years or younger and also in the next 10 years, 1.9 million Saudis will require jobs.

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Table 2.1: Saudi Arabia's Population by Gender, Age, and Nationality

Population by Gender , Age Groups and Nationality (Saudi/Non-Saudi)

Total Kingdom — ٢٠١٥ — إجمالي المملكة

Age Groups	Total			Non - Saudi			Saudi			قئــات العمــر
	Total	Females	Males	Total	Females	Males	Total	Females	Males	
0-4	2878783	1401403	1477380	644558	305440	339118	2234225	1095963	1138262	٤-٠
5 - 9	2304881	1101158	1203723	700478	330733	369745	1604403	770425	833978	٩- ٥
10 - 14	2456229	1179611	1276618	616103	291586	324517	1840126	888025	952101	١٤-١٠
15 - 19	2540329	1221561	1318768	499759	231932	267827	2040570	989629	1050941	١٩-١٥
20 - 24	2531574	1206268	1325306	461868	193244	268624	2069706	1013024	1056682	٢٤-٢٠
25 - 29	2752658	1260442	1492216	694144	237733	456411	2058514	1022709	1035805	٢٩-٢٥
30 - 34	3098467	1297785	1800682	1198694	347977	850717	1899773	949808	949965	٣٤-٣٠
35 - 39	3337479	1283594	2053885	1673973	446566	1227407	1663506	837028	826478	٣٩-٣٥
40 - 44	2875337	1096225	1779112	1462587	384702	1077885	1412750	711523	701227	٤٤-٤٠
45 - 49	2098909	745707	1353202	979094	183113	795981	1119815	562594	557221	٤٩-٤٥
50 - 54	1491139	518608	972531	601831	75064	526767	889308	443544	445764	٥٤-٥٠
55 - 59	1028355	376975	651380	363778	51211	312567	664577	325764	338813	٥٩-٥٥
60 - 64	695355	275137	420218	199204	36496	162708	496151	238641	257510	٦٤-٦٠
65 - 69	427888	179348	248540	77474	18424	59050	350414	160924	189490	٦٩-٦٥
70 - 74	261148	114282	146866	34498	12380	22118	226650	101902	124748	٧٤-٧٠
75 - 79	135130	59525	75605	15418	6258	9160	119712	53267	66445	٧٩-٧٥
80+	102338	46221	56117	17632	7528	10104	84706	38693	46013	٨٠ فاكثر
Total	31015999	13363850	17652149	10241093	3160387	7080706	20774906	10203463	10571443	الجمـــــلة

Source: General Authority for Statistics (2016).

2.1.5 Culture, Politics and Governance

There is a very strict religious culture in SA, so there is very little room for other religious expressions (CIA Factbook 2013). Overall the society is conservative, traditional, and family-oriented (Saudi Network 2015). After the rapid expansion in science and technology, however, the concept of global village influenced the government to transform from a nomadic society to a rich commodity producer during the last 50 years (Saudi Network 2015).

SA is divided into 13 regions, followed by districts. Usually, governors of the regions are appointed by the King of SA. Each governor is considered as the ultimate authority for the region and they are responsible for education, health, finance, agriculture, and municipal affairs. A consultation process applies at the regional level and at the village and tribal level (Lacey 2009).

2.2 The Saudi Arabian Economy

SA is one of the biggest oil producing countries in the world. It gets 75% of its total budget revenue from oil resources, and 90% of its export earnings come from the oil industry. Oil contributes to 45% of Saudi's gross domestic product. The agricultural sector and pilgrimage are the other contributing sectors, with two million people visiting SA annually for pilgrimage (Zuhur 2011). According to Mahran (2012), there are 6 million foreign workers employed in the oil and service sectors who play an important role in meeting ongoing labour and skill shortages. Also, there are programs in place to provide more jobs for youth, especially those who have limited education and skills.These programs also help to reduce the reliance on foreign workers (Mahran 2012).

The government of SA is now paying more attention to privatization of public assets in response to recent emerging financial challenges. Currently, the government is working to attract private sector investors in the education, health, manufacturing and tourism industries (Samargandi, Fidrmuc and Ghosh 2014).

2.2.1 Foreign Direct Investment (Ministry of Foreign Affairs)

United Nations Trade and Development (UNCTAD) published a "World Investment Report" in 2015 that places SA in the third position after Turkey and United Arab Emirates (UAE) in the list of foreign direct investment (FDI) recipients in Western Asia. In 2014, FDI fell by 9.6% compared to 2013. Saudi officials had to invest in developing a national infrastructure to attract the foreign investors and FDI was considered one of the most important and influential factors in diversifying the national economy. Recently, government allowed the foreign investors to open new retail and wholesale hubs and gave foreigners the rights to have 100% ownership of their businesses (SAGIA 2014). SA has a stable currency and exchange rate and low energy costs, both of which attract foreign investors (Khorsheed 2015).

2.2.2 Labour Market in Saudi Arabia

As shown in Figure 2.2, historical unemployment data shows that the average unemployment rate was 5.52% from 2012 to 2016:

Figure 2.2: Saudi Arabia's Employment Rate

Source: Trading economics (2016).

The demographic challenge in SA is compounded by the fact that the youth of SA do not have sufficient education and technical skills that are basic requirements for gaining employment in the private sector. Despite high unemployment rates data suggests that the number of foreign employees in the private sector increased by 11.7% during the past three years. Table 2.2 below shows the composition of SA's labour force.

Table 2.2: Saudi Arabia's Labour Force

Saudi Arabia Labour	Last	Previous	Highest	Lowest	Unit	
Unemployment Rate	5.60	5.70	6.30	4.35	percent	[+]
Unemployed Persons	680176.00	682344.00	700035.00	437648.00		[+]
Population	31.52	30.77	31.52	4.04	Million	[+]
Retirement Age Men	62.00	62.00	62.00	60.00		[+]
Retirement Age Women	55.00	55.00	55.00	55.00		[+]
Labor Force Participation Rate	54.00	53.60	54.40	47.80	percent	[+]
Employed Persons	11067.67	11067.70	11067.70	6167.00	Thousand	[+]

Source: Trading economics (2016).

Under Labour Law M/51drafted in 2005, the Ministry of Labour is responsible for dealing with all the matters of labour and grants work and residence permits to foreign workers. No one can enter, work and leave SA without the permission of sponsoring employers (Zuhur 2011). Under the "Saudization" program of 1996, the Ministry of Labour is responsible for deciding the number of Saudi employees to be employed in the private sector. In its *Saudi*

Vision 2030 plan (2016) the government decided tol allow foreign workers and professionals to have permanent residence in SA. The government adopted this concept from the green card system of the United States of America (USA). Authorities also reduced the existing system of green card holder's sponsorship, and this system will also bind the green card holders to pay taxes, Zakat, and other premiums (if any). A green card will also allow the holder to own property and perform business activities freely (Samargandi, Fidrmuc and Ghosh 2014).

Data on foreigners in SA shows that there were 9 million foreign workers in April 2013 (Arab News 2015) and most of them migrated from their homeland to the SA after the discovery of oil in the late 1930s. Data also reveals that during the first phase of the migration, technical and administrative professionals started to come from other Arab countries and Western countries. In the second phase, a large number of people started to come from Southeast Asian countries. SA became dependent on foreign workers because their nationals did not have sufficient education and skills to be employed in emergent services and technical industries. According to The World Bank, SA is the second largest country after the USA in terms of sending remittances to other countries through expatriate remissions.

2.2.3 Department of Zakat and Income Tax

The "Department of Zakat and Income Tax" is responsible for the collection of corporate taxes in SA (Ageli and Zaidan 2013).SA has low corporate taxes and zero personal income tax. The average corporate tax rate was 25 percent from 1999 to 2015and in 2016, the corporate tax rate of SA stood at 20 percent. Companies operating in SA are required to pay religious tax (Zakat) that is 2.5% of their annual profits. However, foreign individuals and companies are not mandated to pay Zakat. The Ministry of Finance is responsible for determining the tax status of each company. SA is part of the GCC countries which have a unified 5% tariff on most imported goods. The country is also a member of Greater Arab Free Trade Area (GAFTA) and according to which all items for industrial use are free from import duties and all products processed and re-exported in SA are exempt from import duties (Khorsheed 2015).

2.3 Industrial Cluster Programs in Saudi Arabia

The Industrial Clusters Program (ICP) was initiated by the government to support new industries and to develop the new industries included in ICP (Industrial Cluster program 2013). The main purpose of ICP was to develop the targeted industry clusters and diversify the Saudi economy from solely focused on oil to include other industries. SA made a development plan for 2009 to 2014, with the main objective of the plan to improve the living standard, develop human resources, increase employment to Saudi nationals, attain economic diversification, balance regional development, and promote Saudi products (Samargandi, Fidrmuc and Ghosh 2014). The Government National Industry Strategy's aim is the diversification of the Saudi economy by 2020 and includes the following objectives:

1) Increase manufacturing share from 11% to 20% of GDP.
2) Increase the share of industrial employment from 15% to 30%.
3) Improve industrial share of total exports from 18% to 35%.
4) Achieve economic growth of 8% annually.

This aim and objectives are consistent with the country's Vision 2020 whose main purpose is to strengthen the academic-industrial links, expansion of industry, development of human resources, and expansion of the private sector. SA industrial cluster programs are supervised by the Ministry of Commerce and Industry as well as the Ministry of Petroleum and Minerals (Mahran 2012). These programs play a significant role in meeting the objectives of Vision 2020. The cluster strategy is intended to:

1) Give preference to SA Arabian raw material, energy and natural resources to produce products.
2) Increase the growth rate of exports.
3) Derive benefits from technologies and skills development.

The industrial cluster programs include five cluster teams each dedicated to creating mutual understanding between SA and investors. Industries in this emerging cluster have been selected in areas where there are fundamental elements of competitive advantage in the form of raw materials. These raw materials can be leveraged to create competitive ventures that meet the aspirations of both the nation and the investors. The industries that have been selected include minerals and metal processing, automotive, solar energy, plastics and packaging (Industrial Cluster Programs Website 2013).

2.3.1 Background on the Regional Development (Economic City)

The government has set up six Economic Cities located in Riyadh, Jeddah, Dammam, Qaseem, Al-Ahsa, and Makkah in order to attract foreign investment. In these economic cities there are clearly designated zones for defined industries and economic sectors that have flexible licensing control and relaxed eligibility requirements for potential entrants to the clusters. The government has been responsible for the entrants' initial establishment and continuing development as controlled entities. Support infrastructure including land, buildings, telecommunications, ICT, and utilities, are provided by the government authority (Economic city website 2014).

This research investigates the role clustering plays in facilitating knowledge sharing mechanisms using a case study of a cluster located in a new economic city. The city cannot be identified in this research, as this would compromise the confidentiality of the participants. By identifying the city it would, in turn, be possible to identify some of the interviewees who participated in the research (Davis 2013).

The Saudi emerging city is an example of the private-public partnership development program. Within the new city, the economic developer has organized infrastructure and development to support a number of related clusters. The new city site covers an area of 168 q km   and its development is based on a range of incentives put in place for firms interested in investing in SA and the Middle East region (Economic City website 2014). The government incentivises foreign companies by providing them with full ownership within the cluster as well as seaport and logistics support for being part of the cluster (Exhibit A Website 2013). The city aims to become the economic hub of the Middle East, with direct business interactions with western countries. Newly-constructed roads and a railroad network connect the economic city with other cities across SA (SAM Cluster Brochure 2013).

The economic city plan has a residential block of 260,000 apartments and 56,000 villas (SAM cluster quarterly magazine 2016). It is subdivided into smaller residential blocks, commercial areas, and recreational areas, including theme parks. It is expected to provide residence to half a million individuals and can accommodate 10,000 tourists (SAM cluster Brochure 2013). Within the Residential Area of the economic city, there are parks and public facilities including mosques, shops, cafes, and recreational venues (SAM cluster Brochures 2013). The real estate development actors involved with the cluster have designated two residential areas for organization executives, including golfing facilities (SAM Brochures 2013). The Sea Resort Area is designed to have space for 120 hotels with more than 25,000

rooms. It provides features and facilities to attract local and international tourists (SAM Newsletter 2013). Cluster actors designed the Sea Resort Area as a tourist destination of the country and the region; it will also include hotels, restaurants, shopping malls, and recreation areas. An 18-hole golf course is planned for the area, including training facilitates and a driving range. The Sea Resort Area will also include yacht clubs, aquarium clubs, and water sports arenas to hold international sporting events in order to attract a global audience (Exhibit A Website 2013).

The Central Business District in the city is designed to cover over 3.8 sq km of office space and commercial areas. The financial hub of the city has been allocated two times the amount of space initially planned. It is expected to cover over 14 hectares of space, in response to the growing interest and demands of investors (Board of director reports 2013). The Central Business District is expected to become the largest financial center in the GCC region with international banks, investment institutions and insurance companies planned to open offices in the city (SAM Newsletter 2013).

The city is planning to have diversified industry clusters in the region including: manufacturing, pharmaceutical, plastics, FMCG and building and construction material. The clusters are intended to have their own residential areas, accommodations, sea resorts, sports activities and a Central Business District (CBD) where some restaurants, shops, and health services are located. Table 2.3 provides an overview of the entire economic region (economic city), which is government-directed and is inclusive of diverse industries in the region (Khorsheed 2015, Samargandi, Fidrmuc and Ghosh 2014). The selected cluster for this study is a manufacturing cluster with several manufacturing firms. The SAM cluster is still in the early stages of development. The cluster is governed by the sole regulator of the city the Economic Cities Authority (ECA) acting as part of SAGIA.

The SAM cluster is developed along the lines of the cluster models used in Dubai where clustered developments are used to attract foreign investors and to co-locate related industries in the same zones. Connell and Thorp (2012) discuss the Dubai Model and how the planning in that model has been mainly focused on a succession of clearly defined strategic initiatives around priority areas for development. In the Dubai experience, industry clusters were found to have the potential to play a critical role in the growth of established and fresh areas of economic development as collaboration among member firms together with knowledge sharing and innovation could produce positive results in instances where there is adequate

facilitation (Connell, Kriz and Thorpe 2014). According to Connell and Thorpe (2012) the Dubai approach can be adapted by GCC countries, including SA, to support regional planning and the speed of policy implementation.

Traditional economic development strategies focus on the needs of individual firms, such as investment, skills, technology, and infrastructure. In contrast, the cluster approach to development acknowledges that firms' success is often interconnected because of a reliance on shared knowledge and resources such as technology, infrastructure, labour pool and government and professional services. One of the purposes of this thesis is to highlight that because of their proximity clusters support knowledge generation and knowledge sharing (Dreier, Mollenkopf, and Swanstrom 2001). Globally, many developing countries have considered clustering as an effective approach to economic development because it facilitates the bundling of shared resources in a single location and supports the synergies and externalities that are generated through clustering, such as in the United Arab Emirates case study (Connell, Kriz, and Thorpe 2009) and Saudi Telecom Company (Al-Adaileh and Muawad S. Al-Atawi 2007).

The government of SA has put clustered industry development at the core of the Saudi Vision 2030 Plan. According to the plan, government will work with the companies owning those cities to revamp them and transfer vital facilities (Saudi Vision 2030 plan 2016). The economic city website (2014) indicates that they have public-private partnerships between the Saudi government and economic developers. SAGIA is tasked by the government to coordinate with local governments and the private sector to promote regional economic growth by developing specific programs to help firms innovate, internationalize, and collaborate among networks (SAGIA 2016). The Saudi Vision 2030 Plan (2016) states that: "Among our top priorities is to fortify and extend our interconnectivity and economic integration. We will seek to effectively link with other countries in the region" (Saudi Vision 2030 Plan 2016, 58). SAGIA is encouraging ECA seized with attracting foreign and domestic talent, privatizing government services, rehabilitating economic cities, establishing special zones in competitive locations, and creating a regional logistical hub (Saudi Vision 2030 Plan 2016). Included in the Vision 2030 Plan are goals and performance indicators for logistics, universities, and e-government. These indicators also include the goal of having the three

main economic cities with new industry clusters listed in the top 100 economic cities globally (Saudi Vision 2030 Plan 2016).

The cluster approach to industry diversification and development was identified as a critical tool for the future growth of the Saudi Arabian economy. Organizing local businesses, government, tertiary education, and scientific participants to discuss collaborative initiatives was critical during the early stages of the planning process. Common issues affecting participants included infrastructure development, skill development, policy processes, new market development and collaborative activities such as joint marketing programs (Exhibit A Official Website 2013). The cluster is based on the idea of interlocking clusters of industries being co-located within the development zone. The rationale for these specific divisions is to establish a functional separation of industrial, business and lifestyle activities within geographic proximity of the region to facilitate the progressive development and expansion of the cluster (Annual Report of SAM Cluster 2014).

In 2010, the first development stage of the SAM cluster was complete; the full cluster should be fully complete and operational in 2020. According to the economic city's official publications, the SAM cluster and other clusters developments are expected to generate one million jobs in the country (SAM cluster quarterly magazine 2012). This strongly supports the important goals of Saudi Vision 2030 to reduce the rate of unemployment from 11.6 to 7 percent (Saudi Vision 2030 plan 2016).

2.3.2 Planned Major Actors within the Saudi Manufacturing Cluster (SAM)

There are plans to have more than 120 local and international companies in the SAM cluster. Following the VAW framework classification (Brown et al. 2007), the cluster has lateral, horizontal and vertical actors. Government through SAGIA and Economic Cities Authority (ECA), the Economic developer (ED) and the Cluster University (CU) are the lateral actors. In the SAM cluster they are responsible for the provision of essential knowledge and support toward the economic development of the cluster (Ageli and Zaidan 2013). The horizontal actors are the main producers and manufacturers of the products within the manufacturing cluster. These major firms are responsible for end product production and they are still under construction. Seaport shipping services, logistics as well as transportation suppliers and buyers in the respective supply chains are the major vertical actors. The study focuses on a manufacturing and emerging cluster linked to the development and adaption of green and clean production systems across a range of related products building on the conceptualisation

of clusters as overlapping VAWs around single horizontal firms developed by Brown et al. (2007, 2008, 2010a).

Table 2.1: Main planned actors of the clusters within the economic city

HORIZONTAL	VERTICAL	LATERAL
Pharmaceuticals	The Seaport	4 universities
Plastics	Seaport Shipping services	10 Academic schools
Construction and Building Materials	Partly suppliers to or buyers from the horizontal cluster's actors	Government agency SAGIA with two sub divisions (ECA) & (HCA)
FMCG	Logistics firms, distributions, and warehouses	Cluster economic developer (ED)
Automotive	Financing and a Central Business District (CBD)	Living promotion organization, local and international hotels, and villas and apartments buildings.
Manufacturing (SAM)	Logistics services	Engineering and consulting companies
	Accommodation and residential areas	Labour agencies
	Cafes and restaurants, Cafes, restaurants, Supermarkets, Health clinics and gyms	
	Leisure activities and resorts	

The SAM cluster is policy-driven by the government as an initiator, investor and regulator of the cluster. The initial feasibility studies of the cluster were undertaken by ECA to ensure that the different regions were developed relevant to their needs and resources. The next sections represent an overview of some of the key actors within the SAM cluster.

2.3.3 Saudi General Investment Authority (SAGIA)

SAGIA, as the driving force behind the Saudi economic and industrial clusters development program expresses its mandate as:

> "We will continue to improve and reform our regulations, paving the way for investors and the private the public sector. We will seek to shift the government's role… and to increase private sector contribution by encouraging investments, both

local and international, in health care, municipal services, housing, finance, energy and so forth" (Saudi vision 2030 plan 2016).

It has two divisions: Economic Cities Authority (ECA) and Human Capital Authority (HCA). According to the SAGIA website (2014), the objective of SAGIA is to turn SA into an industrial hub by collaborating with all of the stakeholder and cluster actors. SAGIA is responsible for organizing and connecting all of the actors (i.e., horizontal and vertical actors, seaport, residential areas, sea resorts, educational zone and central business district) of the cluster together for the development of the industry cluster. It facilitates the introduction of investors to key stakeholders to help with access to capital, industrial land, commercial premises and funding support. It also offers advice and services to support companies from the initial planning stages to after care once it has been established in the kingdom (Ghassan, Alhajhoj and Alaoui 2013).

SAGIA established its infrastructure and network of "Business Centres" all over the country. It facilitates investor interactions with representatives from the Ministry of Commerce and Industry, Ministry of Labour, General Directorate of Passports, Zakat and Income Tax department, and notary public (Wilson 2008 & Brown, Aarts and Nonneman 2006).

The SAM cluster is unique in that, even though it is a government-directed cluster, the development is supported by the government but led and directed by the private sector (economic developer). Moreover, SAGIA supports and cooperates with ECA responsibilities which range from diversifying the economic expansion of the clusters of the economic cities to include the economic city and SAM cluster in non-oil sectors, with a focus on education, healthcare, real estate, manufacturing and financial services; ensuring a highly-skilled labour force through human capital development. This promotes entrepreneurship, innovation, and leadership in the cluster; and partnering with public and private organisations within the cluster as it relates to governance and business infrastructure (SAGIA 2014).

2.3.4 Economic Cities Authority (ECA)

The Economic Cities Authority (ECA) started developing the SAM cluster in 2006 as part of a program for supporting regional economic growth; the program was conceptualized as collaboration among industry and regional economic development agencies. Immediately, the SAM cluster attracted major national and international investment. ECA sought to build a specialized, knowledge-rich and internationally competitive cluster by bringing together key companies, providing the cluster with tangible and intangible resources and support (Exhibit

A website 2013). These resources are explained in detail in the case study in Chapter Five of this thesis.

The (ECA) is part of SAGIA and manages the economic development programs in SA under the supervision of the Supreme Economic Council of Saudi Arabia to ensure job creation, sustainable economic growth, and development of modern infrastructure (Mahran 2012).

2.3.5 The Human Capital Authority (HCA)

The Human Capital Authority (HCA) was formed in 2008 and is responsible for developing and maintaining the welfare of employees within the industry clusters. HCA responsibilities include training local talent to be more competitive and innovative and develop leadership qualities in employees. It provides facilities for education and industry training (Industrial Clusters program 2013).

SAGIA support and collaborate with the HCA and ECA throughout the process of the cluster's development. The HCA coordinates with the ECA and the SAGIA to provide support programs for employees. Most notably, the HCA provides employee education and training services to the government employees working in the cluster. It establishes regulations to facilitate human capital development and sustainability of the new city and the clusters within it. It collaborates with investors and other cluster actors to recruit appraise and promote employees (Exhibit A Website 2013).

SAGIA, through the HCA, aims to employ over 100,000 Saudi Arabian nationals within the first few years of the city's development (Economic Cities Authority website 2014); it also supports foreign employment within the city. HCA is responsible for developing talent and training domestic talent to place individuals in executive and leadership positions within the emerging city (SAGIA 2014). HCA is working on a five-year plan to make sure that it is able to train and hire young skilled Saudi Arabians from the local market to support the plan's development.

2.3.6 Saudi Arabian Private Economic Developer (ED)

ED is a Public Joint Stock Company in the business of real estate development and was established in 1997. It operates internationally in the field of provision of property development and management services (Board of director reports 2013). It has 60 active companies under six business segments making it one of the dominant real estate developers

in SA with a presence in the other GCC countries, North Africa, Pan-Asia, Europe and North America with competencies sectors such as hospitality, leisure, and retail (SAM cluster quarterly magazine 2013). ED is a key lateral actor in the SAM cluster; ED's primary focus has been the planning and development of the economic city. ED is the main developer of the economic city; however, the sole regulator of the SAM cluster is the (ECA) as subdivision of SAGIA, headquartered in the economic city.

2.3.7 SAM Cluster University

The Saudi Arabia Cluster University (CU) was founded in 2009 with an emphasis on education, research and innovation. Its objective is to generate science graduates and conduct research in the Islamic world using English as the academic language on the campus (Exhibit B Website 2013). The university includes departments ranging from engineering, science, information technology, and environment. A main attraction of CU is the Engineering and Technology Campus, which offers programs in electrical, mechanical, civil, chemical, and computer engineering. The campus covers approximately 36 sq km. The science programs offered at CU include advanced physics, biological sciences, and information technology (CU Newsletter 2013). CU is the first coeducational university in Saudi Arabia (Arab News 2015).

Another area in the emerging city development is the Educational Zone, featuring multiple university campuses and research and development facilities (SAM Newsletter 2013). Universities are expected to provide educational needs for over 18,000 students and 7,500 faculties. It has a role to promote Saudi Arabian culture and technological capabilities at the global level (Exhibit A Website 2013).

CU is a public institution providing educational and research facilities. CU enrols students from around the region and the globe, including the USA, Europe, China, and Japan. CU is located within 20 km from the cluster complex. Faculty and students are diverse with over 60 countries represented on the campus (Exhibit B Website 2013). CU is the major university in the city and it is one of the most important and well-known universities in SA.

2.3.8 Seaport Operator

The Seaport is the main vertical actor and logistics support infrastructure for the economic city and the SAM cluster, which covers approximately 14 sq km. It is the largest seaport in the region, with the capability of handling 10 million twenty-foot equivalent units (TEU) of

cargo per year (Exhibit C Website 2013). It is designed to handle bulk, dry cargo, and equipment brought in from vessels from around the world. One of the regional advantages of the port is handling 300,000 pilgrims (for offering Hajj) with dedicated tunnels and customs services for the pilgrimage ships (Exhibit C Website 2013). Providing commercial services, the Seaport is privately-owned. It is a gateway port for the Middle East region.

Since the Seaport is located within the emerging city, it provides logistics support to the cluster. It is the first subsidized port in SA, and China and India's high rates of growth have helped make the Gulf region a key location for port investment (Harris 2013). Focusing on innovation, customer service, and competitive regulations encourages shipping lines to rely on the port, avoiding major diversions (Exhibit C Website 2013). The Seaport is the vital resource of the SAM cluster; it is considered as the main logistic administrator and distributor for the firms within the cluster in terms of exports and imports.

Background of six horizontal actors and one vertical firms as the key firms understudy are discussed in Chapter Four (section 4.3).

2.4 Conclusion

The background on the history, politics, economy, culture and society of SA were presented in this chapter. The chapter outlined the governmental plans and modernisation program for growth and industrial diversification through the lens of Vision 2030. The program of modernisation and industry diversification is in place to support economic growth and stability, attract foreign investors and provide future jobs for the growing Saudi workforce. This process involves building new and planned cities that contain interlocking developing clusters. This model is based on the diversification model used in Dubai. The developmental process is led and controlled by the government. Within this model and within the planned city that is the subject of this study, there are interrelated clusters occupying defined areas of the city. Manufacturing is one of the identified clusters within the new city. Within the developing city and SAM cluster, there is an opportunity to examine the framework and processes that support knowledge sharing. The thesis examines the knowledge sharing processes in a planned and emerging cluster context. The next chapter presents a review of relevant extant literature on knowledge sharing in industry clusters.

Chapter 3: Literature Review

3.1 Introduction

This research examines knowledge sharing mechanisms and activities in a newly created and government driven cluster using the value-added web framework for analytical purposes (Brown et al. 2007). This chapter examines the literature on clustering, including the role of public policies in their development and how they are used in regional economic development. Furthermore, it considers how clustering can support knowledge sharing through geographic proximity. It also examines theoretical concepts of knowledge managements, types and sharing.

Searching for relevant literature in this literature review involved the identification of keywords, including: industry clusters, knowledge sharing in clusters, Saudi Arabia industry clusters, governmental-driven clusters, management and clusters, emerging clusters, and public policy and clusters. The Curtin University Library catalogue, Google, Google Scholar, electronic library websites and online databases were the main search engines used to locate the relevant references. The search results were reviewed for their relevance, with only the most appropriate academic journal articles, reports, and governmental reports used in the review. This chapter is organised starting with an overview of industry clusters and emerging clusters, providing the practical case study lens that is the focus of this study. This is followed by a discussion of the value adding web framework that is the analytical tool of the project. The chapter concludes with an analysis of literature used to create the conceptual model as the theoretical foundation for the research.

3.2 Conceptualising Industrial Districts and Industry Clusters

Chapter One clarified the ideas of industry districts and clusters, highlighting various foundational concepts that are critical to understanding relationships between clusters and knowledge sharing. This study is situated within the broader literature examining industry clusters, to the extent that it attempts to understand how clustering as a value adding web is related to knowledge sharing processes and mechanisms and its potential impact on economic development.

Industrial districts are a variation of clustering with the primary difference being that these districts are inclusive of multiple industries and multiple clusters. Park and Markusen (as quoted in Markusen 1996) define industrial districts as those that are geographically large,

focusing on a specific area of economic growth that may be focused on resources, manufacturing or service-delivery. Given that industry districts include clusters, the focus of this study is on sharing knowledge within an industry cluster, located within an industrial district, specifically an emerging cluster in a planned economic city of SA. The concept of an industry cluster began with an emphasis on collaboration and networking among organisations in similar industries within a geographic proximity. Maskell (2005, 418) explains why clusters exist in a way that is relevant to this research as follows:

> "Cluster[s] exists because of locational economies that are largely independent of the internal degree of interaction. The sole requirement is that many firms undertaking similar activities are placed in circumstances by co-locating where they can monitor each other constantly, closely, and almost without efforts or costs."

Porter's (1990) seminal work on industry clusters brings together dynamic perspectives including business strategies, cluster specialization and entrepreneurship in regional geographies. Porter (2003, 562) situates the importance of clusters in "...*the externalities that connect the constituent industries, such as common technologies, skills, knowledge, and purchased inputs*." Porter further posits that specific industries can participate in multiple clusters, thus resulting in challenges in studying cluster performance. Martin and Sunley (2003, 22) state that clusters "raise the productivity, innovativeness, competitiveness, profitability, and job creation of their constituent firms, of the geographical areas in which the clusters are located, and thence the wider national economy."

Research acknowledges Porter's early work, which focuses on competitive advantage at the firm and industry levels of analysis and includes a minor governmental role (Feser 1998; Kaufman et al. 1994). As Martin and Sunley (2003) note, Porter's early work on how to market clusters was presented to policymakers as a way to cultivate economic growth in a regional economy. Based on this work, Munnich et al. (2002) develop Porter's diamond advantage model (1998), as shown in Figure 3.1.

Figure 3.1: Porter's Diamond Advantage Model

Michael E. Porter's Diamond Model
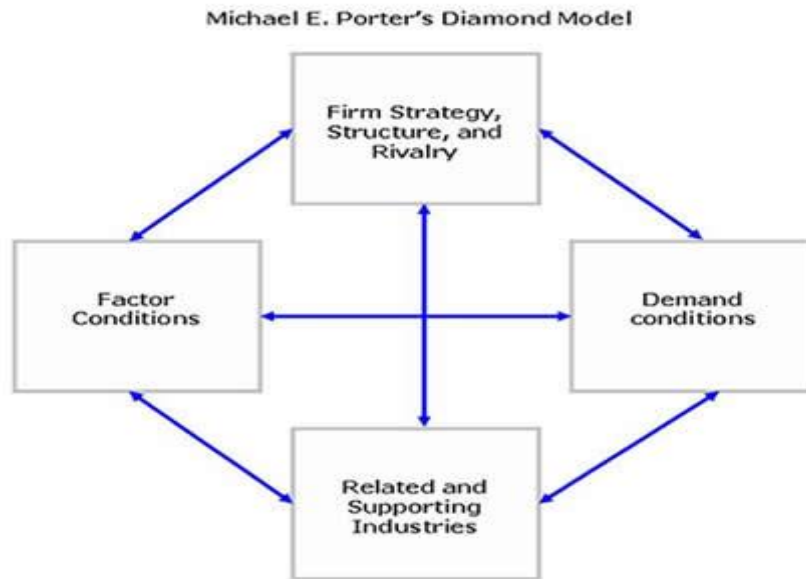
Source: Porter (1998) and Munnich et al. (2002)

This model emphasises the connected nature among factors in Porter's (1998) framework because they drive cluster growth at the regional level via the initial resources of the cluster and the broader economic climate. For example, the initial resources in the cluster may include material resources and less tangible resources such as the conditions supportive of growth. Moreover, the economic climate is inclusive of the variety of firms within an industry, an entrepreneurial culture within the region, and an institutional system designed to launch new firms. As firms take advantage of strategies and resources available within the cluster, they are able to provide specific services and products, characterising an emerging cluster. Also important during this emergence is a firm's ability to improve quality, increase collaboration among firms and innovate with new products and services based on market demand. In the model, factors affecting the cluster's growth are connected with knowledge-sharing processes. As an example, university and research centres aid with expanding production and creating new knowledge. Ketels (2003d) applies the model, clarifying the role of governmental actors in the cluster's economic growth, asserting that four roles exist for the government to cultivate knowledge-sharing: supporting factor conditions, strategy and rivalry, demand conditions, and related industries. According to Ketels, governmental actors' role in supporting factor conditions involves creating educational programmes to train employees. Further, these actors support strategy and rivalry by overcoming knowledge-sharing barriers and attracting foreign investment to grow the cluster. Here, the focus is on exports within the cluster. Supporting demand conditions requires the government to identify standards to regulate cluster activities, such as minimizing uncertainty, supporting early-

adoption, and stimulating the knowledge-sharing process within the cluster. Finally, the government sponsors programs to align cluster actors in establishing educational and logistic zones.

Cluster development also involves knowledge sharing through direct mechanisms within the cluster, such as technology collaboration and new technology acquisition, and indirect mechanisms, such as competition analysis and workforce trend identification (Porter 1998). Porter (1998) posits that clusters should include a social capital dimension. Drawing from research on social networks and economics at the institutional-level, Porter (1998, 225) maintains that the "social glue" holding clusters together is social capital, thus creating cluster value for the firms that participate.

Porter (1998, 2000) argues that clusters facilitate knowledge sharing between participating firms, particularly through sharing technology. There is a positive impact to firms joining the cluster in the form of reduced information costs, increased trust among member firms and decreased bureaucracy in regulatory processes and internal activities (Malmerg and Power 2005). Malmerg and Power (2005) argue that these processes can increase firm competitiveness and productivity. Moreover, Simmie (2008) maintains that clusters with broader global connections are likely to produce higher economic growth for the region. Steinle and Schiele (2002) argue that clusters assist in the cost-reduction process by collaboration among firms within a related industry, thus increasing innovative efficiencies. Scholars state that efficiency results from the coordination among cluster actors with regard to production and marketing processes (Arther 1990; Porter 1990). Motoyoma (2008) states that cluster enable firms to reduce input externalities, labour market externalities and knowledge externalities because firms within a cluster are able to share knowledge, resources and competencies, while outsourcing complementary activities.

Related to Porter's work is Atherton and Johnson's (2008) study on emerging clusters. Atherton and Johnson (2008) posit that there are three stages to cluster formation from the bottom-up, these are: potential, emerging and established. These stages come from three patterns that are not necessarily exclusive namely: physical proximity that facilitates deriving advantages from a specific location and benefiting from agglomeration economies; transaction proximity which is a result of increased trading and cooperation among firms resulting in the building up of trust among them; and relational proximity that generates new economic activity as a result of knowledge creation and distribution centres. The expansion

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of such clusters is characterised by the presence of a critical mass of self-organised new firms coupled with technologies, innovation, products and cluster- specific activities. According to Atherton and Johnson (2008), emerging clusters focus on developing primary stages of collaboration and therefore need to articulate and agree on member benefits and to be prepared to allocate resources to cluster activities. Collaboration at this stage tends to be on a case by case basis (Atherton 2003). Moving to the next stage depends on clear recognition of the benefits of collaborating, developing trust and credibility among the members.

3.2.1 Formation of Industry Clusters

According to Malmberg and Maskell (2002) clusters follow a cycle of birth, growth, stability, decline, and renewal or death. The main factors influencing cluster formation are the decisions of facilitators, local environmental resources, and governmental policy (Feldman, Francis, and Berconvitz 2005) (see Figure 3.2). Entrepreneurs play a vital role in the formation of clusters by acting as change agents to promote business interests, vision, and strategies.

Figure 3.2: Factors Supporting Cluster Formation
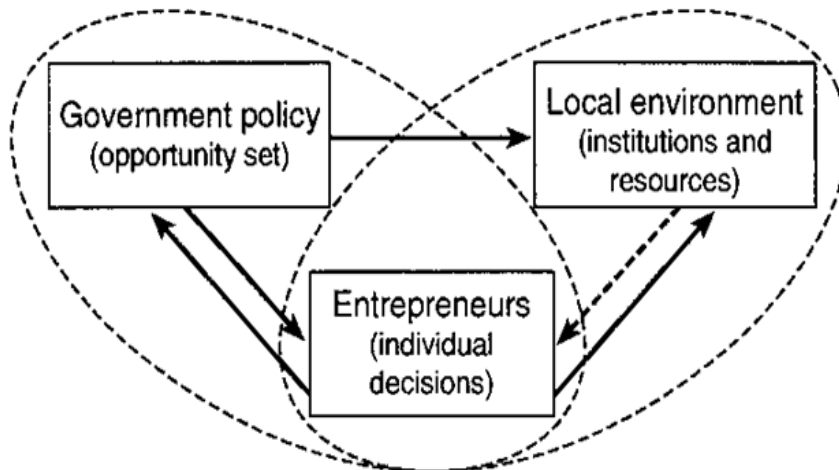
Source: Feldman, Francis, and Berconvitz (2005, 132)

Figure 3.2 depicts the interdependent relationships between the local environment, governmental policy, and entrepreneurs as drivers of cluster formation and development. Feldman et al. (2005) observes that cluster development is affected by all three factors.

The relevance of local environment as represented by institutions and resources was previously highlighted by McDonald and Vertova's (2001) who posited that geographic

factors, historical events, and institutional frameworks influence cluster formation. Feldman et al. (2005) however, focused on policy-driven or planned clusters, which is the case with the SAM cluster in this study. They explain that financial support by government actors, venture funds, and pre-seed and seed capital contributes to the cluster's growth.

It is critical to consider a cluster's life cycle and what relationship there is among firms in the cluster and firms in competing clusters. A cluster's life cycle has implications for technology and innovation as it can render cluster advantages redundant making it necessary for a cluster to have some transition mechanisms in place (Cornett 2012). Dijk and Sverrisson (2003) identify four types of transition mechanisms found within clusters which are: regression to earlier stages; development to later stages; growth or decline while keeping the cluster's main characteristics. The SAM cluster is in the process of being implemented and therefore transitioning to or is in the growth stage as indicated by the few vertical and horizontal actors. In considering transition mechanisms applicable to a cluster, Valdaliso et al (2013) consider the structure of the cluster in terms of the types of firms and agents in it and their business strategies; the knowledge base in terms of both intra-cluster and extra-cluster knowledge bases; absorptive capacity; level of social capital and supporting public policies. According to Giuliani (2005), a cluster's dynamic growth depends on the absorptive capacity of firms within the cluster of knowledge from outside -spreading it within the cluster.

The Saudi Arabian government is aiming to support the development of industry clusters, promoting spinoffs from the cluster while also identifying emerging and potential clusters (Industrial Clusters 2013). However, in terms of cluster formation (see Figure 3.2), the SAM cluster located in the economic city, is driven by government policy. The purpose of the policy is to develop the conditions within this district in which institutions and entrepreneurial opportunities will evolve and develop. The approach seems consistent with The World Bank (2009) that notes that the initial stage of cluster development requires the cluster and government and policy actors to create a map of the cluster, showing cluster locations and relationships between the cluster and the macro economy. During this stage, the purpose is to learn about behaviour within the cluster.   Connell and Thorpe (2012) explain that some countries have data available at the firm-level, cluster-level, and sub-cluster-level, enabling studies to identify connections among actors. This analysis permits actors to map clusters within a region. This data, however, is not frequently available in developing countries (World Bank 2009). The question then becomes how public policy may proactively assume a role in the process by supporting the cluster environment. Yusuf (2008) states that

policies could be developed within an existing cluster, rather than attempting to create a new cluster in situations where the cluster lacks a dominant industry leader.

Important components of the cluster plan include creating an effective capital market, training employees with required skills, and building technology. Connell et al. (2009) refer to this process as a bottom-up approach. They maintain that clusters continue growing when participating firms identify a competitive advantage by participating in the cluster. Ionescu (2005) observed that building clusters from the ground up is often unsuccessful because the challenges relating to building social capital counteract the benefits of working from within an existing cluster. Further, research suggests that the development of new clusters often focuses on physical infrastructure such as transport and communications at the expense of the processes and mechanisms that support social capital development and growth (Connell and Thorpe 2009).

Feldman et al (2005) describe cluster creation as a multi-stage process with the first stage as the emergent phase. Such a phase occurs when entrepreneurial innovation is inspired by a combination of external factors and is characterised by the production of ideas about how the cluster will function. It is often inspired by factors within and outside of the industry (Anderson and Teubal 1999). The second phase is characterised by self-organisation where players, such as enterprises, entrepreneurs, and institutions develop relationships by reinforcing feedback with other cluster members and identifying opportunities to benefit from the synergies created while protecting their interests (Feldman et al. 2005). The third phase is the maturation stage, which according to Feldman et al. (2005, 132), is characterised by a *"well-functioning and rich innovative and entrepreneurial system."* This phase is representative of the ultimate results of clustering, whereby, a fully-functioning entrepreneurial space emerges. The success of the cluster then generates other possibilities, to include spin-offs or new start-ups as members of the cluster continue to identify new ways of retaining competitiveness (Feldman et al. 2005). Andersen and Teubal (1999) maintain that by the third phase, a mature and stable cluster must be supported by strong networks in the industry, supported by a local culture, and be able to withstand reformation. According to Feldman et al. (2005) the effectiveness of a cluster is indicated by its ability to withstand adverse shocks during its third phase at which it should be a *"well-functioning and rich innovative and entrepreneurial system[s]"* (Feldman et al. 2005, 132). This maturation stage enables stronger clusters to sustain challenges and barriers (Feldman et al. 2005). Anderson and Teubal (1999) highlight the need for mature clusters to be supported by networks and the

local community to maintain success. While clusters sometimes decline, regional and local regulations have been found capable of supporting cluster growth (Gompers, Lerner, and Scharfstein 2003).

The website of Exhibit A (2013) shows the stages of cluster development that the governmental actors and economic developer are following which are: gaining support for the clustering approach; developing feasibility plans; establishing plans and leadership teams; and formalising the cluster process via structures and regulations put in place by the government. The cluster in this study has undergone these stages and is at the stage equivalent to Feldman et al.'s (2005) second stage. However, in this instance players are not self-organising as the process is currently government and developer led and not led by small firms or private businesses.

3.2.2 Emerging Clusters

While a mature cluster is one that has been functioning for a long time with an established infrastructure, membership, and reputation, an immature, or emerging, cluster differs in size, characteristics, relationships and collaboration among firms (Barkley and Henry 2003). An emerging cluster is characterised by on-going development of infrastructure, few cluster members, and under-development of links within and outside of the cluster. As the clustering process progresses and the cluster evolves, policies should shift toward establishing institutional systems to sustain and grow economic development (Motoyama 2008). Scott (2008) explains that institutional policy-making can be characterised into three groups: regulatory policies, such as formal rules and incentive programs; normative, or those informal rules and values; and cognitive, which includes the notion of the policies that are taken for granted within the cluster. New firms are expected to enter into the cluster as it further evolves and develops. Grimstad and Burgess (2015) maintain that new firms joining the cluster should follow the same policies (i.e. regulatory, normative, and cognitive) as existing firms.

Firms in an immature cluster may lack special knowledge or access to membership in the cluster. They may also lack the capability to convert, share, exchange, transform, and apply knowledge found in the cluster (Lan and Zhangliu 2012) yet knowledge sharing has been found to be renewable and to increase a firm's resources over time (Nonaka and Konno 1998). Governmental institutions should therefore be designed to provide stability of social capital within the cluster (Scott 2008). Demonstration of competitive advantage gained from knowledge sharing within the cluster attracts more firms to join the cluster. In the case of SA,

the World Bank Knowledge economy index which ranks countries on the basis of the extent to which their economy is positioned to support effective use of knowledge for development purposes ranks SA as position 68 out of 147 countries (World Bank 2012) and being the least ranked among the GCC. Within the GCC challenges relating to knowledge availability in the form of weaknesses in the following areas: trained human resource, marketing expertise and information gaps have been identified as some of the ills that can be addressed through specialised knowledge-bases created and shared within clusters (Thorpe and Connell 2013). Further knowledge sharing among entrepreneurial leaders in an emerging cluster has been found to lead to the emergence of communities of practice that benefit members of the cluster (Daniel, Huang, Rathnappulige and Neale 2013). It is therefore important to study emerging, immature clusters and the process by which specialist knowledge within them is enhanced, understood, and applied (Beijerse 2000).

3.3 Value Adding Web Framework

Gray et al. (2001 cited in Molina and Yoong 2003) suggests a schema for cluster development (see Figure 3.3) that commences with the initiation stage, where the potential to initiate a cluster is identified and the firms discuss the possibility of establishing the cluster. The incubation stage includes bringing cluster members together, and determining the vision, strategies and objectives for the cluster. The implementation stage is attained when the cluster obtains export contracts as a result of developing new products, knowledge and services. This stage focuses on developing the cluster and strengthening conditions for innovation and productivity. It is also characterised by formation of within-cluster business alliances and initial stages of earning revenue and becoming partly self sufficient. The improvement stage involves building market and developing social capital.

Figure 3.3: Cluster Development Process
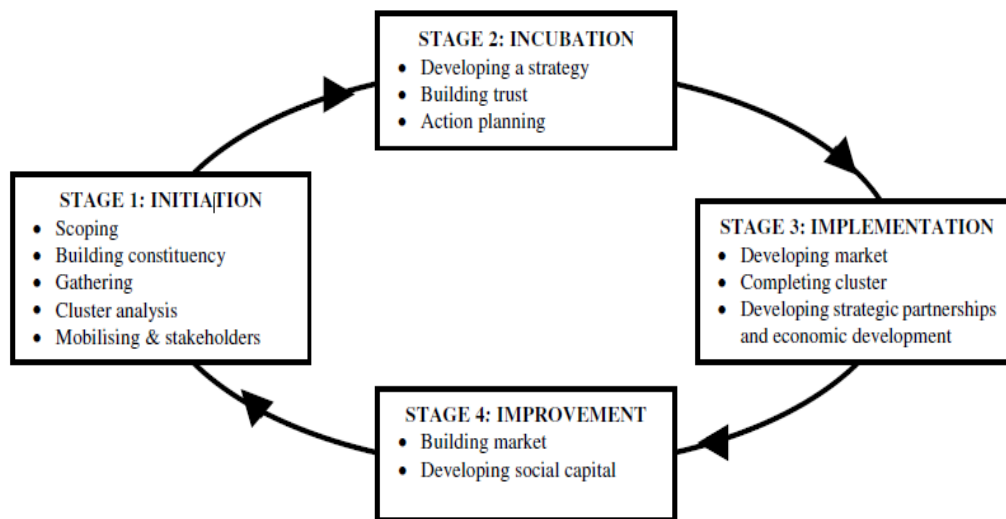
Source: Gray, Harvey & Brimblecombe 2001

Fuentes (2005) argues that firms participating in emerging clusters share knowledge through formal and informal strategies. Yokakul et al (2010) posits that social capital is frequently weak during the early developmental phases of clustering (see Figure3.3), resulting in minimal funding opportunities and information. Moreover, during this stage of clustering, actors' trust is often weak. This lack of trust amplifies the complexity of knowledge-sharing processes (Bianca and Cappelin 2006; Fuentes 2005; Sureephong et al. 2007) and actors' relationships. This is necessary as suggested by the VAW framework, to understand knowledge-sharing mechanisms and the subsequent impact on economic growth within a region.

According to Guo and Li (2012), clusters are the relationships between firms within a specific industry. Actors' connectedness to one another is based on the interdependence of boundaries (Gretzinger and Royer 2014). Further, the cluster actors' connections are described according to their strength and quality (Brown et al. 2007). Clusters can be viewed as a "value-adding web" considered as link between institutions and single firms within a defined space of interaction. In order to analyse the process of value-creation, the process should identify lateral, vertical, and horizontal actors. The task of identification is the central activity of value analysis of a cluster within a particular industry (Fang, Liang, and Jia 2014). Brown et al. (2010, 2008 and 2007) explain that horizontal actors are part of the core industry of the cluster. Every horizontal actor should have a common background within the particular

industry. Suppliers or buyers are considered as vertical actors of the industry. Vertical actors generally supply or buy products from the horizontal actors. Different actors can be vertically integrated to different degrees (Eisingerich et al. 2012). Lateral actors provide infrastructure and support to the cluster with for example, economic development agencies, as well as universities (Delgado, Porter, and Stern 2015, Brown et al. 2007).

The strength of the VAW is that it highlights the roles of different actors in value-added activities and recognises that the cluster of VAWs has the potential to generate collective gains across the cluster. In particular, clustering activity facilitates knowledge generation and knowledge sharing among participants and among the cluster and the outside world (Brown et al. 2007).

Knowledge brokers, such as consultants, are drawn to clusters and share their expertise with firms participating in the cluster. This knowledge would not be available without the presence of the cluster (Mitchell et al. 2010). This process cultivates social capital, which results in formal and informal knowledge exchanges in the cluster (Brown et al. 2007). Actors within the VAW who play a facilitation role are considered lateral actors providing special expertise (Collins, Bray, and Burgess 2012). Collaboration of actors facilitates knowledge-sharing mechanisms which in turn facilitates knowledge dissemination by participants (Malmberg and Power 2005). This also enables increased access to resources, thus continuing the cycle of knowledge sharing (Burt 2004). In the SAM cluster, the government, the university, and the cluster developer serve in this capacity.

Figure 3.4 below shows this conceptualization by mapping an ideal-type value-added web around the horizontal actor, HMF1 (Brown et al. 2010a). Horizontal actors (H 1-H6), vertical actors (V1-V3), and lateral actors (L1-L3) interact with each other on the network level. Relationships are evident in different quantities and qualities that may be characterised by a higher or lower degree of interdependence, between a rather low-pooled interdependence to a very high team-oriented interdependence. Further, every actor has resources on the firm-level that may be more or less valuable and can be shared with other firms within the cluster leading to strategic growth and development. The different interdependencies are explained in the following section.

Figure 3.4: Ideal Type Value-Added Web

Source: Royer and Burgess (2013)
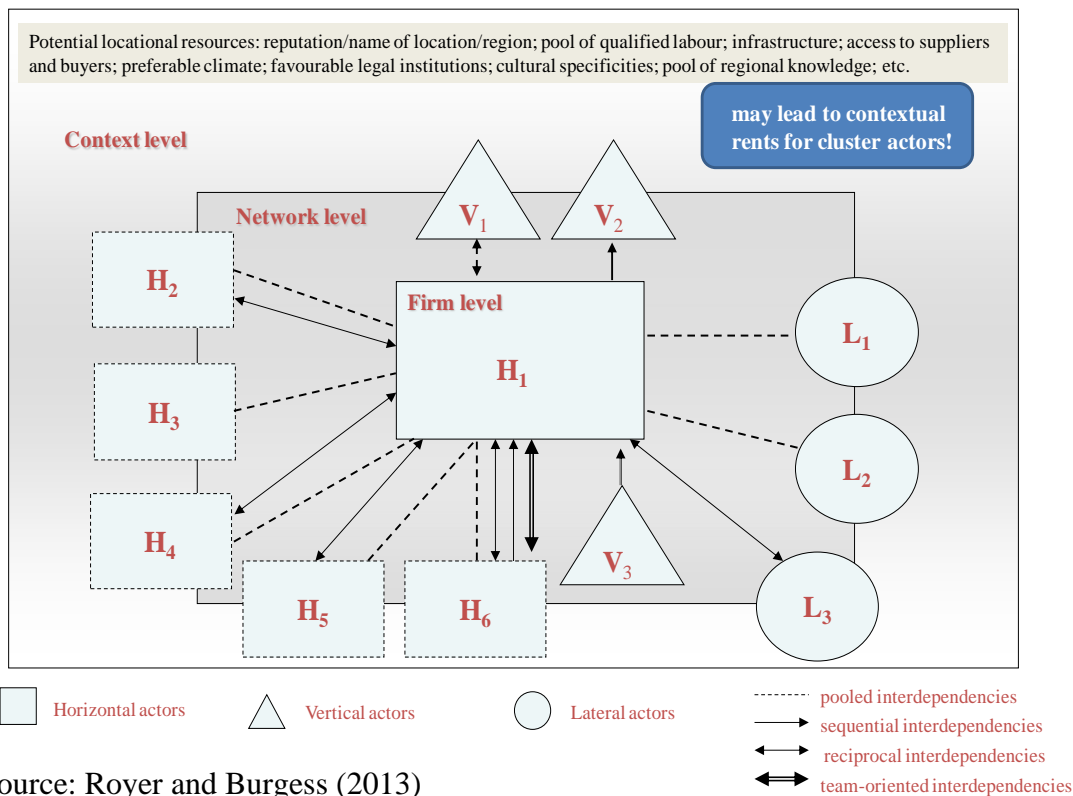
3.3.1 Interdependencies between Actors

Figure 3.4 suggests that clusters are overlapping VAWs, consisting of horizontal, vertical, and lateral actors around single firms. Actors refer to private and public entities that are part of the cluster, but not necessarily performing similar functions. They include competitors and suppliers, public agencies and consultants. Every actor should be connected in terms of interdependencies within the web. If there is an absence of interdependencies, then the actors are not strongly linked to the web and to its spill-overs (Dai and Zhang 2014). According to Royer and Burgess (2013), there are different types of interdependencies of each actor in the web, including: (1) sequential, during which time the output of an actor is considered as the input for another; (2) pooled, in situations where the entire sphere of actors compete for positive resources; (3) reciprocal, involving a mutual exchange of input or output within every group of actors; and (4) team-oriented, the creating of output together among actors.

Connell, Kriz, and Thorpe (2009) suggest there are many important value adding web resources, like context specific resources, web specific resources, and firm specific resources. In this perspective, proximity or regional characteristics can function as important and necessary resources for the value adding web. Chandran (2004) states, however, that web

specific resources mainly focus on the relationship among different actors of the particular industry. The analysis of social networks can detect the web specific resources. It also examines the relational value and resources. It predominantly focuses on the capital that is shaped through exchange relations and the interchange between value adding web-participants and the synergy of different elements that work together (Callagher 2012).

Focusing on individual firms embedded into the network of relationships provides the starting point for the analysis in this research project. Focusing on the value creation potential of different levels, such as firm level, relationship level, and context level of cluster members shows the rationale beyond receipt of public funding for clustering.

Firm specific resources can be divided into human resources, tangible, and intangible resources (Bembenek and Piecuch 2014). Human resources refer to skilled employees and tangible resources refer tophysical equipment. Intangible resources include the reputation of the firm, tactic knowledge, customer relationships and organisational culture and ability to cooperate (Pearson, Pitfield and Ryley 2015)... All participating actors in the cluster have an impact on the aspect of the creation of value and the competitiveness within the web. Therefore, a value adding web can contribute to development that does not result from the particular competencies and specific resources but rather can be formed from the competitiveness of the whole web in terms of the other webs (Xu and Wang 2015).

In an emerging cluster key locational resources include: economy-wide aspects of the business environment such as the road network, corporate tax regime and the legal system and cluster specific resources such as availability of specific types of suppliers and expertise (Porter 2000). For Menzel and Fornahl (2007), clusters emerge in locations occupied by firms whose routines are superior although their formation does not solely depend on existing firms and an enabling environment as interdependencies between the firms is also important.

3.3.2 Interactions and Links between Actors

Direct and indirect interactions exist among actors in the VAW. These interactions may reflect strong, weak, and medium links (Brown et al. 2007). It is possible to divide the type of interaction within the clusters into the internal and external interactions and direct and indirect interactions. There are many levels of interactions between different actors within the web (Wu, Gu, and Zhang 2008). The interactions can be internal or external. Internal

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interactions are the link between actors of the value-adding web (Taheri et al. 2014). Internal interaction occurs among actors that are located in a web. The internal links may be direct or indirect and may be weak, medium, or strong links. From the perspective of direct links, two firms of the value-adding web can act directly with every actor in the web (Ritvala and Kleymann 2012). In the case of an indirect link, the third party functions as an effective connector or facilitator between the firms within the cluster. External interactions take place when an actor in the value-adding web seeks to interact with other actors located externally to the value-adding cluster (Brown et al 2007).

The typical relationship between buyer and supplier can be considered as a strong link between actors of a cluster. The relationship between a firm within a cluster and the agency of economic development can be considered as an example of medium link in a web (Newbert 2008). What is important in an emerging cluster are conditions for the creation of strong linkages such as a strong expertise base or political backing which enhance the chances of the emerging cluster to attain a critical mass. Certain conditions, for example a strong scientific base or political support, give the emerging cluster the potential to reach a critical mass (Menzel and Fornahl 2007).

3.3.3 Role of the Government as a Lateral Actor on Initiating and Supporting Clusters

Considine (1994) defines a clustering public policy as one that includes the governmental actors' decisions to implement a cluster as well as the longer-term financial and supportive resource provisions. For Hood (1983), public policy regarding clusters are driven by the government to facilitate knowledge-sharing relevant to cluster organisation. Incentives are offered to implement the clustering policy, such as providing financial support, tax reductions, and opportunities to finance. Montana and Nenide (2008) state that policy-makers within the GCC should emphasize infrastructure building in the early stages of cluster development as this would minimize barriers to firms' access to participating in the cluster. Scott (2008) views institutional policy-making from three perspectives: regulatory policies such as formal rules and incentive programs; normative or those informal rules and values; and cognitive, which includes the notion of the policies that are taken for granted within the cluster.

The SAM cluster is developed and driven by the governmental actors and regulations. The government supports SAM financially (SAGIA 2014) with $45.3 billion allocated to the country's clusters (Vision 2030 Plan 2016). The manufacturing legislature can be viewed as a

regulatory policy, whereas the shared knowledge among the individuals in the firm about manufacturing issues is a cognitive policy; the shared beliefs regarding manufacturing outcomes serve as the normative policy. Regional policy-makers involved with the cluster development should focus on the broad strategic level of their actions, as well as sustaining the cluster. The economic developer of the cluster is an active participant with the government, serving as key actors in the cluster case study.

3.4 Summarising the Contextual and Conceptual Framework of this Research

The previous sections discuss that the SAM cluster is funded by and planned by the government as part of a new city designed to diversify and develop the industrial structure of the country. The cluster is in the early stages of development and has yet to reach maturity. The VAW framework facilitates analysis of the relationships and interactions within the cluster. The next sections focus on theories and concepts from knowledge management literature.

3.4.1 Knowledge Management and Knowledge Sharing

Knowledge in organisations is classified into different types which have implications for how it is shared. Kogut and Zander (1992) categorise knowledge into information and know how. Information refers to knowledge that can be transmitted without compromising its integrity once it has been codified. It is also referred to as explicit knowledge. Its major characteristic is that it is revealed or shared through its communication (Grant 1996). Know how is defined as the collected practical expertise that helps someone to communicate and work efficiently (Kogut and Zander 1992). Knowing how is also referred to as tacit knowledge. It is only revealed through application and because it is transferred through practice its transfer process is slow, expensive without guaranteed results (Kogut and Zander 1992). Within the two broad domains of knowledge (tacit and explicit) are different types of knowledge. De Jong and Ferguson-Hessler (1996) describe knowledge in terms of type and quality. Among types, knowledge is described as one of four: situational, conceptual, procedural and strategic. In terms of quality knowledge is classified is terms of levels (which could be deep or surface); structure (whether automated or unautomated); modality (whether verbal or pictorial); and generality (whether general or domain specific).

The purpose of knowledge management is to maximize individual and organisational knowledge by concentrating all available implicit and tacit knowledge, converting these into

explicit knowledge to be codified, interpreted, represented, saved, retrieved, and shared (Alavi and Leidner 1999; Cummings 2003). Kim, Hong, and Suh (2012) suggest that knowledge management has four components: capturing, storing, sharing, and using.

The purpose of sharing knowledge in an organisation is to create new knowledge or exploit existing knowledge (Christensen 2007). Knowledge sharing has positive consequences associated with reducing production costs, rapid achievement of projects, team performance, firm innovation, and firm performance. Understanding the potential benefits that are provided by knowledge sharing, organisations invest in technology that can facilitate the collection, storage, and distribution of knowledge (Connell, Kriz and Thorpe 2014; Panahi, Watson and Partridge 2013).

As it relates to cultivating social capital, knowledge-sharing involves individuals' motivations to initiate the transfer of knowledge. Cabrera and Cabrera (2005, 692) explain that knowledge-sharing "can be conceptualized as a particular case of a paradigmatic social situation known as a social dilemma. Social dilemmas describe paradoxical situations in which individual rationality, simply trying to maximize individual pay-off, leads to collective irrationality." Moreover, they agree that building social capital within the economic environment sees knowledge as an asset shared among participating firms, yet managers should focus on shifting employees' traditional views against knowledge-sharing. Related is the work of Foss (2010), showing that knowledge-sharing involves firms' capabilities, communities of practice, and absorptive capacity at the macro-level.

In clusters, knowledge-sharing is advanced by shared industry and geographic proximity. Economic commonalities are inclusive of knowledge spill overs, the intangible impact of the process. These intangible aspects of sharing in clusters emphasize economic development within the region and cluster. Scholars study knowledge-sharing in clusters predominantly from the perspectives of behavioural and social cognitive theories. The emphasis is on the individuals involved in the process as they connect with technological advancements.

Daniel et al. (2011) maintain that within a cluster context knowledge is a connecting process, grounding the development of a cluster in an emerging industry and is similar to the resource-based view of the firm (Clark and Turner 2004). Firms enter the cluster to access and gain leverage from critical resources that remain unavailable to external firms and actors (Tallman, Jenkins, Henry 2004). This provides a competitive advantage to firms within the cluster. In high technology clusters, Waits (2000) notes that this point is particularly relevant

because knowledge-sharing builds firms' capacity and drives economic growth (Keeble and Wilkinson 1999).

Adopting transparent strategies within the cluster also provides opportunities to highlight the cluster's "absorptive" learning (Seely, Brown, and Duguid 2001, 201). Firms' networks that are located geographically close together facilitates knowledge-sharing, specifically that of tacit knowledge shared through individuals' contact among the firms (Arikan 2009). According to Yokakul et al. (2010), absorptive capacity shares knowledge among firms and supports firms' ability to learn, affecting the cluster's development (Li 2011) (see Section 3.5.1).

Moreover, Mitchell et al. (2010) maintain that knowledge takes various forms and that closeness through clustering increases the ability to access knowledge for members of the clusters by directly sharing knowledge through commercial and social interaction and by accessing knowledge through transactional relationships. The development of clusters brings the opportunity to access specialists upstream and downstream, bringing specialist expertise into the cluster. These knowledge brokers provide the chance for participants of the cluster to have direct access to expertise that would otherwise be not so easily accessible if the member was not part of the cluster.

Knowledge-sharing among firms has been examined extensively (Connelly and Kelloway 2003; Han and Anantatmula 2007; Vera-Munoz, Ho, and Chow 2006), but gaps exist, as previously discussed regarding the roles performed by social capital and governmental policies. The literature also notes that firms often participate in the cluster to share knowledge via a value chain (Chaminade 1999; Kluge et al. 2001; Snyder and Wilson 2000). Collaborating closely with suppliers facilitates a firm's ability to attain knowledge about production processes that increase performance and thus the economic development of the cluster. Firms incorporate new knowledge directly into their operating strategies and also shift employee behaviours toward knowledge sharing (Connelly and Kelloway 2003; Lin and Lee 2004).

Research on knowledge-sharing within clusters is missing an integrative model that includes a broader perspective of factors influencing the process (see Table 3.1). In this research the focus is on the firm-level and the web-level in the VAW to understand knowledge-sharing processes within the SAM cluster. There is a strong case that clusters support knowledge-sharing and that there are value-added benefits to firms and the cluster. Research should

identify these processes that support knowledge-sharing in clusters as being in a cluster has been associated with expanding learning possibilities leading to enhanced innovation capabilities on the part of participating firms (Mitchell, Burgess, and Waterhouse 2010).

3.4.2 Knowledge Sharing Processes within Clusters

It is important to understand the processes of knowledge sharing within the clusters especially for new and emerging clusters. According to Sethumadhavan (2007), an effective knowledge sharing program within the cluster is important because it helps the firm achieve the following: understanding the markets and customers, fostering innovation through supporting the free flow of ideas, developing strategies and vision, constructing competencies, enhancing customer service, increasing revenue, improving rates of employee retention and simplifying operations. Giuliani and Bell (2005) assessed patterns of knowledge flow within a Chilean wine cluster, finding that there were considerable differences in the degrees of exchange, access, and processing within the cluster. Hence, firms may have proximity to a cluster, but they may be isolated from the activities that generate knowledge flows within the cluster. This suggests that proximity and cluster membership is not in itself sufficient to access knowledge and social capital, bridging and bonding capital (Boschma 2005). Studying clusters as VAWs at the firm- and web-level brings together proximity and industrial considerations relating to Saudi Arabia's emerging cluster.

Figure 3.5 below outlines the different processes for knowledge to be shared and transferred within the cluster. After the knowledge has been created and stored within the source actor or firm, it then be shared and distributed to other member actors (Lin 2007). This is a typical knowledge sharing dynamic process, and it goes in the form of a circle in which knowledge is circulated for the benefit and outcome of the sharing to occur. Research shows that the importance of knowledge sharing encourages cluster actors to exchange, express, understand, and negotiate tacit knowledge. There are various methods of sharing knowledge that incorporate cooperation, interaction, solving problems, and text broadcasts (Christensen 2007; Sawhney and Prandelli 2000).

Figure 3.5: Knowledge Sharing Process
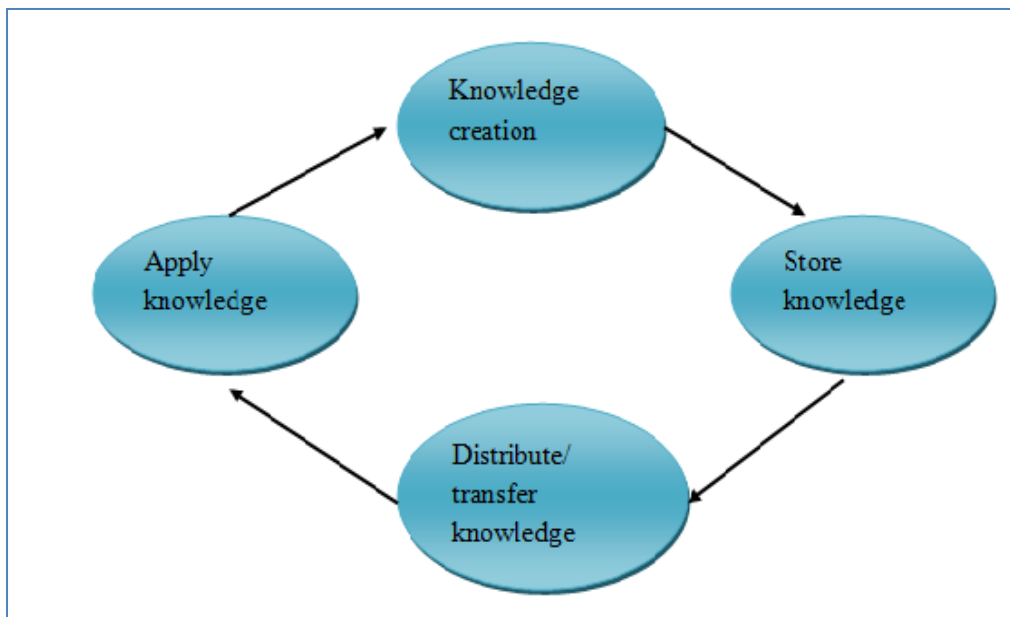
Source: Lin (2007).

The ability of cluster members to develop using information acquired from other members within the cluster is a critical success factor (Eisingerich and Boehm 2007; Yoong and Molina 2003). This perspective is consistent with Tzortsaki and Mihiotis' (2014) presentation of knowledge as a social process. Studies have highlighted the role played by the openness of networks in strengthening the performance of a cluster (Eisingerich et al. 2010). However, there is a clear need for studies that illustrate how knowledge sharing within clusters results in growth and development. Knowledge sharing processes have antecedents and factors that facilitate development and growth of emerging clusters (Connell et al. 2009). The research theoretical model is presented in the following sections including the most relevant research for this research.

Individuals possess varying degrees and types of knowledge which they apply knowledge to their firm. Within clusters, individuals share knowledge to create innovative procedures, maximizing productivity of the firm (Ashkensas et al. 1998). Studying tacit and explicit knowledge identifies mechanisms of sharing knowledge. In this context it can be differentiated between 'organic' or 'developed' clusters respectively between 'bottom-up' or 'top-down' initiatives. While the former cluster types are privately organized and financed by the involved members, the latter ones, like the SAM cluster case, are financed with public money (Fromhold-Eisebith and Eisebith 2005).

3.4.3 Explicit Knowledge Sharing

Drawing a clear distinction between explicit knowledge on the one hand and data and information on the other can be difficult as it depends on where the knowledge is positioned on tacit to explicit knowledge continuum (Davenport and Prusak 2000). Explicit knowledge is predominantly declarative and practical or objective and quantifiable. Frost (2010) describes it as codified and formalized. Explicit knowledge is usually managed through knowledge sharing systems that effectively facilitate its storage, retrieval, and modification (Rhodes, Hung, Lok, Lien, and Wu 2008).

Examples of explicit knowledge forms in SAM cluster include: memos, databases, documents, and notes social networks apps and websites, brochure and monthly magazine. Explicit knowledge is in the form of technical data describing formal procedures such as manuals, mathematical expressions, copyrights and patents, tools, photographs, product specification technical drawings, software codes, prototypes, computer data bases, and patents (Lake 2004). It is shared through print, electronic, or other formal mechanisms within the firm and among firms (Frost 2010). Because it is codified, explicit knowledge can be reused when similar challenges arise (Hansen et al. 1999). It occurs successfully when the following criteria are met: articulation, awareness, access, guidance, and completeness (Rhodes et al. 2008).

3.4.4 Tacit Knowledge Sharing

Tacit knowledge is difficult to express in terms that are easily shared with others (Grant 2002; Nonaka and Konno 1998). The knowledge sharing process is affected by the nature of knowledge that will be shared (Frost 2010) as when actors acquire explicit knowledge they add their own perceptions and in that way convert the knowledge into some form of tacit knowledge (Koulopoulos and Frappaolo 1999). According to Lake (2004) tacit knowledge is displayed through actors enacting their work knowledgeably. Tacit knowledge is frequently captured via softer systems, such as: precise actions, intranet opportunities and instant messaging, mentoring, shadowing, and voluntary teams/communities of practice (Nonaka and Takeuchi 1995). According to Davenport and Prusak (2000), tacit knowledge sharing happens through socialization. This may include: informal networks, provisions of space for unstructured discussions, and less structured or experimental work practices (Davenport and Prusak 2000). Tacit knowledge transmission includes observation, languages, practice, and imitation (Bembenek and Piecuch 2014). Staff mobility and interactions between the

employees of different actors within clusters, enables the spilling over of the tacit knowledge within the cluster. Tacit knowledge is regarded as the most valuable source of knowledge which has an important effect on innovations and sustainable growth and development in clusters (Frost 2010; Davenport and Prusak 2000).

3.4.5 Linking Explicit and Tacit Knowledge Sharing

According to Nonaka and Konno (1998) there are four mechanisms by which explicit and tacit knowledge may be linked: observation and becoming "socialized" to the firm's norms, combining multiple points of explicit knowledge, recording tacit knowledge into explicit knowledge, and reinterpreting based on an individual's perspective. Blending these two types of knowledge contributes towards building cooperation and trust, or social capital, as individuals willingly contribute to the process (Chiu, Hsu and Wang 2006).

Knowledge sharing increases firms' resources over time because it is a renewable resource but this is the case provided knowledge-related resources are kept up to date (Nonaka and Konno 1998). Hansen et al. (1999) posit that knowledge sharing can be sustained through high-quality interpersonal communication within the firm. Therefore, knowledge-sharing whether explicit or tacit strongly relies on building social capital in order to contribute to the cluster's success and to grow the economy within the region.

Knowledge sharing is critical for firms in emerging clusters given its association with quicker identification of new business opportunities emanating from technological advancements, adoption of new business models identifying and exploiting changes in market demands, identification and exploitation of complementary competencies (European Commission 2006). Further, knowledge sharing facilitates cross fertilisation within the cluster and development of knowledge economies based on innovation, something that is difficult for firms to achieve in isolation (Bessant 2004). The next section presents the theoretical framework which aids in understanding the process of knowledge sharing within emerging clusters.

3.5 Theoretical Framework for Understanding Knowledge Sharing within an Emerging Cluster

This research project examines the impact of clustering on knowledge sharing processes within the SAM cluster. The research proposed five factors that impact knowledge sharing

processes (see Table 3.1 below). Reviewing the literature identified different factors influencing knowledge sharing. This research uses the VAW framework as analytical tool to define the relationships and linkages through which knowledge sharing is happening between actors within the SAM cluster. Past studies focusing on proximity and knowledge sharing in clustered firms reveal that clustering impacts knowledge sharing from a minimum of five areas which are: absorptive capacity, inter-organisational trust, Knowledge of expertise location, social capital and accessibility (Borgatti 2000; Boschma 2005; Cohen and Levinthal 1990; Collins et al. 2012; Inkpen and Tsang 2005; Lane et al. 1998; Levin and Cross 2004; Maskell 2001a; Mitchell et al. 2010; Szulanski 1996; Szulanski and Capetta 2003; Van Wijk et al. 2007). Mitchell et al. (2010) present a discussion of the conditions that support knowledge sharing through proximity. They outline the mechanisms and processes that support knowledge sharing through proximity, some barriers to knowledge sharing, and it provides some initial base for beneficial implications for government policy to facilities knowledge sharing within cluster. The next section outlines each of the five mechanisms and reviews the research that links VAW linkages and the mechanisms through how they enhance knowledge sharing in SAM cluster. The identified five mechanisms provide explanations for behaviour in clusters and provide a systematic way of studying knowledge sharing relationships. In this study, the theoretical-framework is assessing research streams on industry cluster and knowledge sharing.

Table 3.1 summarises the framework used to study the SAM emerging cluster from the perspective of VAWs at the firm- and web-level by bringing together proximity and industrial considerations relating to emerging clusters. An adaptation of Mitchell et al (2010), it illustrates that knowledge sharing in an emerging cluster is influenced by: the capacity of firms both individually and as part of a cluster to absorb external knowledge; their ability to identify the correct question to ask and locating the person with the knowledge and expertise to answer the question; reciprocity derived from inter-organisational trust; social capital in the form of both bonding and bridging capital and accessibility through proximate availability of relevant knowledge.

3.5.1 Absorptive Capacity

The concept of absorptive capacity refers to the firm's capability to recognise the importance of outside knowledge and information for use towards the achievement of its various goals and ends (Ninan 2005). Absorptive capacity points to the ability of an organisation to

produce, identify, and generate a maximum strength in economic performance through the determination, absorption, and utilization of external information and knowledge (Giulani 2005). The absorptive capacity of a cluster is identified through the ability and capacity of firms within it to absorb each other's external knowledge. The process is therefore dynamic and interactive with firms that have identical cultures and areas of business facing fewer obstacles in the process (Lake 2004). Cohen and Levinthal (1990) posit that a firm's absorptive capacity is associated with the quantity of overlap existing among organisational members' knowledge groups, an overlap that may be transported through knowledge sharing activities. The absorptive capacity of each organisation in the cluster differs and is determined by whether its existing knowledge base allows it to utilize new knowledge or information.

Studies show that knowledge-sharing mechanisms should involve the capacity to use information gained, after the firm has applied relevancy to the context of the organisation. This then requires a foundational understanding to enable firms to close the loop between old and new knowledge (Cohen and Levinthal 1990). Individuals within firms may be more successful at this process if the knowledge meets their current perspective. Szulanski and Capetta (2003) posit that individuals' differing perceptions and industry-specific jargon inhibit the sharing process. Studies have emphasized the importance of a shared industry where actors communicate from the same technical expertise (Cohen and Levinthal 1990; Colombo 2003), which should improve communications, as antecedents of firms' absorptive capacity. At firm level, knowledge-sharing is facilitated by both the sender and the recipient being mindful of the tacit processes involved within the industry, which may be accomplished by actors participating in the same or similar industries (Zeller 2004). Senders of information are likely to craft the message based on what they perceive the recipient knows. Hence communication at the firm level improves the recipient's understanding as a result of shared understanding of industry specific jargon and technical terminology.

Brown and Duguid (1991, 2001) suggest that shared understanding at the firm level is central to the knowledge-sharing process. At the web level, Zucker (1986) opines that capacity improves as information is processed at the firm level, such as through shared educational and professional training. Training new employees has been found to benefit from the inclusion of shared language via interactions in a professional setting (Bazerman and Paradis 1991). This knowledge-sharing results in improving the process beyond industrial boundaries (Brown and Duguid 2001). Research also shows that deliberate activities help to foster the

process. At the web level, knowledge-sharing has been associated with growth of firms' absorptive capacity by helping them to understand their internal processes and the challenges they have to overcome (Gretzinger, 2012). One of the key challenges to overcome in the knowledge-sharing process is acknowledging that a gap exists. Rulke and Galaskieqicz (2000) posit that outside inter-actors help firms understand their capacity, thus identifying gaps.

The absorptive capacity of a cluster incorporates the extent to which firms in the cluster are able to build cluster knowledge and to assimilate, publish and utilize it (Ninan 2005). The degree of cluster absorptive capacity can be inferred from cluster knowledge links inside and outside the cluster from those industries with extra knowledge sources. Absorptive capacity is classified into two forms: desirable and non-desirable. Absorptive capacity is classified as desirable when it is advanced and as non-desirable when it is basic (Paulsen and Hjerto 2009). Absorptive capacity of a cluster is considered basic in situations where industries or firms have weak bases of knowledge characterised by a weakly connected inside cluster knowledge system with restricted openness to the outside. Absorptive capacity is considered advanced in situations where industries create deep knowledge links characterised by assimilation of knowledge from external cluster sources and participation in knowledge formation through investment in in-house research and development (Duchek 2013; Muscio 2005).

Table 3.1 below illustrates how facilitators who are skilled with well-developed knowledge networks assimilate external knowledge use professional contacts to act as a channel for the transmission of knowledge to the cluster actors. Information regarding knowledge gaps is transferred through external relationships resulting in the generation of research activities. Shared knowledge and mutual understanding are built through individual relationships. Knowledge from one actor to another is facilitated by similar tacit knowledge and shared understanding of language (Mitchell et al. 2010).

3.5.2 Knowledge of Expertise Location

Facilitation of knowledge exchange requires identifying the correct question to ask and finding the correct person in order to answer the correct question (Ackerman 2000). Similarities among firms participating in the cluster may improve the knowledge-sharing process through their understanding of the local environment and through their collective knowledge and expertise. Borgatti and Cross (2003) argue that seeking information external

to the firm is influenced by knowledge of the presence of differing information sources and by access to these sources.

Research regarding the knowledge sharing process, specific to transactive memory systems and knowledge mapping, show that a structure must exist that helps to collect, interpret, and exploit knowledge (Wegner 1986; Wegner et al. 1991). Individual actors can then turn to their knowledge network when they need information, rather than investing their own time identifying new knowledge sources (Moreland and Myaskovsky 2000; Yuan et al. 2007). Studies show that similarities are the key to the knowledge-sharing process with regard to understanding the location because it improves relationships among actors and increases sharing information on a more regular basis (Rempel et al. 1985; Uzzi 1996, 1999; Zucker 1986). Studies illustrate that this improves the growth of individual actors' technical expertise (Palazzolo 2005; Yuan et al. 2005).

As captured in Table 3.1, in emerging clusters shared values and beliefs among organisations that knowledge sharing generates economic benefits for cluster actors, together with the actions by facilitators of building relationships to provide location specific knowledge on expertise, is linked to the decision to search for explicit and tacit knowledge. At firm level, location specific expert knowledge associated with technical and professional expertise is developed through individual interaction (Mitchell et al. 2010).

3.5.3 Inter-organisational Trust

Trust among actors can help bolster productive interactions between them. It is recognized as a fundamental characteristic of business networks that can significantly affect collaboration and co-operation and the information quality and flows of knowledge between people (Murphy 2006). Relationships that are based on trust contribute to the knowledge-sharing process by influencing actor decisions regarding where to locate knowledge (Szulanski 1996; Uzzi 1996). Trust incorporates reciprocity, which facilitates the building of trust among actors (Cross and Borgatti 2000; Inkpen and Tsang 2005; Levin 1999; McAllister 1995). Because trust can mitigate uncertainty, it assists in minimising fear in knowledge-sharing (Nooteboom et al. 1997).

Trust is an important factor in knowledge sharing that focuses on the networks and relationships (Welch and Welch 2008). It influences knowledge sharing process in both web

and firm levels. The ability for maintaining and developing the trust as well as relationships based on trust, is highly crucial for the performance of organisations (Stahl and Björkman 2006). Trust strengthens and determines how the knowledge can be used, and promotes the disclosure as well as sharing of knowledge (Welch and Welch 2008). Knowledge sharing based on trust occurs when the receiver is considered as reliable and the sender is convinced that the recipient will not misuse the offered knowledge. In organisations, individuals consider knowledge as a source of power and there is fear of losing this power as well as a certain status when sharing their knowledge with the others (Wang and Noe 2010; Szulanski 1996). At the cluster web level, trust is connected with cognition-based trust (Parkhe 1993; Uzzi and Gillespie 2002) which incorporates competence, responsibility, and reliability (McAllister 1995). This improves the exchange of knowledge by increasing actors' willingness to participate in the process (Mayer et al. 1995; Tsai and Ghoshal 1998).

According to research on personal exchange theory, economic relationships build reciprocity which improves willingness to share knowledge (Watson and Hewett 2006). At the web- and firm-levels connections that exist in actors' networks and in personal relationships foster trust (McAllister 1995; Rempel et al. 1985; Schamp et al. 2004). Professional standards have also been found to contribute to the process of trust building (Pietro et al. 2000; Zucker 1986). At firm level, operationalizing shared norms, values, and beliefs into procedures contributes towards trust building (Bhagat et al. 2002).

Factors that help in building processes of trust, according to Welch and Welch (2008), are developed through face-to-face interaction as well as through socialization. Trust is the relationship based on the phenomenon that has an animated role in sharing the tacit knowledge therefore language will be one of the keys that can unlock the possibility to contributing trust. It is hard to create the relationship of trust without effective communication. Welch and Welch (2008) indicate that the trust environment improves the teamwork but such is related directly with the level of face-to-face interaction and communication with time. Sharing of knowledge, information and resources across organisations encourages goodwill and mutual understanding (Porter 2009). Trust is not rigid but is a process that is developed in line with relationship development (Kriz and Keating 2010). Worl (2000, 13) explains: "Trust, as a component of social capital, helps overcome market failures or reduce the level of market costs for firms in densely related networks." Welch and Welch (2008) note that it is an important factor in knowledge-sharing because it identifies how knowledge is shared among actors.

As captured in Table 3.1 below, in emerging clusters norms sanction against opportunistic behaviour and promote knowledge sharing mechanisms (Mitchell et al. 2010). Developed economic relationships lead to cognition-based trust and reciprocity which encourage a willingness to share knowledge, engage in knowledge-based collaboration and in inter professional cooperation and knowledge sharing. Individual ties bring about affect-based trust and reciprocity. The collaboration increases firms' perception of trust and shared values, providing a context that engenders further collaboration and knowledge sharing (Mitchell et al. 2010).

3.5.4 Social Capital

Putnam (1993a) posits that networks supply access to precious resources through social capital, influencing performance through exchanging tangible and intangible resources and acquiring and sharing knowledge. Nieves and Osorio (2013) note that there are two views on social capital: that it is a private good benefiting only participants, or public good that is available to the broader community. Putnam (1998, v) states: "Social capital refers to the norms and networks of civil society that lubricate cooperative action among both citizens and their institutions."

According to Porter (1998, 227), the cluster model has the potential to "reveal how network relationships form and how social capital is acquired." Rosenfeld (1997) agrees with Porter's assessment, referring to social capital as the impetus to concentrate firms in related industries into a working production system. Social capital performs a significant role for the development of clusters, as the role of social capital is to confirm coordinated and concerted action.

Mason (2008) describes social capital as the resources included in and reached through a group or network of relationships. It appears that social capital emerges from an individual's relationships and can be differentiated from organisational capital, which arises from the organisation's network of relationships. Social capital presents as a variable with three dimensions: relational (i.e. trust and identity), structural (i.e., pattern of relationships between actors), and cognitive (i.e., codes and cultures of behaviour) (Reed 2004). Literature focusing on these dynamics explains that they can create trust through strong relationships (Atkon 2005; Nieves and Osorio 2013; Pessoa 2011).

Solvell et al (2003) suggest that social capital is embedded in local cultures. Although some interactions and cooperation may be driven by market forces some are more informal involving the personal interactions among economic agents. Emerging cluster activity and interest facilitates social structures for the group through shared knowledge and their local proximity improves their tacit engagement resulting in the development of desired social capital in the network (Garnsey and Heffernan 2005).

Social capital has been linked to enhancing collaborative activities like knowledge sharing (Keeble et al. 1999; Racco 1998) through the presence of strong institutions that support local networks, a situation also referred to as. institutional thickness. (Amin and Thrift 1995) In regions that are economically thick, such as the case in SAM cluster, institutions effect growth as the cluster develops (Racco 1999). Absent in the literature, however, is a focus on whether institutional thickness facilitates knowledge-sharing in clusters at emerging developmental stage (Connell and Thorpe 2009; Collins, Bray, and Burgess 2012; Yeo and Gold 2014).

Research suggests that firm-level and web-level relationships provide a foundational understanding for institutional thickness, as it develops informal and formal institutions within the cluster via social capital (Collins, Bray, and Burgess 2012). Racco (1999) found that formal institutions enable sharing values and trust, building social capital to improve the economic growth within the cluster. Claus and Collison (2004) found that the role of professional associations also improves social capital by facilitating knowledge-sharing. Though Porter's (1998) work focuses on the role of linking firms, it neglects a focus on the importance of social capital.

The research framework discusses the influence of bonding and bridging capital on social capital by enhancing knowledge sharing mechanisms, specifically on the relationships between main actors in the cluster. Within the cluster, formal and informal networks share knowledge via specialists of knowledge dispersing information throughout the cluster (Mitchell et al. 2010). Collins, Bray, and Burgess (2012) maintain that social capital can be conceived in terms of bonding and bridging capital. The former improves relationships; in the VAW, this occurs among horizontal actors and enables sharing tacit knowledge. Bridging social capital facilitates innovation (Dyer and Noboeka 2000) among firms within the cluster by bringing together disjointed actors to generate knowledge (De Drue and West 2001). Proximity enhances the potential of generating both bonding and bridging social capital. In

particular, industry clusters provide a focus and meeting point where different types of capital can be generated. While trade associations are likely to develop bonding capital, more generic institutions such as universities are likely to be a form of bridging capital. According to Giuliani (2005), while both sources of capital may be present in clusters, it does not follow that all organisations either have access or possess the ability to process such knowledge.

Bonding capital enhances accessibility, or the extent to which knowledge is available for application to a given problem or situation, as well as provides small firms with access to knowledge networks (Borgatti and Cross 2003). Relationships can be strengthened through sharing knowledge and resources. Bridging capital is important in terms of strengthening the links between horizontal actors and lateral actors in the VAW. The bonding and bridging linkages can be formal or informal. They may be based on existing network linkages such as economic arrangements, especially in the case of vertical and horizontal actors, or through formal clustering that links actors and provides connections to the world outside of the cluster (Brown et al. 2007). This activity can be performed by industry clusters.

Researchers note the importance of knowledge brokers in the knowledge-sharing process, as they bridge gaps from external members and bring that information into the cluster members (Collins, Bray, and Burgess 2012). Therefore, relationships among a range of information sources require these brokers to be technically skilled specialists with established networks. Knowledge brokers connect internal and external cluster actors, disseminating information that would not be otherwise available. This serves as a way to overcome challenges in bridging and bonding social capital.

In emerging clusters, social capital provides a basis for collaboration and the potential for knowledge sharing and innovation. As illustrated in Table 3.1 bonding capital enhances the extent to which knowledge is available for application to a given situation while bridging capital assists in the identification of shared issues thereby strengthening the links between horizontal actors and lateral actors. At the firms level bonding capital improves relationships enabling sharing of tacit knowledge among horizontal actors and provides access to knowledge networks while bridging capital facilitates innovation by bringing together disjointed actors to generate knowledge (Mitchell et al. 2010).

3.5.5 Accessibility

Accessibility relates to the extent to which knowledge is obtainable for addressing a current situation (Mitchell, Burgess and Waterhouse 2010) in a manner that is beneficial to the firm. Knowledge accessibility also depends on the willingness of the technical expert to devote time to the process of collecting knowledge and sharing it (Borgatti and Cross 2003). Studies from institutional economics show that regulations and informal structures contribute to the knowledge-sharing process through accessibility to information and help develop norms (Inkpen and Tsang 2005). At the firm level, norms, values, and beliefs enable the firm to develop routines (Knoben and Oerlermans 2006). At the web level, Helmsing (2001) explains that firms share information during logical, rational interactions that result in positive outcomes for cluster members. Additionally, accessibility reduces uncertainty among actors' participation in knowledge-sharing by cultivating a climate that values economic partnerships and shared goals (Ahuja 2000; Capello 2002; Capello and Faggian 2005). Web-level knowledge-sharing also develops formal routines and informal networks (Allen et al. 2007), often resulting in knowledge spill overs. At the firm level, Keeble and Wilkinson (1999) posit that knowledge can be shared by the communications among suppliers and customers while for Schamp et al. (2004) technical similarities grow the knowledge-sharing process by connecting actors together in their networks.

Table 3.1 illustrates that in emerging clusters knowledge sharing at the web-level is enabled by accessibility issues relating to: shared values and policies and professional proximity derived from normative pressures of knowledge sharing activities which are likely to minimise cultural conflict; networks of professional and skilled employees; and localised employee mobility. At the level of firms, accessibility is driven by shared norms and values, coordination across organisations and control mechanisms all of which promote the perception of shared values in knowledge based collaboration while minimising opportunism `related risks. (Mitchell et al. 2010).

Table 3.1: Conceptual Framework of Knowledge Sharing in an Emerging Cluster

Levels of Analysis on cluster as a VAW	Factors Influencing Knowledge Sharing in an Emerging Cluster				
	Absorptive Capacity	Knowledge of Expertise Location	Inter-organisational Trust	Social Capital (bonding and bridging capital)	Accessibility
Web-Level (Lateral, Horizontal and Vertical actors)	Facilitators assimilate external knowledge sharing to the cluster, transmitting knowledge to cluster actors through professional contact. Facilitators are skilled with well-developed knowledge networks to act as a channel among actors/firms. External relationships transfer information regarding knowledge gaps, generating research activities.	Shared values and beliefs in organisations that knowledge sharing generates economic benefits for cluster actors. Facilitators build relationships to provide direct and specific knowledge on expertise. Links to the choice to share and receive tacit and explicit knowledge	Norms sanction against opportunistic behaviour and promote knowledge sharing mechanisms. Cognition-based trust and mutual benefits as a result of economic relations. Willingness to share knowledge and involve in knowledge-based cooperation.	Social capital provides a source for collaboration and the willingness and aspiration for knowledge sharing and innovation. Bonding capital increases availability or the extent to which knowledge is accessible for application to a given problem. Bridging capital help to identify shared issues, strengthening the links between horizontal actors and lateral actors.	Shared values and policies minimises cultural conflict and specialized proximity linked to normative controlling and leading role of knowledge sharing activities Access through professional and skilled employees networks result in knowledge sharing practices. Localised employee movements flexibility is linked to tacit knowledge sharing.

		Absorptive Capacity	Knowledge of Expertise Location	Inter-organisational Trust	Social Capital (bonding and bridging capital)	Accessibility
Firms-Level	(Horizontal actors)	Absorptive capacity links mutual benefits, understanding and shared knowledge base. Individual relationships build mutual understanding and common shared knowledge. Similar tacit knowledge, including shared understanding of language, enables the exchange of knowledge between actors	Associated technical and professional expertise knowledge. Individual interaction builds ad hoc knowledge on available expert location.	Cognition-based trust and normative pressure towards inter professional cooperation and knowledge sharing. Individual ties link to affect-based trust and reciprocity. Collaboration increases firms' perception of trust and shared values, providing a context that engenders further collaboration and knowledge sharing.	Bonding capital improves relationships; this occurs along horizontal actors and enables sharing tacit knowledge. Bridging capital facilitates innovation among firms by bringing together disjointed actors to generate knowledge. Bonding capital provides firms with access to knowledge networks	Common norms and values, inter- organisational management and control mechanisms minimise the risks associated with opportunism, and promote the awareness of shared value. Individual ties provide access through personal interactions.

Source: Self-construction &Adapted from Mitchell et al. (2010). Collins et al. (2012); Inkpen and Tsang (2005); Levin and Cross (2004);

Maskell (2001a); Szulanski and Capetta (2003); Van Wijk et al. (2007) and Welch and Welch 2008).

3.6 Barriers to Knowledge Sharing in a Cluster

There are different barriers and challenges to knowledge sharing in industry clusters. First, a lack of trust in organisations reduces the desire to transfer and receive knowledge created external to the firm (Barson et al. 2000). Moreover, the costs associated with sharing knowledge can serve as another barrier. Another important barrier is lacking well-developed strategic models that support organisations to link knowledge oriented organisational forms to strategy (Kim, Hong, and Suh 2012).

Research demonstrates that knowledge sharing barriers and challenges are linked to efficiency, access and costs (Barson et al. 2000)Firms in emerging clusters, particularly in developing countries, face numerous challenges to knowledge-sharing, including poorly trained human resource and marketing capabilities, infrastructure challenges, information gaps that must be bridged, and poorly coordinated relationships among stakeholders in a weak institutional system and limited technological capabilities (Al-Adaileh and Al-Atawi 2011; Al-Alawai et al. 2007; Connell and Thorpe 2009; Migdadi 2009; Yeo and Marquardt 2013; Fraser, Marcella, and Middleton 2000)).

According to Van Wijk et al. (2007) cultural differences can be another barrier to intra organisational knowledge transfer as the strategic importance of knowledge may be reduced when transferred to a different organisational culture. Easterby-Smith, Lyles and Tsang (2008) allude to strategic knowledge being embedded in the culture of the firm.

Tension between cooperation and competition has also been identified as a possible barrier to knowledge sharing in a cluster. Becerra et al. (2008) cited in (Easterby-Smith, Lyles and Tsang 2008) posit that because explicit knowledge can be replicated easily, it is more dangerous to transfer it to competition. A sense of losing strategic competitiveness can be a barrier where access to knowledge within a network is seen as making it difficult for individual firms to protect their unique competences (Sammarra and Biggiero 2008 cited in Easterby-Smith, Lyles and Tsang 2008).

Barriers to knowledge sharing have implications for a firm's capacity to innovate and its competitiveness given the criticality of knowledge sharing and its transfer to both innovativeness and competitiveness. In emerging clusters barriers to knowledge sharing tend to be different from those found in mature clusters. Studies have highlighted cultural barriers as among major influencers of successfully implementing knowledge sharing activities both within a firm and among firms (Rivera-Vazquez et al. 2009). Cultural barriers can be both at firm and web level given that a cluster's constituent parts are individual firms. In SA, the predominant culture is different from that found in regions with mature clusters a situation likely to interfere with knowledge sharing and transfer. Linked to culture is the element of trust. Low levels of trust have been found to impede knowledge sharing within firms in emerging markets (Vajjhala and Vucetic 2013). Given that clusters are made up of individual firms, the same problem of trust is likely to impede knowledge sharing among firms in emerging clusters.

Low levels of absorptive capacity among firms in emerging clusters could compromise ability to perceive business benefits that could be derived from the process of knowledge sharing. Within SA in particular, low absorptive capacity is one of the major obstacles to successful knowledge sharing in such clusters.

3.7 Summary and Conclusion

This study investigates how clustering supports knowledge-sharing mechanisms in an emerging, government-directed industry cluster in Saudi Arabia. The discussion in this chapter brings together scholarship from a wide breadth of literature, contributing to the field's understanding of emerging clusters and knowledge-sharing mechanisms. In this chapter, the literature reveals that knowledge management and sharing continues to evolve, focusing on how firms create and share knowledge between firms and in a cluster context. The VAW framework integrates research on emerging clusters into a government-driven cluster context; this is an emerging field of study because most research examines established and organic clusters in developed economies, whereas this research examines an emerging cluster, government driven and in an emerging economy. In the situation understudy, where an emerging cluster is both backed and driven by government, the conceptual framework presented in Table 3.1 facilitates an

understanding of how each one of the factors could be enacted differently from situations where the process is not government driven. Using the conceptual framework developed from the literature review, as shown in Table 3.1 above, the originality of this study is derived from the importance of industry clusters as a strategic economic developmental tool, as well as the importance of knowledge sharing mechanisms as an influential factor. The research area is significant because few research studies that investigate the role of industry clusters in promoting knowledge sharing in government driven cluster in SA.

The research employs multiple data collection, including three main research strategies: first, a case study of SAM cluster, semi-structure interviews with the key managerial positions within the key actors of the cluster, and documentary analysis from multiple available resources. Chapter four presents the research methodology in more detail.

Chapter 4: Methodology and Research Design

4.1 Introduction

This chapter sets out the philosophical basis of the research and explains the research approach, process, and procedures and the characteristics and justification for each element. The chapter discusses selection and implementation of the case study analysis, considerations of qualitative and quantitative designs, case selection and procedures, and details of the pilot study, participant selection, and information on interviewees.

According to Corbin and Strauss (2008, 1) methodology is a 'way of thinking about and studying social phenomenon' and provides the rationale for deciding to use one method over other', while Bryman (1984) refers to it as an epistemological position. For Guba and Lincoln (1994) the process of selecting a methodology is guided by three factors: the ontological question that focuses on what the researcher believes to be the nature of reality and what it is that subsists that the researcher can know about it; the epistemological question that focuses on the nature of relationship between the researcher and that which can be known; and the methodological question which focuses on how the researcher can proceed to knowing that which they want to know. Terre Blanche and Durreheim (1999) subscribe to the same views as Guba and Lincoln explaining that ontological and epistemological concepts concern themselves with an individual's perspective of the world, what Kuhn (1962) referred to as paradigms, which can either be objectivist or constructivist.

4.2 The Research Paradigm

Kuhn (1962) is credited with using the term paradigm in reference to the theoretical lens that constitutes the basis for examination of issues. Ever since he explained the idea, in the context of research methodologies, there has been an ongoing scholarly debate between the advocates of quantitative and qualitative research paradigms for instance, Campbell and Fisky, (1959); Maxwell and Herold (2004) and the scope of the term getting broadened to mean qualitative, quantitative and mixed methods of research (Ragin 2014).

The selection of a research methodology is guided by a paradigm which is the philosophical framework that guides how research should be undertaken which informs the tools used for designing of the research, collection of the data and its analysis (Cavana, Delahaye, and Sekaran 2001; Collis and Hussey 2003, 2009; Sekaran and Bougie 2013). Since Kuhn's popularization of paradigms in the context of research methodologies, there has been ongoing scholarly debate between the advocates of positivist and interpretivist research paradigms, for instance, Campbell and Fisky (1959) and Maxwell and Herold (2004). Research, in general is characterised by the two approaches, namely positivism and interpretivism (Collis and Hussey 2003, 2009; Remenyi, Williams, Money, and Swartz 1998).

The underlying assumption of a positivist paradigm is that "the researcher is independent of and neither affects nor is affected by the subject of the research" (Remenyi et al. 1998, 33). The research is carried out through a process of hypotheses testing and deductions. The sample size is usually large and respondents are selected using probabilistic sampling methods. There is a requirement for cause and effect relationships to be established. The conceptual basis would have to be operationalised in a manner that is amenable to quantitative measurements. On the other hand an interpretivist paradigm is underpinned by the belief that the researcher is not independent of the subject of the research but is an intrinsic part of the research (Collis and Hussey 2009; Remenyi et al. 1998). Understanding is linked to the context of action and not to any pre-prescribed conceptual structures, wherein the researcher has a personal knowledge of the subject of the research that is being conducted. There is no testing of any hypotheses and the aim is to explain how a phenomenon either influences the social context or is being influenced by it. The researcher seeks to gain an understanding of the phenomena through interpretations of meanings the participants assign to the issues. The interpretative research rejects the possibilities of objective account of events and instead takes into consideration a relativistic and shared understanding of the phenomena being studied with the objective of getting a better understanding of the intricacies built into the phenomenon, which could be transported to other settings.

The constructivist or interpretive approach privileges reality and interpretation based on the researcher's perceptions while positivists or objectivists privilege observation, quantification and measurement.

Berg and Lune (2004) claim the basic foundation of constructivist research is that knowledge precedes all the reasoning. The objectivist approach, on the other hand, has its roots in essentialism (in which the research is premised on the belief that every object has a set of attributes that can be observed and measured). Saunders and Tosey (2012) maintain that the constructivist approach comprises philosophy and pragmatic science, whereas the objectivist approach is artistry and cognitive science.

Given that interpretivists and positivists have distinctive ways of seeing the world and according to (Guba 1990) none of the approaches is better than the other, Johnson and Onwuegbuzie (2004) opine that both can be considered to be appropriate guided by the purposes for which they are used or contemplated to be used to the extent that they can even be mixed. Mixing methods is a pragmatic approach that seeks to use the best of both worlds. It involves using more than one type of method in executing the research based on the assumption that collecting both qualitative (interpretivist) and quantitative (positivist) data results in more inclusive understanding of the problem at hand (Creswell and Clark 2007).

4.2.1 Selection of the Research Paradigm

In this study, the constructionist epistemology is considered suitable because of the socially constructed nature of individuals (firm-level) and groups (web-level) in the SAM cluster are central to the processes of collaboration and knowledge sharing. The dynamic nature of knowledge sharing mechanisms within industry clusters lends itself to use of exploratory research since the cluster itself and the processes of knowledge transmission and development within the cluster are evolving.

Using an interpretive perspective for this research enables the study to focus on the social constructiveness of reality (Walsham 1993). From interpretive perspective assumptions the researcher introduces into this project include: that there are various combinations of social actions that are being utilised in constructing knowledge sharing within SAM cluster; that it is

better to understand the social processes by analysing the meaning of these social actions as they encourage sharing of knowledge; that the interpretation of knowledge sharing in the SAM cluster should be performed by considering the context of the cluster, levels of analysis and key actors and links between them and the nature and strength of the relationships. Further, it is assumed that there exists a blending of social activities used in knowledge sharing process inside the SAM cluster and the researcher can study social techniques by dissecting the significance of these social activities as they support transfer of knowledge. It is also assumed that understanding knowledge sharing in the cluster is achievable within the context of key actors of the cluster.

Constructivism is associated with use of an inductive approach with a focus on theory generation, rather than testing as is the case with objectivism. This means the researcher need does not have in place a hypothesis to begin their research. An inductive approach calls for the collection of deep information, as for instance, through interviews and perceptions to bring to the fore the experiences and perceptions of individuals in their own settings. Based on the collection of such data, mutually shaping influences start to emerge, which go towards understanding the reality. In essence, the strategies to be followed are characterised by flexibility and the design emerges in a gradual way along with the collection of data. When the data collection gets completed, it is comprehensive enough for an analysis in the context of the theoretical framework in which the research was undertaken. The results are discussed in relation not only to existing knowledge but also to how they are likely to help in the expansion of the knowledge within the overall body of research.

This research uses the inductive approach because it aims at examining and exploring knowledge sharing mechanisms in an emerging and government controlled cluster in Saudi Arabian economy. Inductive reasoning is based on learning from experience (Eisenhardt 1989); examining the SAM cluster in its early stage of development in a developing country context, facilitates the examination of patterns, regularities and resemblances in experiences when juxtaposed with experiences of mature clusters in developed countries. From the data collected patterns, relationships will be identified to answer the research questions. The contemporary nature of industry clusters research with respect to studying an emerging, government-directed

cluster lends itself to inductive reasoning (Al-Adaileh and Al-Atawi 2011; Al-Alawai et al. 2007; Migdadi 2009; Yeo and Marquardt 2013).

The two main research paradigms lead to two main groups of research strategies: quantitative and qualitative research (Bryman 2012; Bryman and Bell 2003). Quantitative research is a means for examining theories and hypotheses through the collection of data through the use of questionnaires, surveys, and experiments that can subsequently be converted into numbers that are amenable to statistical analysis (Cooper and Schindler 2008; Creswell 2009). Apart from the questionnaires, field and laboratory experiments, quantitative research methods can also utilise statistical data gathered by organisations such as data from statistical bureau (Cavana et al. 2001).

Quantitative research aims at testing hypotheses and considers cause and effect and also provides the avenues for making predictions, whereas the purpose in qualitative research is to gain understanding in order to interpret the social actions. Quantitative research can accommodate four designs: correlational, descriptive, experimental and quasi-experimental. All the elements of the research design are finalised before the commencement of the data collection. The characteristics of participants are deliberately hidden from the researcher (e.g. double blind studies). The types of data collected are numbers and statistics. With regard to data analysis, quantitative methods rely on finding the existence of statistical relationships (e.g. regression). The findings of quantitative studies can be generalised to the rest of the population.   In qualitative methods, the design tends to emerge during the course of the study. The approach provides the researcher with the scope to generate theories. In qualitative studies participant characteristics are usually known to the researcher. The types of data collected include words, images and or objects. Instruments used to collect data are interviews, focus group discussions, and observations (Cavana et al. 2001). With regard to data analysis focus is on identifying patterns and themes. The findings of qualitative studies only apply to the sample being studied. ,

4.2.2 Mixed-methods Research

The use of mixed methods is based on a view that embracing both quantitative and qualitative approaches is more likely to provide the researcher with a better understanding of what is being

studied (Cameron and Molina-Azorin 2011; Johnson and Onwuegbuzie 2004). Creswell (2014) give an example of mixed methods as a project with two phases, whereby the researcher collects quantitative data during the initial phase, analyses it and uses the results to plan the subsequent qualitative phase. Rigorously combining methods has been found to provide an enhanced understanding of social phenomenon (Johnson and Onwuegbuzie 2004).

4.2.3 Research Design

The purpose of research design is to enable the "arranging, structuring and executing" of the research that facilitates and expands the "legitimacy of discoveries" (Crotty 1998, 8), Yin (2013) suggests that "a research design is an action plan for getting from here to there, where 'here' may be defined as the initial set of questions to be answered and 'there' is some set of (conclusions) answers". According to Tang et al. (2013), the research design should result in a clear identification of the problem and method selection, particularly relating to existing, alternative, valid designs. Previously published literature linked to the problem must be reviewed, and the methods of analysis applicable to the data must be described in detail. This study started by reviewing the existing literature for examples of different approaches and methods to the analysis of clusters, being mindful of the methods selected and the processes of data collection and analysis. The researcher examined studies that used case studies to examine clusters in different national, industry and policy contexts, ranging from traditional agriculturally-based clusters through to high-tech clusters in the biotechnology sector (Clark and Turner 2004, Fang, Liang, and Jia 2014 and Brown et al. 2010, 2008 and 2007).

4.2.4 Case Study Research

Yin's (2003, 13) defines a case study as "... an empirical inquiry that investigates a real-life phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident." A case study approach involves in-depth analysis of a single case or several cases. A single case study is chosen for this study as the unit of analysis here is the cluster, which is conceptualized as an agglomeration of value adding webs woven around horizontal actors. Choosing a single case provides the opportunity engage in in-depth analysis of the case (Punch 2003). The approach lends itself to using both qualitative and quantitative

methods of data collection and can be utilised to generate thick descriptions of phenomenon and to test or generate theory (Eisenhardt, 1989). According to Richie and Lewis (2003), the advantages of case study research is its distinct feature of permitting a multiplicity of research perspectives. Important characteristics of case study research design that are particularly applicable to this project include its facilitation of the investigation of a contemporary phenomenon related to knowledge transfer within its real life context where there is: no clear evidence of boundaries between knowledge sharing process and their context; many variables to consider in the analysis; and need to use prior developments in the collection and analysis of empirical data. Given the multilayered nature of this research, a natural setting was seen as having greater potential to elicit views and opinions relating to knowledge sharing mechanisms in Saudi Arabia.

Case study design has been criticised for producing results that are not generalizable since it focuses on the specific case. In the case of cluster in SA, the criticism is not relevant since the intention of the study is to gain an understanding of human beings in a societal-oriented environment. As pointed out by Gillham (2008), the focus of a case study based investigation is to obtain answers to specific research questions. According to Richie and Lewis (2003), the advantages in case study research lie in its distinct feature of accommodating a multiplicity of perspectives, a view supported by Yin (2003) who posits that case studies have the flexibility to include data from many sources. The focus of a case study is depth of analysis as opposed to generalising beyond the case (Lee, Collier and Cullen 2007).

Case study design is a preferred strategy when attempting to answer 'how' or 'why' questions at multiple levels of analysis, where the investigator has little control over events and when a contemporary and dynamic phenomenon is the centre of the investigation (Yin 2003). Investigating the value of resources in different levels of a cluster corresponds with the narrated conditions (Punch 2003). It investigates a contemporary and dynamic phenomenon and the emerging related body of knowledge (e.g., Eisenhardt 2002; Yin 2003). The levels and actors that are the subjects of analysis in the current study may be too complex for other methods as it requires the inclusion of data from many sources.

Case study design is used to respond to this study's research questions. According to Yin (2013, 2014) the research design of a study is determined by the degree of control that the researcher has over relevant behaviours. The research question for this study is: How does clustering support knowledge sharing in an emerging, government-directed cluster in Saudi Arabia? The cluster studied is located in a geographical area that is easily accessible for the researcher which is an issue for females in Saudi Arabia where movement can be restricted. There is more freedom in the SAM cluster for a female researcher to conduct research in the selected Saudi cluster due to the modified rules and regulations (see section 2.1.5) where there is an environment for both male and female employees to work together (Exhibit A Website 2013).

4.2.5 Case Selection

This study comprises a single case study analysis as this facilitates the necessary focus in the investigation of knowledge sharing in a government directed SAM cluster. The selected research site is located within Saudi Arabia's emerging, government-directed industry cluster. A single cluster and manufacturing, was selected for the following reasons. First, the cluster is new and emerging, it is still evolving and this makes it of interest in the research. Studying this project while it is still in the early stages of development makes it possible to examine knowledge sharing mechanisms and processes as well as implications for policy makers of knowledge sharing mechanisms that can be implemented right from the early stages in other economic cities within Saudi Arabia or GCC countries. Second, all actors are located within a single location and this supports the ability to conduct the research efficiently (within a short time period) and effectively (reaching all relevant actors). Third, there is a cluster development authority that provides access to the actors in the cluster and extensive background information around the formation and development of the cluster. Fourth, it was possible for a female researcher to gain ease of access to the cluster in terms of being able to interview male participants because of the freedom and less conservative society in the new economic city where the SAM cluster is located (See section 2.1.5). Finally, the selected cluster has sufficient membership to support the examination of the research questions regarding the mechanisms of knowledge sharing within an emerging and centrally co-ordinated cluster.

4.2.6 Research Procedures

The research procedures refer to the methods and sequencing of data collection, the selection of participants and other information sources, the process of recording and evaluating information, and the process of validation of information and analysis. The terms of reference for this thesis are the understanding of knowledge generation and knowledge transfer. It was anticipated that semi-structured interviews with the selected participants would yield relevant information to fulfil the key aims of the study. The respondents were contacted via telephone and through emails prior to the interviews and prior consent from them were obtained before such recordings were made. The interviews were semi-structured as that provided the flexibility for interviewees to air their views according to the nature of the discussion and this gave them an opportunity to express not only their thoughts but feelings as well (Holloway 1997).

Dawson (2002) contends that the semi-structured interview is generally the broadest type used in qualitative research. In this type of interview, the researcher pre-establishes a set of questions to guide data collection about particular issues It is adaptable in that after every interview the researcher can incorporate additional questions to further clarify issues. As discussed by Jafar and Eshghi (2011), semi-structured interviews conform to a process of inquiry that combines a previously determined set of open questions, with the option being available to the researcher to explore additional responses.

A semi-structured interview in an informal way makes it possible to introduce new ideas to the issues discussed, (Nigro, Luon, and Baker 2013). Because a semi-structured interview is in the form of an open discussion, it opens an avenue for new ideas to be brought in (Nigoro, Luon, and Baker 2013). Stated otherwise, it provides a framework containing themes that could and should be explored from where specific topics can be prepared well in advance. In qualitative research, semi structured interviews are widely used (Otterstad 2013). Interviews are a social encounter not just a random conversation or an integrative session (Klenke 2008; Oakley 1999). The researcher is guided by their will to understand and learn from participants, generating active conversation through a series of questions. Use of semi-structured interviews enabled the researcher to adapt to the Saudi context where a more formal approach was expected with some participants. Information obtained from interviews not only provided answers, but also the reasons for those answers.

Interviews provided the avenue to gain an understanding of the complexity of the cluster, the range and types of actors involved, the resources that go with them and establish the linkages. To accomplish this, the researcher conducted 39 interviews with cluster actors. The interview transcripts provide the basis for further analysis. The data analysis comprised a series of steps involving allocation of codes to the themes, the web, firm level actors and the five factors identified as affecting knowledge sharing.

There are limitations to the data collected through interviews. They can be guided by the interviewees' perspectives regarding the topic discussed. People have different views regarding a given topic. Therefore, establishing a number of semi-structured interviews with people of different class, gender and age should provide the researcher with various aspects and viewpoints on a certain topic (Creswell 2003; Wengraf 2001).

4.2. 7 Pilot Study

A pilot study was conducted in order to evaluate the appropriateness of the research methods used in the research. It was also conducted to test whether or not the instructions and research questions were clear and understandable (Cavana et al. 2001). The purpose was to assess the clarity and validity of the interview questions. This strategy of pilot-testing the research instrument has been used in previous studies to discern the authenticity of questions with a variety of respondents (e.g., Fiksenbaum 2013; Md-Sidin, Sambasivan, and Ismail 2010). Another goal of the pilot study was to determine a reasonable time frame required for conducting the interviews (Saunders and Tosey 2012).

The pilot study was conducted to determine the time required to conduct the interviews. This approach has been used where a small number of respondents are tested to ensure that the interview questions were clear and understandable and could be completed in a reasonable time period. The pilot study was conducted with seven participants who included the researchers' colleagues, managers from organisations outside of the cluster, as well as a professor from the university faculty in SA. The results of the pilot show that each interview required a minimum of 30 minutes, the instructions and questions were understood, and that there were no ambiguities or relevant issues that appeared to be missed in the research protocol.

4.2.8 Participant Selection

Choosing participants required planning and scheduling. Prior to the actual dates of data collection, the researcher first contacted the cluster facilitators via email and phone to gain approval for interviews with the selected cluster firms and organisations. The researcher used a snowball technique to identify key informants in the cluster in order to follow up with subsequent participants (Denzin and Lincoln 2003a). The sampling process was purposeful in terms of groups of actors, as well as opportunistic in that the contact was made through the snowball procedure. The cluster administrative agency acted as a conduit to contact facilitators as it offered a list of contacts for different firms within the cluster who they believed would be interested in participating in the study.

Attitudes of the senior managers determine the knowledge sharing culture within an organisation and this view is supported by the research carried out by HsiuFen and Gwo-Guang (2004) that found that knowledge sharing mechanisms and behaviours within a cluster are encouraged and facilitated by senior manager's intentions. Therefore, participants with managerial positions were interviewed. The research focused on the mechanisms and processes of knowledge sharing within two levels of the cluster (namely the web level and firm level). It was therefore important to pick managers who work within departments involved in knowledge transmission, processing and who have responsibility for key functions within the firm/organisation. In that regard participants who were chosen were either directly involved in the development, sales or human resource (HR) departments, or would have had some experience working in these sections within the chosen firms. Managers selected had to have good knowledge of and experience within the cluster/firm. The participants were grouped into lateral, vertical, and horizontal actors. From these three groups a selection of actors within each group were interviewed. Thus, the respondents who were chosen complied with these guidelines each of which is presented in Tables 4.1 and 4.2.

Table 4.1: Coding A Study Participants and Identifying Positions within the Cluster: Web-level (Lateral Actors)

Participating Lateral actors	Actor's Initial Coding	Participant's Positions
Cluster economic developers	ED	- Head of business development. - Senior director cluster's developer. - Manger of shareholder affairs. - Senior manager of business marketing. - General manger - Head manager of sustainability. - Media representative manger.
University	CU	- Vice president. - Project manager. - Research fellow
Government agencies	SAGIA ECA HCA	- The vice secretary manger. - PMO officer. - HR managers.

Table 4.2: Coding Study Participants and Identifying Positions within the Cluster (Firm-level)

Participating Actors	Actor's Initial Coding	Participant's Positions
6 Horizontal actors	HMF1	-An Owner - HR manager
	HMF2	- An Owner -An Engineer
	HMF3	-An Owner -General manager
	HMF4	-Owner General manager
	HMF5	- Owner - project manger
	HMF6	-General manger
2 Vertical actors	The seaport	-General manger
	V1	-Strategic planning manager

Figure 4.1: Conceptual Map of Actors in the SAM Cluster
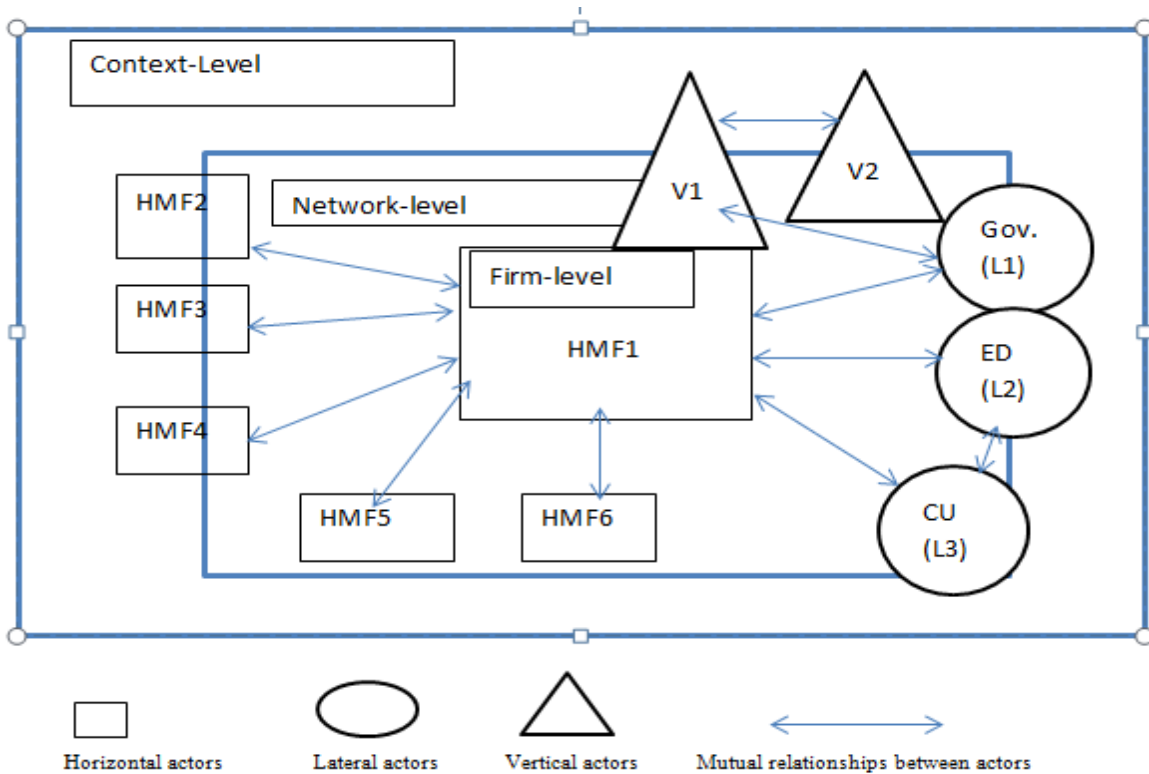
4.3 Participating Firms

The following sections indicate how long firms have been in the cluster and whether they are the locally or internationally owned. Table 4.3 below shows the details of the firms participating in the SAM cluster.

Table 4.3: Participating Firms in the SAM Cluster

Participating Firms	Firm Size	Local or International (MNEs)	Number of Employees	Year of Operation

V2	Large	MNE	900	2012
HMF1	Medium	MNE	500	2010
HMF2	Small	Local	54	2011
HMF3	Large	Local	800	2011
HMF4	Medium	MNE	660	2007
HMF5	Medium	Local	480	2012
HMF6	Large	MNE	2000	2009

Even though the intention is to eventually have over 60 firms as horizontal actors in the SAM cluster, at the time of study, only eight can be considered to be developed and operational. Most horizontal and vertical actors in the SAM cluster are either under construction or are about to commence operations. Some of them had just purchased/leased lands and were not likely to commence their operations anytime soon. It is planned that the entire city, clusters and specifically SAM cluster are going to be fully operational by 2020 (Economic city website 2014). The study included six operational horizontal actors and one vertical firm. All of the 6 horizontal firms are manufacturers however the vertical firm is a supplier specialising in warehousing and a logistics industry.

Manufacturing firms are located in the manufacturing cluster of the new city. Local and MNEs in manufacturing are in designated areas within the cluster, as they are expected to produce high-quality raw materials to diversify the economy (SAM Newsletter 2013).

4. 4 Data Collection

Data collection for this research consisted of interviews and document analysis. Each will be discussed in detail in the following sections.

4. 4.1 Interviews

Prior to interviews taking place the researcher sent information sheets to potential participants via emails; requests to participate in the study were sent to selected lateral, horizontal and vertical actors in the cluster including representatives of the following: economic developer, the university, the government, the firms and the seaport. These information sheets included the background on the study, study procedures, confidentiality, and a description of how the results

would be disseminated. The general manager, or equivalent, and all interview participants signed a consent form prior to being interviewed. Each participant was also given a copy of the research summary and contact details. Participation in the interviews required that organisations/firms and interviewees would not be identified in the writing up process of the research.

Furthermore, a cluster facilitator took the researcher on a tour of the cluster to observe different zones prior to conducting the interviews. The researcher also attended an intensive induction presentation about the cluster before beginning. Interviews were generally conducted in private rooms, though some occurred in a quiet lounge area in the main cluster building. Participants were informed that answers would remain confidential.

The interviews included 39 participants. While this was in line with Perry (1997b) who recommends between 35 and 45 interviews to increase the depth and breadth of data-collection and analysis, the researcher was guided by the need to achieve complete understanding. In determining the adequacy of a sample size in qualitative research, there are references to stopping when categories have been theoretical saturated. What amounts to saturation is not however defined (Morse 2007; O'Reilley and Parker 2013). After 39 interviews the researcher was convinced that they had reached saturation which is described by Morse (2007, p.243) as the stage when "the researcher is convinced that they understand what they see, can identify it in many forms, and it appears culturally consistent, then the category may be considered saturated and sampling may cease."

 Twenty interviews were conducted face-to-face and 19 interviews were conducted through Skype and over the phone. There was 18 interviews were recorded and transcribed, however 21 interviews were not recorded as per the instructions of participants; in these cases, the researcher took copious notes. As the most dominant actors of the cluster are from the web-level most interviewees belong to the lateral actors and specifically cluster's facilitators. There were 26 interviewees from the web-level and 13 from the firm-level.

Sekaran (2003) opines that a face to face interview facilitates a higher level of understanding between interviewer and respondent and provides the opportunity for a controlled interview situation allowing the interviewer to ask complex and follow up questions. Skype / telephone

interviews were conducted where it was difficult to arrange a suitable time to conduct a face to face interview. Where permissible, face to face interviews were recorded and transcribed.

Interviews commenced with a short introduction of the topic followed by general questions that solicited information about the overall knowledge management in the firm. This was followed by specific questions about knowledge sharing mechanisms and factors facilitating or hindering knowledge sharing in the cluster. Interviewees were asked to provide explanations about the specific hindrances in the cluster/actor and how they responded to the hindrances. The interviewees were also asked about their own efforts to share knowledge in terms of how they did it and why they adopted that approach. The interviews were semi-structured designed in a way that would generate discussion with interviewees. There were four forms of interview questions depending on each actor (lateral, horizontal and vertical) participating in the study. The first form was for the cluster's facilitator including (the economic developer and the government). The second form of questions were designed and provided to the cluster university. Third were those for the vertical actors including interview questions for vertical firms and the seaport. Finally were the questions for participants from the horizontal firms. All the interview questions forms (see Appendix B) covered the same five broad research issues regarding the following:

   i. The role of the cluster's facilitators in enhancing knowledge sharing activities.
   ii. The types of knowledge do actors share in the SAM cluster.
   iii. The mechanisms of knowledge sharing do actor use to exchange knowledge in the SAM cluster.
   iv. The factors that influence knowledge sharing such as: trust, expertise of location, accessibility, social capital, and absorptive capacity.
   v. Barriers to knowledge sharing activities.

4.4.2 Document Analysis

Jafar and Eshghi (2011) define document analysis as a systemic process for evaluating and reviewing electronic and printed materials of document. Document analysis requires that the particular data is interpreted and examined to extract meaning, as well as gain an understanding

of empirical knowledge within the process of research (interviews). The researcher examined and analysed different kinds of documents provided by the cluster's facilitators and/or the firm's managers/owners. Some other documents were available online for downloading or on different sources of social media through the internet. The documents analysis included: cluster's agendas, advertisements, Investor Relations Presentations, brochures, background papers about the clusters, journals and diaries, newspaper articles, cluster quarterly magazines (from August 2012 till May 2016), charts and maps of the clusters and firms, press releases, scripts of television and radio about SAM cluster achievements and activities, survey data, and institutional reports, official governmental documents such as Saudi Arabia Vision 2030 plan, local governmental reports, and internal newsletter publications from the cluster, university and the seaports.

The documents provided background to the study, supported the interviews and offered validation of the interviews through triangulation of the different data sources. Analysing a combination of sources for document analysis increases the validity through triangulation and strengthens the results from document analysis (Marshall and Rossman 1995). The process however has some limitations; for instance, there are certain documents that may not be made available because of security or confidentiality reasons (Patmore 1998). There may also be other challenges relating to incomplete and/or inaccurate documents and irrelevant documents (Patton 1990).

This research has two phases of documentary analysis. In the first phase, before conducting the interviews, the researcher checked SAM cluster websites and each actor's official website for those participating in the study. This assisted the researcher to gather information to assist in framing the interviews. There was also information related to the cluster that was available to the public through web pages, social media (Facebook, Twitter, and Instagram) and the media.

The second phase of documentary analysis was conducted after the interviews for the purpose of following up the interview details. Following the interviews some of the participants provided private and in confidence documents that had to be treated carefully to avoid disclosure of any sensitive information. Documents accessed in phase two included: financial reports, presentations for investors and official email messages and conferences reports.

Analysing documents incorporates coding content into themes similar to the process for the interview transcripts. The researcher used three primary types of documents: public records, personal documents and physical evidence. The official, ongoing records of the city and the cluster activities have all been investigated and examined by the researcher in this research. Examples include interview's transcripts, mission statements, annual reports, strategic plans. Some examples of the personal documents are e-mails, minuets of meetings, photograph album, blogs, Facebook posts, logs, event reports, and newspapers. The documents analysis also included the physical objects found within SAM cluster such as flyers, posters, agendas and brochures.

4.5 Data-Analysis

For this research project, the researcher's primary focus was on overall, broad data, then adopting a narrower, definite analysis via categorization. This assisted in making associations and in identification of distinctions in the data. Open coding (Corbin and Strauss 1990; Glaser and Strauss 1967) was used as it helped the researcher to distinguish the designated sets into which the observed phenomena would be assembled. This facilitated the creation of multi-dimensional categories that formed the preliminary framework for analysis.

Data collection was iterative as the results of the document analysis guided the subsequent collection of data with data collection and analysis informing each other resulting in a higher level synthesis of the information. The iterative cycle was repeated throughout the data collection process as it was designed, developed, checked and revised as the process continues (Johnson and Onwuegbuzie 2004).

Nvivo 10 software was used for analysing the qualitative data. This software helps systematic analysis of qualitative data with regard to: organisation of data, its storage and preparation of reports (Jones 2007). The interviews were analysed using deductive content analysis with the coding done through Nvivo. In coding, data was reorganized into parts to visually map out a holistic model that tells a story (Ryan 2006; Monette, Sullivan, and DeJong 2011; Denzin and Lincoln 2011; Creswell 2013). The next step in the analysis was defining categories related to the research contents. The content categories acted as the variables that acquired some values

after their application to the data analysis methods. The level of the measurement of the content variables was selected on the basis of the coding definition. Coding of the intensity, frequency, values, and appearance of the data units was defined and used as the basis for analysing the data. After transcribing the interviews, the data was entered into the Nvivo software for analysis. A list of "nodes" (categories) was created in Nvivo to identify emergent themes arising from the interviews (Table 4.4).

Table 4.4: Thematic coding framework

Theme	Sub-theme
Knowledge sharing mechanisms	Formal mechanisms Informal mechanisms
Forms of web-level knowledge sharing in the SAM cluster	Explicit knowledge Tacit knowledge
Factors Influencing Knowledge Flows in the Cluster (Web Level)	Absorptive capacity Knowledge of expertise location Knowledge sharing through the ICP to the SAM Cluster Inter-Organisational Trust Social Capital Accessibility
Barriers to web-level Knowledge Sharing in the SAM Cluster	Rigidity of rules and regulations Cost of research and development Intellectual property concerns Lack of commitment among participants
Mechanisms of knowledge sharing at firm	Formal knowledge sharing

level	Informal knowledge sharing

Coding and categorising large chunks of interview text allowed the author to locate all the data relevant to a particular theme, thus ensuring that each phenomenon was thoroughly examined and making it easier to identify similarities and difference across cases. The research design is illustrated in Figure 4.2

Figure 4.2: Research Design
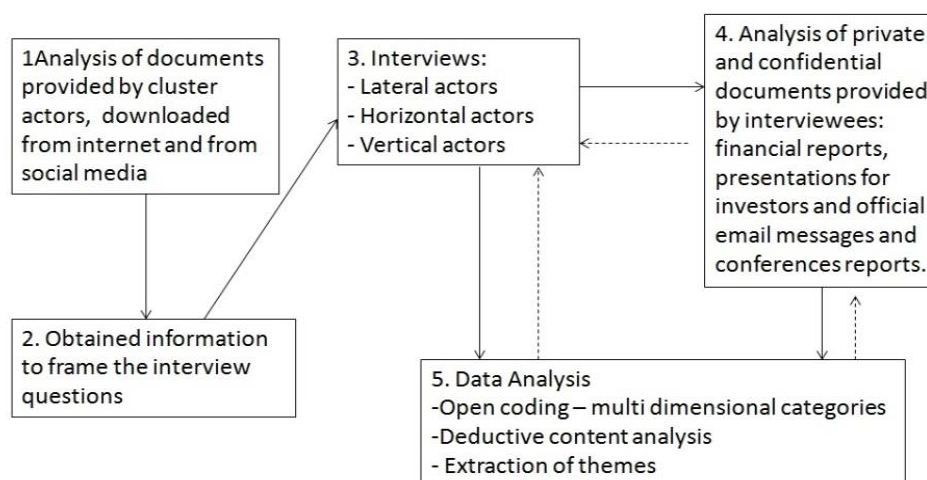
4.6 Triangulation

Triangulation is the process of combining methodologies in studying the same phenomenon (Denzin, 1978). It represents a convergence of methods in order to produce results that are more objective and valid (Niglas 2004; Jonsen and Jehn 2009). In this study that relied on semi-structured interviews and document analysis validity was increased through cross checking a combination of data types throughout the process. Semi-structured research questions were formulated based on data derived from both formal and informal documents; data derived from

the interviews was cross checked with both formal and informal documents derived from the different cluster actors. The content of documents was also cross checked against findings from the interviews. Brannen and Peterson (2009) define this form of triangulation as "within methods" triangulation involving collecting data using multiple methods: in this case data was collected through interviews and analysis of different document forms and social media.

4.7 Validity and Reliability

Validity and reliability concern the extent to which research findings can be transferred to comparable subjects in similar circumstances (Merriam, 1998). Validity refers to the integrity of the conclusions that are drawn from a specific research (Bryman and Bell 2007). Validity has two components, internal validity and external validity (Lundahl and Skärvad 1999). In qualitative studies, validity is about internal and external credibility. Onwuegbuzie and Leech (2007, 234) summarised internal credibility as referring to: 'applicability, consistency, neutrality, dependability, and/or credibility of interpretations and conclusions within the underlying setting or group.' They summarised external credibility as referring to '... the degree that the findings of a study can be generalized across different populations of persons, settings, contexts, and times.'

As pointed out by Welman, Kruger, and Mitchell et al. (2005) the validity of a study is reliant on the validity of the data gathering instruments in terms of whether they yield data in accordance with the objectives and research questions set by the researcher.

Although there are no set standards available in the literature for assessing reliability and validity in qualitative research (Andersen and Skaates 2004; Chambliss and Schutt 2006), this study attempted to maximise these qualities in the following ways: first, efforts were made to gain the interviewee's trust, thus encouraging him/her to be more honest (Saunders et al. 2009). This included presenting interviewees with a consent form from the researcher's university assuring anonymity and asking each respondent to describe his/her own background. Second, each participant was provided with a short description of the project prior to the interview in order to promote validity and reliability by allowing the respondent to consider the information being requested and to process some thoughts about the research topic (Bryman and Bell 2007; Saunders et al. 2009). Third, where suitable, open questions were employed, allowing

respondents to describe particular thoughts or experiences as they wished (Rubin and Rubin 1995). Fourth, collecting data over an extended period of time (over a 3-month period) gave some assurance that the patterns of relationships reported were relatively stable (Johnson and Christensen 2004). This research uses a multi-level coding approach; data are coded according to the defining actors based on the value-added web framework. Participants are coded at the firm- and web-level for horizontal, vertical, and lateral cluster actors. See Tables 4.4 and 4.5 for the coding of study participants.

In so far the application of external validity with particular reference to this research, it may be noted that there is a limitation. It is because this study is based on only one emerging cluster in Saudi Arabia and it may not be possible to replicate the results of the study for other clusters due to the differences in physical location, industry composition, formation, the prevalence of culture and the stage of development in which they are placed. In spite of the above limitation, the dependability and reliability in this study are achieved through having designed the research based on prior theories and studies, meticulously documenting the information, and exercising choice on the questions by making them suitable for the cluster actors.

4.8 Ethical Considerations

Creswell (2003) stresses the need for the researchers to anticipate some of the ethical issues that they have to take into consideration, such as taking measures to protect their participants which go towards developing the participants' trust. They also need to guard against the misconduct or inappropriate behaviour as that may affect the organisations or institutions on behalf of which they could have undertaken the study. Remenyi (1998) specifies some of the challenges as: obtaining informed consent from the interviewees, keeping their privacy and confidentiality. According to Silverman (2000), the relationship between the researcher and their subjects is of utmost importance as that may determine the ability of the researcher to influence the findings. In short, the researcher has to subject themselves to a series of tests to make sure that the research process fulfils the established ethical standards.

For this research project, the research methods and its ethical implications were subject to an independent review and approval process conducted by Curtin University. After the review

process an ethics clearance certificate (SOM-17-13) was issued prior to the data collection taking place. The researcher was required to inform the participants of the reason and nature of data gathering methods and the purpose of the research. Participants were provided with information sheets and were required to sign consent forms before interviews were conducted. They also had the right to withdraw from the research at any time and to review transcripts of their interviews. The researcher guaranteed anonymity for participants and their organisations. In terms of documents that were either confidential or not in the public domain there was an undertaking that sensitive material would not be disclosed. All the relevant documentation supporting the ethical review process associated with this research can be found in (Appendix A).

4.9 Limitations

In terms of the method's limitations of this study, this research was conducted at one point in time and therefore provides a snapshot of the key areas of focus. A three months period for the actual data collection in the field is insufficient to examine how the case study progresses at different stages in time. This is an evolving cluster and many of the conditions observed in the study may not hold into the future as the cluster develops. Due to the cluster being still under construction during the time of data collection, there were a limited number of horizontal and vertical actors to include in the research. Furthermore, the use of only one emerging cluster limits the applicability of the results obtained. In addition, the research is confined to one new city within Saudi Arabia and this limits the application to clusters in other locations. As a case study, the generalizability of research findings cannot be assessed except in so far as they conform to existing published research and to prior theory. While this is an inherent limitation of a case study, in this thesis the limitation does not affect the study's aim of understanding the complexity of knowledge sharing in a emerging structure in a very specific environment with no intention of generalising beyond it (Lee, Collier and Cullen, 2007).

4.10 Conclusion

This chapter outlined the research paradigm, methodologies, and techniques used to conduct the study. Using an exploratory single case study, viewed from the lens of the interpretive perspective enabled depth of analysis regarding Saudi Arabia's emerging cluster and the

knowledge sharing processes. After the pilot study, revisions were made to the semi-structured interview questions, which were then coded for analysis. Document analysis from multiple sources in addition to the semi-structured interviews triangulated findings. This chapter helps explain the broader research design of this project from data-collection to analysis, inclusive of validity and reliability, limitations and ethical considerations. In the next chapter, case study data is discussed to show how knowledge sharing is facilitated within an emerging industry cluster.

This chapter has set the methodological basis that guided the conduct of the study. It comprises a blend of theoretical propositions, scholarly opinions and the practical measures adopted to explore and document the findings. It explains that the method to be followed as interpretive and constructivist. After explaining what these terms mean and convey, it proceeded to discuss the finer elements with which the methodological aspects of research have evolved. For instance, it deals with quantitative, qualitative methods, research design, and the role of case studies in arriving at conclusions, the justification and relevance of taking a single case study and connects them to the cluster and the people working therein. This has helped in relating the theory with the practical application followed in this study. It detailed the completion of a pilot study, as per established procedure, before getting further into the collection of the data on a larger scale. It also presentenced the researcher's approach to dealing with reliability, validity and ethical considerations.

The next chapter presents the analysis of case data to demonstrate how knowledge sharing is facilitated within an emerging industry cluster.

Chapter 5: Data Analysis and Findings [1]

5.1 Introduction

Based on the data analysed from interviews and cluster documents and guided by the theoretical framework proposed in Chapter Three, this chapter seeks to answer the research question: How does clustering support knowledge sharing in an emerging, government-directed industry cluster in Saudi Arabia? The chapter starts by providing the characteristics of the lateral, horizontal and vertical firms included in the cluster study followed by an analysis of the semi-structured interviews data and documentary data of SAM cluster. There are two levels of analysis within the cluster; the web-level and the firm level. First, the SAM cluster's (web-level) consists of different actors (lateral, horizontal and vertical) and second the firm-level consists of horizontal firms. This chapter starts by presenting findings for the web-level followed by those for the firm level.

Analysing knowledge sharing within the cluster depends on interactions at the different levels of analysis (web-firms) and forms of knowledge and the links/relationships between actors. Qualitative analysis applies the theoretical framework set forth in Chapter Three with a view of understanding the process of how knowledge sharing is used within an emerging cluster in Saudi Arabia.

Data reported in this chapter are based on analysis of documents collected from various sources including public records, organisational documents, websites, reports, online news sources, social media sources such as Facebook pages, fact sheets, flyers, brochures, board of director

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[1] This chapter includes data analysis from documents and interview's transcripts of different actors within the SAM cluster. The economic city cannot be identified in this research as this would compromise the confidentiality of the participants through indirect identification. All the information cited in this chapter is based either on confidential sources or public sources that cannot be directly identified. Therefore, for confidentiality and anonymity reasons, actual in-text and end-text reference cannot be revealed.

reports (2012/2013/2014), quarterly reports, annual reports, investor presentations and .
interviews conducted with key actors in the SAM.

5.1 Characteristics of SAM cluster actors

The following sets out the firms included in the cluster. The government and economic
developers in the SAM cluster are termed as the facilitators who provide essential knowledge in
the economic development of the cluster. These actors are: the Economic Developer and the
Economic Cities Authority who are responsible for the administrative support of the cluster.

5.1.1   V2 - Large MNE

V2 is a logistic, warehouse and supply-chain management firm in Saudi Arabia. The firm stores
and handles inventory for firms in the manufacturing industry. The inventories and warehouse
are situated in locations in which they are strategically placed for the horizontal firms. The
warehouse of the cluster owned by V2 is built in the centre of the cluster, offering contractual
and duty paid services options to client and strive to cater different needs of the actors and
customers in the cluster. V2 uses special technology and systems to manage warehouse and
inventories with strategies to minimise wastage, better space utilization, use right equipment and
streamline storage expenses. They also use technology as their main mechanisms for knowledge
sharing with other actors in the cluster. They share knowledge about their service, labelling,
kitting, packaging and software installation to their customers.

Because of its proximity and access to the other firms, V2 is the main transportation and logistics
centre in the SAM cluster; it shares its knowledge on logistics to provide e clients with effective
decision making solutions for their logistics and inventory network requirements (V2 company
profile 2013). V2 deploys supply chain management that is important for the cluster firms'
operational efficiency. The company offers customised solutions to the horizontal actors, which
go towards reducing the inventory costs, expediting transactions and their speed, which all
together, can improve the sales through an implementation of customers' requirements more
efficiently. V2 uses several communication channels and social resources to share inter-
organisational knowledge within the cluster. In logistics, knowledge sharing between clients and

partners, is important since the business depends upon the available knowledge. V2 also uses pagers and cellular phones for inter organisational communication. The communication is a major part of knowledge sharing, as the organisations rely on real-time information for key operations and logistics management.

Manufacturing firms are located in the manufacturing cluster of the new city, which covers about 11,000 acres. These firms are key economic drivers for the Saudi Arabian economy, and the area is expected to host more than 2,700 firms (Annual Report of SAM Cluster 2014). Local and MNEs in manufacturing are in designated areas within the cluster, as they are expected to produce high-quality materials for use in the biomedical, automobile, and food packaging industries. Raw materials for these cluster industries are readily available in the country (Cluster Newsletter 2013).

5.1.2 Horizontal Actor: HMF1 Medium MNE Firm

HMF1 was established in Saudi Arabia since 1970 with an objective to manufacture broad range of industrial product. Their equipment and products have gained recognition in over 50 countries. According to the interview with HMF1 manger, He pointed out:

> "The decision to invest in the industry cluster is governed by various reasons. The first is the direct access to the seaport that has immense potential; the second is that the industry cluster has a highly developed basic infrastructure and very advanced facilities. Therefore, we decided to make industry cluster one of our main supply lines."

HMF1 has growing demand from national and international clients, and in order to fulfil these demands the company has launched its new manufacturing facility in 2010 within the cluster. The facility has more than 500 managerial and engineering staff (HMF1 Official Website 2013). Training is an important element of the firm's strategy. An employee from the firms had stated in the interview that, the firm has weekly in-house training and they encourage their employees to improve and seek knowledge through various rewards. He also had pointed out that they have different communications mechanisms. For example, they use emails for official documents distributions within the firm. The firm also has strong link and relationships with vertical and lateral actor. HMF1 uses communication channels, such as e-mails and online portals, for communication with clients.

5.1.3 Horizontal Actor: HMF2 - Small Local Firm

HMF2 is engaged in a clean products manufacturing business. The firm joined the cluster in 2011. It is one of the small manufacturers and only has 54 workers in the firm. It has dedicated its own products processing and manufacturing unit in the cluster. The firm sells its products directly to distributors; the distributors then supply the products to the customers within and outside the SAM cluster. HMF2 also provides services to other similar manufacturing firms within the cluster. The firm provides in-house training to its employees, which is vital for their business strategy and marketing. The manufacturing unit is equipped with modern manufacturing machines.

The manufacturing facility has an in-house quality control laboratory that is responsible of testing the quality of product manufactured. Since the inception of the products manufacturing facility, the main reasons they join the cluster based on the interview with the owner is the SAM cluster has a single regulator which is the ECA for key government's requirements.

5.1.4 Horizontal Actor: HMF3 Large Local Firm

HMF3 started its business in 1980s as a marketing, sales, and Distribution Company. HMF3 has joined the SAM cluster in 2011 and it is a large firm based on employee numbers of around 800. Due to its diversification strategies, HMF3 has many companies and divisions; it continues to grow in Saudi Arabia and the GCC, since the cluster is a gateway to the Middle East, Asian, and Western markets. HMF3 has established its business on the related industry products in the cluster. The specific division of HMF3 in the cluster has its own management structure and holds a comprehensive portfolio of products line as it collaborates with reputable. As stated by an HMF3 owner:

> "Our goal is to transfer the knowledge, to bring the small (their specific products) from abroad and make sure that we are able to form a proper cluster in Saudi Arabia. We selected this industry cluster as it realized that there is a huge demand for our specific industry products in Saudi Arabia and that the genre of products available on the market was very important".

The Manager of Planning and Strategy shares the perspective on HMF3:

"Powered with cutting-edge technology, they ensure that the storage requirements and inventory management needs are met while providing real-time visibility at all levels to help the firms to control their stock levels, streamline purchases and improve their order cycle time."

According to the HMF3 Website (2013), the firm has very active training programs and workshops to their employees. It has participated in many collaborations research with the cluster university. The firm's facility has four well equipped laboratories that are responsible of testing the product quality. HMF3 has aimed to provide good products to its clients.

5.1.5 Horizontal Actor: HMF4 - Medium MNE Firm

HMF4　is a significant producer of diverse special products and materials. The firm has an assembling and production facility in the SAM cluster. It is the first firm was established in SAM cluster in 2007 and they have 660 employees. The HMF4　quality policy is the pioneer in the manufacturing of its industry. It owns several offices and branches covering the Middle East and international markets (HMF4 Firm Profile 2013).

The quality management system (QMS) ensures that HMF4　delivers high calibre and reliable products and services in all the work they do. The QMS guarantees that official correspondence with different actors within the SAM cluster, work control, and responsible traceability records are created for all work attempted. All HMF4　representatives are responsible with ensuring these regulations and obligations are applied in the quality manual of the firm. The manual characterizes the quality management system that has been received as the methods for accomplishing their business targets, through regular management surveys. All suppliers and actors collaborating with HMF4　within the cluster thereby obtain the vital knowledge to adjust to the strict QMS regulations. To achieve this quality assurance system, the firm has various training programs, both internal and external with other firm in the cluster, due to their proximity and access and hence helps the extent to which knowledge is available for application to a current problem or situation in the different firms. The reason why they joined the SAM cluster is indicated in the interview with the manager, stating: "*There is a business ready connectivity through the Port, railway and the cargo land bridge which gives us an international and national access to the region's market and the entire GCC countries.*"

5.1.6 Horizontal Actor: HMF5 - Medium Local Firm

HMF5 is one of the main manufacturers and leaders in their industry in Saudi Arabia. In 2012, the firm joined SAM cluster. Today, the firm has around 480 workers in manufacturing. HMF5 has an industrial facility that stands out in producing a wide range of products in their specific industry. It has its own research centre, which is run and directed by qualified staff and technicians. In order to counter the rising prices of the products in the Middle East, the factory manufactures the highest quality reinforced products that provide similar properties when compared to other products and have required standards about safety. HMF5 guarantees the defect-free product with high value for workmanship when the products are being purchased.

HMF5 has special departments to interact with the clients and customers about the quality of products and gain feedback on how to make their products higher quality. HMF5 is conscious about the quality of their product and wants to build on the trust the clients put in their products. This initiative has brought the company in spotlight in its own products manufacturing market and is starting to capture more market share in Saudi Arabia and the Middle East. Most employees in HMF5 attend several training and workshops courses made within the cluster in order to improve their communications channels with firms. This encourages the employees to communicate informally with clients and participate more in social events facilitated by the clusters.

5.1.7 Horizontal Actor: HMF6 - Large MNE Firm

HMF6 is a main supplier company within the SAM cluster. It is a world-wide leader in its industry; it has established its business in more than 130 countries. HMF6 has been operational in the cluster since 2009, and it is a publically traded company with around 2000 employees. It is considered as a large firm in the SAM cluster. Recently, HMF6 has emerged as a major player in green industry processes. HMF6 signed with the ECA to establish their green manufacturing facility in the cluster. This manufacturing facility has been established by HMF6 in the cluster, creating jobs for around 500 people in SA (HMF6 minutes of meetings 2013).

HMF6 has also become a member of the Industry-University Collaboration program by establishing a unique working relationship with research and development centres at the

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university; their engineers at HMF6 ensure knowledge sharing at this level (HMF6 Website 2013). It also has training programs and research and development facilities as a mechanism for knowledge transfer and sharing.

5.2 Background for the analysis and mechanisms of knowledge sharing

In order to analyse the role of clustering in facilitating knowledge sharing processes, three kinds of data are necessary. First, we require knowledge about the context and location of the industry cluster (economic city) that has been established. This information is set out in Chapter Two. Second, we require knowledge about key actors who are participating in the cluster;, these were identified in Chapter Two and in section 5.1 above. Third, we require data about knowledge types, forms and sharing mechanisms within the cluster, this information is assessed from document analysis and from key informant interviews.

There are six identified clusters in the industrial district within the economic city however, this research examines only the manufacturing cluster within the new city. As indicated in Table 5.1 below, there are six horizontal and one major vertical firm within the manufacturing cluster which is the focus of the study. Although the Seaport is another vertical player, it is still at a developmental stage.

There are three main lateral actors in the SAM cluster: Government authorities who include SAGIA, ECA and HCA; the economic developer (ED) and the Cluster University (CU). The initial feasibility studies for establishing the cluster were undertaken by ECA to ensure that the different clusters were developed with due consideration for regional relevancy and resource availability. In this thesis the ECA and the ED are called facilitators, because they are the main influential actors in the governmentally driven cluster and they have shared objectives. The data confirms the dominant role played by lateral actors in leading, controlling and developing the newly emerging cluster and generating for it both bonding and bridging capital. The ED HR manager stated in the interview:

"We as a government authority located in the same building with the economic developer, we are considered most of the time as one entity in term of acting with investors here in the cluster. We have shared objectives, visions and aims regarding the entire region of the economic city. The government has given much permission of decision's making and providing some rules related to the SAM cluster as long as it does not interfere with the basic rules of the country. Therefore, many decisions are provided from the ED and they have the responsibilities of informing us 'the government' of all the decisions. So, in the SAM cluster case, the ED is acting on behalf of the government sometimes to achieve the ultimate goal of economic development and success of the cluster."

The relationships between actors are another important aspect of VAW framework that needs to be investigated for the purposes of data analysis. In the web-level, links and interactions indicate knowledge sharing flow between the lateral, vertical and horizontal actors in the SAM cluster. Also there is evidence of knowledge sharing between lateral actors. Moreover, analysing the data from the documents and interview's explicates the types/forms of knowledge being shared between actors in the web-level of the SAM cluster.

Table 5.1: Identification of the Participants in the SAM Cluster at the Time of Data Collection for this Study in (2013-2014)

HORIZONTAL (6)	VERTICAL (2)	LATERAL (3)
Horizontal manufacturing firm 1 (MHF1)	The Seaport (Partial operation) and Vertical Logistic Firm (V1)	1 university/ Research and development centres and training centres.
Horizontal manufacturing firm 2 (MHF2)	Partly suppliers to or buyers from the horizontal firms	1 Academic school
Horizontal manufacturing firm 3 (MHF3)	Logistics firm, distribution and warehouses. Vertical actor 2 (V2)	Government agency (SAGIA) with two sub divisions (ECA) &(HCA)
Horizontal manufacturing firm 4 (MHF4)	Cafes, restaurants, Supermarket, Health clinic and gym (integrate into context as places for meeting)	Cluster economic developer (ED)
Horizontal manufacturing firm 5 (MHF5)	Local hotel, villas and apartments buildings and dormitories (Residential).	Engineering and consulting company.
Horizontal manufacturing firm 6 (HMF6)		

The next section assesses the links within the SAM cluster and analyses their nature and strength.

Table 5.3 below provides detail about the links of the interactions and the connection's strength within the SAM cluster. The interdependencies come with different degrees of competition, cooperation and complementation among the actors of the cluster. Assessing the strength of the relationship is based on how often actors contact each other and whether they contact each other in direct or indirect links. In an emerging and new cluster as is the situation in the SAM cluster, there is a small number of horizontal and vertical actors as a result relationships are also limited. However, there are strong and direct links at this early stage of development because the cluster is government-directed with the lateral actors leading and having a dominant role in the cluster. Links will change in the near future when more actors join the cluster. Lateral actors in the SAM cluster have direct and strong links which is different from findings from other clusters where usually lateral actors have medium link with horizontal actors (Connell and Thorp 2009, Burgess and Henderson 2010 and Brown et al. 2010),. What makes the SAM cluster unique is that lateral actors are dominant and they are controlling and leading so they have direct connection with the firms. They also have strong links with the firms in the cluster because they interact with the firms on a regular basis and firms are dependent on the lateral actors for providing infrastructure, services, employees, training, connections with institutions outside the cluster and facilitating knowledge sharing activities. The strength of the links differs within the cluster. Large firms, mainly MNES, have established links with horizontal actors that they can bring to the new cluster. Small and local firms, horizontal and vertical, do not have these established direct and indirect links. One of the challenges of cluster development is to integrate SMEs into the supply chains that are present in established MNEs.

Seaport (V1) is in the emerging stage of the cluster as it has only started a partial operation, it has weak but direct link with the actors. They are in the stage of signing contracts and cooperative arrangements with firms in the cluster. There are strong and indirect links between the vertical firm (V2) and horizontal firms. V2 is the only established vertical firm in the cluster and as a result, most horizontal actors have strong links with this firm. It handles the transportation of manufacturing machineries, packaging and warehouses and provides other valuable services to the cluster firms. With only one major vertical firm it means that many of the relationships are external, especially from horizontal to vertical actors. Another challenge in cluster development is to attract and integrate further vertical actors into the cluster.

For the external interaction, V2 as a supplier may have direct connections with customers outside the cluster as they provide the technology for manufacturing, fuel, machines, raw materials and other resources. The suppliers partially engage in the industry cluster activities. Therefore, horizontal actors and the outside firms have indirect links due to the vertical firm facilitating the connections. The connections and links between other actors may not be equal (Brown et al. 2007: 20). The Ministry of Commerce & Ministry of Business and Trade has direct but weak links with the cluster actors as they still provide the business rules and regulations to the lateral actors with the permission to be modified according to the cluster's requirements. Although the government authority of the cluster (ECA) is the sole regulator and they act on behalf of those ministries. Another external linkage in the SAM cluster is with the ministry of work and workers within the cluster. The links are indirect and of medium strength. This is because one of the main aims for establishing the cluster is job creation. As a result, there are some expected requirements from the ministry for the numbers of jobs to be available for Saudi nationals within the cluster (Exhibit A website 2013). Links among horizontal actors vary depending on the size of the firm (Small, medium or large) and weather the HMF is Local or international firm (more details are discussed in chapter Six section 6.1.1). Ministry of petroleum and minerals, Government Export Authority have indirect and weak links as they are dominant in the Saudi economy so they have some shares in the government financial funding. Also the Government Export Authority has limited interaction at this stage of cluster because the seaport has not yet started full operation in the region.

Table 5.2: Types and Form of Links within the Cluster

Actors	Type of Link	Strength of Link
Among Lateral actors: The University The ED & The Government	Direct	Strong
Among Lateral actors and Horizontal actors	Direct	Strong
Among Lateral actors and Vertical actors	Direct	Strong
Ministry of Commerce & Ministry of Business and Trade and the Cluster	Direct	Weak
Ministry of work and workers and the Cluster	Indirect	Medium
Ministry of petroleum and minerals and	Indirect	Weak

cluster		
Government Export Authority and cluster	Indirect	Weak
Among Horizontal actors	Direct	Depends (strong-medium and weak)
Among Horizontal actors and the one major Vertical firm in cluster	Indirect	Strong

Some firms of the industry cluster are vertically integrated which means that they manufacture, advertise and sell their product without any help of a third party support. In the cluster individual firms add value in their own right, but also add value to the total cluster. The reputational and locational identification associated with the "SAM cluster made products" means that individual companies are both rivals and collaborators. The cluster has value adding processes associated with product manufacturing and products sales, it also has relational value adding being generated as a result of the synergies that are present within the economic region.

Mechanisms of knowledge sharing at the Web level

 The next paragraphs presents the different types (Formal-informal) mechanisms of knowledge sharing in the Web-level among lateral actors based on the interviews with the participants.

There are several mechanisms of knowledge sharing within the web-level in the SAM cluster, there are distinctive methods for interchanges, however formal and informal are most used mechanisms (see Table 5.2 below).

Formal mechanisms include: formal monthly meeting, meeting (one to one or group meeting), formal events including conferences and presentations, formal documents such as consultancy reports and industrial forms, (technology) emails with official documents, consultancy advice, and workshops. Examples of meetings are those in the form of joint gatherings and presentations. . The knowledge sharing in the Web-level requires the formal meeting of the members to discuss and share thoughts and ideas in order to develop best regulations and operational activities in the cluster. Another effective mechanism of knowledge sharing are the formal social events, these events are another form of gathering between the cluster actors where they get to know each other more which result in the facilitation of knowledge sharing between the organisations.

The informal mechanisms inside the Web-level are casual social occasions and gatherings, for specific events, monthly barbecue, phone calls, e-mail, flyers, pamphlets the quarterly magazine to share recent news about the Cluster. In the cluster, there are different types of knowledge sharing mechanisms, most of them are being organised and supported by lateral actors within the SAM cluster. Proximity plays an important role in facilitating these mechanisms in addition to the leading role of the lateral actors.

Table 5.2: Knowledge Sharing Mechanisms

Mechanism	Responsibility for the Process	Beneficiaries / Recipients
Formal		
Monthly meetings	Cluster facilitators Web-level facilitators	Cluster actors
One to one meetings	Lateral actors	ECA and ED
Regular meetings - daily, weekly, monthly, or quarterly basis, depending upon the discussion and availability of the participants	Cluster facilitators; Web-level facilitators	Lateral actors Individual firms Project managers and other executives of the firms
Meetings with investors	Cluster facilitators	Lateral actors Individual firms
Conferences, seminars and presentations	Cluster facilitators; University	Lateral actors, Individual firms; Individual employees
Documents/Reports	Cluster facilitators; University	
Emails with formal documents	Facilitators - information and communications technology (ICT) infrastructure	All actors
Cluster official website	Cluster facilitators, ICT	All actors within and outside the cluster
Horizontal actors' websites	Horizontal firms e.g. Seaport PCS	Horizontal and vertical actors
Organised social events	Facilitators	Cluster actors - firms
Informal	Cluster facilitators	
Gatherings for specific events	Cluster facilitators	Cluster actors - firms
Phone calls and emails	Cluster facilitators – provision of information and communications technology infrastructure ICT	Cluster actors - firms
Quarterly magazine and flyers	Cluster actors; Facilitators	All actors within and outside the cluster
Online e-forums	Facilitator	Firms and individual employees
Informal lunch or coffee break meetings informal emails, Flyers, brochures and magazine and chat on the residential	Facilitators, Horizontal actors and employees	Cluster actors – firms Individual employees

Phone calls, text messages	Facilitators - free hotline with an 800 dedicated number operating 24/	All actors within the cluster
Monthly barbecue, Social events and sporting activities	Cluster facilitators	Employees

The cluster's facilitators support, enhance and facilitate actor's interactions (directly or indirectly) as one of the main objective of the cluster from the beginning. This is clear when the cluster's facilitator has developed the information and communications technology (ICT) infrastructure from the 1st stage of the development within the economic city and the SAM cluster (Gulf industry worldwide 2008). According to Gulf industry worldwide (2008), a well-known global company developed the ICT foundation and ensured that investors and residents in the economic city got access to the highest broadband connectivity possible which included access to telephony and multimedia. USD266 million was spent by the lateral actors on building the communications infrastructure. The latter connects the 4.8 million square metre development.

A total of USD6.6 billion was scheduled to be spent on ICT over twelve years (gulf industry worldwide 2008). The lateral actors ensure that the cluster has a significant internal IT infrastructure, including global network linking operations (Exhibit A website 2013). The ICT infrastructure has a critical role as a major mechanism in facilitating knowledge sharing among actors (Exhibit A website 2013). Many knowledge sharing mechanisms in the cluster involve the use of the ICT infrastructure, including online activities. For example, the development of an extensive official website of the SAM cluster that promotes the activities and services of the cluster, distributes regional and manufacturing news and reports, lists companies in an online directory, and offers online job listings. The official website of the cluster is an important formal mechanism of sharing information with all actors inside the cluster and also with the external entities outside the cluster. Additionally, horizontal actors have their own websites as a way of facilitating direct connections and interactions with other actors in and outside the cluster, mainly used for company information, overview of products line to potential clients to support the economical efforts. Online forums and email addresses including the cluster's URL are all forms of knowledge sharing mechanisms available in the clusters. Additionally, the lateral actors organize many offline mechanisms of knowledge exchange involving the integration of ICT.

These include seminars, educational services, conferences and social events, and regular monthly meetings. These activities to a large extent take advantage of the proximity of actors to facilitate knowledge sharing in the cluster. ICT infrastructure provides a range of support services in both levels to promote knowledge exchange in the cluster, including networking and social events arrangements, legal advice with consultants, and training and R&D services (Economic City Fact sheet 2013). ICT infrastructure alone would not enhance knowledge sharing process between actors. Rather, it is the interaction between cluster dynamics and ICT infrastructure supported by lateral actors that produce the types of different mechanisms of knowledge exchange highlighted above.

The Manager of economic developer confirmed the advantages of ICT infrastructure as main mechanisms for facilitating business, interactions and knowledge exchange in the cluster. He stated that some of the significant benefits of ICT infrastructure as a communication mechanism within the cluster included use of emails, , dissemination of reports online, use of companies' websites for highlighting results of consulting reports, and customer acquisition through online referrals. At firms' level, ICT infrastructure was credited with the provision of a range of business consulting services focusing on strategy and economic issues.

In addition, the vice secretary manager from ECA commented that using ICT infrastructure facilitated the maintenance of an online database of firms in the cluster and the publication of online newsletters and reports to help advertise activities and businesses of the cluster and job listings. Email contact among members helped them to connect both among themselves and with external constituents. The HR manager of the HCA stated another benefit of ICT infrastructure within the cluster as that of facilitating online application for jobs resulting in good recruitment services especially when recruiting scientific staff in the cluster university and training centres.

Furthermore, the Port Communication System (PCS) helps to transfer and share essential data for effective port operations. It support the links of all various frameworks of the different firms that may take part in the port's operations or inside the cluster, incorporating and sharing information from the different sources (Exhibit C Website 2013). The Director of the Seaport PCS explains the cutting-edge system implementation and how it affects the information sharing:

"The PCS facilitates single entry and sending out of information as the system distributes the relevant message to the relevant recipients using a format preferred by the recipient"

The major role of PCS is knowledge sharing of shipments logistics with horizontal firms. According to Exhibit C website (2013) the PCS has the following advantages: ensures the convenient sharing of knowledge to the firms within the cluster, reduces the manual handling of archives and documents, promotes reuse and sharing of information, maintains a database and henceforth minimizing the danger of errors, distributes information on a "need basis," ensures the security of the information, provides English-Arabic interpretation to reduce errors, provides convenient and precise information about the status of vessels and load in the seaport, and conducts probabilistic analysis of the shipments and cargo load.

The consultants advice is one of the formal mechanisms facilitators use to enhance knowledge sharing in the web-level. A PMO officer stated that:

"We realised that it was necessary to encourage any industry in areas where we felt we had some special advantage. We are basically a manufacturing cluster-located in an economic city. For us this was something with some potential. We took into consideration all the expert advice we could get including engaging consultants to advise us on how we could assist given that it is a private enterprise operation dependent on their internal capacities."

According to an employee from the economic developer, at Web-level, facilitators share knowledge frequently, as they:

"sit together and meet on daily basis to talk about task related things. Every two weeks, we meet over half a day during which time we look at what is going on in our respective areas. For me whatever is good for the cluster is also good for me."

Meetings are the formal mechanism for knowledge sharing at the web-level. This could be through joint gatherings, presentations, dialogs, workshops. In some occasions, there are special meetings that incorporate the economic developer, external accomplices, regulator advisors, and the economic advisors. The Vice Secretary manager (G1) states:

"At the formal level we have meetings when investors come in. I would say we have several professional gatherings so we have research exposure events, industrial visits organised for our clusters or for the professor on specific topics that attract industries."

The participant from the university shares ideas on enhancing knowledge sharing and communications between the cluster actors in the cluster:

> "So the key success criteria are to have multiple channels and build the business cases to support collaboration. And that requires many explanatory meetings, investigations, brainstorming and workshops".

Technology is used at the web-level as a way to share knowledge between lateral, horizontal and vertical actors. The vice secretary manager from ECA pointed out that the cluster facilitator setup internal e-forums for actors within the SAM cluster to discuss manufacturing problems and solutions and every employee has access to share their ideas and knowledge. The forums have become knowledge hubs within the SAM cluster, and firms have benefited from this method of commutation with some firms attaining production improvements as a result of solutions suggested during e-forums. The firms constantly catalogue the solutions from the forums as a knowledge resource. Web level monthly meetings were mentioned as very critical for the knowledge sharing process within the SAM cluster. According to one participant clustering is meant to grow to a stage where it has developed enough capacity to handle both national and international business opportunities. This illustrates the importance of having firm representatives with the capacity to contribute freely and decisively. ED representative stated that:

> "It's critical that people who come for meetings are able to make on the spot decisions. Those who keep on wanting to go and consult the boss should not be in those meetings as they waste everybody else's time and delay decisions."

Being part of the monthly meeting has the effect of allowing knowledge to be shared to encourage growth and development for firms specifically and the cluster growth as well. This meeting helps some actors to learn about the success or failure experiences of earlier firms within the cluster.

A participant emphasized the continuing importance of team members face-to-face meetings in the office indicating that although social media has been heralded as a solution for keeping in touch, it could not completely replace face-to-face contact because not everyone likes to work with social media. The participant likened social media to

"...eating snacks, you cannot live only on snacks, you need main meals too. Social media can provide to a certain extent, but it is too volatile to replace face to face contact completely."

The criticality of having firm representatives who are articulate and are authorised to make binding commitments was highlighted. One firm was said to be not as active as others as a result of sending an inappropriate representative to the steering committee. Having a manager representing a particular firm was considered as an indication of the high regard with which the firm holds knowledge sharing and engaging within the cluster. The high turnover rate of employees within some firms presented continuity problems as the owner kept on sending new people to meetings.

Having firm representatives such as owners and managers who commit to attend this meeting to set and know each other enhances the factor of accessibility which facilitates knowledge sharing in both levels. Emphasizing the need for continuing strong involvement in the meeting the general manger from HMF4 stated that;

"We agreed totally that lack of involvement inhibited knowledge sharing because facilitators create the necessary environment for knowledge sharing."

A participant from economic developer stated that when one of their participants who was attending the meeting as a representative of their firm stopped attending the meetings the firm lost many interesting opportunities they derived from the meetings. Another firm was challenged to ensure that its representatives continued attending meetings even during periods when they were busy with important contracts after an observation was made that the firm was reducing its participation in meetings. Cluster facilitators ensure that they put in place appropriate processes and structures to allow the firms to concentrate on doing business rather than solving internal and communications issues. (HMF1) holds quarterly review meetings and training workshops and seminars with the research and development centre in the SAM cluster in which every employee participates. Every employee gets a chance to review their experiences and provide suggestions on how they would have reacted in different situations. In this way (HMF1) shares knowledge within the firm. These training workshops and seminars also include knowledge sharing because the firm supports knowledge sharing for the sake of research and development as it is beneficial

in securing the future of the company. The HR manager of (HMF1) indicated that the training facilities in the firm and affected the quality assurance policy of the company.

Communications for sharing knowledge take several forms in the SAM cluster. A representative of the government agency stated that:

> "We as a government agency have multiple communication channels with the economic developer. We communicate with each other using emails, phones and meetings with the economic developer's employees."

The government and economic development officials conduct regular meetings with project managers and other executives of the cluster firms. These meetings are on daily, weekly, monthly, or quarterly basis, depending upon the discussion and availability of the participants. Knowledge sharing in the web-level requires the formal meeting of the members to discuss and share thoughts and ideas in order to develop regulations and operational activities in the SAM cluster.

Another effective mechanism of knowledge sharing is the formal social events between cluster actors, during which time they get to know each other, resulting in the facilitation of knowledge sharing between firms. These events can include: new contract signing ceremonies, exhibitions, annual meetings, and conferences and special holiday festivals such as (Ramadan, Eid Al-Fiter and Eid-Al Adha) (SAM cluster Quarterly magazine 2013). Different events and conferences within the cluster have the purpose of cluster development. A participant of the economic developer shares thoughts about the annual conferences:

> "We had a conference last year and had a major event which was about the clusters' development around the world. Experts from all over the world came to the cluster. In these conferences, cluster's actors share information, new technology and innovative ideas. Our plan for 2015 is to have an event on logistics and another event on investment opportunity in the cluster. Whenever, there is an event, we try to invite all our firms in the cluster."

Explicit knowledge about the cluster's services and facilities was largely retrieved by lateral actors through professional connection and through participation in research collaborations with the cluster university (CU). Head manager of sustainability from ED indicated that:

> "I get information from cluster's quarterly magazine, I get publications and information from the university, I get information from the government website…, from the factories …There's a plethora of knowledge to benefit from provided from various cluster's actors"

(V2) has an efficient way of managing and sharing information with suppliers and customers, it uses computer/phone applications to manage their supply chain and logistics solutions. (V2) integrates the knowledge sharing and utilization process by combining the applications and their online client portal. The customer can use the online portal to view the update of their work from anywhere in the world (V2 company profile 2013). (V2) attends the monthly meetings arranged by facilitators to review their performance and transforms the reviews into a journal that is available to every employee through their online portal (V2 official website). Based on the V2 online journal (2014), transfer of services and products, information and funds between the cluster's suppliers and customers is efficiently managed by V2's end-to-end supply chain and logistics solutions and this enables the firms to focus on maximising the performance of their businesses. The (V2) director states:

> "All stages of our supply chain are being covered from the moment the inventory leaves the suppliers until the moment it reaches final customers or retailers. We use emails for inter-organization and intra-organization communication. We also extensively review the performance and take suggestions to sort out future problems."

Informal mechanisms of knowledge sharing are also being used in the web-level. These mechanisms include: informal chat over lunch or coffees, monthly barbecue, informal phone calls, messages, emails, Flyers, brochures and magazine and chat on the residential areas. The facilitators established a free hotline with an 800 dedicated number operating 24/7 for the cluster actors to share their information, requirements, and needs with the lateral actors (Exhibit A website 2013; SAM cluster Flyers 2013).

Moreover, the monthly barbecue is an interesting event arranged by the facilitators where all actors in the SAM cluster are invited to attend including lateral, horizontal and vertical actors. Facilitators send a reminder email every month with the date and locations of the barbecue ED - Investor Relations Presentation 2013). This casual event includes soccer, tennis and other sports activities prior the food as the facilitator of ED mentioned in the interview. This event

encourages employees to meet and chat with each other in a more casual atmosphere sharing beneficial knowledge in the web-level.

The food court in the centre of the SAM cluster is a very active place for casual knowledge sharing between actors in the web-level. The HMF5 engineer mentioned in the interview:

> "I had a culture shock when I just started working in HMF5 … I met with other foreigner employees from HMF3 and HMF6 at lunch time who had the same difficulties as I had; we made so many friends and have enjoyable time over the lunch break… yes I have their mobile numbers and we call each other to ask about new things we do not know in the cluster."

The manager of economic developers' indicated that he often meets and shares information with some colleagues "at the coffee lounge located downstairs."

5.3 Forms of web-level knowledge sharing in the SAM cluster

Before investigating and analysing the influence of actor's capability to identify and assimilate knowledge, it is essential to explore the nature and type of knowledge being shared at the web-level. Knowing the nature of knowledge is also important in order to examine the mechanisms of knowledge sharing within cluster. Based on the data analysis, the types of knowledge shared at the web level are tacit and explicit. At the early stages of development, knowledge sharing at the web level is important. In the web-level, there are specific types of knowledge that are shared by lateral actors in the early stage of development. The most common form of knowledge shared at the web-level is explicit knowledge including rules, regulations and standards to be followed within the SAM cluster. They facilitate skilled and well developed knowledge networks through specific channels in the university and R&D centres within the web level.

Tacit knowledge between lateral actors includes shared values and mutual collaboration within the cluster and understandings of the shared rules and regulations that enable the ECA, economic developer and the university to identify and assimilate knowledge. Information about services provided by the facilitators is shared within the web-level (ED-Investor Relations Presentation 2015).

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Additionally, there is informal information sharing across horizontal actors facilitated by proximity. Through this firms share the problems and challenges they are facing with the facilitators in order to try to find the appropriate solutions. For example, a manager from HMF4 shared his experience when they first joined the cluster and had to seek information regarding infrastructure and use of solar power from the neighbouring firm HMF6 who already had previous experience.

The director of (ED) shared his view in the interview about the types of knowledge that firms usually share with the facilitators:

> "We encourage all firms to meet with us (economic developer) and the ECA in order to hear out their complaints or any requirements they have once they join the cluster."

An example of the services that firms may need and how they inform the economic developer is articulated by the cluster facilitator:

> "For example, some firms need employee's lap coats to be washed and cleaned daily. So, it is important to provide a specialized dry cleaning provider nearby."

Another type of knowledge shared through external relationships is that between lateral actors and local media in SA which is information about the value adding activities, advantages and features of joining the cluster. According to interviews with the PMO officer of ECA, facilitators share knowledge and information about the cluster with the other economic cities of Saudi Arabia. This can also be beneficial from a marketing and advertisement perspective of the cluster. Many clients and firms have been attracted, toward joining the cluster because of what they have heard about the cluster through the knowledge shared by member firms (SAM cluster newsletter 2014). The media representative from the economic developer indicates that firms share knowledge outside the cluster and how this increases the reputation of the cluster:

> "I know from speaking to clients of some firms that they are benefiting from a certain amount of information sharing particularly from a marketing perspective. I think there this kind of knowledge sharing add to the reputations of the cluster as an attractive location to invest in which enhance the development and growth of the entire regions".

The owner of HMF5 stated that because the owner of HMF1 was one of his best friends when they were doing their postgraduate studies in Jordan, he consulted him before joining the cluster

to get advice and "benefit from his experience so far… about the cluster and the facilities they are getting… and so many other things".

Tacit knowledge is shared among cluster facilitators and then becomes explicit knowledge through informing actors about cluster rules, regulations and services. For example, one of the main aims for the Saudi government to establish industry clusters is to create jobs for Saudi graduates (Exhibit A website 2013). Facilitators in the web-level try to link the tacit and explicit knowledge through supporting the talent, helping start up new businesses, training, mentoring and providing exposure to the established local and national industries. The university acts as a driver of industrial value creation from tacit, codified and conceptual to applied knowledge creation and sharing (Economic Cities Authority website 2013).

It was evident from the interview and document analysis that firms in the SAM cluster have knowledge sharing processes where the knowledge gained through different projects, product manufacturing and developments is stored. Commenting upon the sort of knowledge shared in the SAM cluster, A PMO officer of ECA stated that;

> "At the end of every project a meeting is arranged to document information from the project so that it is stored for future use. The system is easy to use and can be accessed by all interested parties."

The following sections examine the factors that influence knowledge sharing process in the Saudi Arabia Cluster (SAM cluster).

5.4 Factors Influencing Knowledge Flows in the Cluster (Web Level)

Following the conceptual framework described earlier in chapter Three (section 3.4, table 3.1), analysis focuses on antecedents of knowledge sharing and consequences of proximity and clustering, using the five factors as seen in table 3.1 provided earlier. These factors are absorptive capacity, Knowledge of expertise location, inter-organisational trust, social capital and accessibility. Analysing data based on the theoretical framework provides useful categorisations for the main research issues that lead to answer the main research question.

5.4.1 Absorptive capacity

Knowledge sharing occurs between actors of the SAM cluster, with entities outside the SAM cluster such as other clusters in the economic city, or with others area of Saudi Arabia. The cluster's facilitators and the university act as a channel to connect the firms with the available resources within the cluster and also connect the firms with the external knowledge. These processes represent tacit knowledge sharing activities in the web-level. The explicit knowledge shared in web-level is promoting better understanding between actors within the cluster. Facilitators assimilate external knowledge to the cluster's firms transmitting knowledge through professional contacts.

The university is involved with the cluster in the economic region (Economic city), enabling technology development and knowledge sharing, spin-offs and job creation within the cluster. The government is enhancing the knowledge sharing mechanisms and activities within the cluster to achieve potential growth and development. It strives to enhance the sharing of significant knowledge to develop the cluster's industries. Additionally, the mutual flow of knowledge between lateral actors and horizontal actors regarding job opportunities for the Saudi people and for the firms are essential. Knowledge sharing is the vital tool for job creation in the SAM clusters. The HR manager of the government authority (HCA) said:

> "We are the "main windows" I can say for new graduates where they can enter and work in the cluster…. We are helping the guys out there to find many jobs' opportunities in different factories of our investors. Young Saudis can apply through the main website of the cluster, submit their C.Vs and our employees assign and match C.V s with available job's opportunities".

In another example of information shared regarding job creation in the SAM cluster and numbers/types of workers needed, the facilitator said:

> "We should have information of how many jobs are needed in total, and we try through the HCA to find the right talents locally and if not we make sure that they can bring someone with enough experience, skill and the know-how to work in their field."

In support of the lateral actors' role as knowledge sharing facilitators, the research indicates that lateral actors identify, retrieve and share knowledge sourced from outside to inside the cluster, indicating a significant bridging capital function that they perform. This confirms the important influence of the absorptive capacity at the web level on facilitating knowledge sharing. In

addition, lateral actors arrange well-developed knowledge networks and various sources of knowledge such as conferences, monthlies, e-forums and regular meetings which act as channels for knowledge flow among actors within the cluster. At web-level the multiplicity of information sources reflect the capabilities of the clusters to identify and absorb new knowledge, influencing knowledge sharing process within lateral actors and between lateral actors (facilitators) and horizontal and vertical actors.

Lateral actors share external knowledge regarding research gaps to generate different research activities. For example, feedback from the firms and results from the collaborative work between firms and the university enables actors to engage in research and development to search for new knowledge. The research fellow shared his view in this regard:

> "The university is working on a research project sponsored by some investors here in the SAM cluster… common advantages and benefits are being generated as a result of this project. Some of our postgrad students are collaborating to get the most of the available competences out there."

Further, the university provides the cluster with the latest and innovative technologies developed by the faculty and researchers. Second, the cluster sees opportunities in developing smart technologies that are related to monitory, control systems, automation, and flood systems. The main goal is the construction and the development of the cluster itself in the web level. According to a brochure of the CU (2013) from the research and technology department in the CU:

> "There are over 200 applied scientific projects and 100 plus patents. This is a quite significant number for a five years old university. They know that these are early stage technologies and just on the lab and part of the role now is trying to scale up the technologies. The scientists work on the early stage of the new ideas in the university and this is normally is conceptual, which create a gap with the firms in the industry. So what we do here is group concept projects and they invest on them and this makes industries more adaptable in the technology field."

There are new technologies that are being patented and licensed by the university and commercialised by the industry cluster. The university also provide a clear contractual "action research," a very flexible approach that allows firms and organisations to conduct some research and test their ideas in the university. There are some solutions for the benefit of the SAM cluster

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that have developed with corporations between the university and the cluster. One of the solutions is a dual-usage wireless sensor system that tracks traffic congestion and flood incidents in the cluster. The integrated sensor system within the SAM cluster can also help monitor urban floods and traffic congestions. A review of the Investor Relations Presentation of the economic developer, for the managerial employees between the years 2013-2014 included the following:

> "There are mechanisms that have been put in place through which we can share knowledge. The ECA is working on a supervisory role and the economic developer as the agent. Not only do they have to understand the firms in the clusters, plan for clusters and build up services, they also have to make sure that things are being implemented by all the firms in the cluster. Facilitators make sure that things are being done properly as per the regulations and the safety requirements. The economic developer is involved in research and training in specific areas by using the experts in these areas support knowledge sharing. They also ensure that proper guidelines are in place in regard to patents."

5.4.2 Knowledge of expertise location

Clustering also influences knowledge sharing by enhancing knowledge through creating access to expertise. It is when one perceives the other firm as a source of valuable and relevant knowledge and skills that they decide to seek information from them. This is evident from the participants' comments and from analysing collected documents of the web-level. Knowledge of expertise location within the SAM cluster is available through the university, the research and developments centres and innovation and training centre. The cluster's facilitators in the web-level have administrative roles. Not only do they have to understand, plan and build up services in the cluster, but they are also responsible for ensuring that policies are implemented effectively and efficiently in order to create shared values and believes within the SAM cluster. For example, the industry-university collaborative program is an important mechanism that has been established by the lateral actors to encourage collaboration and knowledge sharing. Participants from the economic developer confirmed that all facilitators in the web-level encourage firms to join industry-university collaboration programs. This helps to build relationships to provide direct and specific knowledge on expertise. The project manager of the university explained:

> "The associated technical and expertise between firms and us, encourage different forms of knowledge sharing which is crucial for the development of the cluster and the advancement of the university too."

The university collaborates on over 60 projects with the horizontal actors. A focus of CU is knowledge sharing within the cluster to bridge the gap between academia and industries participating in the cluster (CU official Facebook page 2013). The facilitators have a direct role with the cluster university regarding knowledge sharing of available expertise needed for particular firms. The research fellow of the university shares his views in this regard:

> "Collaboration and links between us and these firms is a complement for us. We are now working on the triple P model which is basically the link between the Government, the Firms and the Academia for the development of the cluster."

There was some evidence that identified different sources of knowledge within the cluster. The role of the facilitators within the cluster in establishing connections that help to provide specific knowledge about available expertise within and outside the clusters was evident. According to the manger from the Economic Developer, The proximity of the university has a mutual beneficial effect for both the cluster and the university. A recent collaborative project between the university and some firms in the cluster was reported in the official Facebook page (2013):

> "With storms and floods accounting for nearly 70% of the world's natural disasters, the project provides this smart technology can provide up-to-the-minute warnings and allow rapid response to emergency situations. The data collected from these sensors is sent to central servers for assimilation with satellite data, forming real-time maps and forecasting the future path, intensity, and speed of floods and traffic."

Another form of mechanisms that supports knowledge sharing activities influenced by the factor of Knowledge of expertise location is the entrepreneurship program established in the cluster. This program is a collaborative program between the economic developer and the university to help students start new businesses in the cluster to commercialise their research and innovative ideas. In this regard the facilitator of the economic developer stated that:

> "The entrepreneurship program is very important for the students who want to start their own businesses because they get all the information about the cluster rules and regulations and facilities through us. I think this is a very important factor. The university has first all the unique facility in terms of research which is supported by expertise and a strong administrative database management that allows and encourages collaborations with industries."

The Industry Collaboration Program (ICP) was another important mechanism for the collaboration between the university and the firms through knowledge sharing processes, in

which organisations and firms join so that they focus on a long-term relationship (Economic Cities Authority website 2013). Both the university and the ICP individuals have the chance to benefit from this venture. The university has an essential role in the early stages of cluster development and evolution. The Industry-University Collaboration Program (ICP) is an interesting source of knowledge- based collaboration and it shows how firms can join the cluster at the early stages and become involved in research and development activities. Their role is to train the young graduates who have the talents, the ideas and the passion to drive and to establish a new business through their developed skills and research during their study, the tutoring with the expert mentors, as well as the industry. The university provides them grants in the form of funds to develop their products. The Vice President of the university stated:

> "The university is the value adding resource to the SAM cluster. It is a platform for the firms to share their knowledge and know-how information. The University helps build trust between organisations by encouraging different firms to collaborate and work with each other in specific research projects. We are setting up several research projects in the cluster which will increase the trust and collaborative work spirit in between different firms."

ICP is an enrolment-based system whose purpose is to cultivate solid and beneficial associations with the industry, producing benefits for both the clusters' firms and the university. The ICP is the cluster development portal to the university, sharing knowledge to ensure expansion of opportunities and familiarity with all CU research, most recent innovations, expertise pool, classes, conventions and scientific events. It has distinctive arrangements that add to the primary idea of the cooperation with the cluster. As indicated by the University Newsletter (2011; 2012), these arrangements are to make and oversee industrial associations with the university and augmenting the benefits and value of Industry-CU organisations. Forms of knowledge that are being shared through this program includes: research and development needs, and employments opportunities for the graduates (CU newsletter 2013).

5.4.3 Knowledge sharing through the ICP to the SAM Cluster

The SAM cluster (Exhibit A Website; Exhibit C Website) provides several forms of knowledge sharing activities as a result of the ICP between the CU and firms within the cluster. Based on the CU factsheet (2013), this program has monthly meetings with firms where sharing creative

thinking and innovation to make unique and differentiated products and services using new technology are discussed. Actors also share knowledge about different skills available in the firms. Increased corporate exposure and access to knowledge of professional working environment help to build future qualified and skilled employees. Also, knowledge sharing was evident through firms' participation in expert systems databases and information sharing through seminars regarding the program's classes, and workshops (CU flyers 2013). Interaction in seminars and meetings with the university professors, researchers and other employees and firms' representatives results in research in new technologies and in studying applied practices in business.

There is also evidence of knowledge sharing between the university's protected innovations, which drive the business advancement of new products in the cluster firms. In the centre, they take a direct, proactive approach to engage with firms to facilitate new, early-stage technology commercialization (CU Brochure 2013). There are new technologies that have been invented or developed by the university that are part of the industry cluster and CU technology sharing and commercialization program that looks to encourage development and commercial use of CU-developed technologies.

An example of the innovative work which is being shared among different actors within the cluster (illustrating how tacit knowledge is being interpreted to explicit knowledge through knowledge sharing activities within the SAM cluster) is the design of a three-dimensional microfluidic device for the mass production of mono-disperse single emulsions (CU Newsletter 2013). The device is being used in the production of highly mono-disperse single emulsions by different firms and industries within the cluster (Exhibit B Website 2013).

The location and proximity to expertise influenced facilitators to build relationships to provide direct and specific knowledge around effectively accessing international expertise through streamlining employment visas. One role for ECA is arranging workers' visas for the cluster firms, as a result, value adding activities to the actors where firms and organisations can quickly bring in their experts and skilled labour into the cluster. This helps firms to quickly get started with establishing a business in the industry cluster and the Middle East. A government official noted that:

"The goal behind establishing the SAM cluster is to attract investors and businesses. So we have the ease of doing business, we try to facilitate things for new factories, we are able to bring visas and skilled labours from abroad as much as they need for their facilities. We do assist all the tenants; we offer a lot of services in addition to the governmental services are regarding the training of workers including the initiative done by the HR department".

5.4.4 Inter-Organisational Trust

Inter-organisational trust is a significant factor influencing knowledge sharing across both web and firm level in the SAM cluster. Trust is considered as the main element to encourage knowledge sharing. Attitudes to inter-organisational trust at the web-level are evident from the interview data and document analysis of this research. According to the senior director from economic developer, trust is not an issue among lateral actors in the web level (i.e. economic developer, university and the government) as they share knowledge and come to each other's assistance as needed. He stated that: "*Having worked together for a long time, we are free to consult among ourselves whenever it becomes necessary. Trust is not an issue among us.*"

The personal ties and strong direct links among actors in the web level have led to cognition-based trust that facilitates the knowledge sharing in a convivial atmosphere among actors in the web level. A PMO officer said: "*The people in the ECA and ED freely share knowledge without any expectations of reciprocity as they are working towards a common goal*."

Cluster facilitators enable the mechanisms of knowledge sharing through different forms such as the monthly meeting and social events within the SAM cluster. These activities create a friendly environment between horizontal firms where they can build economic relationships and perceived trustworthiness which encourages firms to engaging knowledge based collaboration. The university is a key asset in this regard, as it serves as a platform for firms to collaborate and share some of their know-how for mutual research purposes (ED -Investor Relations Presentation 2014). The reciprocity in the relationship between the university and the horizontal actors enhance the cognition-based trust. Participants from the university confirm in the interviews the willingness to share knowledge which strengthens the knowledge based collaborations among different actors in the web-level.

5.4.5 Social Capital

Social capital is evident in the SAM cluster as an effective factor influencing knowledge sharing activities. The norms and networks at web-level facilitate and provide basis for cooperation between actors. The impact of the bonding capital is evident in the web-level as facilitators assist firms to collaborate with the university by providing opportunities for work and research studies in the cluster. Modifications of the rules within the cluster emphasises the influence of social capital on which knowledge is available for application to certain problems or situations at web-level. SAGIA through ECA has modified rules and regulations specifically for the SAM cluster. During the interview with the vice secretary manger, he outlines the processes of collaboration within the cluster:

> "All the divisions have a counterpart at the economic developer side. We have people working on the regulation side, on the infrastructure side and the service side all working together with the economic developer".

This demonstrates the joint collaboration between the ECA and the private economic developer in promoting growth and development, facilitating and arranging connections, relationships and cooperation within the SAM cluster. In the cluster, the role of the government is to collaborate with the economic developer and undertake the initial feasibility studies in leading the industry cluster toward further development (ECA website 2013).

All the interviewees on the web-level stressed that reputation is important and they are seeing their role as a broker in the cluster. Knowledge sharing with outsiders regarding the reputation of the SAM cluster is formal and the concrete tasks of the lateral actors as brokers are very structured and clear.

While the SAM cluster is still evolving, there are some projects being developed through collaboration of the firms and lateral actors under various areas including economic impact, social development impact and areas of environmental impact. This collaboration increases interaction in the cluster and therefore encourages knowledge sharing. Although, the relationship is still very young in terms of years, the potential of the project with regard to improving the inter-professional cooperation of the cluster is high and according to a manager from the economic developer:

"Given that the industry cluster is at an early phase, we have established projects with the university in different fields including areas in economic, social development and environmental impact. The relationship with the university is still in the early phases but the potential of future projects is very high. The university is the main driver for research and innovation which once commercialised will bring great value and economic growth to the region."

Moreover, facilitators enhance the accessibility of the firms to different research facilities to the extent to which knowledge is available. Through the strong relationships between lateral actors, bridging capital is evident through identifying the shared issues and having a ready access to knowledge network. The Research fellow noted:

"We from research and development facilities often meet and talk on regular basis. They are using their lab facilities for research and development requirements which is exactly what we are looking for because eventually this is very important for the university, the students and for the SAM cluster. We have seen so many investors visiting us through University who tried to joint her cluster and benefit from the proximity and the infrastructure. It is very important for us to share knowledge with the university and work cooperatively to understand the need of the market because the new graduates will be moving out to the private sector for challenging job market."

5.4.6 Accessibility

Proximity also influences accessibility. The value of extant knowledge is in its accessibility in terms of being available for use in a given situation. The accessibility of knowledge also is linked to levels of engagement and the ability of the facilitators to channel activities towards relevant knowledge sharing. When actors decide to search for knowledge they expect that being in the cluster makes knowledge access easier. The governing model adds value to all the horizontal actors in the cluster through certain polices and strategies. The government has three main roles in the industry cluster: regulate, supervise, and serve (Exhibit A website 2013). From the facilitator's point of view, they do the promotion and marketing of the cluster and provide accessibility of knowledge in the web-level regarding shared cluster's polices and values to ensure that principles are implemented by actors within the cluster.

Localised employee mobility is linked to embodied knowledge sharing because of the physical location of the SAM cluster in the economic city. As a result, the facilitators provide access through professional employees networks which results in knowledge sharing practices as all the

facilities are located at optimum geographical positions within the cluster. Knowledge at the web-level is intended to be available and accessible to all actors in the cluster on the grounds that the data is imperative for the cluster operations and advancement. The economic developer has no restrictions against any transfer or sharing of knowledge in the web-level. The cluster facilitator states:

> "From the formal basis we don't have any rules or regulations that restrict knowledge sharing within the cluster that I am aware of. From the economic developer point of view ED does not constrain or restrict knowledge sharing. But obviously as an economic planner I can help to promote knowledge sharing from a geographical point of view and for my clustering strategy."

The factor of accessibility influencing knowledge sharing in the web-level was evident through shared values and policies of the SAM cluster. Actors in the cluster have some accessibility to skilled employees' network through HCA who is responsible for training local talent to be more competitive and innovative. It provides industry workshops and training (Industrial Cluster website 2013). Some of the services that the government is also providing are workshops and training support to the horizontal actors within the cluster. Facilitators are making it easy for investor firms to start operations in the cluster by providing necessary support, offices, real estate and 24-hour issuing of investment licenses. A facilitator of economic developer shares the following views in this regard:

> "We have some kind of special treatment where investors can get facilities to start up and to get licenses to start their operations. The Multi Nationals Enterprises need to have foreign investment licenses that are provided by ECA through a very elaborate procedure. But due to our close relationship and direct communications with the ECA, it has been very easy in facilitating within 24 hours issuing licenses for the start-up business."

The physical location of the research and development facilities and the training centres provide an academic advantage to the actors specifically horizontal firms. The nearness and accessibility of the cluster seaport is another important benefit in this regard as firms can use this huge facility to import/export materials and products. Through proximate network of professionals, the facilitators reduce conflict within the SAM cluster. The location of the university, the research facility and the R&D centre facilitate access to skilled networks and add value to the firms as they can facilitate personal knowledge interaction. The cluster actors can also take part in

research programs to innovate their manufacturing processes. The vice president of the university research and innovation centre describes how the localised knowledge and expertise of the university being in the proximity of the SAM cluster enhances knowledge sharing practices:

> "The University provides best accredited faculty supported by knowledgeable research scientists and enrols different students from around the world. Factories within SAM contact university to get the sustainable competitive advantage through the expertise of the university. We have research centres and laboratories which have latest technology sophisticated equipment."

In the university newsletter (2013) it was mentioned that university knowledge and research should be available to everyone and should be accessible to all actors in the SAM cluster:

> "The goal of the university is to do the best to share all the knowledge and every scientific finding that can benefit people, the industry and the nation and not for profit. In this regard, professors and the economic developer make sure that the appropriate information is available to all investors to benefit from."

The government provides financial support to investors which enhance accessibility to certain forms of technical knowledge and sharing it with related industries. The manager of ED said:

> "We have several institutions for financial support of which our individual investors do actually apply for these sources of funds. I think the next step for us is to actually tailor make specific financial programs for specific industries that have been identified by us into more efficient programs. What we are working on is classifying different investors in the cluster into pioneering investors who want to start new industries."

5.5 Barriers to web-level Knowledge Sharing in the SAM Cluster

Different barriers to knowledge sharing are observed at the web-level. Barriers from the governmental side relate to the efforts put forth by the governmental authorities in integrating and establishing projects that are within the Saudi Arabian government vision in building the country's economic policies. There is a need of more modification in laws and regulations to become coherent within the SAM cluster and the other regions of the Saudi Arabia. The HR manager of ECA stated that:

> "The government has integrated several programs in the cluster to cater for a wide audience in the cluster because obviously they want the clusters to be open to different

types of industries. So the challenge for us is to shape programs that are clear, focused and supportive in terms of regulations, implementation and financing."

After analysing the comments and perspectives of actors and documents from the SAM cluster, a participant of the economic developer opined that integrating and modifying main rules and regulations of Saudi Arabia to make them applicable to the cluster's context might be a barrier to sharing knowledge with economic entities that are outside the cluster. Therefore, this might limit the exchange of knowledge to some extent or might restrict the applicability of some types of knowledge available outside the cluster. He said:

"The main challenge faced by the cluster is its own policy of connecting with the national economy… with some modifications of the rules. Sometimes facilitators find it hard to integrate some policy within the cluster."

The need for the integration of Saudi Arabian rules and regulations with rules in the SAM cluster given that there are many rules that are not applicable in other regions of the Saudi Arabia but are implemented in the industry cluster, an example is the possibility of foreign ownership of local real estate (ED- Investor Relations Presentation 2013).

Another barrier to the knowledge sharing process in the web-level is the cost of facilitating and encouraging research and development, especially when it is in its early stage of development. The participant of the economic developer explained:

"We certainly need to facilitate R&D for all the actors and firms in the cluster. R&D is extremely costly and according to my experience is that the budget out-weighs other considerations unless, the R&D can be commercialized then we can use the profits as revenue."

A great deal of information and knowledge provided from the facilitators is distributed and shared via emails and telephone conversations. This type of exchange faces problems relating to overloaded mailbox with emails that never get opened as employees have insufficient time to attend to all emails resulting in misunderstandings and misperceptions. A manager from HMF3 said:

"This is a universal problem in all large organisations… I think it may be better to prohibit the use of emails within the cluster as at times I miss a lot of critical information because of the clutter of not so important messages."

At web-level, there is also general lack of knowledge and awareness on how to use and take advantage of the available tools and technology within the cluster. Language also presents challenges as languages in the SAM cluster vary based on the nationalities of workers and company where they come from such as India, UK, USA, Australia, Europe and East Asia (Exhibit A website 2013). There are many foreign workers at the cluster. Although English is corporate business language in the SAM cluster (Economic City fact sheet 2013), the fact that it is not native for most of employees presents its own challenges. An ED manager highlighted that because employees from different actors are of mixed nationalities, differences in native languages sometimes made it difficult to communicate with employees from different actors. When communicating with other divisions or with international offices those without a good command of English face challenges. A participant of ECA explained that:

> "This challenge of language is especially a problem during telephone discussions where it is sometimes impossible to understand the other party. This makes it difficult to explain what a person wants..; even language used in email conversations can be difficult to understand."

Participants from the economic developer emphasize that they are trying to help and encourage knowledge sharing between the cluster actors, but the low levels of trust remain a barrier to more effective knowledge sharing. Some firms are just not willing to share their core business strategies and their manufacturing techniques with other firms. The firms believe sharing their secrets and know-how will reduce their competitive advantage over their rivals in the same industry. The economic developer representative shares views about the intellectual property being an obstacle in the knowledge sharing process:

> "I think one of the barriers in knowledge sharing is the security of intellectual property. I mean the ownership of certain specific processes in some cases it might be core competencies for particular industries, or products in the firm. Our approach as facilitators is to promote knowledge sharing by the cluster actors in the same industry due to proximity. However, from the firms' perspective they protect intellectual property; they have some restrictions, limited and security access to protect the entry to the main factory which they are not very comfortable to share. So I think the release of information in a very competitive market is going to be very challenging."

Additionally, not all actors are committed to attending the social events, monthly meeting and barbecues which are arranged by facilitators. The manager of ED shared his view:

> "Last barbecue we had to take away home some meats due to few participants showing up in for the beach barbecue event… I think they are just busy or may be are not interested."

This may be the result of the cluster being new and firms not having as yet developed networks. Given that the cluster is government driven, other participants look for direction from the government agencies.

5.6 Web-level Conclusions

Findings provide useful insights into the focus of this study which is: how clustering supports knowledge sharing, among actors in the cluster. The effective mechanisms of knowledge sharing at the web-level of the SAM cluster were explored including barriers to knowledge sharing at web-level. Evidence from the study provides some initial support for the notion that a cluster's potential for contributing towards the region's economic development is a function of the cluster's knowledge sharing mechanisms. In the SAM cluster, the manufacturing cluster shows the presence of strong relationships with lateral actors. Supporting evidence shows that actors collaborate to develop trust, share information and build a community identity of the cluster. Knowledge like rules, regulations, infrastructure, service guidelines, new research projects ideas are some of the common types of knowledge shared in the web-level.

The section provided an analysis of the SAM cluster and its actors as a value-added web; actors are a combination of lateral, vertical, and horizontal (Web-level). The chapter investigated and analysed data of the factors that influence knowledge sharing in the SAM cluster as a government-directed manufacturing cluster. The different formal and informal mechanisms of knowledge sharing and barriers to knowledge sharing in the web level were explored through an analysis of documentary and semi-structured interviews based evidence from the cluster actors in the web-level. The important role of the lateral actors or facilitators in influencing knowledge sharing during the emerging stages in the SAM cluster was discussed. The next section section presents firm-level data analysis.

5.7 Analysis of Knowledge Sharing at the Level of the Firm[2]

This section presents results from documentary evidence and data from interviews relating to knowledge sharing among Horizontal Manufacturing Firms (HMFs). The analysis integrates direct quotes from the interviews with study participants to demonstrate how horizontal actors at the firm-level utilize knowledge sharing and what obstacles they encounter in doing so. Building on the conceptualisation of cluster as overlapping VAWs around single horizontal firms developed by Brown et al. (2007, 2008, 2010a), there is no single product (unlike dates or apples) (Jaradat and Zaid 2004; Grimstad and Burgess 2015) but a system of emerging entrepreneurial manufactures has emerged within the cluster.

In order to understand the process of how clustering impacts knowledge sharing at firm level, the analysis is based on the theoretical framework set forth in the literature review chapter (Section 3.5, Table 3.1). Data analysis provides evidence that helps to identify some of the factors that enhance knowledge sharing activities between HMFs located in the SAM cluster.

Focusing on the firm-level, this section is organised as follows: it starts by analysing the mechanisms of knowledge sharing at firm level, the types of knowledge being shared in the cluster, the factors that facilitate knowledge sharing between HMFs and the barriers to knowledge sharing at firm level.

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[2]This section includes data analysis from documents and interview's transcripts of different actors within the SA cluster. The city cannot be identified in this research as this would compromise the confidentiality of the participants through indirect identification. All the information cited in this chapter is based either on confidential sources or public sources that cannot be directly identified. Therefore, for confidentiality and anonymity reasons, actual in-text and end-text reference cannot be revealed.

There are strong and direct links between lateral actors and the firms at this early stage of development because this cluster is government-directed with the lateral actors leading and having a dominant role in the cluster. Further, there are a small number of horizontal and vertical actors because the cluster is still at an emerging stage. Links will change in the near future when more firms join the cluster. The strength of the links differs within the firm level. Large firms, mainly MNES, have established links with horizontal actors that they can bring to the new cluster. Small and local firms, both horizontal and vertical, do not have these established direct and indirect links which presents challenges of integrating them into the supply chain.

5.8 Mechanisms of knowledge sharing at firm level

Horizontal Firms in the cluster share knowledge in both formal and informal ways via different mechanisms. The most dominant method of sharing knowledge is through online facilities using ICT services provided from the government (ECA) to help the establishment of effective and fast communication services.

5.8.1 Formal knowledge sharing at firm level

The formal knowledge sharing process at firm-level takes place through several formal engagements organised by the lateral actors especially the cluster's facilitators, such as monthly formal meetings, seminars and briefing about projects, e-forums, progress presentations, conferences and seminars, training programs and print media. The lateral actors encourage people from HMFs to participate in these sorts of events in order to establish active cooperative networks within the cluster and thus enhancing active knowledge sharing. A senior manager of business marketing commented:

> "These events are very important in getting people together especially for the new investors, we emphasise the importance of the attendance ...."

E-forum is one example of the useful outcome of incorporating ICT to enhance and facilitate knowledge sharing mechanisms between HMFs. The senior manager of HMF5 mentioned in the interviews about his experience with the e-forum and how it assisted in improving the performance of the factory:

> "The e-forum is the knowledge assets of the cluster. Employees post their suggestions to the problems which brings ideas and innovation in the manufacturing process. We have been able to cut-off 30% of the production time through constant application of solutions presented in e-forums."

Additionally, the lateral actors (facilitators) assist communication between the customers from outside the cluster and the firms through these forums in order to get customer feedback. This feedback can help firms to improve their products and services and help them achieve customer satisfaction. The lateral actors are working more on programs that can facilitate the ease of communication between the cluster actors. At this developmental stage, they provide external links and they arrange meetings with the vertical actors from outside the cluster, these arrangements play an important role because they help to handle the logistics support for the cluster actors. The general manager of the ED stated that:

> "It's our role to introduce the new firms to the government when they first come into the cluster. We arrange this meeting at the beginning between the client and the ECA and then we do the follow up. We review the rules and regulations which are developed by the ECA from time to time. We arrange for example formal meetings between factories and the ECA or with a logistic client, to facilitate cooperative deal and to understand what is best for the cluster."

He further explained that there are regular scheduled management meetings. Formal knowledge is also shared through seminars and conferences. Talking about the best way of sharing knowledge an engineer of HMF2 said while it was good that they had meetings as information gathering sessions he realised that it was good as it forced them to go beyond talking about things to documenting them.

This need to integrate explicit knowledge and tacit knowledge is illustrated in the following participant (owner of HMF5) interview, who attends the formal meeting regularly:

> "I get value out of the monthly meeting, when they do things in relation to the specific manufacturing services. Because they're facilitators, they usually contact the university and request it to organise a specific seminar and to bring a specific presenter or the professor in the field. They help us identity causes of problems and how we can manage them at a practical level... I always attend the seminars and they're very helpful. I find them as an opportunity for all of us to get together and talk about developments and coming things."

Monthly meetings arranged by the cluster's facilitators are very rich mechanisms for knowledge sharing. The main aim of this formal meeting is to communicate, share knowledge and ideas and most importantly the progress or concerns of the firms within the cluster. One of the main aims of the lateral actors as facilitators is encouraging HMFs to cooperate and interact. The meetings provide facilitators with necessary information that enables them to improve and develop the cluster and to solve any issues or problems raised by cluster actors. The meetings therefore work as effective mechanisms for knowledge exchange in the cluster.

Attendance at the monthly meeting is not obligatory but is strongly recommended for all cluster actors. The facilitators inform each actor when they first join the cluster about this meeting and the importance of sending a representative to attend the meetings and other communication activities being run by the facilitators in order to benefit from the opportunities gained by meeting other actors. The facilitator is neutral in the meeting and guides new actors during the early stage when they first join the cluster. This meeting is usually run from safe neutral venues within the buildings of lateral actors (investor presentation 2012). The facilitators also ensure that informal meetings are conducted in a good atmosphere by providing drinks and eats (Investor presentation 2013). According to the owner of HMF1:

> "These meetings help cluster actors to learn more about what other actors are doing, their strengths, ideas and even their products and services. It helped us to work together on projects and jobs. So meetings have been good mechanism for knowledge exchange."

An engineer from HMF2 indicated that some ideas have come to his mind after listening to "progress presentations." A general manager from HMF3 indicated that "progress presentations" engendered a spirit of respect among facilitators, which developed into trust. Participants from the HMFs indicated that during the first stage of the cluster development the meetings were played the important role of getting people to know each other and build personal ties. Over time, "progress presentation" meetings became less although whenever a new firm joins the facilitators organise a meeting to introduce the newcomer. The meetings are initiated, organised and driven by the lateral actors.

The research findings indicate that there are several outcomes of the monthly meeting and its role in facilitating knowledge sharing at firm-level the two critical being developing initial

respect and trust within horizontal firms and firms recognising the importance of collaboration. Although respect and trust are considered essential factors for knowledge sharing within the cluster, there are some limitations. HMF1 owner indicates a need for a level of mutual respect for capabilities of each actor within the SAM cluster as that made actors more comfortable working with their competitors. Lack of respect was noted to affect inter-organisational trust in the SAM cluster. The owner of HMF1 stated that:

> "Some employees from HMF6 can't be trusted. I for one would not share any information with them, because I don't think that they've the integrity to equally interact and participate, they'll take information but not give, which is not fair."

Mutual respect among actors was based on past experience of working together and from considerations of what each was perceived to be contributing to the cluster. It was accepted that firms might not like each other, but as long as there was respect and initial trust they could share knowledge.

Participants also expressed concern that other firms of the cluster might steal their ideas. They believed their concerns were based on doubt about others' work ethics, and on lack of trust and respect between participants in the cluster due to the short period they have known each other. These concerns undermined knowledge sharing processes within the firm level. The general manager of HMF6 stated that: "We want to know about others but we prefer to keep silent".

The importance of collaboration is another outcome recognised by the horizontal actors. The need to collaborate to share knowledge was acknowledged by participants with the focus being on the need for collaboration to deliver as it was not an end in itself. An interviewee from HMF5 explained that

> "collaboration must bring benefits to the firm otherwise it becomes a waste of everybody's time. We need new contracts, access to research and development facilities and assistance with labour problems."

A manager from HMF1 stated:

> "We realise that to complete an important order or project, when it comes to a critical situation, we will need to contact our competitors within the SAM cluster and collaborate with them, because we'll be missing out, so is better to have 50% of something, than 100% of nothing."

HMF6 manager while reluctant about sharing knowledge with some specific players was on the other hand optimistic about sharing with other firms and did not perceive it as leading to loss of competitive advantage. He however conceded that some firms are reluctant to share knowledge particularly with newly joined firms for fear of losing competitive advantage.

(HMF6) has numerous collaborative programs and maintains that knowledge transfer and research and development provide the firm with an edge in their specific market. (HMF6) shares knowledge selectively, for example it does not share its manufacturing methods with competitor firms as it is their core competence that gives them their competitive edge. (HMF1) provides opportunity to every employee to share their knowledge on how manufacturing processes should be improved.

5.8.2 Informal knowledge sharing at the firm level

The informal mechanisms of sharing knowledge are common at the emerging stage as most actors have built personal relationships between each other since they first joined the cluster. Therefore, exchanging knowledge through informal meetings or chat is a common mechanism at firm-level.

HMF4 was the first firm that joined the SAM cluster and its workers live in the dormitory of the SAM cluster where other workers from the other firms also reside. This provides informal opportunities for knowledge sharing and developing social capital. HMF5 manager confirmed that: "My workers live in the same dormitory of HMF4… I always get the quickest answer regarding services I need of the cluster".

Despite reservations expressed by the HMF1 owner, the HR manager of the firm commented on the friendly environment of knowledge sharing between firms, he said:

> "The SAM cluster at this stage is a small community where knowledge is readily available from fellow workers or colleagues….the employees are always willing to go out for coffee or lunch casually and share problems they faced during their first days in the cluster."

The manager noted that some firms within the cluster were more willing than others to share knowledge. General explicit knowledge stored on a central database such as the e-forums is

more accessible and sharable among firms while knowledge collected by different firms is less accessible as it is in the form of paper documents and therefore managed and stored by individual actors. Further, some firms lack proper mechanisms to benefit from active knowledge sharing. Findings suggest that early stages of cluster development can be an advantage for knowledge sharing as new entrants are keen to learn from established firms in the cluster.

The data has also provided some evidence of informal engagements of knowledge sharing occurring during lunch and coffee breaks. Such engagements are not facilitated by the lateral actors. HMF4 owner said,

> "Meeting daily over a cup of coffee is important as it gives people a chance to share ideas and compare notes. These types of meetings can be improved because I think it is important to interact and cooperate with our neighbouring factory. I prefer formal ways of sharing information because we can refer to documents when there are recurring problems."

Knowledge sharing at firm level illustrate the facilitative role of proximity. Informal knowledge sharing activities at firm-level are casual meetings, casual chat between workers in the dormitory and during lunch breaks, informal emails, and phone calls.

Table 5.4: Summary of the Mechanisms of Knowledge Sharing at the Firm Level

Type of sharing	Mechanisms	Facilitated by
Formal	Monthly meetings	Lateral actors (facilitators)
	Conferences and seminars	Lateral actors (facilitators)
	Progress presentations	Lateral actors (facilitators
	e-forums	ICT courtesy of government (ECA)
	Training programs	Lateral actors (facilitators)
	Print media	Official websites; printed journal
Informal	Casual meetings Casual chats between workers	Proximity, communal eating and living areas, social functions
	Informal emails	ICT courtesy of government (ECA)
	Phone calls	ICT courtesy of government (ECA)

5.9 Forms of knowledge sharing at the firm-level

Evidence indicates that HMFs largely share general explicit knowledge and tend to be reluctant to actively share specific tacit type of knowledge related to know how and technical knowledge at this stage. Knowledge that is freely shared relates to general services, logistics, connections

and events of the cluster. It is therefore largely knowledge whose sharing is facilitated by the lateral actors. "Know how" type of knowledge whose sharing depends on the individual firms is less shared. The owner of HMF1 expressed his reluctance to share such knowledge thus: "*I don't think they have integrity, they'll just take information without giving anything back.*"

This view was backed by HMF6 manager who stated that *"Some firms have the tendency of not sharing knowledge to protect their competitive advantage."*

5.10 Factors Influencing Knowledge Flows in the Cluster Firms

Factors that affect knowledge sharing activities between horizontal actors are: capability to identify and assimilate knowledge; knowledge of expertise location including the role of training and R&D centres; inter-organisational trust; social capital both bridging and bonding and how these impact the process of knowledge sharing at firm level; and accessibility of knowledge. Also included is analysis of the different possible mechanisms of knowledge sharing at firm level. Perspectives of barriers to knowledge sharing between firms in the cluster are also presented.

5.10.1 Absorptive capacity

The type of knowledge shared at firm level includes knowledge about business opportunities, general ideas, manufacturing ideas and technical information. The shared knowledge can be tacit, explicit or both. The owner of HMF3 commented that:

> "The nature of manufacturing activities in our factory requires very skilled, experienced and educated employees….we would like to prevent knowledge loss due to employee's turnover. However, experience, always goes with the employee."

The tacit and idiosyncratic nature of knowledge means that that a firm has access to the expertise of the cluster does not necessarily translate to knowledge acquisition. It was evident that sharing knowledge requires the firms to be able to identify, interpret and exploit new knowledge not only provided by cluster facilitators from outside the clusters (i.e. with other firms, expertise or associations) but also from other horizontal firms in the SAM cluster. This can be understood with reference to participants' comments that firms are more likely to identify and absorb

information that is consistent with their existing pool of knowledge. It was also evident that firms can absorb new knowledge from other firms in the cluster if the said knowledge complemented their manufacturing activities or other processes in the firm. Data confirmed that tacit knowledge which includes shared knowledge and mutual understandings enabled one firm in the cluster to share knowledge with other horizontal firms.

Many participants confirmed that explicit knowledge is easily communicated and shared between firms in the form of hard copies data, scientific formulae or codified procedures. The HR manager of HMF1 shared his experience in this regard:

> "Knowledge and information are disseminated within our firm through documents, drawings and standard operating procedures and manuals of best practice".

At firm-level, firms can share their problems and difficulties with the facilitators; the solution to the problem is shared among other firms so that they can benefit from the appropriate solutions. There is a form of explicit knowledge use between firms that allows new joining firms to benefit from extant expertise and experience resulting in having a platform for ongoing development on the cluster's learning path. This was apparent from the interview with a general manager from HMF6, He said:

> "The first firm we would rely on is HMF4 , the earliest firm that joined in and started manufacturing and productions in SAM cluster in the first years back in 2007. They created the iconic brand of 'made in SAM cluster."

The research data also indicates that the few horizontal actors are willing to engage in diffusion of some types of explicit knowledge, and suggested a distinction be made between the tacit and explicit knowledge sharing (ED- Investor Relations Presentation 2013). Interviews revealed that explicit knowledge was usually codified and technical while tacit knowledge was situated within firms and acquired through firms HMF1and HMF5. Exceptions were HMF1 and HMF6 because of their being competitors with the same product lines. Explicit knowledge sources furnished scientific research-based knowledge generated from some in-house training centres and practice-based, experientially-derived knowledge produced in local contexts. The general manager of HMF3 explained how tacit knowledge becomes explicit through knowledge exchange between horizontal actors:

"Often we get temporary water cut problems in the manufacturing works and the whole factory stop and machines have no water supplies. We had tried different ways of filling temporary containers and tanks and try and connect them to the machines, and one employee said, well HMF4 has some water trucks in their firm…And they do – they have them ready and filled and they used them in emergency days like today. And so I said to our owner, 'this employee" thinks we should try and give this a go. Then later we did and I asked them to get the water truck and it helps the machines to be filled with the water and the work continues. Our employees is on the dormitory of the SAM cluster and every time they hear that other firms who was talking about water cut, they said, have you tried water trucks? And so other people and factories in SAM started trying it."

Knowledge is also sourced through direct searches resulting in gaining awareness of knowledge gaps as described by a manager from HMF5:

"I requested a service in my factory to be installed by another firm (HMF1) when we first join in…. and the job was done successfully the way we requested for, but also there was some difficulties in the start-up and lunching the facilities that we had absolutely no idea of how to lunch it… So I had to call (HMF1) and just ask them for a technician to come and inform us how to use it. And about five minutes we had the technicians in and they show us and explain the best they could do how to start up the service and what it was all about so that we did not have any problems. If we need something and it can be found from the neighbouring firms, we always phone and ask for help."

5.10.2 Knowledge of expertise

The proximity of the university provides access to expertise that benefits not only the large firms but also the small and medium firms. It is an economic driver with very tangible, social and economic roles and benefits (CU Brochure 2013). Researchers from the university are ready to build business relationship with firms within the cluster. This is a significant advantage for the start-up firms to choose the cluster as their business location. The university also encourages horizontal firms who are engaged in production and manufacturing to extend their presence by having a research and innovation relationship with university. The owner of HMF3 shares thoughts on the collaborative advantages:

"Because the two sectors are complementary we can achieve a lot together. The academia does basic explorative research which is further developed by industry. In particular, with specific industry R&D, the result may have to be validated in clinical trials, together with academic clinicians, so therefore there is interdependence from start to finish."

The general manager of HMF4 shares the perspective on the research and development facilities helping the firm achieve their objectives:

> "R&D is critical for business like us. We work with specific products manufacturing, where innovations and competition is very high. Hence we need to be updated in current technologies and products for gaining advantage over our competitors. Hence our relationship with the university and the research centres is very crucial, as we always need expertise from the scientists."

In addition, the project manager from the university transfer and innovation centre works with the researchers to protect, manage, and commercialize the university-cluster cooperation's intellectual property portfolio. This research participant has been involved with assessing many of the systems developed at cluster firms and implementing them in collaboration with other cluster actors. He explained:

> "The technologies being developed at CU are being adopted by different actors and industry partners in SAM cluster who are able to integrate it within their systems and use it to build new infrastructure projects for the cluster. This is just one of the smart systems developed as a result of knowledge sharing and cooperation between us and the investors of the cluster."

The owner of HMF3 emphasised how proximity of the university's research has helped the cluster firms:

> "We are working on a big program this year in collaboration with the university. There is no need for us to use other expertise outside the cluster as the University have enough capable expertise to do that for us and their proximity with us is very ideal."

5.10.3 Inter-organisational trust

There is an element of trust that encourages firms to share ideas with each other among initial members of the cluster. The owner of HMF1 stated that:

> "In the SAM cluster at this stage today, trust developed from the mutual respect that developed during the early stages of the cluster when firms had just started operating here. We care about trust because it is important for sharing information freely..."

For one participant firm, lack of trust was only overcome when other firms made the first move by sharing their knowledge, and ideas. In other words, this firm was not first mover; thus those firms had two of the factors that are considered essential to efficient knowledge sharing at the

early stage of emerging cluster which are: inter organisational trust and social capital. The owner of HMF5 confirmed that "*Trust can affect who you share your knowledge with.*" An HR manager from HMF1 stated that he felt it was difficult to trust newer firms as some of the information shared can be sensitive. In addition, the owner from HMF1 feels there is a tendency from neighbouring firm HMF6 in the cluster to not share knowledge about know-how due to lack of trust between the firms. The participants reported that undertaking these kinds of meetings arranged by cluster facilitators also tested cluster actors' trust in each other. If a firm sends someone from their factory to attend the meeting and share some of their ideas and knowledge, which was then effective, this consolidated trust between firms for the next time they meet.

Inter-organisational trust therefore seems to vary among organisations making it difficult to be conclusive about its existence or absence. A project manager of HMF5 indicated a recent occurrence of an intensive mutually beneficial cooperation with HMF1 which resulted in lower transaction costs without taking undue advantage of each other's know-how. This is evidence of mutual trustworthiness, cooperative norms and sharing attitudes among neighbours. The manager of HMF5 commented that:

> "Membership of the SAM cluster results in shared relationships that are guided by trust, shared experiences and which destroy hurdles to exchange of ideas."

5.10.4 Social Capital

It is evident that horizontal players utilised their social capital to bridge structural holes, or gaps in knowledge sharing, spanning the cluster boundary, and in that way provided themselves access to different types of needed knowledge. Social capital partly develops from the way the firms find themselves located close to each other and participating in activities arranged by the facilitators. The manager of shareholder affairs from the economic developer explained:

> "We have carefully put some firms next to each other ... partly because some are better suited to work next to each other."

On the same issue of location as a potential facilitator of the development of social capita, HMF4 owner bemoans that: "At this early stage of cluster's development, firms located next to each

other are more competing rather than cooperating" preferring a situation where "firms should be in a way helpful to each other and communicate and cooperate together." There is evidence of cooperation among some horizontal actors. Through interaction among horizontal actors, they established links between different sources of expertise, including other vertical actors, research centres and the university. Horizontal actors also collaborate between each other on general knowledge. A manager of V2 noted personal ties and finding the right person with the required knowledge as important aspects of social capital which can affect the knowledge sharing process. However where his firm is concerned it was apparent that this was not an issue as he said: *"Firms in the SAM cluster have fair knowledge of each other′s expertise."*

This illustrates how bridging capital relied on overlapping as a result of clustering enabling horizontal firms to derive resources through organisational and professional linkages with other actors. Bridging capital influenced knowledge sharing through the provision of advantages derived from strong ties and links among horizontal firms. The general manager of HMF4 suggested that:

> "Through our embeddedness and other neighbouring factories in the SAM cluster, we connect to the facilitators in the cluster quickly and share knowledge about manufacturing services as well as employments, power, housing and utilities."

The data indicates that lateral actors, use bridging capital to identify and extract explicit knowledge from firm-level actors and use bonding capital to facilitate acquisition of tacit knowledge derived from experience, and the diffusion and sharing of knowledge throughout the actors of the cluster. This is an important role for the lateral actors as they also act as knowledge brokers and knowledge gatekeepers.

Bridging capital helps horizontal actors within the cluster, to share tacit knowledge which can be a source of innovative manufacturing ideas and research (SAM newsletter 2013). Strengthening of relationships through bridging capital provides horizontal actors with the opportunity to demonstrate their skills and provide firms innovative research through the R&D centres. This results in improvement in operations as confirmed by the owner of HMF3 . The project manager from the economic developer stated:

"We have signed an MOU in our public domain and in the competitive forum. But basically this is an arrangement that we have jointly made as we want to encourage our entrepreneurs to move in and to establish their business here in the SAM cluster. We want the manufacturing firms to trust each other."

The Project Manager of HMF5 observed:

"We have partnered with other firms within SAM. We want industries to take advantage of R&D centres as access to knowledge network. This can only happen if the factories trust each other as mutual knowledge resource. We have common goals for this cluster to succeed and become an economic giant in the region. This is beneficial for all of us. So, we have to strengthen the relationships between each other as our goals are similar."

The data also illustrate that in developing bonding capital the technical specialist's role enabled firms to recognize and assimilate local knowledge and expertise and to share the knowledge with recipient firms. In that regard a manger of HMF1 observed that:

"Bonding capital facilitates the development of cooperative norms, trust and shared training institutions so that connected factories are able to cooperate effectively to achieve cooperative goals".

5.10.5 Accessibility

The head of business development of (ED) stated that the firms are willing to share knowledge that is important and beneficial in the operation and development of the cluster where the knowledge does not affect their sovereignty and intellectual property like know-how type of knowledge. He stated that: *The firms at this stage have no pressure to share knowledge that they do not want to share."*

The proximity and vicinity of the cluster in the economic city add value to the firms against their rivals outside the SAM cluster. On the other hand, Ad-hoc Knowledge protection between horizontal actors in the firm-level where technical knowledge are not being accessible by all actors, influences the process of knowledge sharing negatively at this stage of cluster's development. This is confirmed by the owner of HMF1:

"From the firm perspective they protect intellectual property, some factory such as HMF6 are not willing to share and they keep protecting their know-how, they have specific technologies and other obviously arranged systems which they are not very comfortable

to share with us. So I think the release of information in a very competitive market is very challenging at this early stage of development."

HMF1 and HMF6 produce the same line of product, they have been competing in the cluster from the early stages. HMF1 is local small firm and HMF6 is large MNE and the evidence suggests that HMF6 is not willing to share their tacit knowledge with HMF1. The differences in size and organisational culture of both firms make HMF6 very protective and reluctant to share their know-how knowledge. Moreover, the general manager of (HMF6) indicated that regarding firm's knowledge and R&D centre, they protect the intellectual property to protect the firms from the risk of opportunism from other competitor firms in the cluster:

> "Managing and protecting the intellectual property is very important. We have a very strict policy about protecting intellectual property, database and securing it in a professional way applying strict rules within our factory. So there are mechanisms that have been put in place once we joined the cluster through which we can protect our know-how knowledge."

5.11 Barriers to knowledge sharing in the SAM cluster

Barriers to knowledge sharing in the SAM cluster largely emanate from its newness and its having few players with limited knowledge of connections that exist within the cluster, and an over dependence on government and lateral actors to facilitate the knowledge sharing. Because the cluster is not established as a free zone in which local and MNE firms can bring their own rules and regulations, firms must follow the basic Saudi Arabian economic regulations. Dealing with regulations and government agencies requires finding the necessary expertise and connections to the lateral actors. HMF1 as a small firm are only looking for skilled employees to hire in their factories. A manger from (HMF1) noted that:

> "I think what is important from our perspective is that lateral actors need to make sure that there are skills training as per the needs of the firms in the cluster."

Another issue that discouraged individual firms from sharing ideas was the fear of losing control of proprietary knowledge (ownership of the manufacturing ideas) that contributes to their competitive advantage. Once an idea was brought to the cluster's attention, it was changed by the actors' observations and contributions. The result was that *"firms felt as if their ideas and know-how have been stolen"* (an Owner of HMF4).

Reciprocity is a natural phenomenon, but in the cluster an owner from HMF4 said that firms share information about the cluster with other neighbouring firms and seek general information from them when needed without thinking of getting anything in return. He said they try to help each other as much as possible according to their knowledge because they are cooperating at this early stage of development. However, a general manager of HMF3 stated that:

> "Although at this developmental stage we feel like being in a small village where most firms [are] very close and cooperative….In some cases there is still a tendency that some firms are not as open to share their particular expertise with counterparts as others."

Some participants from HMF1 and HMF5 believed they still had difficulties relating to trusting each other when it comes to sharing specific types of knowledge such as technical or financial information. The owner from HMF1 stated that:

> "To start with there was some bit of hesitation if I may call it that, when we first joined people were still trying to figure out who was doing what, and how much. Some people were unwilling to share how much they're getting for various projects, contracts and things. So one is always wondering what to tell the others and what to keep secret."

The main method of communication is through face-to-face conversations, emails and via telephones. These are used for internal and external communication at firm-level. Firm HMF4 firm faced the challenge of e communication distortion. The owner of HMF4 said:

> "Some messages that are sent by email never get opened by the targeted recipient. They then claim that they never received it yet you will be knowing that they did but did not bother to read it. In some cases peoples mail boxes have too many emails and end up not opening some."

Lack of agreed procedures between horizontal actors to share expertise and know-how is another barrier to knowledge sharing at the firm level. The focus of knowledge sharing has been on general explicit knowledge to the disadvantage of sharing know-how. The arrangements made by facilitators do not encourage the sharing of know-how. This highlights the need for more focus on developing formal opportunities for know-how sharing.

5.12 Summary and Conclusion

Data from documents and interviews of horizontal actors revealed facilitating mechanisms of knowledge sharing and barriers. Lateral actors were found to play a central role in developing

mechanisms for and facilitating the knowledge sharing both at web-level and within the firm-level between horizontal actors. While horizontal actors were found willing to share specific types of knowledge, there was also evidence of reluctance to share some knowledge as a result of lack of trust. The findings revealed some advantages of joining a cluster during the emerging stage when the number of firms is small and having more close relationships, cooperation and trust due to personal ties at firm-level. From the view of the individual firm the cluster promotes proximity which supports knowledge sharing. In turn this is also supported by the formal mechanisms put in place by the lateral actors and informally through employees being located in adjacent living facilities. Challenges are nevertheless there relating to new firms joining the emerging cluster and gaining access to knowledge networks. Also, while lateral actors support knowledge sharing in the cluster there remains a dependence on them to develop social capital and knowledge sharing mechanisms.

The chapter presented findings of the factors that influence knowledge sharing in the government directed SAM cluster based on an analysis of documentary and interviews which were based on data guided by the theoretical framework presented in the literature review chapter (Section 3.5, Table 3.1). Formal and informal mechanisms of knowledge sharing at both the web and firm level were explored. Barriers to knowledge sharing at both levels were identified and analysed. The central role played by the lateral actors in influencing knowledge sharing was discussed. Absorptive capacity, inter-organisational trust, and knowledge of expertise location, social capital and accessibility were identified as the five factors affecting knowledge sharing at both the web and firm levels of analysis. The five factors seem to be interlinked and to overlap possibly as a result of their being dependent on the facilitative role of the lateral actors which was apparent at both web and firm level.

Chapter 6: Significance of the Findings

6.1 Introduction

This thesis set out to examine knowledge sharing mechanisms in an emerging and government controlled cluster in a Saudi Arabian economy. The research focused on two features of industry clusters: 1) the extent to which an emerging industry cluster organises and supports knowledge sharing mechanisms, and 2) how, through clustering, proximity influences knowledge sharing processes and exchange among firms. The study also sought to explore four sub-issues: how the value-added web analytical framework of cluster analysis could be applied in an emerging, government-driven industry cluster; the identification of the key actors that support knowledge sharing in the cluster, the challenges and barriers to knowledge sharing and lessons and implications that could be derived from the research for government policy towards clusters.

Clusters have been identified as vehicles which generate cooperation, innovation and knowledge transfer. Developing knowledge sharing processes within industry clusters has been recognised as an important public policy objective (European Commission 2006). However literature frequently overlooks the role of lateral actors and specifically government agencies in facilitating knowledge sharing within clusters. The research findings and discussion in this research explain how clustering impact on knowledge sharing process at the web and firm levels of the SAM cluster in a newly established regional city. This research uses the VAW framework as an analytical tool to define the relationships and linkages through which knowledge sharing is happening between actors within the cluster as presented in Section 3.5 of Chapter Three. Reviewing the literature identified different factors that influence knowledge sharing, and the proposed research framework presented in Table 3.1 guided the analysis and discussion of the findings in investigating the utility of clustering in understanding the nature of knowledge sharing. The findings come from analysing the firm-level and the web-level in the VAW in order to understand knowledge sharing processes within the cluster.

Based on the research findings presented in chapter Five and Six, knowledge sharing in emerging clusters is supported in situations where the mechanisms are led, developed and implemented by lateral actors. In turn this direction and leadership provides value-adding

benefits to participating firms and to the cluster. The research findings also highlight the main role of cluster facilitators in bringing the different actors together to address shared challenges. The facilitators also play the role of acting as catalyst for the development of both bonding and bridging capital which in turn facilitates the knowledge sharing process (section 5.4.5 and 5.7.4). The aim of this chapter is to discuss the results of this research (web level and firm level) in the context of extant literature outlined in Chapter Three (Literature review). The discussion proceeds as follows: section5.9 discusses the findings of knowledge forms and the process of knowledge sharing; section 5.10 discusses factors that influence knowledge sharing as applied and analysed in the SAM research results; section 5.11 discusses findings related to the barriers to knowledge sharing in the cluster and section 5.12 summarises and concludes the discussion of the research findings.

6.2 Knowledge sharing mechanisms and forms of knowledge in the SAM cluster

Based on the research results in chapter Five, knowledge sharing mechanisms in the cluster are initiated and organised by the lateral actors who are leading the process of knowledge exchange to facilitate actors' collaboration in order to achieve positive outcomes as suggested by the findings at the web-level. For example, the industry-university collaborative program is a mechanism established by the lateral actors to facilitate collaboration and knowledge sharing among horizontal actors (section 5.4.3). This finding is consistent with Mesmer-Magnus and DeChurch (2009) who examined knowledge sharing and found that it has positive consequences associated with reduction in production costs, faster completion of projects, enhanced team and firm performance and innovation.

The lateral actors of the cluster recognise the importance of using knowledge sharing mechanism that maximize individual, organisational and cluster knowledge by facilitating the integration of available explicit and tacit knowledge through formal meetings, seminars and conferences (section 5.3; section 5.7.3). Formal meetings and presentations facilitate conversion of tacit knowledge into explicit knowledge which is then shared within the web-level (section 5.3). This is consistent with Kim, Hong, and Suh (2012) who posit that knowledge management has four components: capturing, (in this case through the lateral actors facilitated forums such as

meetings); storing (through presentations, databases, e-forums and websites and reports); sharing (e-forums, informal gatherings and chats); and using (both at individual, firm and web level). The lateral actors' focus on harnessing all forms of available knowledge and converting it into explicit accessible knowledge that is documented and can be shared in the cluster (5.3) is consistent with Howell and Annasingh's (2013) view that the purpose of knowledge management is to maximize individual and organisational knowledge by concentrating all available implicit and tacit knowledge, converting these into explicit knowledge to be codified, interpreted, represented, saved, retrieved, and shared.

Findings show that through interactions in the cluster, actors gain access to valuable tacit knowledge relating to cluster's services, utilities, facilities and activities which is shared and embedded in local context and therefore very difficult for firms outside the cluster to imitate. According to the web-level findings, as expressed by a general manager of HMF6 in reference to their relationship with HMF4, this local knowledge was perceived as being central to the refinement of the 'Made in SAM cluster brand' of manufacturing products and therefore evidenced advantages of intra-cluster knowledge sharing from a path dependency perspective (section 5.10.1). Based on the web-level findings, the lateral actors in the cluster have shared values and understanding of the shared rules and regulations that enable the university to identify and assimilate knowledge (section 5.3). Although the forms of knowledge shared in the web-level have similarities with those shared in other types of clusters (Connell and Thorp 2009, Burgess and Henderson 2010 and Brown et al. 2012), it is more focused on basic infrastructures, communications, rules and regulations. This reflects the main features of this cluster which are that: first, it is government-driven and secondly it is still emerging and in the early stage of development as illustrated in (sections 5.1 and 5.7.4).

According to Frost (2010), the knowledge sharing process is affected by the nature of knowledge that will be shared. In the findings whereas actors at firm level have no problems sharing explicit knowledge, they are more reluctant when it comes to specific tacit knowledge they believe gives them a competitive urge. This is because knowledge sharing process in the cluster is driven by the lateral actors; the form of knowledge shared is predominantly explicit (section 5.7.35.9). Despite the socialisation opportunities created by the lateral actors which, according to Thomas

(2000) is what supports sharing of tacit knowledge. Not all actors attend the social events meaning that the intended socialisation does not always occur (section 5.6). The apparent reluctance to share tacit knowledge among actors has been attributed to lack of trust as stated by participants from the economic developer that lack of trust stands as a barrier to effective knowledge sharing (section 5.6). This is confirmed by some of the horizontal actors, for example the owner of HMF2 explains his reluctance to share tacit knowledge because he doubts the integrity of the other players while a HMF6 manager gives lack of reciprocity by other players and the reason for his reservations about sharing tacit knowledge (section 5.7.5). The newness of the cluster and the small number of actors at this developmental stage and the fact that the knowledge sharing process is not driven by the horizontal and vertical actors but rather by the facilitators (lateral actors) may explain the reluctance to share tacit knowledge. As the cluster matures and the number of actors increases, Thomas' (2000) assertion that tacit knowledge sharing is supported by socialization is likely to manifest given research findings that suggest that lateral actors facilitate experienced knowledge networks through specific channels between the university and R&D centres with other actors at the web level (section 5.10.2). The results show that exchange of knowledge about the features and advantages of the SAM (cluster's reputation) and its reputation as a strategic new economic city of clean and green manufacturing excellence in order to attract more business to join the cluster happens between lateral actors and the local media as explained by a representative of the ED (section 5.3). At the web level of the SAM cluster, the social events facilitated by lateral actors in addition to the proximity and the shared living dormitories for the workers result in tacit knowledge sharing through personal interactions. Staff mobility and interactions between the employees of different actors within cluster, enables the exchange of the tacit knowledge within the cluster (see section 5.4.6).

Tacit knowledge is regarded as being the most valuable source of knowledge, which has an important effect on innovations and sustainable growth and development in clusters (Frost 2010; Thomas 2000). Tacit knowledge in the cluster was gained through different projects and general products manufacturing. For example, the knowledge gained by some actors during the design of a three-dimensional microfluidic device for the mass production of mono-disperse single emulsions (See section 5.4.3). This is consistent with Power (1999) who suggested that

knowledge sharing is more concerned with issues like capturing and reusing past experience, embedding knowledge in products, services and processes, producing knowledge as products and driving knowledge generation for innovation. Eisingerich and Boehm (2007) and Yoong and Molina (2003) suggest that the ability of cluster members to develop based on information learned from other members is a critical success factor. This supports the findings about how the monthly meetings arranged by the facilitators and the e-forum encourage knowledge sharing through learning from other firm's earlier experiences when they first joined the cluster. This is further facilitated by the practice of lateral actors of arranging an introductory meeting whenever a new actor joins (see section 5.7.4.

It is apparent from the findings that it is not mainly about formal exchange and communication but rather that it is critical to create a platform for all actors at web-level to meet and build informal networks using informal mechanisms which then influence knowledge sharing. At the web-level, the relationships of the lateral, horizontal and vertical actors are informal due to the small numbers of firms and their geographical proximity. All the interactions and links between the three actors are arranged by cluster facilitators and the informal mechanisms are the strength of the cluster exchanges happen at that level among all the actors. This exchange process is mainly driven by the lateral actors. To bring it to a more developed level of the knowledge sharing process would need reduction of the dominant role of lateral actors. The findings are in the line with a case study analysis of a Danish mechatronics cluster by Gretzinger and Royer (2014) that analysed relational resources within the cluster. They investigated social capital in this context and found that exchange between the horizontal, vertical and lateral cluster actors was largely happening through the informal mechanisms. Results show that formal communication promoted by the cluster facilitators usually referred to forms of knowledge not directly related to the core strategic business activities and know-how as perceived by the horizontal actors, for instance workshops to share general knowledge about recruitments and manufacturing. The informal communication (and social events) worked well among those who had worked together in the SAM cluster for a long time. This is illustrated by the relationship between Firm HMF4 and HMF5 who easily shared knowledge because of a long standing personal relationship formed at the time of joining the cluster (Section 5.8.2).

The findings indicate that the lateral actors are always close enough to the horizontal and vertical actors to support effective knowledge sharing. This is due to the facilitators having established good communication systems, for example the ICT infrastructure, the scheduled and ad hoc meetings and social events which enable them to learn as much as possible about the needs of the firms (Section 5.2).

The findings at firm-level confirm that, some firms are reluctant to share their tacit or specific know-how knowledge with other actors for a range of reasons. First, the differences in size between horizontal actors such as large, medium and small firms presents a situation where large firms most of which are MNEs have links with horizontal actors outside which bring to the new cluster while the smaller local firms do not have such links presenting a challenge of integrating SMEs and therefore of knowledge flow (section 5.2). Second, some horizontal actors are MNEs while others are local firms meaning they are different in terms of organisational culture, for example HMF6 (a large MNE) is reluctant to share tacit knowledge with HMF2 (a smaller local firm) (section 5.10.5). Third, is lack of trust as discussed in more detail in section 5.4.4 and 5.10.3). This reinforces the central and critical role of lateral actors in supporting knowledge sharing in an emerging cluster where the bonds across horizontal actors are in their infancy and thus hampering knowledge sharing.

There are opportunities available to exchange knowledge due to the proximity of horizontal actors and employees in one region, most actors have built very good personal relationships which generate more informal mechanisms for the knowledge exchange in near future section 5.8.2). Thus, while the lateral actors play a critical role in planning, leading and organising knowledge sharing initiatives, the strength for knowledge sharing in the cluster is generated from informal mechanisms which influence trust building between actors resulting in more possibilities of sharing tacit knowledge considered as the critical type of knowledge for competitive advantage.

6.3 Factors Influencing Knowledge Sharing in the SAM Cluster

6.3.1 Absorptive capacity

According to Giulani (2005), absorptive capacity points to the ability of an organisation to maximise economic performance through determination, absorption and utilization of external knowledge. While the lateral actors are managing and controlling the creation and sharing of knowledge at the firm-level, they require that horizontal firms possess a degree of absorptive capacity whether it is in terms of improving learning skills, problem solving or general knowledge (Mitchell et al. 2010). The findings of the web-level confirm the active professional role of the university and training centres in training new employees of cluster actors. For example, HCA trains local talents to be more competitive and innovative through providing industry workshops and training (section 5.4.5) while the cluster university has established collaborative programs with some of the horizontal actors (section 5.4.2; 5.4.3). This agreed with the research by Berkenkotter and Huckin (1995) training and the associated assimilation process promotes a shared language via interactions in a professional setting. This in turn improves absorptive capacity.

The VAW framework (Brown et al 2007) identifies the interactions between lateral and horizontal actors are direct and strong in the SAM cluster as set out in section 3.3. The identification of the links and interdependencies of the actors, especially between lateral actors was highlighted by Guo and Li 2012; Gretzinger and Royer 2014. For example, the ECA and the ED have strong and direct links as they interact on a daily basis for the purpose of improving and developing the cluster. Previous studies suggest that absorptive capacity is derived from the ability to acquire knowledge from the external environment such as inter organisational relations combined with learning from past experience and current activities indicating the criticality of density effect (Easterby-Smith et al. 2008; Zahra and George 2002; Cohen and Levinlhal 2002). Research findings in the current study suggest that there was limited absorptive capacity within some of the smaller horizontal actors partly as a result of the cluster being in its infancy and therefore only having developed a basic type of absorptive capacity (section 5.10.1). The facilitative role of lateral actors through sharing both formal and informal knowledge enabled some horizontal actors to understand their internal processes, their strengths, limitations and the challenges they have to overcome. This way they mitigated limitations associated with low levels of absorptive capacity. For example, a manager from HMF4 sought needed information on

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infrastructure and utilisation of solar power from HMF6 through the facilitation of the ED (section 5.3).

According to Szulanski and Capetta (2003), one of the key challenges to overcome in the process of knowledge-sharing for horizontal actors is acknowledging that an information gap exists. Consistent with Rulke and Galaskieqicz (2000) interactions among horizontal actors helps firms understand their capacity, and thus enabling them to identify gaps. This makes the horizontal actors dependent on the links and support provided by lateral actors regarding facilitating knowledge sharing in the cluster all the time. Given then the dominant role of lateral actors in the knowledge-sharing process within the cluster, this could prevent firms from developing absorptive capacity which could compromise their ability to handle challenges in later stages when more actors join the cluster. According to the research results, cluster absorptive capacity is basic as firms have weak knowledge bases as a result of the cluster being new and emerging. Inside the cluster, the knowledge system is weakly connected and the level of outside or external openness with other economic cities is restricted and confined to the links provided by lateral actors (section 5.10.1). This process is confined to the early stages of development. With the growth and development of the cluster, based on the participant comments regarding the enthusiasm and willingness of knowledge sharing, there are expectations that the situation will change in the future. The absorptive capacity level will be upgraded when cluster actors assimilate knowledge from external cluster sources and participate in the establishment of knowledge by investing in in-house R&D. Clusters that have advanced absorptive capacity are characterised by an internal innovative infrastructure and environment, where industries create deep knowledge links (Paulsen and Hjerto 2009; Duchek 2013; Muscio 2005).

Firms' ability in the cluster to identify and synthesize knowledge is affected by similarities in the industry. Studies show that knowledge-sharing mechanism should involve the capacity to use information gained, after the firm has applied relevancy to its own context. Proximity of actors within the SAM cluster was found to be an ideal tool for easing the process of identifying and assimilating knowledge. For example, the proximity of the university presents benefits for both the horizontal actors and the university (section 5.4.2). This finding is consistent with Zeller's (2004) assertion that both the sender and the recipient actors should be mindful of the tacit

knowledge processes involved within the industry, which may be accomplished by manufacturing actors within the same or related industries. Absorbing, assimilating and sharing tacit knowledge can be achieved through seeking/providing complementary information or services. This is in line with the literature that emphasizes the importance of industry similarities for actors to communicate with the same technical expertise (Cohen and Levinthal, 1990; Colombo 2003), which according to firm level results should improve communication and enhance knowledge sharing in the early stage of cluster's development. Therefore, as an outcome of knowledge sharing, lateral actors provide new technologies that are adopted and commercialised by horizontal actors including the university's protected innovations (CU Brochure 2013). 5.10.2Communication at the firm level in the cluster improves the horizontal actor's understanding through shared understanding of technical terminology and jargon as illustrate by a manager from HMF5 who explained how he benefited from calling for assistance from a technician at firm HMF1.

In summary at the web-level, lateral actors enhance the capabilities of actors to identify and assimilate new knowledge which results in developing an active and effective absorptive capacity whether it is for skills learning, problem solving or general knowledge. Additionally, it was clear from the findings that lateral actors are adopting strategies and providing opportunities for the development of the cluster's absorptive learning, innovation and information sharing through use of ICT (see section 5.2 and section 5.8.1). On the other hand, there was some evidence that at firm-level, know-how (tacit knowledge) is not being shared among horizontal actors. This reduces the firm's ability to learn and develop due to the immaturity of the cluster at the firm level. Yokakul et al. (2010) and Li (2011) suggest that absorptive capacity supports the sharing of knowledge among firms, supports firms' ability to learn and affects the cluster's development. Examining the limitations and of absorptive capacity at the firm level in the SAM cluster leads to an understanding of how the horizontal actors can exchange knowledge more effectively in the later stages of development.

6.3.2 Knowledge of expertise location

Findings at the web-level confirm that lateral actors participating in the cluster improve the knowledge-sharing process through their proximity and their collective knowledge and expertise.

It is clear from the results that, lateral actors such as the university provide access to a pool of expertise through for example, firms building relationships with researchers (Section 5.10.1). Additionally, knowledge sharing through ICP, the cluster development portal to the university Proximity of the university in the cluster presents potential to attract local graduate job seekers to the SAM cluster in line with Burgess and Royer (2013) suggestion that clusters respond to public policy challenges relating to job growth and employment. Universities offer specialist skills and research capabilities that are not available to individual businesses and clusters. The SAM cluster is attracting research and training institutions and developing potential synergies. Moreover, the training centres provide specialist skills that are relevant to manufacturing activities (see section 5.4.2). For example, training of local talent to be more competitive and innovative is provided by HCA in the form of industry workshops and training (Industrial Cluster website 2013).

The importance of the lateral actors, specifically the university, as a source of locational expertise was highlighted in the research. The lateral actors such as university involved in educating students and training them for a first job and through the university entrepreneurship program equipping them to start new businesses in the cluster to implement their research and innovative ideas. While some firms in the cluster employ this talent as apprentices and trainees, other firms recruit these trainees within the VAW to achieve the objective of skills development within the cluster. This type of dependency and interactions enhance knowledge exchange between different actors in the web-level. This is similar to the research by Festing and Schäfer (2013) where they discuss the sequential interdependencies between actors that are built around human resources where the output for some companies and input for others occur between different actors within the cluster. For example, the ICP program has strengthened relationships between actors through knowledge-based collaboration. According to Connell and Thorp (2012), in the case of technical specialists, their expertise may be available to some actors through commercial relationships while many other companies may be excluded from such knowledge through insufficient resources or expertise. In the SAM cluster, which is government driven, results show how lateral actors incorporate such expertise into the cluster and make it available to all cluster actors. A typical example is the ICT infrastructure developed by the facilitator as explained in Section 5.2. At firm level, the findings confirm that actors are able to turn to the available knowledge and expertise network in the SAM cluster when they need information,

rather than investing their own time identifying new knowledge sources due to the proximity and the facilitative role of lateral actors. For example, the owner of HMF3 who says there is "no need for us to use other expertise outside the cluster ..." (see section 5.10.2).

Similarities across firms (the horizontal actors) and proximity are keys to the knowledge-sharing process because it improves relationships among actors and increases sharing information on a more regular basis (Rempel et al. 1985; Uzzi 1996, 1999; Zucker 1986). Research finds that this improves the growth of horizontal actors' technical expertise (Palazzolo 2005; Yuan et al. 2005). In the SAM cluster, it was evident that the lateral and vertical actors (specifically the Seaport) provide depth and important forms of social capital to the horizontal actors. Therefore, the clustering of firms around a similar industrial manufacturing process and around the Seaport enhances knowledge sharing in the cluster. There is evidence of the existence of strong bonding links through the lateral actors as illustrated in sections 5.10.2and 5.10.3 on inter-organisational trust and social capital respectively, suggests that these actors develop information sharing, trust and help in building a shared identity. From the findings there is an indication that lateral actors of the SAM cluster have been successful in facilitating and encouraging knowledge sharing among many of the local and MNEs firms in the cluster. In the absence of the intervention of lateral actors, it would seem that knowledge sharing would be limited by the newness of the cluster and low knowledge sharing comfort levels as illustrated in section 5.10.3 by the reluctance of HMF6 to share know-how with HMF2. This reinforces the point of the inability of small firms to access, process or apply specialist knowledge (Guiliani and Bell 2005). What is required are mechanisms that help these businesses in sharing the expertise and specialist knowledge they require at firm level to develop effective long term knowledge sharing strategies without being fully dependant on the lateral actors to generate the knowledge sharing activities.

6.3.3 Inter-organisational Trust

According to the literature, trust is recognized as a fundamental characteristic of a cluster that can significantly affect collaboration and the information quality and flows of knowledge between people in business (Murphy 2006). This has relevance to the SAM cluster as lateral actors have high levels of mutual understanding and trust which encourage knowledge sharing and willingness among other actors to share knowledge openly regarding available infrastructure

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and resource. For example, the university helps build trust among organisations by setting up research projects that encourage different firms to collaborate and work with each other and in that way increasing inter-organisational trust and collaborative work spirit. This finding is also in the line with Welch and Welch (2008) who note that trust is an important factor in knowledge-sharing because it identifies how knowledge is shared among actors. Building trust between different actors and encouraging them to trust each other is important for the lateral actors. This is because lateral actors believe that trust minimizes the fear of knowledge-sharing by reducing uncertainty. At the cluster web level, trust is connected with what scholars call cognition-based trust by providing the efficient technical basic infrastructure for actors within the SAM cluster (Parkhe, 1993; Uzzi and Gillespie 2002). Tsai and Ghoshal (1998) indicated that cognition-based trust includes technical competence, responsibility and dependability (which incorporate competence, responsibility and reliability). The results at web-level demonstrated that most actors are willing to exchange general explicit knowledge (section 5.9). Shared norms, values and beliefs that are operationalized as procedures increase trust among actors at web and firm level. Murphy (2006) supports trust-building as key in developing higher-quality information within clusters. In the SAM cluster, knowledge sharing of know-how based on trust occurs between some actors such as the university and firms, or between two firms among the horizontal actors in situations where actors believe that there is not going to be misuse of the shared know how (See section 5.10.2for a discussion). This is important because the cluster is still emerging and horizontal actors especially MNEs want to strengthen their presence in the country. This is similar to what Wang and Noe (2010) discussed in their research that in organisations, individuals consider knowledge as a source of power and there is a fear of losing this power as well as a certain status when sharing their knowledge with the others. In the findings, one MNE horizontal firm expressed unwillingness to share their know-how with other horizontal actors in the cluster for fear of losing power and status as a well-known large MNE (Section 5.10.2) Currently, horizontal actors including the MNEs manufacturers as the major constituents of SAM cluster lack access to specialist knowledge (Know-how) or the ability to transform and apply this knowledge due to small numbers of actors, lack of trust and fear of sharing technical knowledge at this early stage.

What the research on knowledge sharing and technical specialists in clusters suggests is that there is a need to develop processes that improve access to and improve the understanding and implications of such knowledge once it is accessed. In many clusters with key dominant firms, there are often commercial linkages and commercial routines whereby the dominant firms provide the knowledge, the technical specialists and the expertise to encode and apply the knowledge (Grimstad and Burgess 2012; Giuliani 2005). The SAM cluster has various sizes of firms (small, medium and large). There are three large manufacturing horizontal actors that possess the resources and expertise to access and process knowledge through national and international networks, but in the main the other small and medium horizontal actors in the cluster do not possess the resources or have access to such networks. This is because of the newness of the cluster it requires the lateral actors to take on the dominant role in order to manage the interactions in the cluster and to develop the mechanisms for developing bridging and bonding capital among the actors. Evidence in clusters where there are many small firms, such as in regional wine clusters (Henderson and Burgess 2010), indicates that local trade associations, tertiary institutions and government agencies are important in developing social capital. In the SAM cluster, this function falls on lateral actors as the small number of firms and the immaturity of the cluster are factors that inhibit the development of robust trust based networks and informal knowledge sharing mechanisms that are driven by the horizontal and vertical actors.

From previous research, trust plays roles at the web and firm-levels through connections in actors' networks and personal relationships (McAllister, 1995; Rempel et al., 1985; Schamp et al. 2004). The owner of firm HMF5 highlighted the importance of personal ties to the process of trust building among horizontal actors and that this affected who one shared knowledge with while the HR manager of HMF1 indicated the difficulty of trusting new entrants (section 5.10.3). Further, trust has been associated with cost-reduction through minimising opportunistic behaviour (Torsvik 2000). In the findings, HMF 1 and HMF5 who are neighbours have engaged in intensive cooperation that enabled both parties to achieve lower transaction costs while minimising chances of one party taking advantage of the other's know-how (section 5.10.4). Findings at firm-level illustrate that most horizontal firms at this stage of the SAM cluster development have a sense of goodwill; respect and broader understanding of other participating

firms (see Section 5.10.2). These firms are enjoying the outcomes from trust regarding cost reductions by only sharing general type of knowledge regarding rules infrastructure, services of the SAM cluster.

6.3.4 Social Capital and Knowledge Sharing

Social capital is developed through the relationships between cluster facilitators and horizontal actors and through formal links provided by the facilitators which connect the firms to the world outside of the cluster. According to the research findings, lateral actors share common objectives regarding the entire region of the economic city that encourages them to establish an effective network of knowledge sharing activities within the SAM cluster (Section 5.2). Cabrera and Cabrera (2005) agree that building social capital within the economic environment sees knowledge as an asset shared among participating firms.

Social capital was found to have a key role in SAM cluster (Yeo and Marquardt 2013). At the web-level, social capital provides the formal and informal linkages in the SAM cluster. Therefore, the cluster has the basis for collaboration and the potential for knowledge sharing and innovation consistent with Solvell et al. (2003) suggestion that that the cluster environment benefits from social capital that is embedded in local cultures, institutions and actors. While at the firm- level, some interactions may be a result of lateral actors formally leading and supporting knowledge sharing activities in areas such as training, finance, marketing and technology development, at web-level the impact of social capital may be more informal and involve personal interactions among lateral actors. Emerging cluster activity and interest not only facilitates social structures for the group through shared knowledge, but also their local proximity enhances their tacit engagement and thus the development of vital social capital in the network.

Research findings confirm that interaction and synergy and collective representation by lateral, horizontal and vertical actors help to have a common manufacturing purpose and shared norms and values for the SAM cluster as stated by the Project Manager from HMF5 that they want industries to take advantage of the research and development centres to access the knowledge network (section 5.10.4). The role played by lateral actors in the SAM cluster of supporting

local networks and enhancing collaborative activities like knowledge sharing creates institutional thickness at the web-level (Keeble et al. 1999; Racco 1998). The institutional thickness of lateral actors indicates the availability of highly skilled personnel and talent in the SAM cluster, and thus the intense exchange of knowledge between facilitators and horizontal and vertical actors. For example, in the HRM context, HCA provides actors in the cluster with access to skilled employees networks thus leading to potentially active knowledge exchange in the web-level compared to other types of clusters (e.g. organic) where this is not the case. Thus the lateral actors' efforts in the cluster present an example of institutional thickness at the web-level consistent with Brown et al. (2007) regarding the location-specific resources which introduce contextual rents that embed cluster actors within the VAW.

The formal presence of the lateral actors in the SAM cluster facilitates shared values, trust and building social capital to improve the economic growth within the cluster. This is consistent with research that suggests that firm-level and web-level relationships provide a foundational understanding for institutional thickness, as it develops informal and formal institutions within the cluster via social capital (Collins, Bray, and Burgess 2012). Racco (1999) found that formal institutions enable sharing values and trust, building social capital to improve the economic growth within the cluster.

Complete dependence on the lateral actors for enhancing the knowledge sharing activities as indicated in section (5.10.4) is potentially problematic if it prevents the development of social capital mechanisms within and between the horizontal actors (Connell and Thorp 2009). As clusters evolve, there needs to be a shift by policymakers from a concentration on just member firm numbers towards the establishment or facilitation of mechanisms and systems whereby knowledge and skills can be shared and innovation encouraged. This will ensure sustainability of the cluster (Motoyama 2008). Social capital as a contributing factor in leveraging the business development activities of novice entrepreneurs is supported by Mosey and Wright (2007) and thus further established as a contributing antecedent in the establishment of an emerging industry.

6.3.4.1 Bonding and Bridging Social Capital through Knowledge Brokers

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A key finding of this research was that horizontal actors looked towards their neighbouring firms and/or the University for Information exchange, advice and support (see section 5.10.4). Collins, Bray, and Burgess (2012) maintain that universities as lateral actors have credibility and are a source of technical specialist knowledge and provide both bonding and bridging capital to a cluster. In this case, there is an existing cluster with formal strong links through lateral actors, established technical specialists in the region and a degree of cooperation across horizontal and vertical actors. To continue the efficiency of this foundation in later stages of development, there needs to be more institutional depth added to the cluster—that is, developing other institutions that facilitate knowledge sharing, knowledge access, knowledge generation and encoding knowledge for application within the cluster. However, if the strong dependence on lateral actors as the leaders and organisers of social capital continues, this may not arise.

Findings indicate that bonding capital improves relationships in the SAM cluster, specifically where some horizontal actors are sharing tacit knowledge for example, the case of firms HMF 1 and HMF5 (Section 6.3). Additionally, bridging capital is evident in the form of cooperation between firms and the university, R&D and training centres (see section 5.10.4). Prior research suggests that bridging capital occurs through innovation among firms within the cluster by bringing together disjointed actors to generate knowledge (Dyer and Noboeka 2000; De Drue and West 2001). SAM cluster provides a focus where different types of capital can be generated. At the web-level, lateral actors' enhancement of the accessibility to knowledge regarding a given problem or situation or providing horizontal firms with access to knowledge networks are all indications of bonding capital at web–level. The continuous active knowledge and resources sharing will result in strong knowledge sharing relationships in the SAM cluster. Further, the findings indicate evidence of bridging capital, where lateral actors cooperate in the provision of shared values, beliefs and ensuring flexible regulations for the benefit of horizontal actors for example, and the case of visas for foreign workers in the SAM cluster. This is consistent with Mitchell et al. (2010) who posit that bridging capital is important in terms of strengthening the links between horizontal actors and lateral actors in the VAW.

The firm-level results indicate that manufacturing associations and horizontal firms are less likely to develop bonding capital at this early stage of development in the SAM cluster. The

results at web-level also illustrate how bonding capital of the technical specialists within the SAM cluster allows lateral actors to identify and assimilate local knowledge and expertise and also to share that knowledge between actors at web-level through for example all facilitators encouraging firms to join industry-university collaboration programs.

Researchers note the importance of knowledge brokers in the knowledge-sharing process, as they bridge the gap to the external world and bring information into the cluster (Collins, Bray, and Burgess 2012; Fernandez and Gould 1994). In the case of the SAM cluster, lateral actors especially cluster's facilitators, make sure that specialists with the technically skilled are available within the cluster through the university-industry collaboration programs. They help to connect cluster actors with the cluster outsiders, disseminating knowledge that would not be otherwise available. Lateral actors act as a broker to help to overcome challenges in developing bridging and bonding capital in the cluster since it is in its early stage of development.

Establishing a cluster brand and reputation is important in attracting knowledge brokers into the cluster. All the interviewees at the web level stressed that reputation in this context is important and they are developing their role as a broker in the cluster. Therefore, encouraging the knowledge sharing with the outsiders regarding the reputation of the SAM cluster is formal till now and the concrete tasks of the lateral actors as brokers are very structured and clear.

The findings also highlighted how lateral actors bring different actors together through monthly meetings and barbecues, presentations, conferences and social events. This assist in incorporating technical specialists into the cluster and developing more knowledge exchange mechanisms to improve access to both bridging and bonding capital. The cluster university has an important role in assisting and incorporating technical specialists into the cluster through various programs and projects. The role being played by lateral actors is similar to that observed in the case of the Mechatronics cluster in Southern Denmark where the lateral actors' role was to provide information, to link cluster members and to link the cluster with specialists outside of the cluster (Gretzinger and Royer 2014).

6.3.5 Accessibility

Findings indicate how the factor of accessibility may influence knowledge sharing through the willingness of the horizontal actors to share knowledge and allocate time to the process of collecting knowledge from other actors in the cluster (see section 5.4.5 and 5.10.5). At the web level, shared norms, values and beliefs enable the actors to develop some routines and activities of knowledge sharing such as through the monthly meetings and social events. Allen et al. (2007) note that knowledge-sharing helps to develop formal routines and informal networks often resulting in knowledge spill overs. Institutional economics studies show that regulations and informal structures contribute to the knowledge-sharing process via accessibility to information and this helps develop norms (Helmsing 2001; Inkpen and Tsang 2005). Research results from the firm-level show that firms share some types of knowledge during interactions in the living areas and lunch or coffee breaks resulting in positive outcomes of knowledge sharing for cluster members. At the web-level, accessibility reduces uncertainty among actors' participation in knowledge-sharing by promoting a climate that values economic partnerships and shared goals (Ahuja 2000; Capello 2002; Capello and Faggian 2005). Findings indicate that at the web-level, actors share similarities in the geographic location of the economic city, facilitators are located in one building, manufactures are located close to each other and the closeness to the seaport improves accessibility through mobility and physical distance enhance accessibility to knowledge. While some studies have shown that a small increase in distance among actors can result in a reduction in the need for face to face interactions (Allen, 1977), in the SAM cluster the physical location increases opportunities for face to face meetings among actors.

Keeble and Wilkinson (1999) maintain that at the firm level, knowledge can be shared through communications between firms, suppliers and customers. For others, technical similarities grow the knowledge-sharing process by connecting actors together in their networks (Brown and Duguid 2001; Schamp et al. 2004) and by driving normative pressures within the institution. Moreover, Mitchell et al. (2010) maintain that knowledge takes various structures and that closeness through clustering increases the ability to access knowledge for members of the clusters by directly sharing knowledge through commercial and social interaction and by accessing it through transactional relationships. The development of clusters brings the opportunity to access specialists in the university, bringing specialist expertise into the cluster. In

this cluster, the university with its strategic location and modern campus of has been actively employed and accessed by key lateral actors. One reason for this initiative may be seen in the realisation of the firms in the location that it was hard to get access to highly qualified staff in this new region. Accessing expertise, particularly knowledge gatekeepers, is a problem that faces new and emerging clusters. Without large actors or large numbers of actors it is difficult to locate specialists to the region and this in turn reduce the appeal of the cluster to potential new entrants. This has led to the government cluster agencies developing and supporting the university in order to attract expertise, research and knowledge brokers to the region and to the cluster. Lateral actors as knowledge brokers provide the chance for participants of the cluster to have direct access to expertise that would otherwise be not so easily accessible if the member was not part of the cluster such as linking the cluster with specialists outside of the cluster, such as ministries and professional networks.

According to Mitchell et al. (2010), one of the measures that could be considered to improve accessibility is using proximity by bring cluster members closer together. This was evident in the research from the lateral actor's plan of placing related industries close to each other for complementarity purposes in the planning of the cluster lay out (see section 2.3.1) and installation of a robust ICT infrastructure (see section 5.2) to support both formal and informal communication. Further results indicate that lateral actors ensure the element of access through organising monthly meetings, social events, conferences and seminars to which cluster actors are invited.

6.4 Barriers to Knowledge Sharing in a Cluster

Research demonstrates that knowledge sharing barriers are linked to efficiency, access and costs (Burton 1999; Nabuco and Rosario 2003). Firms in emerging clusters, particularly in developing countries, face numerous challenges relating to knowledge-sharing. These challenges include limited infrastructure, human resources and marketing capabilities, access to skills and expertise and access to outside markets. In the SAM cluster, these particular challenges are diminished as the lateral actors are implementing infrastructure, providing for workforce and skill development and developing mechanisms to strengthen the relationships among actors in the cluster. The

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dominant role of lateral actors is what in future may prove a challenge to knowledge sharing. Firms are over dependent on lateral actors to facilitate all the activities of knowledge sharing leaving them exposed should there be changes to the operations of lateral actors. For example, reductions in government funding or restructuring of the cluster support mechanisms could remove the knowledge sharing infrastructure that has been developed to date.

The findings show that lateral actors are guiding the knowledge sharing process in the cluster at web-level in terms of the development of absorptive capacity (section 5.4.1), knowledge of expertise location (section 5.4.2), inter-organisational trust (5.4.4), social capital (5.4.5) and accessibility (5.4.6). At the firm level this was found to be achieved through formal and informal mechanisms facilitated by the lateral actors (section 5.8.1 and section 5.8.2).The knowledge sharing relationships that are guided by the lateral actors run the risk of remaining as 'artificial relationships' which may not necessarily address the needs of horizontal actors and may be a barrier to genuine horizontal and vertical actors led knowledge sharing. This is contrary to Wickham's (2005) observation on the Tasmanian light shipbuilding cluster that despite the pronounced role of government in the cluster and regional economy, at no stage did the government seek to influence the innovative nature and knowledge sharing of the industry, which is always left in the hands of the private sector and its entrepreneurs.

Access issues can be a barrier to knowledge sharing as firms may have proximity to a cluster, but be still isolated from the activities that are linked to knowledge flows within the cluster (Giuliani and Bell 2005). Although vertical actors in the SAM cluster are within vicinity of the knowledge sharing arrangements put in place by lateral actors, findings indicate their level of involvement knowledge sharing activities is limited. This may indicate that vertical actors may not be fully aware of the importance or relevance of the activities arranged by lateral actors, seeing them as exclusive and relevant for horizontal actors and may also reflect the small number of vertical actors that are present in the cluster. The situation confirms Boschma's (2005) assertion that proximity and membership in themselves do not translate to access to knowledge and social capital. It follows that social and industry activities that are made available by the lateral actors should include other lateral actors and vertical actors if they are to be effective in developing 'knowledge sharing enhancing' bonding and bridging capital within the cluster.

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Another access related barrier to knowledge sharing relates to cultural differences. Consistent with Van Wijk et al. (2007) observation those cultural differences can be a barrier to intra organisational knowledge transfer as a result of the strategic importance of knowledge being depleted when transferred to a different organisational culture, for example HMF6 is reluctant to share knowledge with HMF2 because of differences in organisational culture. Given Easterby-Smith, Lyles and Tsang's (2008) view that strategic knowledge is embedded in the culture of the firm, even if HMF6 were to share know-how with HMF2 the shared knowledge could lose its strategic potencies once in firm HMF2.

Linked to organisational culture is language as a barrier to communication. Sharing knowledge involves communication among individuals and firms in the cluster to aid the learning process. Research results for both web and firm level indicate that different spoken languages in the cluster is another barrier to knowledge sharing for most actors in the SAM cluster. This problem increases the level of uncertainty between actors as it is hard to create the relationship of trust without effective communication. For example, although English is considered as the corporate language, command of the language is at different levels among the actors and misunderstandings during communication are a common feature (see Section 5.6.) This is confirmed by Welch and Welch (2008) who posit that the trust environment improves teamwork but such is related directly with the level of face-to-face interaction and communication with time. Actors are more likely to engage in knowledge-sharing with individuals who share similar language (Rumizen 2002). This was an issue between local firms and MNE firms, especially where managers did not speak Arabic.

At the web-level, the costs associated with mechanisms of knowledge sharing serve as another barrier (Kim, Hong, and Suh 2012). Lateral actors feel that research and development and some of the mechanisms to knowledge sharing are costly at this stage of development (section 5.6). While government and lateral actors prioritise the budget for infrastructure, lack of knowledge and awareness in terms of usage and taking advantage of the available tools and technology within the cluster is a barrier to knowledge sharing. The criticality of information technology as a facilitator of knowledge sharing is highlighted by earlier studies (Whiddett, Tretiakov and Hunter 2012).

Uneven resources and network capability, especially between MNEs and SMEs within the cluster, is also a potential barrier to knowledge sharing. SMEs and local firms, both horizontal and vertical lack established direct and indirect links which makes it difficult to integrate them into the supply chain and therefore in knowledge sharing (section 5.2). Further SMEs' lack of absorptive capacity serves as a barrier to knowledge sharing as which could be compounded by their lack of ability to reciprocate which may makes MNEs reluctant to share knowledge or to participate in networking events with SMEs section 5.8.2 .and 6.3). Another cost related barrier to knowledge sharing in the cluster is fear of losing competitive edge to other actors as that would have cost implications. The findings indicate lack of trust between large MNEs and other horizontal actors which reduces the desire to exchange technical know-how knowledge. Lack of trust at firm level at this emerging stage could be due small number of horizontal and vertical actors in the SAM cluster. Participants from the ED emphasize that while they try to encourage knowledge sharing within the cluster, lack of trust is a barrier to effective knowledge sharing as some are reluctant share their core business strategies and manufacturing techniques. In this instance the lack of trust as a barrier to knowledge sharing could be more a result of the newness of the cluster and the limited number of actors and with time as the cluster matures this could change given Kriz and Keating's (2010) submission that trust is a process that is developed concomitant with relationship development. Findings at firm level also show that at this early stage of developments, firms are more concerned about strengthening their presence in the cluster as opposed to looking for ways to share know- how as indicated by poor attendance at some of the social events arranged by facilitators (section 5.6). They prefer to invest the time in improving their business and economic activities rather than attending the social events or monthly meetings arranged by lateral actors as indicated by other actors challenging one firm to continue ensuring that their representatives attend meetings even during busy periods following a realisation that they had reduced its level of participation in meetings (section 5.6). This is consistent with Weiss's (1999) finding that barriers to knowledge-sharing include time limits and lack of rewards and recognition especially where SMEs are involved.

Firms participate in clusters in order to improve their competitiveness and to become more innovative. The cluster university and knowledge institutions join the cluster as a way of gaining access to knowledge, while the government and economic developer focus on job creation and

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attracting new firms to their administrative domain. Firms usually work with shorter time horizons focused on profitability and competitive advantage unlike the lateral actors and knowledge institutions that are likely to have a more long term perspective. The different interests must be balanced and aligned in order to establish a foundation for successful knowledge sharing within the cluster. The main challenge is the question relating to the extent to which e lateral actors are close enough to the market and the businesses in the cluster to be in a position to facilitate its knowledge sharing activities as well as having the right competences and qualifications to identify and select new ideas that are relevant to the cluster.

Finally, it is a challenge for the lateral actors, when acting as a cluster facilitator, to be a neutral broker when the government at the same time is a central stakeholder in both the cluster and the on-going knowledge sharing activities. In this case, there is a possibility of conflicting roles and goals which might result in compromising processes, communication and trust.

The results highlighted how the value adding web (VAW) (Brown, Burgess, Festing, Royer, Steffen, & Waterhouse 2007) is effective in helping map the capacity and capabilities of networks, especially bonding and bridging capital access and exchange can be enhanced and developed. The research provides an approach towards expanding the ability of emerging government-directed clusters to facilitate knowledge sharing activates at web and firm levels and overcoming barriers to knowledge sharing. The research findings demonstrated that there is an intensive dependency on the lateral actors at both levels in facilitating knowledge sharing activities and mechanisms in the cluster as a result of the leading and dominant role of the lateral actors. It is clear that they have an important role in developing bridging capital in the cluster. Within the firm-level, the SAM cluster has limited numbers of horizontal actors at this stage of its development. The cluster will be strengthened in later stages through the incorporation of more horizontal and vertical actors who can develop mechanisms for knowledge sharing. With more actors in the cluster specialist knowledge brokers such as consultants will be attracted into the cluster. However, the research findings indicated that stand-alone lateral actors have limited effectiveness in enhancing the sharing of technical knowledge between horizontal actors. There should be more cooperative efforts between all horizontal actors in the cluster for the process of knowledge sharing to be successful. One challenge is that the formal mechanisms developed by

lateral actors, especially the ICT based communication processes, do not fit with the capabilities of many horizontal actors who seem unable to take full advantage of them. The fact that bonding and bridging capital has been developed at an informal level through the initiative of lateral actors, the challenge is to set up more formal mechanisms at horizontal actor's level which will remain effective when the cluster is fully developed with increased numbers of investors. Currently, horizontal actors have not developed many formal sharing mechanisms, a situation that can stand as a barrier to knowledge sharing in the future. Better formalised and goal oriented mechanisms could enhance knowledge sharing activities and encourage the process of developing and fostering social capital.

Blakely (1994) notes that the literature has yet to fully assess the knowledge sharing process in emerging clusters, but the studies contribute to the broader understanding of knowledge-sharing within mature clusters. Knowledge-sharing among firms has been studied extensively (Connelly and Kelloway 2003; Han and Anantatmula 2007; Vera-Munoz, Ho, and Chow 2006), but gaps exist, as previously discussed regarding knowledge sharing in embryonic government driven clusters where lateral actors play a dominant role. An analysis of the benefits and challenges associated with such an arrangement is currently absent from extant literature. Trust among actors encourages interactions, thus growing knowledge-sharing in the cluster. At the web level, this translates into lateral actors improving the knowledge base and sharing activities. The findings fill the gap in the literature by making the first contribution of providing some evidence regarding how institutional thickness driven by lateral actors facilitates knowledge-sharing in a government-directed cluster while it is still in its emerging stages. Much of the existing research (Connell and Thorpe 2009; Collins, Bray, and Burgess 2012; Yeo and Gold 2014) emphasise competition and collaboration at firm level, finding that collaboration in the cluster facilitates knowledge sharing.

What is apparent from the case study of knowledge sharing processes and mechanisms in the SAM cluster hinge on the dominance of lateral actors in terms of providing the necessary leadership, planning and coordination to bring actors together using formal mechanisms such a scheduled formal meetings, conferences and seminars and through informal mechanisms such as social events, e-forums and general communication through the robust ICT infrastructure.

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Factors and mechanisms that support knowledge sharing in the cluster include the role played by the lateral actors, the proximity of the actors and the ICT infrastructure. This is coupled with lateral actors' facilitated absorptive capacity, knowledge of expertise location, social capital both bonding and bridging, and accessibility. Knowledge sharing is however inhibited by fear of losing competitive advantage as a result of sharing unique strategic know how in a context where there is limited trust among some players, language barrier as a result of usage of English which is not necessarily native to all the actors, and the limited absorptive capacity on the part of some of the players especially the local ones and SMEs.

While the findings in this study confirm those of earlier studies, others do not. New findings coming out of the study are that knowledge sharing in a new emerging cluster that depends on government as a key actor among lateral actors has peculiarities that set it apart from situations where the role of lateral actors is less pronounced. Two specific peculiarities are apparent: In the current situation all the five themes relating to knowledge sharing at both web and firm level (absorptive capacity, knowledge of expertise location, inter-organisational trust, social capital, and accessibility) are interlinked and not separable as they are all driven by government initiatives. First, therefore is the need to balance government's long term interests in knowledge sharing with the interest of, firstly other lateral actors, and secondly those of horizontal and vertical actors in a manner that would ensure sustainable mechanisms of knowledge sharing beyond the period of lateral players' dominance. Secondly, is to realise that knowledge sharing is not only about formal exchange and communication, as arranged by the facilitators, but rather about creating a platform for all actors at web-level to interact and establish informal networks using informal mechanisms which then influence knowledge sharing beyond the presence of lateral actors.

Chapter 7: Conclusions and Implications

7.1 Introduction

The concluding chapter of a doctoral thesis is like the completion of a jigsaw puzzle (Perry, 1997). Although at the beginning the research is unclear and unorganised, the context and literature review chapters develop a picture that illustrates the main borders of the area being studied, missing pieces and gaps that need to be filled. The following chapter describes how the missing pieces will be found and the gaps filled, and how the new pieces fit to make the whole picture clear. Continuing with the jigsaw puzzle metaphor, the research questions incorporated within chapter one, serve as the main framework for the picture. In this final chapter the sub-questions are addressed first in order to complete the picture as far as possible, before the main thesis question is addressed. The chapter also provides some implications for policy and practices. Then contributions to theory and practice are outlined as well as suggestions for future research and research limitations.

7.2 Findings on the Research Sub-Objectives

This section addresses the four research sub questions posed before responding to the principal question outlined in Chapter One. When drawing conclusions, references will be made to both the research findings presented in Chapter Five and to the discussion presented in Chapter Six.

The first research question to be addressed was: how does the value-added web analytical framework of cluster analysis apply in an emerging, government-driven industry cluster?

The VAW framework (Brown et al 2007) provides a system for identifying and classifying the main actors in a cluster, identifying the links and interactions between them, and assessing the strength of the relationships between actors. It helps to identify the different contexts and levels in the cluster to facilitate the network analysis of the cluster (at the web-level and firm-level). Through the VAW framework this chapter highlights the importance of enhancing knowledge sharing mechanisms between actors of the SAM case study cluster.

The relationship between the VAW and knowledge sharing processes is critical. Without identifying the links and the strength of connections in the cluster, researchers would be unable

to assess and investigate knowledge sharing flows and processes due to the multilevel and complex nature of clusters. Therefore, the VAW as a tool is essential to aid understanding of knowledge sharing research within industry clusters (see section 3.3). Moreover, classifying and categorising the actors according to their operation facilitates the identification of the location of drivers of knowledge dissemination and sharing within the cluster. In the SAM cluster that is emerging and evolving, and at an immature stage of development, the research illustrates that the lateral actors are driving and controlling the information sharing process (section 5.2 and 6.2). It is expected that the leading role played by lateral actors will diminish as more vertical and horizontal actors, especially MNEs, join the cluster. Therefore, at an empirical level, VAW can be a useful tool for policy makers to facilitate knowledge sharing mechanisms between actors in a government directed cluster.

The second research sub-question to be addressed was: Who are the key actors that support knowledge sharing in the Saudi Arabia manufacturing (SAM) cluster?

The dominant and leading actors of the SAM cluster are the lateral actors, specifically ECA, ED and CU. They play a significant role in supporting and facilitating knowledge sharing in the cluster. The Saudi government provides the funding for the development and implementation of effective mechanisms for knowledge sharing activities. For example, it provides the basic infrastructure for facilitating communication, broadband and internet access, a budget for social events, presentations, conferences, internet services and technology, marketing and media requirements and informative documents including flyers, quarterly magazines, and brochures (section 5.1). The economic developer plays a critical support role to the government while directing the cluster. Together it is intended that they develop shared values, objectives and a vision toward enhancing the growth and development of the cluster (section 5.4.1). What makes the economic developer different from the other lateral actors in the cluster is that the incumbent works with other clusters and projects around the world and can therefore introduce best practice processes from elsewhere to try and implement in the SAM cluster. For example, one conference organised by the ED and government brought in experts from all over the world who came to the cluster (see section 5.2). The most important knowledge sharing occurring in the SAM cluster is at the web level between the government and the economic developer as they exchange

knowledge around rules, regulations and policies that benefit the horizontal actors. As stated by one ED representative that they have half-day meetings every two weeks where they focus on highlights of what is happening in each firm (see section 5.2).

The university associated with the cluster is a key asset supporting the enhancement of knowledge sharing in the cluster. This occurs through cooperation with the other cluster facilitators in providing and implementing the best mechanisms for knowledge sharing between all actors in the cluster. University personnel also cooperate with the horizontal actors in many entrepreneurs' projects and scientific experimental research projects as illustrated by the university working on projects sponsored by some companies within the cluster (see section 5.4.1). Additionally, there is mutual benefit in terms of employment programs with the university, as they can provide the appropriate expertise and young talent to work in the cluster firms. Employees access training opportunities in the firm during and after graduation. Also, they are able to start up their own business within a professional supportive environment that is proximate where everything is available and ready in one region (section 5.4.2). This is another important element for external and internal knowledge sharing within the cluster and between all actors and between the cluster, the outside economy and educational sectors of SA regarding job creations and employment opportunities. In time, the activities of the cluster are expected to help lower the unemployment rate in the country in a significant way (see section 2.2.2).

The above three lateral actors (the government, the university and the economic developer) are united in playing a leading role at the early stages of the development of the SAM cluster. They drive the process of the utilisation of knowledge sharing as one of the main strategic tools to enhance the rapid growth of the SAM cluster.

The third research sub-question was: what processes and factors support knowledge sharing in the cluster? Based on the conceptual theoretical model, the five factors are: absorptive capacity, knowledge of expertise location, inter-organisational trust, social capital and accessibility. A conclusion about the impact of each factor on facilitating the process of knowledge sharing is presented in the following section.

7.2.1 Absorptive capacity

Absorptive capacity is an important factor for the SAM cluster, both at the firm and web level as it is about the capacity of actors to maximise economic performance through determination, absorption, and the utilization of external knowledge. In this study the lateral actors facilitated the absorptive capacity of actors through the provision of general knowledge needed about the cluster and through playing a connector role between the firms and the outside world. This enabled actors to acquire knowledge from the external environment. The proximity of actors within the SAM cluster was found to be an important element for easing the identification and assimilation of knowledge as has been noted previously (see section 5.4.1). They occupy an active professional role in research, in training, and in the collaborative activities of cluster actors. It was found that when horizontal actors assimilate knowledge from external sources they contribute to the formation of knowledge by investing in in-house research and development (section 5.4.2). Also through the coordination role of lateral actors, different research activities are embarked upon focusing on research gaps identified through different actors or from external sources (section 5.2). Through various complementary activities arranged by lateral actors, absorption, assimilation and the sharing of tacit knowledge are facilitated. These inter-organisational relations, enabled by the lateral actors, expose firms to learning from others' current and past experiences (section 5.10.1) which results in density effect (Easterby-Smith et al. 2008). This study illustrates how horizontal actors' know-how (tacit knowledge) is often not shared in a cluster environment due to lack of trust and limited opportunism. Further, limited levels of absorptive capacity were observed among the smaller horizontal actors (Section 5.10.1). It would seem that the dominant role of the lateral actors gives them exclusive control of the different elements of knowledge sharing. This dominance of the lateral actors may prevent firms from accruing the benefits of knowledge that could be derived from other actors not necessarily identified by the lateral actors (see section 6.3.1). However for SMEs and local firms that have been found to lack established direct and indirect links; the dominance of lateral actors appears to support their levels of absorptive capacity through the formal and especially informal activities facilitated within the cluster (see section 5.4.1).

7.2.2 Knowledge of expertise location

In this study having a university located in the same proximity of horizontal actors improved the knowledge-sharing process through providing collective knowledge and expertise (5.2). Lateral actors were responsible for providing the access to talent and qualified employees in the cluster and supported job creation through encouraging some firms to employ the graduates from the cluster university as apprentices (see section 5.4.2). Knowledge of where to find expertise within the cluster makes it possible to access professional skills and research capabilities that are not available to individual businesses functioning outside the cluster. For example, in the absence of cluster membership, small firms in the cluster would ordinarily be unable to access, process or apply specialist knowledge. These types of interactions help to enhance knowledge exchanges between different actors. The role of lateral actors in deepening the social capital in the cluster from the emerging stages through to incorporating effective expertise within the cluster reflects the role of clustering in supporting the process of knowledge sharing. Long term mechanisms are required in order to help the horizontal cluster actors to share expertise and specialist knowledge without being solely dependent on the facilitative role of lateral actors.

7.2.3 Inter- organisational trust

Overall, the findings and discussion regarding the trust between lateral actors in the cluster indicated a high level of trust, mutual understanding and willingness to share knowledge regarding the available infrastructure and resources within the cluster. The cognition-based trust in the cluster is clear when facilitators provide efficient technical basic infrastructure for actors within the SAM cluster. As mentioned earlier, proximity in the SAM cluster encourages inter-firm trust building through supporting the development of shared norms, values and beliefs among actors (see section 6.3.3). An indication of trust was found among some horizontal actors who were partially sharing know- how based on trust that such shared knowledge would not be misused and that sharing will not result in them losing power or a favourable position in the cluster. The reason for the conditional trust was found to be a result of the desire among the MNEs to strengthen their presence in the cluster (see section 6.3.3). Actors who provide others with access to their specialist knowledge (Know-how) were found to be the exception rather than the norm reflecting the general reluctance and fear of sharing technical knowledge. Therefore, a lack of trust regarding the sharing of tacit knowledge was considered to be one of the barriers to

knowledge sharing activities in the SAM cluster (see sections 5.6, 5.10 and 6.4). At the same time, cluster facilitators engaged with large horizontal actors in the process of knowledge exchange through trust building, a regional identity and a 'common language' that was shared. This research study confirms the importance of cognition-based trust, competence and professional standards as contributing factors to trust building within cluster (see sections 5.5; 5.6; and 5.10.2).

7.2.4 Social capital

The development of social capital within the cluster plays a critical role in enhancing knowledge sharing as illustrated in sections (5.4.5, 5.10.4. and 6.3.4). Bonding and bridging capital are also important in supporting knowledge sharing. Lateral actors encourage cluster firms to establish effective networks of cooperation and knowledge sharing activities through formal forums such as meetings, collaborative research, and through informal events such as social gatherings. The research findings indicated that the impact of proximity on social capital facilitates access to valuable resources; the sharing of tangible and intangible resources and the exchanging of knowledge in the cluster. 5.8.2 5.10.2furtherproximity enhances social networking opportunities leading to knowledge sharing at both a formal and informal level. In turn, the knowledge sharing activities implemented in the cluster through lateral actors facilitated the development of vital social capital in the network as a result of personal interaction, the friendly environment and proximity. Actors in the cluster developed synergy over time and a collective purpose which resulted in a common business purpose, and apparently shared norms and values for the SAM cluster (see section 5.10.4).

7.2.4.1 Bonding and bridging capital

SAM is an emerging cluster with direct strong links with lateral actors, established technical specialists and a degree of cooperation across horizontal and vertical actors. The research provides evidence of bonding capital in developing cooperation and interaction in the cluster although there are instances of some actors not sending representatives to meetings. Most horizontal actors share explicit knowledge in the form of outputs from the research and training activities of different actors. The potential of generating more bridging social capital in the

cluster results from the leading and dominant role of the lateral actors. As mentioned earlier, knowledge accessibility provides evidence of bonding capital in the cluster. Thus, the continuous active sharing of knowledge and resources is likely to result in strong links and relationships between actors. Moreover, modified regulations, shared values and beliefs are all evidence of bridging capital, which enhances knowledge exchange that is unlikely to be available to firms outside the cluster. Bonding capital is less likely to be developed at the firm level due to the emerging nature of the cluster characterised by new entrants and initial low levels of trust towards these. However, the bonding capital of the technical specialists allowed lateral actors to identify and assimilate local knowledge and expertise, build some level of trust and also to lead the activities of knowledge sharing among other actors (see section 5.10.3). The research highlights the influence of bonding capital. This was reflected in the lowering of transaction costs by minimising the threat of opportunism and increasing the mutual trustworthiness as a result of cooperative norms and sharing attitudes in the cluster (see Section 5.10.4). The role of the lateral actors as knowledge brokers through connecting the cluster with the outside world is emphasized in this research. Integrating such expertise into the cluster for horizontal actors is one way of deepening the social capital of cluster members.

7.2.5 Accessibility

5.10.5 The accessibility of actors increases opportunities of social networking by ensuring the constancy in supporting knowledge sharing activities are available to all cluster members and that lateral actors work together with horizontal actors to improve the access to such events. Proximity enhances the accessibility of knowledge in the cluster through the available shared residential areas for the workers, restaurants or coffee lounge, where personal ties can be strengthened and the possibilities of knowledge sharing increased. Accessibility reduces uncertainty among actors by promoting a climate that values economic partnerships and shared goals as a result knowledge sharing is supported. Accessibility is improved by proximity, mobility, physical distance of actors; enabling services and infrastructure all of which enhance accessibility to knowledge (see section 5.4.5 and 5.10.4). The leading role of the lateral actors has relative importance in facilitating accessibility through providing links and useful information to the actors (see section 5.8.1). Moreover the co-location of the university and the

research institutes facilitates the accessibility of knowledge. For example, the limited number of vertical actors and partial operation of the seaport restricts full accessibility to transport and logistics services in the cluster which forces actors to use external logistics services (see section 5.2).

Processes and factors supporting knowledge sharing in the cluster therefore centred on the role played by lateral actors in facilitating absorptive capacity, knowledge of expertise location, development of inter-organisational trust, social capital in terms of both bonding and bridging capital, and accessibility.

The fourth question was: What are the barriers to knowledge sharing in the cluster? Five barriers to knowledge sharing in the cluster were identified from the data. The first barrier relates to the cluster being in its early stages of development and therefore being immature. This affects knowledge sharing in because of the limited numbers of horizontal and vertical actors located in the cluster. As illustrated in section 5.2, the cluster only has two vertical actors the seaport and one logistics and warehouses firm. The second barrier is the over dependence of firms on lateral actors' contribution to knowledge sharing in the cluster. This was evident in terms of funding, establishing personal relationships and in developing effective knowledge sharing and exchange processes and thus is a potential barrier going forward. A third barrier relates to the fact that because the cluster is still under construction, many services and facilities have not reached full operational levels as illustrated by the dearth of vertical actors. This presents a problem in that integrated processes to support knowledge exchange are currently confined to lateral and horizontal actors. A fourth barrier is linked to the small numbers of horizontal actors present in the cluster which limits the strength and depth of social capital. New entrants into the cluster are likely to be initially isolated and take time to be integrated into existing knowledge exchange networks. This was illustrated by the lateral actors having the responsibility to support the integration of new firms (see section 5.8.1). Additionally, HMF1 commented on the difficulties associated with trusting a newly recruited firm where the sharing of sensitive information was involved (see section 5.4.4). This is consistent with Connell and Voola (2013) who highlight that trust takes time to establish.

A fifth barrier to knowledge sharing was found to be the lack of trust between horizontal actors. The short period of time the firms have been in the cluster contributes to the weakness of personal ties and individual relationships associated with trust building. The firm representatives in the cluster have only known each other for a few years so that some horizontal actors are still unable to trust each other at this early stage as already alluded to previously. Additionally, horizontal firms of different sizes (large, medium and small) have different capacities and capabilities to transfer and absorb knowledge. This is especially the case when comparing MNEs that have extensive national and international networks and have access to knowledge brokers, and local SMEs that have limited network access and limited absorptive capacity (see section 5.4.1).

7.3 The Main Research Question Addressed

The main research question was: How does clustering support knowledge sharing in an emerging, government-directed industry cluster in Saudi Arabia? In Chapter One it was proposed that lateral actors work towards getting actors together in order to facilitate their interactions. This they achieve through providing several mechanisms meant to encourage knowledge exchange. In making an assessment, it should be possible to determine whether mechanisms meant to influence knowledge sharing enhanced knowledge sharing in the SAM cluster. The cluster is located in a new economic city in a strategic location of Saudi Arabia. This enhances the good reputation of the cluster in addition to the supportive role of the government which in turn makes the cluster attractive to many local SMEs to join/start their business in it. The presence of large MNEs in the cluster serves as an attraction for smaller firms to enter the cluster and leverage off the networks of the MNEs.

The importance of getting actors together to cooperate, interact and network in the cluster was recognised by the lateral actors from the beginning and they backed this with the provision of infrastructure, resources and services for knowledge sharing (see sections 2.2.1, 2.3.1).

The important impact of all actors being close to different facilities including the seaport, residential areas and services such as a supermarket, cafes, restaurants, clinics, and leisure activities strongly supports the process of knowledge sharing in the cluster through informal

networks and by attracting skilled labour and knowledge brokers to the cluster. In turn this process of accessing expertise is supported by the university attached to the cluster. This is a source of research and development activity linked to the cluster and national and international networks of expertise. The research findings indicate that the presence of informal mechanisms, personal ties and individual relationships between employees supports knowledge sharing in the cluster. This is due to the small number of actors at this early stage which makes the cluster small and friendly making it possible for people to meet each other occasionally in different places every day. It was evident that while clustering to a large extent supports sharing of explicit knowledge and to a lesser extent, tacit knowledge. The engagement of actors in different types of both formal (meetings, seminars, conferences, training and emails) and informal (social events, social media, non-formal emails) interaction mechanisms was found to result in trust building leading to cooperation and the sharing of tacit knowledge. When the cluster reaches maturity stage in the future and there are more actors sharing of tacit knowledge is expected to increase. In addition to the main thesis question, it was considered necessary to investigate forms of knowledge and types of knowledge sharing mechanisms: both formal and informal in conjunction with how they enhance the knowledge sharing process in the cluster. There is evidence of the existence of direct and strong bonding links through the direction and leadership of the lateral actors. This suggests that these actors assist in developing information sharing, trust and help in building a shared identity. From the documentary and the semi-structured interview analysis there is an indication that the lateral actors of the SAM cluster have been successful in facilitating and encouraging knowledge sharing exchange, particularly explicit knowledge, among the local and MNEs firms in the cluster. Table 7.1 illustrates a summary of the main findings of this research in forms of answers for the main research questions and objectives.

Table 7.1: Summary of the Answers to Key Research Questions

Question	Finding
How does the value-added web analytical framework of cluster analysis apply in an emerging, government-driven industry cluster?	• VAW as an analytical tool provides effective analysis to define the main actors of the cluster. • VAW can be a useful tool for policy makers to facilitate knowledge sharing mechanisms between actors in a government directed cluster.
Who are the key actors that support	• Actors playing a leading role supporting knowledge sharing are

knowledge sharing in the Saudi Arabia manufacturing (SAM) cluster?	the lateral actors – specifically: ECA, ED and CU.
What processes and factors support knowledge sharing in the cluster?	• Five factors supporting knowledge sharing in the SAM cluster are: absorptive capacity, Knowledge of expertise location, inter-organisational trust, social capital and accessibility (Mitchell et al 2010).
What are the barriers to knowledge sharing in the SAM cluster?	• Limited numbers of horizontal and vertical actors located in the cluster due to its newness. • Limited strength and depth of social capital. • Lack of trust between horizontal actors; different capacities and capabilities to transfer and absorb knowledge.
How does clustering support knowledge sharing in an emerging, government-directed industry cluster in Saudi Arabia?	• The presence of informal mechanisms, personal ties and individual relationships between employees supports knowledge sharing in the cluster • Existence of strong and direct bonding links through leadership of the lateral actors.
What are the lessons and implications for government policy?	• Clearly map out knowledge sharing relationships between SMEs and local firms and MNEs. • Review level of dominance by the lateral actors when there are more vertical and horizontal actors and a different mix in terms of small, medium and large firms, and MNEs. • Consider the peculiarities of clusters situated in different regions. • Reconsider mechanisms being used for the facilitation of knowledge sharing. • Attract more vertical players into the cluster.

7.4. Implications for Policy and Practice

This section answers the fifth research sub-question regarding the implications for lateral actors, specifically the government, as the government authority (ECA) is the sole regulator present in the SAM cluster. Suggested implications for policy and practices are presented in the following section.

What are the lessons and implications for government policy?

One of the main purposes of this research is to provide some useful insights for all clusters located in the economic cities in Saudi Arabia in order to help public policy achieve the goals of

Saudi Vision 2030 stated thus: *"Our aim is for these cities to contribute in the development of the economy and to attract quality investments as well as local and international talent, all kept in line with our national priorities"* (Vision 2030 plan 2016, 50).

The role of the government in a regional Saudi Arabian economy is significant and dominant over the early stages and life cycle of the cluster; as a result its agencies need to have the capability to identify and monitor the set of natural industries that exist within different regions and their stage of development in order to be able to know the most appropriate knowledge sharing mechanisms for a given situation and in that way avoid the adoption of a 'one size fits all' policy regime for its set of industry clusters. In this study, the presented framework of factors influencing knowledge sharing (section 3.5, Table 3.1) assists lateral actors in understanding how to conceive and implement mechanisms of knowledge sharing more effectively. This can occur by emphasizing the essential elements of knowledge sharing in inter-firm collaboration at the firm-level. The main categories of the framework comprise absorptive capacity, knowledge of expertise location, inter-organisational trust, social capital and accessibility as important supporting conditions. Specific recommendations for policy development to support knowledge sharing emanating from this study are presented in the following order: policy implications at the design and implementation stages; and implications for practice and implications for establishing clusters in SA.

7.4.1 Implications at the policy design stage

While proximity presents a number of mechanisms that support knowledge sharing (Mitchell et al. 2010); these mechanisms can be evaluated in terms of their operational effectiveness in the cluster. In the early stage of a cluster's life cycle, it is important to define the links and interactions of all key actors in the cluster. This can be achieved through detailed cluster mapping that not only sets out the physical relationships between cluster actors but also sets out the commercial and networking relationships (both formal and informal) (Brown et al.2010, 2008 and 2007). The possibilities for cooperation and knowledge sharing are explored and gaps in networks can be identified and addressed. Knowledge sharing relationships between SMEs, local firms and MNEs need to be clearly mapped out.

At policy design level the implications of this study are that in pursuing cluster development initiatives ECA will need to take into consideration the peculiarities of clusters situated in different regions. In particular location specific issues that may be a barrier to knowledge sharing such as the level of dominance by the lateral actors. While a high level of dominance in terms of leading the process of planning and organising actors may work for clusters that still have few horizontal and vertical players and are still at the infancy stage, adjustments may need to be made where there are more vertical and horizontal actors and there is a different mix of actors in terms of small, medium and large firms and MNEs.

7.4.2 Implications at policy implementation stage

At the policy implementation stage, the government may need to reconsider the mechanisms that are being used for the facilitation of knowledge sharing. While meetings seem successfully for formal knowledge sharing, the extent of involvement on the part of lateral actors my need reconsidering given that attendance is not always as good as what is desired. Good meeting attendance is not always indicative of the right people adding value to the meetings. This is an indication that attending the meetings may have become an end in itself, as indicated by an ED representative (section 5.2) that meetings would be better if attended by people who have the authority to make decisions with "none of this going back to the boss to ask." The same applies to the informal meetings, which despite the efforts of lateral actors to even provide meals, beverages and barbecues still fail to attract the desired numbers of actors. There is a clear need to revisit the concept of social events organised for the purposes of developing social capital among the various actors. For example, the value to be derived from such encounters may need to be articulated and demonstrated more clearly in order to improve attendance and the intended subsequent knowledge sharing. Involving both the horizontal and vertical actors in the implementation side of the policy of encouraging knowledge sharing may also produce better results since the actors are more familiar with the challenges they are facing and with aspects of knowledge sharing that are appropriate for their businesses.

Another policy implementation issue relates to attracting more vertical players into the cluster. The two vertical actors did not participate a great deal in knowledge sharing activities (see section 5.4, 5.10). Firms join clusters to derive benefits such as cost reduction and the low cost of

suppliers may indicate that the current vertical actors have not realised the benefits and therefore that may remain a deterrent to those who may want to join. Although currently the vertical players are said to have close links with the horizontal actors (see section 5.2) these do not seem to translate into their participating in organised knowledge sharing activities. At the implementation stage, it is critical for the government to establish what is required for vertical actors to find it worth their while to participate in the organised knowledge sharing activities.

7.4.3 Policy effectiveness

Policy relating to clusters can be made more effective for the purposes of knowledge sharing by systematically reducing the dominance of lateral actors in order to increase the independence of both horizontal and vertical actors in developing the social capital (both bonding and bridging) to build sustainable knowledge sharing mechanisms. The current situation appears to be unsustainable in the longer term. This could be achieved by leaving those players with capacity to develop and deepen relationships unaided while focusing resources on those who need the assistance.

Another possible area of enhancing cluster effectiveness would be to assist SMEs to improve their absorptive capacity, network access and the development of social capital. Currently there are problems relating to mixing SMEs and larger organisations in terms of sharing especially tacit knowledge. This is a result of differences in capabilities and absorptive capacities between SMEs and MNCs. Diverting attention from those horizontal actors that are capable of developing their own links and knowledge sharing mechanisms can free capacity to focus on the needs of SMEs.

Another policy issue that needs to be attended to at implementation stage relates to the challenge presented by the use of English as the official or commercial language in the cluster. This is proving to be an obstacle to effective communication and therefore is detrimental to knowledge sharing (section 5.5, 6.4). The appropriateness of using English as the cluster business language in an environment where it is not the native language of most cluster actors needs to be considered with a view to mitigating the highlighted communication problems.

7.4.5 Implications for practice

There is a need to refocus the role played by government in the cluster. Government support for knowledge sharing at the firm level should be provided only to those firms that have demonstrated lack of resources required for continued operation and expansion. The government also needs to request evidence to prove that their support of the firm would result in additional jobs being created within the cluster in line with Saudisation policy (see section 2.2.2). The main point to this recommendation is the need for government to be able to recognise the existing and potential synergies that exist within the industry cluster, and therefore be better able to aid the optimisation of this idiosyncratic relationship. There is a need for the cluster facilitators to play a more effective role in enhancing the sharing of tacit knowledge which is currently lagging. In doing this the government needs to be mindful of creating artificial synergy within the industry cluster using imitated mechanisms without examining their suitability. Another practice implication of this research is that government must focus on attracting more vertical actors to join the cluster as the Seaport (which is one of the two vertical firms) is not adequately fulfilling needs of the other services firms as it is still in the emerging stage (see section 5.2). Delays in increasing the number of vertical actors, has limited the potential benefits of being in the cluster for those firms that are already part of it. This was demonstrated by the observed limitations of social capital that facilitates knowledge sharing as a result of the few numbers of vertical actors.

7.4.6 Implications for establishing clusters in SA

There is an already growing uncoordinated competition for local manufacturers within Saudi Arabia, with expansions in economic cities in the many regions around Saudi Arabia. This will inevitably lead to market share being 'cannibalised' with overlapping catchment areas as well as increases in competing demand for labour and skills. By providing supporting infrastructure and easing regulations within economic cities, Saudi Arabia can continue to attract more MNEs and dynamic start-ups into the clusters within economic cities to benefit from inter-firm collaboration and knowledge sharing. National and regional capability is more than the sum of individual firm capabilities. It is a system of linkages, networks and support industries that encompass ways of doing business. These factors influence interaction and knowledge sharing and provide links between technology, markets, skills and other inputs. Hence, clusters of manufacturing and

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economic activity are an important aspect of raising business sophistication and industry diversifications with regard to many of these processes, and specifically, learning through knowledge sharing.

7.5 Research Limitations

The Limitations of this research are related to the methodology, the time of fieldwork and the nature of the case study of the SAM cluster.

First of all, in terms of the limitations of the research methodology, the use of a qualitative methodological approach suggests that the results of the study cannot be generalised beyond the context of this study. Notwithstanding this, the research offers insights into knowledge sharing from different perspectives and presents wider views of analysis levels within emerging clusters. The numbers of the interviewees and participating actors may also be considered another limitation as some divisions of the cluster remain unattended, for example confidential governmental related data which could have been obtained from interviewing other government officials. The study also focuses on a single emerging cluster that is still in its infancy and therefore is not likely to be representative of what would be found in mature clusters in terms of knowledge sharing. Additionally, there are some limitations regarding the time associated with this research. The data for the study was collected at one point in time thus providing a snapshot of the knowledge sharing phenomenon in the SAM cluster. Also, the fieldwork was conducted over a three month period from late 2013 to early 2014 for the actual data collection. This does not provide the context from which to examine other stages and transformation of the cluster in other phases of development. This is a growing cluster where many areas are under construction and many of the conditions observed in the study may not hold into the future as the cluster develops. For example, the dominance of the lateral actors may not be a permanent feature, but rather a reflection of the embryonic state of the cluster. The newness of the cluster presented a limitation in itself because there were a limited number of horizontal and vertical actors able to participate in the research.

Furthermore, the applicability of the research results is limited to a few contexts such as developing countries, the Middle East, the GCC and Saudi Arabian context. Also, being a

governmentally driven cluster means the results are limited to being applicable only to this type of cluster to the exclusion of for example, organic clusters where actor interactions and knowledge sharing are not facilitated by government. In addition, the research is confined to one economic city within Saudi Arabia and this limits the application to clusters in other locations outside economic cities.

7.6 Contributions of the Research

This research has contributed to the enhancement of knowledge sharing in various ways. Firstly, the research has proposed that in an emerging government-driven cluster knowledge sharing mechanisms are facilitated by lateral actors with government playing a dominant role.

The study also provides evidence that the Value adding web framework (VAW) can be used as analytical tool in governmentally driven types of cluster at an early stage of development, to classify main actors, their links and interactions. The VAW helps to understand the communicative interactions of knowledge sharing processes, in different levels of analysis within the cluster. For example (the web-firm level), and thus shed the light on factors that influence knowledge sharing, various forms of knowledge and the appropriateness of sharing mechanisms. The richness of the outcomes from using the VAW analytical tool allowed the identification of what actors and interactions links in which level of the cluster to consider for further assessment in terms of knowledge management in the later stages of cluster development.

The second contribution of this study was to explore factors that influence knowledge sharing activities as proposed in the theoretical framework presented in chapter three of this thesis table 3.1. The impact of absorptive capacity, knowledge of expertise location, inter-organisational trust, social capital and accessibility, combined with the dominant and leading role of lateral actors such as the ECA, ED and the university in the SAM cluster provided a new framework of looking at the knowledge sharing process. The mechanisms can be utilised from the early stages of emerging clusters in developing countries as basic guidelines for enhancing cooperation between actors, thus effective knowledge sharing with its impact on the rapid growth of the cluster.

Another contribution of this study was in identifying the factors that government has to consider in order to support knowledge sharing when more actors join the cluster. Studying knowledge sharing in the early stages of the SAM cluster while the numbers of horizontal and vertical actors are still low provided a holistic view of the cluster and all its actors and their formal and informal interactions. The VAW framework integrates research on "organic" clusters into a government-driven cluster context; this is an emerging field of study because most research examines established and organic clusters in developed economies, whereas this research examines an emerging cluster, government driven and in an emerging economy. Traditionally, knowledge management has been viewed without due attention to social capital, both bonding and bridging, and the role it plays in the knowledge creation and transfer process. This research contributes to work on the knowledge-sharing process by factoring in the influence of social capital on the sharing of both tacit and explicit knowledge. Using the conceptual framework developed from the literature review, the originality of this study was derived from the importance of industry clusters as a strategic economic developmental tool, as well as the importance of knowledge sharing mechanisms as an influential factor. The lack of research studies that explore issues relating to the role of clustering in supporting knowledge sharing in an emerging, government directed industry cluster in the GCC countries in general and the Saudi Arabian context in particular, makes the topic of high practical significance. Therefore, a better understanding of how knowledge sharing mechanisms in a government driven emerging cluster has broad theoretical and policy relevance for key stakeholders in government led clusters' growth and development.

From these findings it is apparent that lateral actors have a fundamental role in facilitating knowledge sharing activities in the SAM cluster. Extant literature has however generally neglected regional clusters as a particular context. Further, research into the role of lateral actors in cluster establishment is an area that requires more attention. This thesis goes some way in addressing that gap by exploring the role of lateral actors in a government-directed cluster in facilitating knowledge sharing between actors in early industry activity and potential impact on growth and development.

7.7 Suggestions for Further Research

Future research might follow a number of different directions in relation to either the topic or the methodology chosen. Three suggestions are made with respect to the methodology, two of which concern the sample itself and the third, the method of data collection. First, a study may be undertaken which focuses on firms of a similar size, within another government driven cluster in order to determine whether findings were comparable with this study or not. Second, further research in the topic area may widen the boundaries of the research to include studies of organisations situated in different economic cities in different countries within the GCC states. Third, a mixed methods study that draws from qualitative methods for a better understanding of the social processes involved in knowledge sharing, combined with quantitative methods to measure observed patterns and relationships among the knowledge sharing mechanisms could provide a clearer picture of the knowledge sharing process in a government driven cluster.

Given that the study focused on a cluster that is in its infancy and represents a "three month" period snap shot of knowledge sharing practices among a limited number of actors, there is room for a study that tracks cluster development through time. In particular it is suggested that it would be worthwhile to track the changes that occur as the cluster evolves and more new firms enter to establish whether actors continue their dependence on lateral actors as facilitators of knowledge sharing within the cluster. Further research on the topic may also consider studying the role of clustering in knowledge sharing using the SAM cluster when it becomes fully mature around 2020 or even other full mature industry clusters in Saudi Arabia and their knowledge sharing mechanisms.

Finally, this research highlighted some barriers to knowledge sharing mechanisms within the cluster. Further research may assist in offering suggestions of how to overcome such restrictive knowledge sharing barriers. The last word, hopefully this research has contributed to the goal of strengthening the Kingdom of Saudi Arabia as an ambitious potential contribution towards Vision 2030. Further research about Saudi Arabia should consider and keep this goal in their heart as a main objective of their research, that:

"Our real wealth lies in the ambition of our people and the potential of our younger generation. They are our nation's pride and the architects of our future…..we can strengthen the Kingdom of Saudi Arabia's position as a great nation in which we should all feel an immense pride" (**Mohammed Bin Salman Bin Abdulaziz AL-Saud** Chairman of the Council of Economic and Development Affairs, Vision 2030 plan 2016, 6).

References

Abrol, Dinesh. 2010. "Policies For Self-Reliant Development: Lessons From India." *History And Sociology Of South Asia* 4 (1): 41--73. doi:10.1177/223080751000400103.

Ageli, Mohammed Moosa and Shatha Mousa Zaidan. 2013. "Saudi Financial Structure And Economic Growth: A Macroeconometric Approach". International Journal Of Economics And Finance 5 (3). doi:10.5539/ijef.v5n3p30.

Ahuja, Gautam. 2000. "Collaboration networks, structural holes, and innovation: a longitudinal study." *Administrative Science Quarterly* 45 (3): 425-455.

Aikovna, Arutyunyan Svetlana. (2013) "Concept Of Fishing And Hunting Tourism Development Based On Cluster Approach." *Modern Research of Social Problems* 4 (1): 1--12. doi:10.12731/2218--7405--2013--4--36.

Akgün, Ali E., John Byrne, Halit Keskin, Gary S. Lynn, and Salih Z. Imamogu. 2005. "Knowledge networks in new product development projects: a transactive memory perspective." *Information and Management* 42 (8): 1105-1120.

Akpinar, Murat, and Melike Mermercioglu. 2014. "Benchmarking Knowledge Potentials Of Clusters: A Comparative Study In The Tourism Industry." *International Journal of Knowledge--Based Development* 5 (4): 344--366. doi:10.1504/ijkbd.2014.068047.

Al, Serhun. 2013. "Interpretive Research Design: Concepts And Processes." *International Journal Of Social Research Methodology* 16 (4): 351--352. doi:10.1080/13645579.2013.802464.

Al-Adaileh, Raid. M., and Muawad S. Al-Atawi. 2011. "Organizational culture impact on knowledge exchange: Saudi Telecom context." *Journal of Knowledge Management* 15 (2): 212 - 230. http://dx.doi.org/10.1108/13673271111119664.

Al-Alawi, Adel Ismail, Nayla Yousif Al-Marzooqi, and Yasmeen Fraidoon Mohammed. 2007. "Organizational culture and knowledgesharing: Critical success factors." *Journal of Knowledge Management*, 11 (2), 22-42.

Alavi, Maryam, and Dorothy Leidner. 1999. "Knowledge management systems: issues, challenges, and benefits." *Journal Communications of the AIS* 1 (7): 2--36.

Al-Bahussin, Sami Abdullah and Wael Hassan Elgaraihy. 2013. "The Impact Of Human Resource Management Practices, Organisational Culture, Organisational Innovation And Knowledge Management On Organisational Performance In Large Saudi Organisations: Structural Equation Modeling With Conceptual Framework". *International Journal Of Business And Management* 8 (22): 824--841. doi:10.5539/ijbm.v8n22p1.

Al-Darwish, Ahmed, Naif Alghaith, Alberto Behar, Tim Callen, Pragyan Deb, Amgad Hegazy, Padamja Khandelwal, Malika Pant, and Haonan Qu. 2015. Saudi Arabia: Tackling Emerging Economic Challenges To Sustain Growth. (Middle East And Central Asia Departmental Paper Series. Washington, D.C: International Monetary Fund. http://www.imf.org/external/pubs/ft/dp/2015/1501mcd.pdf. Accessed February 16, 2013

AlFaraj, N. 2008. "Enhancing Public Participation in Regional Development: The Case of Riyadh Regional Council." School of Management, Curtin Business School, Perth.

Al-Khaldi, Muhammad A, and Reginald Sylvanus Olusegun Wallace. 1999. "The influence of attitudes on personal computer utilization among knowledge workers: the case of Saudi Arabia." *Information & Management* 36 (4): 185-204.

Allen, James, Andrew James, and Philip Gamlen. 2007. "Formal versus informal knowledge networks in R&D: a case study using social network analysis." *R&D Management* 37 (3): 179-196.

Allen, Jennifer. H., and Thomas Potiowsky. 2008. "Portland's Green Building Cluster: Economic Trends And Impacts." *Economic Development Quarterly* 22 (4): 303--315. doi:10.1177/0891242408325701.

Allen, Thomas J. 1977. *Managing the Flow of Technology*. Cambridge MA: MIT Press.

Al-Rasheed, Madawi. 2006. "Saudi Arabia Post 9/11: History, Religion And Security". Middle Eastern Studies 43 (1): 153-160. doi:10.1080/00263200601079823.

Al-Rasheed, Madawi. 2010. *A History Of Saudi Arabia*. 1st ed. New York: Cambridge University Press.

Amin, Ash, and Frank Wilkinson. 1999. "Learning, Proximity And Industrial Performance: An Introduction". *Cambridge Journal Of Economics* 23 (2): 121--125. doi:10.1093/cje/23.2.121.

Amiot, Claire. 2009. "Cluster Categories For Algebras Of Global Dimension 2 And Quivers With Potential." *Annales De L'Institut Fourier* 59 (6): 2525--2590. doi:10.5802/aif.2499.

Andersen Esben, and Morris Teubal. 1999. "High Tech Cluster Creation and Cluster ReConfiguration: A Systems and Policy Perspective." Paper Presented at the DRUID Conference on Innovation Systems, Rebild.

Apaydin, Fulya. 2012. "Overseas Development Aid Across The Global South: Lessons From The Turkish Experience In Sub--Saharan Africa And Central Asia." *The European Journal of Development Research* 24 (2): 261--282. doi:10.1057/ejdr.2012.5.

Arikan, Andaç T. 2009. "Interfirm Knowledge Exchanges And The Knowledge Creation Capability Of Clusters." *Academy of Management Review* 34 (4): 658 -- 676.

Arikan, Andaç T., and Joris Knoben. 2014. "Sources Of Inter--Firm Heterogeneity In Accessing Knowledge--Creation Benefits Within Technology Clusters". *Industry And Innovation* 21 (6): 476--493. doi:10.1080/13662716.2014.985455.

Armitage, Andrew. 2012. "A Methodology Of The Imagination". *Journal Of Business Administration Research* 1 (1): 1--12. doi:10.5430/jbar.v1n1p1.

Arun, Korhan. 2015. "Effect Of Knowledge Sharing And Supply Chain Management On Organizational Performance". *International Journal Of Knowledge--Based Organizations* 5 (3): 19--32. doi:10.4018/ijkbo.2015070102.

Ashkenas, Ron, Dave Ulrich, Todd Jick, and Steve Kerr. 1998. *The Boundaryless Organization: Breaking the Chains of Organization Structure*. San Francisko: Jossey-Bass.

Asiki, Athanasia, Dimitrios Tsoumakos, and Nectarios Koziris. 2010. "Distributing And Searching Concept Hierarchies: An Adaptive DHT--Based System." *Cluster Computing* 13 (3): 257--276. doi:10.1007/s10586--010--0136--5.

Assem, Ibrahim, and Grégoire Dupont. 2013. "Modules Over Cluster--Tilted Algebras Determined By Their Dimension Vectors." *Communications In Algebra* 41 (12): 4711--4721. doi:10.1080/00927872.2012.700982.

Atherton Andrew and Andrew Johnston. "Cluster formation from the 'bottom-up': a process perspective." In *Handbook of research on Clusters Theory*, edited by Charile Karlsson, 93--112. Cheltenham: Edward Elgar Publishing, 2008.

Atherton, Andrew, and Andrew Johnston. 2008. "Cluster formation from the 'bottom--up': a process perspective." In *Handbook of Research on Innovation in Clusters*, edited by Charlie Karlsson. Cheltenham: Edward Elgar, 2008.

Atwood, Ed. "Game changer: King Abdullah Economic City." Arabian Business (blog), Accessed February 28, 2014. http://www.arabianbusiness.com/game--changer--king--abdullah--economic--city--552956.html.

Audretsch, David B., and Maryann P. Feldman. 1996. "Innovative Clusters And The Industry Life Cycle." *Review Of Industrial Organization* 11 (2): 253--273. doi:10.1007/bf00157670.

Austrian, Ziona. 2000. "Cluster Case Studies: The Marriage Of Quantitative And Qualitative Information For Action." *Economic Development Quarterly* 14 (1): 97--110. doi:10.1177/089124240001400110.

Baardsen, Sjur. 2011. "The importance of knowledge sharing." Presentation at COST event -- European and global forests - which way for the future?, European Parliament, Brussels, September 2011.

Baker, Jacob. 2010. "A Cluster Analysis Of Long Range Air Transport Pathways And Associated Pollutant Concentrations Within The UK." *Atmospheric Environment* 44 (4): 563--571. doi:10.1016/j.atmosenv.2009.10.030.

Baker, Therese L. 1999. *Doing Social Research*. Boston: McGraw--Hill College.

Bangdiwala, Shrikant I., and Viswanathan Shankar. 2013. "The Agreement Chart". *BMC Medical Research Methodology* 13 (1): Published electronicaly July 29. doi:10.1186/1471--2288--13--97.

Banister, Elizabeth M., Bonnie J. Leadbeater, and Anne E. Marshall, eds. 2011. *Knowledge Translation in Context: Indigenous, Policy and Community Settings*. Toronto: University of Toronto Press, Scholarly Publishing Division.

Barbieri, Elisa, Marco R. Di Tommaso, and Stefano Bonnini. 2012. "Industrial development policies and performances in southern China: Beyond the specialised industrial cluster program." *China Economic Review* 23 (3): 613--625. doi:10.1016/j.chieco.2010.12.005.

Barjak, Franz, Nordine Es--Sadki, and Anthony Arundel. 2014. "The Effectiveness Of Policies For Formal Knowledge Transfer From European Universities And Public Research Institutes To Firms." *Research Evaluation* 24 (1): 4--18. doi:10.1093/reseval/rvu024.

Barkley, David, and Mark Henry. 2003. "Are industry clusters a good bet for rural development?" *Community Economics Newsletter* 325 (November): 1--3.

Bazerman, Charles and James Paradis. 1991. Textual Dynamics of the Professions: Historical and Contemporary Studies of Writing in Professional Communities. Wisconsin: University of Wisconsin Press.

Brannen, M.Y. and Peterson, M.F., 2009. Merging without alienating: Interventions promoting cross-cultural organizational integration and their limitations. *Journal of international business studies*, *40*(3), pp.468-489.

Bechky, Beth A. 2003. "Sharing meaning across occupational communities: the transformation of understanding on a production floor." *Organization Science* 14 (3): 312-330.

Beijerse, Roelof P. uit. 2000. "Knowledge management in small and medium--sized companies: Knowledge management for entrepreneurs." *Journal of Knowledge Management* 4 (2): 162--179.

Bell, Martin, and Keith Pavitt. 1993. "Technological Accumulation And Industrial Growth: Contrasts Between Developed And Developing Countries." *Industrial and Corporate Change* 2 (1): 157--210. doi:10.1093/icc/2.1.157.

Bell, Martin, and Michael Albu. 1999. "Knowledge Systems And Technological Dynamism In Industrial Clusters In Developing Countries." *World Development* 27 (9): 1715--1734. doi:10.1016/s0305--750x(99)00073--x.

Bembenek, Bogusław, and Teresa Piecuch. 2014. "Knowledge management in industry clusters as an indication of entrepreneurship." *CBU International Conference Proceedings* 2 (July): 5--14. doi:10.12955/cbup.v2.441.

Berends, Hans, Hans Bij, Koenraad Debackere, and Mathieu Weggema. 2006. "Knowledge sharing mechanisms in industrial research." *R&D Management Journal* 36 (1): 85--95.

Berg, Bruce L. 2004. Qualitative Research Methods For The Social Sciences. Boston: Allyn & Bacon.

Berger, Peter L., and Thomas Luckmann. 1991. The social construction of reality: A treatise in the sociology of knowledge. London: Penguin.

Berkenkotter, Carol, and Thomas N. Huckin. 1995. *Genre Knowledge in Disciplinary Communication: Cognition/Culture/Power*. Hillsdale, NJ: Lawrence Erlbaum.

Bernard, H. Russell. 1994. *Research Methods In Anthropology*. Thousand Oaks, CA: Sage Publications.

Bhagat, Rabi S., Ben L. Kedia, Paula D. Harveston, and Harry C. Triandis. 2002. "Cultural variation in the cross--border transfer of organizational knowledge: an integrative framework." *Academy of Management Review* 27 (2): 204-221.

Bhatia, Pooja, and Archana Chugh. 2015. "Role Of Marine Bioprospecting Contracts In Developing Access And Benefit Sharing Mechanism For Marine Traditional Knowledge Holders In The Pharmaceutical Industry." *Global Ecology And Conservation* 3 (January): 176--187. doi:10.1016/j.gecco.2014.11.015.

Bianca, Massimiliano, and Riccardo Cappellin. 2006. "Innovation and knowledge creation in the SMEs of an aeronautical industrial cluster." Paper presented to Italian Association of Regional Science -- Annual Scientific Conference, Pisa.

Black, Thomas R. 1999. Doing Quantitative Research In The Social Sciences. London: SAGE.

.

Blumberg, Boris, Donald R. Cooper, and Pamela S Schindler. 2011. *Business Research Methods*. London: McGraw--Hill Higher Education.

Bogdan, Robert, and Sari Biklen. 1994. *Investigação Qualitativa Em Educação.* Porto: Porto Editora.

Boschma, Ron. 2005. "Proximity and Innovation: A critical assessment." *Regional Studies* 39 (1): 61--74.

Bourgeault, Ivy Lynn, Robert Dingwall, and Raymond G. De Vries. 2010. *The SAGE Handbook Of Qualitative Methods In Health Research*. Los Angeles: SAGE.

Brachert, Matthias, Mirko Titze, and Alexander Kubis. 2011. "Identifying Industrial Clusters From A Multidimensional Perspective: Methodical Aspects With An Application To Germany." *Papers In Regional Science* 90 (2): 419--439. doi:10.1111/j.1435--5957.2011.00356.x.

Bowen, Wayne H. 2008. The History Of Saudi Arabia. 1st ed. Westport, Conn.: Greenwood Press.

Brown, L. Carl, Paul Aarts, and Gerd Nonneman. 2006. "Saudi Arabia In The Balance: Political Economy, Society, Foreign Affairs". Foreign Affairs 85 (5): 176. doi:10.2307/20032121.

Brown, John Seeely, and Paul Duguid. 1991. "Organizational learning and communities--of--practice: toward a unified view of working, learning, and innovating." *Organization Science* 2 (1): 40-57.

Brown, John Seely, and Paul Dugui. 2000. *The Social Life of Information*. Boston, MA: Harvard Business School Press.

Brown, John Seely, and Paul Duguid. 2001. "Knowledge and Organization: A Social--Practice Perspective." *Organization Science* 12 (2): 198--213.

Brown, Kerry A., John Burgess, Marion Festing, Susanne Royer, C. Steffen, C. Waterhouse, and Robyn Keast. "Conceptualising clusters as overlapping value adding webs." In *Value Adding Webs and Clusters : Concepts and Cases*, edited by Kerry A. Brown, John Burgess, Marion Festing, Susanne Royer, 11--42. Munchen: Rainer Hampp Verlag, 2010.

Brown, Kerry, John Burgess, Marion Festing, and Susanne Royer. 2013. *Resources And Competitive Advantage In Clusters*. Mering: Rainer Hampp Verlag.

Brown, Kerry, John Burgess, Marion Festing, Sussane Royer Charlotte Steffen, and Jennifer Waterhouse. 2007. *The value adding web -- A multi--level framework of competitive advantage realisation in firm--clusters*. Berlin: European School of Management.

Bryman, Alan. 2007. "Barriers to integrating quantitative and qualitative Research." *Journal of Mixed Methods Research* 1 (1): 8--22. doi:10.1177/2345678906290531.

---. 2012. *Social research methods*. 4th ed. New York: Oxford University Press.

Bryman. Alan, and Emma Bell. 2003. *Business research methods*. Oxford: Oxford University Press.

Buber, Renate, Johannes Gadner, and Lyn Richards. 2004. *Applying Qualitative Methods To Marketing Management Research*. Houndmills, Basingstoke, Hampshire: Palgrave Macmillan.

Burns, Robert B., and Richard A. Burns. 2008. *Business Research Methods And Statistics Using SPSS*. Thousand Oaks, CA: SAGE Publication.

Burt, Ronald S. 2004. "Structural holes and good ideas." *American Journal of Sociology* 110 (2): 349-399.

Cabrera, Elizabeth, and Angel Cabrera. 2005. "Fostering knowledge sharing through people management practices." *The International Journal of Human Resource Management* 16 (5):720--735. doi:10.1080/09585190500083020.

Callagher, Lisa. 2012. "Searching near and far: A practice perspective of knowledge access in emerging clusters." *International Journal of Entrepreneurship and Innovation Management* 15 (1/2): 4--28. doi:10.1504/ijeim.2012.044074.

Campbell, Donald Thomas, and Donald W. Fiske. 1959. "Convergent and discriminant validation by the multitrait-multimethod matrix." *Psychological bulletin* 56 (2): 81-105.

Campbell, Donald Thomas, and Julian Cecil Stanely. 1966. *Experimental and quasi-experimental designs for research*. Chicago: Rand McNally.

Campbell, Donald Thomas. 1975. "Degrees of freedom" and the case study." *Comparative political studies* 8 (2): 178--193.

Capello, Roberta, and Alessandra Faggian. 2005. "Collective learning and relational capital in local innovation processes" *Regional Studies* 39 (1) 75-87.

Capello, Roberta. 2002. "Spatial and sectoral characteristics of relational capital in innovation activity." *European Planning Studies* 10 (2): 177-200.

Cavana, Robert, Brian L. Delahaye, and Uma S. Sekaran. 2001. *Applied business research: Qualitative and quantitative methods*. Milton, Qld: John Wiley & Sons Australia, Ltd.

Ceglie, Giovanna, Michele Clara, and Marco Dini. "Cluster and Network Development Projekts in Developing Countries: Lesons Learned Through the UNIDO Experience." In *Boosting Inovation: The Cluster Approach*, 269-292. Paris: OECD, 1999.

Chandran, Jay P. Review of *Managing new industry creation: Global knowledge formation and entrepreneurship in high technology*, by Thomas P. Murtha, Stephanie Ann Lenway, and Jeffrey A. Hart. *Academy of Management Review* 29 (April 2004): 303--306. doi:10.5465/amr.2004.12736120.

Chen, Fang, Zheng Jianzhuang, Jin Yuhan, and Zheng Wenyu. 2014. "Industrial Insertion And Embeddedness To Local Cluster Network: A Path Of China's Agricultural Machinery Industrial Cluster Upgrading." *Journal Of Applied Sciences* 14 (9): 960--964. doi:10.3923/jas.2014.960.964.

Chen, Haoming, Rucong Yu, and Bingyi Wu. 2012. "FY--2C--Derived diurnal features of clouds in the southern contiguous China." *Journal of Geophysical Research: Atmospheres* 117 (D18). Published electronicaly September 18. doi:10.1029/2012jd018125.

Chen, Yuh--Jen. 2010. "Knowledge Integration And Sharing For Collaborative Molding Product Design And Process Development." *Computers In Industry* 61 (7): 659--675. doi:10.1016/j.compind.2010.03.013.

Chikh, Azeddine. 2011. "A Knowledge Management Framework In Software Requirements Engineering Based On The SECI Model." *Journal of Software Engineering and Applications* 04 (12): 718--728. doi:10.4236/jsea.2011.412084.

Chiu, C.M., Hsu, M.H. and Wang, E.T., 2006. Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision support systems*, 42(3): 1872--1888. https://doi.org/10.1016/j.dss.2006.04.001.

CDSI (Central Department of Statistics and Information). 2013. *The Hajj Statistics*. Riyadh: Central Department of Statistics and Information. http://www.cdsi.gov.sa/english/index.php?option=com_docman&Itemid=173.
---. 2012. *Manpower Research Bulletin 2013 Round*. Riyadh: Central Department of Statistics and Information. http://www.cdsi.gov.sa/english/index.php?option=com_docman&task=cat_view&g id=226&Itemid=162.

Christensen, Peter Holdt. 2007. "Knowledge sharing: moving away from the obsession with best practices", *Journal of Knowledge Management*, 11 (1): 36 - 47.

CIA Factbook 2013. "Saudi Arabia." Copyright 2013. Accessed February 16, 2013. https://www.cia.gov/library/publications/the-world-factbook/geos/sa.html

Cieślik, Andrzej, and Mahdi Ghodsi. 2015. "Agglomeration Externalities, Market Structure And Employment Growth In High--Tech Industries: Revisiting The Evidence." *Miscellanea Geographica* 19 (3): 76--81. doi:10.1515/mgrsd--2015--0007.

Clark, Herbert H. 1996. *Using Language*. New York: Cambridge University Press.

Clarke, Bryan, and Jim Parsons. 2013. "Becoming rhizome researchers." *Reconceptualizing Educational Research Methodology* 4 (1): 35--43. doi:10.7577/rerm.685.

Clarke, Jayne, and Paul Turner. 2004. "Global competition and the Australian biotechnology industry: developing a model of SMEs knowledge management strategies." *Knowledge and Process Management* 11 (1): 38--46.

Claus, Lisbeth, and Jessica Collison. 2004. "HR Professionalism: Perceptions of US HR Practitioners." *Problems and Perspectives in Management* 4: 111--124.

CNBC,. 2016. "Great Plan, But Saudi Arabia Really Needs More: IMF". *CNBC*. http://www.cnbc.com/2016/04/26/saudi-arabia-economic-plan-needs-this-imf.html.

Cohen, Michael D., and James G. March. 1972. "A garbage can model of organizational choice." *Administrative Science Quarterly* 17 (1): 1-25.

Cohen, Wesley M., and Daniel A. Levinthal. 1990. "Absorptive capacity: a new perspective on learning and innovation." *Administrative Science Quarterly* 35 (1): 128-152.

Colli, Stephen P. and Rob Cross. 2003. "A relational view in social networks." *Management Science* 49 (4): 432--445.

Collins, David, Mark Bray, and John Burgess. 2013. "Responding to Global Warming Mitigation Policies: The Hunter Valley Construction and Engineering Cluster." In *Resources and*

Competitive Advantage in Clusters, edited by Kerry Brown, John Burgess, Marion Festing and Susanne Royer, 113--130. München: Rainer Hampp Verlag.

Collins, Kathleen M. T., Anthony J. Onwuegbuzie, and Ida L. Sutton. 2006. "A model incorporating the rationale and purpose for conducting mixed--methods research in special education and beyond." *Learning Disabilities* 4 (1): 67--100. doi:10.2167/eri421.0.

Collis, Jill, and Roger Hussey. 2009. Business research: A practical guide for undergraduate & postgraduate students. 3rd ed. London: Palgrave Macmillan.

---. 2003. Business research: A practical guide for undergraduate and postgraduate students. 2nd ed. New York: Palgrave MacMillan.

Colombo, Massimo G. 2003. "Alliance form: a test of the contractual and competence perspectives." *Strategic Management Journal* 24 (12): 1209-1229.

Connell, Julia and Michael Thorpe. 2012. "Industry clusters: An antidote for knowledge sharing and collaborative innovation?" Paper presented to Knowledge Management International Conference (KMICe), Johor Bahru.

---. "Do Clusters Support Innovation? An Inside View of Two Dubai Based Clusters." In *Innovation Management*, edited by S. K. Singh and B. Gupta, 25-43. New Delhi: Macmillan, Publishers, 2009.

---. "Regional Development and the 'Dubai Model': Some Observations and Experiences." In: *Business Clusters: Partnering for Competitive Advantage*, edited by C Jayachandran, Michael Thorpe, Ram Subramanian and Vishnuprasad Nagadevara. Abingdon: Routledge, 2010.

Connell, Julia, and Ranjit Voola. 2013. "Knowledge Integration And Competitiveness: A Longitudinal Study Of An Industry Cluster." *Journal of Knowledge Management 17 (2): 208--225.* doi:10.1108/13673271311315178.

Connell, Julia, Anton Kriz, and Michael Thorpe. 2009. "Industry Clusters: An Antidote for Knowledge Sharing and Collaborative Innovation?" *Journal of Knowledge Management* 18 (1): 137-51. doi:10.1108/jkm--08--2013--0312.

Connell, J., Kriz, A. and Thorpe, M., 2014. Industry clusters: an antidote for knowledge sharing and collaborative innovation?. *Journal of Knowledge Management*, *18*(1), pp.137-151.

Cooper, Donald R. and Pamela S. Schindler. 2008. *Business research method.* 10th ed.. New York: McGraw--Hill Irwin.

Corbetta, Piergiorgio. 2003. *Social Research*. London: SAGE Publications.

Corbin, Juliet M., and Anselm Strauss. 1990. "Grounded theory research: Procedures, canons, and evaluative criteria." *Qualitative Sociology* 13(1): 3-21. doi:10.1007/BF00988593.

Cornett, Andreas P. "Clusters and cluster development in the knowledge economy." In: *Foundations of the knowledge economy - innovation - learning and clusters*, edited by Knut Ingar Westeren, 213--232. Cheltenham, UK & Northampton MA, USA: Edward Elgar, 2012.

Corti, Louise. 2012. "Recent developments in archiving social research." *International Journal of Social Research Methodology* 15 (4): 281--290. doi:10.1080/13645579.2012.688310.

Costa, Carla, and Rui Baptista. 2014. "Entrepreneurial clusters and the co--agglomeration of related industries." *Academy of Management Proceedings* 2014 (1): Published electronicaly. doi:10.5465/ambpp.2014.15032abstract.

Craige, Caryne P., and Ellen M. Unterwald. 2013. "Serotonin (2C) receptor regulation of cocaine--induced conditioned place preference and locomotor sensitization." *Behavioural Brain Research* 238 (February): 206--210. doi:10.1016/j.bbr.2012.10.034.

Creswell, John W, and Vicki L Plano Clark. 2007. *Designing and Conducting Mixed Methods Research*. *Applied Linguistics.* Thousand Oaks, CA: SAGE Publication.

Creswell, John W. 1998. Qualitative inquiry and research design: Choosing among five traditions. Thousand Oaks, CA: SAGE Publication.

Creswell, John W. 2003. Research design: Qualitative, quantitative, and mixed method approaches. 2nd ed. Thousand Oaks, CA: SAGE Publication.

---. 2009. Research design: Qualitative, quantitative, and mixed methods approaches. 3rd ed. Thousand Oaks, California: Sage Publications, Inc.

Crossman, Brian, and Joanna Crossman. 2011. "Conceptualising Followership -- a Review of the Literature." *Leadership* 7 (4): 481--497. doi:10.1177/1742715011416891.

Crotty, Michael. 1998. The Foundations of Social Research: Meaning and Perspective in the Research Process. Thousand Oaks, CA: SAGE.

Crouch, Christopher, and Jane Pearce. 2012. *Doing Research In Design*. Oxford: Berg.

Cumbers, Andy, and Danny MacKinnon. 2004. "Introduction: Clusters in urban and regional Development." *Urban Studies* 41 (5--6): 959--969.

Dahl, Michael S., and Christian Ø.R. Pedersen. 2004. "Knowledge flows through informal contacts in industrial clusters: Myth or reality?" *Research Policy* 33 (10): 1673--1686. doi:10.1016/j.respol.2004.10.004.

Dai, Shengli, and Hailin Zhang. 2014. "Assessment on knowledge network sharing capability of industrial cluster based on Dempster-Shafer theory of evidence." *The Scientific World Journal* 2014 (3): Published electronicaly March 24. doi:10.1155/2014/810782.

Dammhahn, Melanie, and Peter M. Kappeler. 2008. "Small--Scale Coexistence Of Two Mouse Lemur Species (Microcebus Berthae And M. Murinus) Within A Homogeneous Competitive Environment." *Oecologia* 157 (3): 473--483. doi:10.1007/s00442--008--1079--x.

Das, Rinku, and Ashim Kumar Das. 2011. "Industrial cluster: An approach for rural development in north east India." *International Journal of Trade, Economics and Finance*, 2 (2): 161--165. doi:10.7763/ijtef.2011.v2.96.

Davenport, Thomas H. and Lawrence Prusak. 2000. *Working knowledge: How organizations manage what they know,* 2nd ed. Cambridge, MA: Harvard Business School Press.

Davis, D. K. 2013. "Desert Kingdom: How Oil And Water Forged Modern Saudi Arabia". Environmental History 18 (2): 446-447. doi:10.1093/envhis/emt008.

Dawson, Catherine. 2002. *Practical Research Methods*. 1st ed. Oxford: Howtobooks.

de Schrynmakers, Patrick. 2009. "Life Cycle Thinking In The Aluminium Industry." *The International Journal of Life Cycle Assessment* 14 (S1): 2--5. doi:10.1007/s11367--009--0072--x.

Deetz, Stanley. 1996. "Crossroads--Describing Differences in Approaches to Organization Science: Rethinking Burrell and Morgan and Their Legacy." *Organization Science*. 7 (2): 191--207. doi:10.1287/orsc.7.2.191.

Delgado, Mercedes, Scott Stern, and Michael Porter. 2014. "Defining clusters of related industries." NBER Working Paper 20375, National Bureau of Economic Research, Cambridge, MA.

Denice E. Welch and Lawrence S. Welch .2015. "Developing Multilingual Capacity: A Challenge for the Multinational Enterprise", Journal of Management, published online, July 8, DOI: 10.1177/0149206315594846.

Denzin, Norman K., and Yvonna S. Lincoln. 2000. *Handbook Of Qualitative Research*. Thousand Oaks: Sage Publications.

Denzin, N.K. 1978. The *Research Act: A Theoretical Introduction to Sociological Methods*. 2nd ed., McGraw-Hill, New York, NY.

Dijk, M.P.V. and Sverrisson, Á., 2003. Enterprise clusters in developing countries: mechanisms of transition and stagnation. *Entrepreneurship & Regional Development*, *15*(3), pp.183-206.

Dremin, I. M., and Chris Quigg. 1978. "The Cluster Concept In Multiple Hadron Production." *Science* 199 (4332): 937--941. doi:10.1126/science.199.4332.937.

Dreu, Carsten K., and Michael A. West. 2002. "Minority dissent and team innovation: The importance of participation in decision making." *Journal of Applied Psychology* 86 (6): 1191--201.

Duchek, Stephanie. 2013. "Capturing absorptive capacity: A critical review and future prospects." *Schmalenbach Business Review* 65 (July): 312--329.

Dul, Jan, and Tony Hak. 2008. *Case Study Methodology In Business Research*. Amsterdam: Butterworth--Heinemann/Elsevier.

Dutton, William H. 2013. 'The social shaping of digital research." *International Journal of Social Research Methodology* 16 (3): 177--195. doi:10.1080/13645579.2013.774171.

Dyer, Jeffrey H., and Kentaro Nobeoka. 2001. "Sharing network: The Toyota case." *Strategic Management Journal* 21 (3): 345--367.

Easterby, Mark, Marjorie Lyles, and Eric Tsang. 2008. "Inter--organizational knowledge transfer: Current themes and future prospects." *Journal of Management Studies* 45 (4): 677--690. doi:10.1111/j.1467--6486.2008.00773.x.

Easterby-Smith, Mark, Richard Thorpe, and Paul R. Jackson. 2008. *Management Research*. 3rd ed. London: Sage.

Eaton, Stephanie. 2013. "The Oxford Handbook Of Empirical Legal Research." *International Journal Of Social Research Methodology* 16 (6): 548--550. doi:10.1080/13645579.2013.823291.

Economic cities Authority website. "Home." Copyright 2014. Accessed December 16, 2015.http://eca.gov.sa/webcenter/faces/oracle/webcenter/page/scopedMD/s8bba98ff_4cb

b_40b8_beee_296c916a23ed/businessRolePages/Page52.jspx?_afrLoop=7537427482891
026#!%40%40%3F_afrLoop%3D7537427482891026%26_adf.ctrl-
state%3D1cl5rc35in_4

Edward, Bergman M. and Edward J. Feser. "Industrial and Regional Clusters: Concepts and
Comparative Applications." In *The Web Book of Regional Science*, edited by Scott
Loveridge. Morgantown, WV: Regional Research Institute, West Virginia University,
1999.

Eisenhardt, Kathleen M. 1989. "Building theories from case study research." *Academy of
Management Review* 14 (4): 532--550. doi:10.5465/AMR.1989.4308385.

Eisenhardt, Kathleen M., and Melissa E. Graebner. 2007. "Theory Building from Cases:
Opportunities and Challenges." *Academy of Management Journal* 50 (1): 25-32.
doi:10.5465/AMJ.2007.24160888.

Eisingerich Andreas, and Lesslie Boehm. 2007. "Group Analysis: Why Some Regional Clusters
Work Better Than Others." *The MIT Sloan Management Review Journal Report*,   3
(September): 1-3.

Eisingerich, Andreas, Oliver Falck, Stephan Heblich, and Tobias Kretschmer. 2012. "Firm
innovativeness across cluster types." *Industry & Innovation* 19 (3): 233--248.
doi:10.1080/13662716.2012.669619.

Ellis, K. 2001. "Dare to Share." *Training*. 32 (2): 74-80.

Emor, Juan Carlos. 2013. "Situating everyday life." *International Journal of Social Research
Methodology* 16 (6): 550--552. doi:10.1080/13645579.2013.823293.

Emory, William. 1976. *Business Research Methods*. Homewood, Ill.: R.D. Irwin.

Etzkowitz, Henry, James Dzisah, Marina Ranga, and Chunyan Zhoub. 2007. "The triple helix
model of innovation." *Tech Monitor Journal* 24 (1): 14--23.

European Commission. 2006. Innobarometer 2006: Clusters facilitate innovation in Europe, Flash Eurobarometer 187. Brussels: European Commision.

Fang, Yongheng, Qian Liang, and Zhouping Jia. 2011. "Knowledge sharing risk warning of industry cluster: An engineering perspective." *Systems Engineering Procedia* 2: 412--421. doi:10.1016/j.sepro.2011.10.055.

Farquhar, Jillian Dawes. 2012. *Case Study Research For Business*. London: SAGE.

Fechner, Gustav. 1960. "Elements of Psychophysics." *The British Journal of Statistical Psyhology* 13 (1): 1--10. Accessed February 28, 2014. http://psycnet.apa.org/psycinfo/1966--35028--000.

Feldman, Maryann P. 1999. "The new economics of innovation, spillovers and agglomeration: a review of empirical studies." *Economics of Innovation and New Technology* 8 (1-2): 5-25.

Feldman, Maryann, Johanna Francis, and Janet Bercovitz. 2005. "Entrepreneurs and the Formation of Industrial Clusters." *Regional Studies* 39 (1): 129--141.

Feser, Edvard, Henry Renski, and Harvey Goldstein. 2008. "Clusters And Economic Development Outcomes: An Analysis Of The Link Between Clustering And Industry Growth." *Economic Development Quarterly* 22 (4): 324--344. doi:10.1177/0891242408325419.

Fiksenbaum, Lisa M. 2013. "Supportive work--family environments; implications for work--family conflict and well--being." *The International Journal of Human Resource Management* 25 (4) 1--20. doi: 10.1080/09585192.2013.796314.

Filip, Małgorzata, Umberto Spampinato, Andrew C. McCreary, and Edmund Przegaliński. 2012. "Pharmacological and genetic interventions in serotonin (5--HT) 2C receptors to alter drug abuse and dependence processes." *Brain Research* 1476 (October): 132--153. doi:10.1016/j.brainres.2012.03.035.

Finkbeiner, Patric. 2011. 'Intercultural Differences In Knowledge Transfers In The Context Of Generational Change Of Smes In Germany, UK And Italy." *International Journal Of Management Cases* 13 (4): 61--64. doi:10.5848/apbj.2011.00111.

Fisher, Eileen and Rebecca Reuber. 2000. "Industrial clusters and SME promotion in developing countries". *Commonwealth Trade and Enterprise*, Paper No 3. London; Commonwealth Secretariat.

Fisher, Ronald Aylmer. 1970. *Statistical Methods For Research Workers*. Darien, Conn.: Hafner Pub. Co.

Foss, Nicolai J. 2010. "Micro--foundations for management research: what, why, and whither?" *Cuadernos de Economía y Dirección de la Empresa* 42 (March): 11--34.

Fowler, Floyd J. 1993. *Survey Research Methods*. Newbury Park: Sage Publications.

Franklin, Cynthia. 1997. "Learning To Teach Qualitative Research." *Marriage & Family Review* 24 (3--4): 241--274. doi:10.1300/j002v24n03_02.

Frost, Alan. 2010. "The Different Types of Knowledge." *The Knowledge Management Tools* (blog), Accessed February 23, 2015, http://www.knowledge--management--tools.net/different--types--of--knowledge.html.

Fuentes, Claudia, and Gabriela Dutrenit. 2013. "SMEs´ absorptive capacities and large firms´ knowledge spillovers: Micro evidence from Mexico." Institutions and Economies 5 (1): 1--30.

Garnsey, Elizabeth, and Paul Heffernan. 2005. "High--technology clustering through spin--out and attraction: the Cambridge case." *Regional Studies* 39 (8):1127--1144.

General Authority for Statistics. Kingdom of Saudi Arabia. 2016. https://www.stats.gov.sa/en . Accessed December16.

Ghassan, Hassan B., Hassan R. Alhajhoj, and Mohammed Kbiri Alaoui. 2013. "The Impacts Of International Financial Crisis On Saudi Arabia Economy: Evidence From

AsymmetricSVAR Modelling". Journal Of Reviews On Global Economics, 390-406. doi:10.6000/1929-7092.2013.02.27.

Gray, C., Harvey, O. & Brimblecombe, P. (November, 2001). *Cluster classification and costing research*. Report commissioned by Industry New Zealand, New Zealand.

Gephart, Robert. 2012. "Paradigms and Research Methods." *Researh Methods Forum* 4 (Summer): 1-8.

Gill, John, and Phil Johnson. 2015. *Research Methods for Managers*. Thousand Oaks, CA: SAGE Publication.

Gillham, Bill. 2000. *Developing a Questionnaire*. *Real World Research.* London: Bloomsbury Academic.

---. 2008. *Case study research methods*. London: Continuum.

Giuliani, Elisa. 2005. "Cluster Absorptive Capacity Why do Some Clusters Forge Ahead and Others Lag Behind." *European Urban and Regional Studies* 12 (3): 269--288.

Giuliania Elisa, and Martin Bell. 2005. "The micro--determinants of meso--level learning and innovation: evidence from a Chilean wine cluster." *Research Policy* 34 (1): 47--68.

Glaser, Barney G. and Anselm L. Strauss. 1967. *The Discovery of Grounded Theory*. Chicago: Aldine Press.

Gnutzmann, Hinnerk. 2008. "Network Formation Under Cumulative Advantage: Evidence From The Cambridge High--Tech Cluster." *Computational Economics* 32 (4): 407--413. doi:10.1007/s10614--008--9145--3.

Gnyawali, D.R. and Srivastava, M.K., 2013. Complementary effects of clusters and networks on firm innovation: A conceptual model. *Journal of Engineering and Technology Management*, *30*(1), pp.1-20.

Gompers, Paul A., Josh Lerner, and David S. Scharfstein. 2005."Entrepreneurial Spawning: Public Corporations and the Formation of New Ventures, 1986-1999." Journal of Finance 60, (2): 577–614.

Gould, Roger V., and Roberto M. Fernandez. 1994. "A Dilemma of State Power: Brokerage and Influence in the National Health Policy Domain." *American Journal of Sociology* 99 (6): 1455--1491.

Grabowski, Richard. 2000. "Economic Reform and South Asian Development: Review of Lessons Learned from the Experience of East and Southeast Asia." *International Journal of Commerce and Management* 10 (2): 1--19. doi:10.1108/eb047399.

Greene, Jennifer C., Valerie J. Caracelli, and Wendy F. Graham. 1989. "Toward a Conceptual Framework for Mixed--Method Evaluation Designs." *Educational Evaluation and Policy Analysis* 11 (3): 255--274.

Gretzinger, S., 2012, October. Social Capital and Absorptive Capacity in Value Adding Webs: An Empirical Investigation Based on the Case of the Djurs Offshore Wind-Energy Network in Denmark. In *ICICKM2012-Proceedings of the 9th International Conference on Intellectual Capital, Knowledge Management and Organisational Learning: ICICKM* (p. 85). Academic Conferences Limited.

Gretzinger, Susanne and Susanne Royer. 2014. "Relational Resources In Value Adding Webs: The Case Of A Southern Danish Firm Cluster". *European Management Journal* 32 (1): 117-131. doi:10.1016/j.emj.2013.02.004.

Grimstad, Sidsel, and John Burgess. "A comparison of two agriculture--based tourism micro--clusters in Norway and Australia." In *Resources and Competitive Advantage in Clusters*, edited by Kerry Brown, John Burgess, Marion Festing and Susanne Royer, 66--96. München: Rainer Hampp Verlag, 2013.

Groff, Todd and Thomas Jones. 2003. *Introduction to knowledge management*. Burlington, MA: Butterworth--Heinemann.

Guardian,. 2016. "Two Disqualified As First Saudi Women Begin Campaign For Election". *The Guardian*. https://www.theguardian.com/world/2015/nov/29/first-saudi-arabia-women-stand-election-begin-campaigning

Guba, Egon G. 1990. *The Paradigm Dialog*. Thousand Oaks, CA: SAGE Publication.

Guivarch, Céline, and Stéphane Hallegatte. 2013. "2C Or Not 2C?" *Global Environmental Change* 23 (1): 179--192. doi:10.1016/j.gloenvcha.2012.10.006.

Gulf Industry Worldwide. Online news. 2008. http://www.gulfindustryworldwide.com/stories/news/321. Accessed November 14.

Gummesson, Evert. 2000. *Qualitative Methods In Management Research*. Thousand Oaks: Sage.

Guo, Bin, and Jing--Jing Guo. 2011. "Patterns Of Technological Learning Within The Knowledge Systems Of Industrial Clusters In Emerging Economies: Evidence From China." *Technovation* 31 (2--3): 87--104. doi:10.1016/j.technovation.2010.10.006.

Guo, Bing, and Xiao Guang Li. 2012. "The research on industry cluster model of eco--industry park." *Advanced Materials Research* 460 (February): 334--337. doi:10.4028/www.scientific.net/amr.460.334.

Hair, Joseph F. 1976. "Mathematical versus Experimental Traditions in the Development of Physical Science." Journal of Interdisciplinary History 7 (1): 1--31.

---. 2003. Essentials Of Business Research Methods. Hoboken, NJ: Wiley.

---. 2007. *Research Methods For Business*. Chichester: John Wiley & Sons.

Håkanson, Lars. 2005. "Epistemic communities and cluster dynamics: On the role of knowledge in industrial districts." *Industry & Innovation* 12 (4): 433--463. doi:10.1080/13662710500362047.

Hansen, Morten T., Nitin Nohria, and Thomas Tierney. 1999. "What's your strategy for managing knowledge?" *Harvard Business Review*, 77 (2): 106-16.

Hanson, William E., John W. Creswell, Vicki L. Plano Clark, Kelly S. Petska, and David Creswell. 2005. "Mixed Methods Research Designs in Counseling Psychology." *Journal of Counseling Psychology*. 52 (2): 224--235. doi:10.1037/0022--0167.52.2.224.

Hare, Denise. 2009. "Tetsushi Sonobe And Keijiro Otsuka, Cluster-Based Industrial Development: An East Asian Model: Cluster-Based Industrial Development: An East

Asian Model." *Economic Development And Cultural Change* 57 (2): 431--433. doi:10.1086/592873.

Helen, Sharp, Yvonne Rogers, and Jenny Preece. 2002. "The Process of Interaction Design." In *Interaction Design: Beyond Human--Computer Interaction*, 165-200. Hoboken, N.J.: Wiley.

Helmsing, Bert. 2001. "Externalities, learning and governance: new perspectives on local economic development." *Development and Change* 32 (2) 277-308.

Henning, Elizabeth , Wilhelm Van Rensburg, and Brigitte Smit. 2004. *Finding Your Way in Qualitative Research*. Hatfield: Van Schaik.

Hesse--Biber, Sharlene Nagy, and Patricia Leavy. 2006. *The Practice Of Qualitative Research*. Thousand Oaks: SAGE Publications.

Hillmann, Diane I., and Elaine L. Westbrooks. 2004. *Metadata In Practice*. Chicago: American Library Association.

Ho, Hillbun (Dixon). 2013. "Knowledge Sharing And Creation In Supplier-Supplier Collaboration." *Industrial Marketing Management* WITHDRAVN doi:10.1016/j.indmarman.2013.01.004.

Holloway, Immy. 1997. *Basic Concepts For Qualitative Research*. 1st ed. London: Blackwell Science.

Horsfall, Debbie, Hilary Byrne-Armstrong, and Joy Higgs. "Researching critical moments." In *Critical moments in qualitative research* , edited by Debbie Horsfall, Hilary Byrne-Armstrong, and Joy Higgs, 3-16. Oxford.: Butterworth Heinemann, 2001.

Howe, Kenneth R. 1988. "Against the Quantitative--Qualitative Incompatibility Thesis or Dogmas Die Hard." *Educational Researcher* 17 (8): 10--16. doi:10.3102/0013189X017008010.

Hunter, Janet. 2013. "Reviving the Kansai cotton industry: Engineering expertise and knowledge sharing in the early Meiji period." *Japan Forum* 26 (1): 65--87. doi:10.1080/09555803.2013.828767.

Ilori, M.O. 1994. "The Role Of Local Government In Technological And Industrial Development In Nigeria." *Technovation* 14 (3): 173--179. doi:10.1016/0166--4972(94)90054--x.

Index Mundi. 2012a. *Saudi Arabia Unemployment Rate*. http://www.indexmundi.com/saudi_arabia/unemployment_rate.html.

Industrial Cluster Program. "About." Copyright 2013. Accessed December 16, 2015. http://www.ic.gov.sa/index.php?option=com_content&view=article&id=2&Itemid=102

Inkpen, Andrew C., and Eric W. K. Tsang. 2005. "Social capital, networks, and knowledge transfer." *Academy of Management Review*: Academy of Management 30 (1):146-165.

Ionescu, Dina. 2005. Social capital: A Key ingredient for Clusters in Post--Communist Societies, in: OECD, Business Clusters, Promoting Enterprise in Central and Eastern Europe, OECD Publications, Paris: 9--41 August.

Jafar, Azizi, and T. Aref Eshghi. 2011. "The role of information and communication technology (ICT) in Iranian olive industrial cluster." *Journal of Agricultural Science* 3 (1): 228--232. doi:10.5539/jas.v3n1p228.

Janin, Hunt and Margaret Besheer. 2003. Saudi Arabia. 1st ed. New York: Benchmark Books.
Keating, Susan Katz. 2004. Saudi Arabia. 1st ed. Philadelphia: Mason Crest Publishers.

Jayachandran, Seema. Adriana Lleras-Muneyand, and Kimberly Smith 2010. "Modern Medicine and the Twentieth Century Decline in Mortality: Evidence on the Impact of Sulfa Drugs." *American Economic Journal*: *Applied Economics*, 2 (2): 118--146.

Jick, Todd D. 1979. "Mixing qualitative and quantitative methods: Triangulation in action." *Administrative Science Quarterly* 24 (4): 602--611. doi:10.2307/2392366.

Jinyang, Li. 2015. "Knowledge sharing in virtual communities: A social exchange theory perspective." *Journal of Industrial Engineering and Management* 8 (1): 170--183. doi:10.3926/jiem.1389.

Johnson, R. Burke, and Anthony J. Onwuegbuzie. 2004. "Mixed Methods Research: A Research Paradigm Whose Time Has Come." *Educational Researcher* 33 (7): 13-26. doi:10.3102/0013189X033007014.

Jonsen, K. and Jehn, K.A., 2009. Using triangulation to validate themes in qualitative studies. *Qualitative Research in Organizations and Management: An International Journal*, *4*(2), pp.123-150.

Jung, Jisoo, Injun Choi, and Minseok Song. 2007. "An Integration Architecture For Knowledge Management Systems And Business Process Management Systems." *Computers In Industry* 58 (1): 21--34. doi:10.1016/j.compind.2006.03.001.

Keeble, David, and Frank Wilkinson. 1999a. "Collective Learning and Knowledge Development in the Evolution of Regional Clusters of High Technology SMEs in Europe." *Regional Studies* 33 (4): 295 -- 303.

Keeble, David, Clive Lawson, Barry Moore, and Frank Wilkinson. 1999b. "Collective learning processes, networking and 'institutional thickness' in the Cambridge region." *Regional Studies* 3 (4): 319-332.

Kerry Brown, John Burgess, Marion Festing, and Susanne Royer. "Conceptualising clusters as overlapping value adding webs." In *Value Adding Webs and Clusters—Concepts and Cases*, edited by Kerry Brown, John Burgess, Marion Festing and Susanne Royer, 11--42. München: Rainer Hampp Verlag, 2010.

Kerry Brown, John Burgess, Marion Festing, Susanne Royer, Charlotte Steffen, and Jennifer Waterhouse. 2007 "The valueadding web: a conceptual framework of competitive advantage realisation in clusters." *Australia and New Zealand Academy of Management Conference* 24 (2).

Kesidou, Effie, and Chris Snijders. 2012. "External knowledge and innovation performance in clusters: Empirical evidence from the Uruguay software cluster." *Industry & Innovation* 19 (5): 437--457. doi:10.1080/13662716.2012.711028.

Kesidou, Effie, Marjolein C. J. Caniëls, and Henny A. Romijn. 2009. "Local knowledge spillovers and development: An exploration of the software cluster in Uruguay." *Industry & Innovation* 16 (2): 247--272. doi:10.1080/13662710902764444.

Ketchen, David J., and Donald D. Bergh. 2006. *Research Methodology In Strategy And Management*. Amsterdam: Elsevier JAI.

---. 2009. Research Methodology In Strategy And Management. Bingley.: Emerald.

Ketels, Christian H. M. 2003. "The Development of the Cluster Concept--Present Experiences and Further Developments." Paper prepared for NRW Conference on Clusters, Duisburg.

Khan, Ghazanfar. "Kingdom to cut reliance on foreign workers." Arab News, Accessed December 16, 2015. http://www.arabnews.com/economy/news/857121

Kim, Jin--Lee, Martin Greene, and Sunkuk Kim. 2014. "Economic impact of new green building code on residential project development from energy consumption perspectives." *Journal Of Green Building* 9 (4): 105--123. doi:10.3992/1943--4618--9.4.105.

Kim, Yong Mi, Donna Newby Bennett, and HeeJoon Song. 2012. "Knowledge Sharing And Institutionalism In The Healthcare Industry." *Journal Of Knowledge Management* 16 (3): 480--494. doi:10.1108/13673271211238788.

Kim, S.J., Hong, J.Y. and Suh, E.H., 2012. A diagnosis framework for identifying the current knowledge sharing activity status in a community of practice. *Expert Systems with Applications*, *39*(18), pp.13093-13107.

Kingdom Of Saudi Arabia -- Ministry Of Foreign Affairs. 2015. 'Al--Naimi Highlights National Industrial Cluster Development Program. |Kingdom Of Saudi Arabia -- Ministry Of Foreign Affairs'. Accessed February 28, 2014.

http://www.mofa.gov.sa/sites/mofaen/ServicesAndInformation/news/GovernmentNews/Pages/NewsArticleID61431.aspx.

Klenke, Karin. 2008. *Qualitative Research In The Study Of Leadership*. 1st ed. Bingley, UK: Emerald Group Pub.

Knoben, Joris, and Leon A. G. Oerlemans. 2006. "Proximity and inter--organizational collaboration: a literature review." *International Journal of Management Reviews* 8 (2): 71-89.

Kogut, Bruce, and Udo Zander. 1993. "Knowledge of the firm and the evolutionary theory of the multinational corporation." *Journal of International Business Studies* 24 (4): 625--645. doi:10.1057/palgrave.jibs.8490248.

Kogut, Bruce. 2002. "Capital Market Development And Mass Privatization Are Logical Contradictions: Lessons From Russia And The Czech Republic." *Industrial And Corporate Change* 11 (1): 1--37. doi:10.1093/icc/11.1.1.

Kong, Zhenpeng, and Qigang Yuan. 2009. "Studies On Spillover Of Scientific And Technological Knowledge In High--Tech Industry Clusters--Taking Jinan High--Tech Development Zone For Example." *International Business Research* 1 (4): 123--126. doi:10.5539/ibr.v1n4p123.

Khorsheed, Mohammad S. 2015. "Saudi Arabia: From Oil Kingdom To Knowledge-Based Economy". Middle East Policy 22 (3): 147-157. doi:10.1111/mepo.12149.

Korsching, Peter F., and Timothy O. Borich. 1997. "Facilitating Cluster Communities: Lessons From The Iowa Experience." *Community Development Journal* 32 (4): 342--353. doi:10.1093/cdj/32.4.342.

Kotler, Philip , John T. Bowen, and James C. Makens. 2006. *Marketing for Hospitality and Tourism,* 4th ed. Upper Saddle River: Prentice--Hall.

Koulopoulos, Thomas M., and Carl Frappaolo. 1999. Smart Things to Know About Knowledge Management. Milford: Capstone.

Krefting, Laura. 1991. "Rigor in qualitative research: The assessment of trustworthiness." *The American Journal of Occupational Therapy* 45 (3): 214--222. doi:10.5014/ajot.45.3.214.

Kriz, A. and Keating, B., 2010. Business relationships in China: lessons about deep trust. *Asia Pacific Business Review*, *16*(3), pp.299-318.

Kuhn, Thomas S. 1962. *The Structure of Scientific Revolutions*. In International Encyclopedia of Unified Science II (2): 92--210. doi:10.1111/j.1468--0149.1963.tb00813.x.

Lacey, Robert. 2009. *Inside The Kingdom*. 1st ed. New York: Viking

Lai, Yung--Lung, Maw--Shin Hsu, Feng--Jyh Lin, Yi--Min Chen, and Yi--Hsin Lin. 2014. "The effects of industry cluster knowledge management on innovation performance." *Journal of Business Research* 67 (5): 734--739. doi:10.1016/j.jbusres.2013.11.036.

Laing, David G. 1994. "Perceptual Odour Interactions and Objective Mixture Analysis." *Food Quality and Preference* 5 (1--2): 75--80. doi:10.1016/0950--3293(94)90010--8.

Lake, Peter. 2004. "Business networks within a regional industrial cluster." PhD diss., University of Southern Queensland. https://eprints.usq.edu.au/114/3/02whole.pdf

Lan, Wang, and Wang Zhangliu. 2012. "Research on interactive learning, knowledge sharing and collective innovation in SMEs cluster." *International Journal of Innovation, Management and Technology* 3 (1): 24--29.

Leadbeater, Bonnie J. Ross, Elizabeth M. Banister, and E. Anne Marshall. 2011. *Knowledge Translation In Context*. Toronto: University of Toronto Press.

Lee, Allen S. 1991. "Integrating Positivist and Interpretive Approaches to Organizational Research." *Organization Science* 2 (4): 342--365. doi:10.1287/orsc.2.4.342.

Lee, Cheng Sheng, and Kuan Yew Wong. 2015. "Development And Validation Of Knowledge Management Performance Measurement Constructs For Small And Medium

Enterprises." *Journal Of Knowledge Management* 19 (4): 711--734. doi:10.1108/jkm--10--2014--0398.

Lee, B., Collier, P.M. and Cullen, J., 2007. Reflections on the use of case studies in the accounting, management and organizational disciplines. *Qualitative Research in Organizations and Management: An International Journal*, 2(3), pp.169-178.

Lee, Jae--Nam M. 2001. "The impact of knowledge sharing, organizational capability and partnership quality on IS outsourcing success." *Information and Management* 38 (5): 323-335.

Leitner, Karl H. 2015. "Intellectual Capital, Innovation and Performance: Empirical Evidence from SMEs." *International Journal of Innovation Management* 19 (5): 1-27. doi:10.1142/s1363919615500607.

Leonard, Dorothy, and Sylvia Sensiper. 2002. "The role of tacit knowledge in group innovation." In *The strategic management of intellectual capital and organizational knowledge*, edited by Chun Wei Choo, Nick Bontis, 485-500. Oxford: Oxford University Press.

Levin, Daniel Z. 1999. "Transferring knowledge within the organization in the R&D arena." PhD diss., Northwestern University, Evanston.

Levin, Daniel Z., and Rob Cross. 2004. "The strength of weak ties you can trust: the mediating role of trust in effective knowledge transfer." *Management Science* 50 (11): 1477-1490.

Levy, Gary. 2012. "Rhapsodic Inquiry And The Methodological Imaginal." *Reconceptualizing Educational Research Methodology* 3 (1): 1--16.oi:10.7577/rerm.356.

Lewis, Jane, and Jane Ritchie. 2003. "Generalising from Qualitative Research." In *Qualitative Research Practice: A Guide for Social Science Students and Researchers*, 263--286. Thousand Oaks, CA: SAGE Publication.

Leydesdorff, Loet, and Martin Meyer. 2009. The Triple Helix Model and the Knowledge--Based Economy. Accessed February 28, 2014.   http://www.leydesdorff.net.

Leydesdorff, Loet. 2000. "The triple helix: an evolutionary model of innovations." *Research Policy* 29 (2): 243-255.

Li, Rong Hua, and Cui Lin Wang. 2014. "Study On The Strategy Of Logistics Industry Development In Gansu Province." *Advanced Materials Research* 1006--1007 (August): 552--555. doi:10.4028/www.scientific.net/amr.1006--1007.552.

Li, Shuai. 2011. "Cooperation, Innovation and the Competitiveness of Chinese Enterprise Clusters." PhD diss., The University of New South Wales. http://handle.unsw.edu.au/1959.4/51381.

Liao, Tsai--Ju. 2010. "Cluster And Performance In Foreign Firms: The Role Of Resources, Knowledge, And Trust." *Industrial Marketing Management* 39 (1): 161--169. doi:10.1016/j.indmarman.2008.08.003.

Lincoln, Yvonna S., and E. G. Guba. 1985. "Establishing trustworthiness." In Naturalistic Inquiry, 289-327.

Liu, Xiao Tie. 2011. "On industrial cluster development of industrial parks: A case study of Jiangxi Province in China." *Applied Mechanics and Materials* 55--57 (May): 2003--2008. doi:10.4028/www.scientific.net/amm.55--57.2003.

Liu, Yu, Nan Wang, Fei Feng, and Lu Gan. 2013. "Knowledge Sharing Partner Selection Of Cluster Enterprise Based On BP Neural Network." *Applied Mechanics and Materials* 333--335 (July): 1301--1305. doi:10.4028/www.scientific.net/amm.333--335.1301.

Long, Rebecca G., Michael C. White, William H. Friedman, and Deborah V. Brazeal. 2000. The 'Qualitative'¨Versus Quantitative 'Research Debate: A Question of Metaphorical Assumptions?" *International Journal of Value--Based Management* 13 (2): 189-197.

Lü, Wen--tao, Yang Xiang, and Bo Zhang. 2008. "Research Of Concept Cluster Based Ontology Mapping." *Journal Of Computer Applications* 28 (11): 2859--2862. doi:10.3724/sp.j.1087.2008.02859.

Lublinski, Alf Erko. 2003. "Does Geographic Proximity Matter? Evidence From Clustered And Non--Clustered Aeronautic Firms In Germany." *Regional Studies* 37 (5): 453--467. doi:10.1080/0034340032000089031.

Luić, Ljerka and Miroslav Bojović. 2012. "Effect Of ICT On The Social Dimension Of Short--Term And Long--Term Alignment Of The Participants In The Construction Of A Knowledge Society." *Advanced Materials Research* 601 (December): 508--513. doi:10.4028/www.scientific.net/amr.601.508.

Mahran, Hatim Ameer. 2012. "Financial Intermediation And Economic Growth In Saudi Arabia: An Empirical Analysis, 1968-2010". ME 03 (05): 626-640. doi:10.4236/me.2012.35082.

Malmberg, Aanders, and Peter Maskell. 2002. "The elusive concept of localization economies: Towards a knowledgebased theory of spatial clustering." *Environment and Planning* A 34 (3): 429--449.

Malmberg, Anders, and Dominic Power. 2005. "(How) do (firms in) clusters create knowledge?" *Industry and Innovation* 12 (4): 409--431. oi:10.1080/13662710500381583.

Maps of the World. "About Saudi Arabia." Copyright 2002- 2007. Accessed December 16, 2015. http://www.mapsofworld.com/saudi-arabia/

March, James G., Herbert A. Simon, and Harold S. Guetzkow. 1993. *Organizations*. Cambridge, MA: Blackwell.

Mariotti, Sergio, Marco Mutinelli, Marcella Nicolini, and Lucia Piscitello. 2014. "Productivity Spillovers From Foreign Multinational Enterprises To Domestic Manufacturing Firms: To What Extent Does Spatial Proximity Matter?." *Regional Studies* 49 (10): 1639--1653. doi:10.1080/00343404.2013.867428.

Markov, Ilya, and Fabio Crestani. 2014. "Theoretical, Qualitative, And Quantitative Analyses Of Small--Document Approaches To Resource Selection." *ACM Transactions On Information Systems* 32 (2): 1--37. doi:10.1145/2590975.

Markusen, Ann. 1996. "Sticky Places in Slippery Spaces: A Typology of Industrial Districts." *Economic Geography* 72 (3): 293--313.

Martin, Ron, and Peter Sunley. 2003. "Deconstructing Clusters: Chaotic Concept or Policy Panacea?" *Journal of Economic Geography* 3 (1): 5-35.

Maskell, Peter. "Towards Knowledge-Based Theory of the Geographical Cluster." In *Clusters, Networks and Innovation*, edited by Stefano Breschi and Franco Malerba, 411--432. Oxford: Oxford University Press, 2005.

Mason, Cecily. 2008. "Virtual communities of enterprise value creation potential for regional clusters." PhD diss., Deakin University. http://dro.deakin.edu.au/eserv/DU:30023302/mason--virtualcommunities--2008.pdf

Maxwell, Scott E., and Harold D. Delaney. 2004. *Designing experiments and analyzing data: A model comparison perspective*. Abingdon: Routledge, Psychology Press.

Mayer, Roger C., James H. Davis, and F. David Schoorman. 1995. "An integration model of organizational trust." *Academy of Management Review* 20 (3): 709-734.

McAllister, Daniel J. 1995. "Affect-- and cognition--based trust as foundations for interpersonal cooperation in organizations." *Academy of Management Journal* 38 (1): 24-59.

McCann, Ian R. Philip Gordon. 2000. "Industrial Clusters: Complexes, Agglomeration and/or Social Networks?." *Urban Studies* 37 (3): 513--532. doi:10.1080/0042098002096.

McDonald, Frank and Giovanna Vertova. 2001. "Geographical concentration and competitiveness in the European Union." *European Business Review*, 13 (3): 157—165.

Md-Sidin, Samsinar, Murali Sambasivan, and Izhairi Ismail. 2010. "Relationship between workfamily conflict and quality of life." *Journal of Managerial Psychology* 25 (1): 58--81.

Meijer, Roel. 2010. "The Gender Segregation (Ikhtilāṭ) Debate in Saudi Arabia: Reform and the Clash between ʿulamāʾ and Liberals." *Journal for Islamic Studies* 30 (1): 2-32.

Menzel, Max--Peter, and Dirk Fornahl. 2009. "Cluster Life Cycles--Dimensions And Rationales Of Cluster Evolution." *Industrial And Corporate Change* 19 (1): 205--238. doi:10.1093/icc/dtp036.

Merriam, Sharan B. 1998. "Case studies as qualitative research." In *Qualitative Research and Case Study Applications in Education*, 29-43. San Francisco: Jossey--Bass Publishers.

Metz, Harold W., and Doris Duffy. 1949. "The Role Of Government In Labor--Management Production Committees." *Industrial And Labor Relations Review* 2 (2): 211-213. doi:10.2307/2519213.

Migdadi, Mahmoud. 2009. "Knowledge management enablers and outcomes in the small-and-medium sized enterprises." *Industrial Management & Data Systems* 109 (6): 840 - 858. http://dx.doi.org/10.1108/02635570910968072

Milbank, Johanna. "Adelaide Hills Apple Industry Cluster Mapping." Preprint, submitted August 3, 2015. http://www.rdahc.com.au/fileadmin/user_upload/docs/Cluster Mapping_AdelaideHillsFruitIndustry.pdf

Miles, Matthew B., and A. Michael Huberman. 1994. *Qualitative Data Analysis: An Expanded Sourcebook.* 2nd ed. Thousand Oaks, CA: SAGE.

Minemura, Teruo. 1965. "The Role of Government in industrial Relations: An Outline." *British Journal Of Industrial Relations* 3 (2): 219--224.

Ministry of Economy and Planning. "News." Copyright 2006. Accessed December 16, 2015. http://www.mep.gov.sa/en/news/

Ministry of Education. 2010. *Students Abroad: Statistical Indicators and Analysis*. M.O.H. Education (Eds.). http://snohe.mohe.gov./ar/Documents/Students%20Abroad.pdf.

Mitchell, Rebecca, John Burgess, and Jennifer Waterhouse. 2010. "Proximity and knowledge sharing in clustered firms." *International Journal of Globalisation and Small Business* 4 (1): 5--24. doi: 10.1504/IJGSB.2010.035328.

Molina Barrantes, María Eugenia. 2008. "Digital genre: a mechanism for knowledge sharing and reuse in business. clusters." PhD diss., Victoria University of Wellington. http://researcharchive.vuw.ac.nz/bitstream/handle/10063/1234/thesis.pdf?sequence=

Molina, Maria, and Pak Yoong. 2003. "Knowledge sharing in a co-opetitive environment: The case of business clusters." *Journal of Information & Knowledge Management* 2 (4): 321--341.

Molina-Morales, Xavier, and Manuel Expósito-Langa. 2013. "Overcoming Undesirable Knowledge Redundancy In Territorial Clusters." *Industry anf Innovation* 20 (8): 739--758. doi:10.1080/13662716.2013.856622.

Moreland, Richard L., and Larissa Myaskovsky. 2000. "Exploring the performance benefits of group training: Transactive memory or improved communication?" *Organizational Behavior and Human Decision Processes* 82 (1): 117--133.

Morgan, Gareth. 1988. "Accounting as reality construction: Towards a new epistemology for accounting practice." *Accounting, Organizations and Society* 13 (5): 477--485. doi:10.1016/0361--3682(88)90018--9.

Morrison, Keith. 2012. "Searching For Causality In The Wrong Places." *International Journal Of Social Research Methodology* 15 (1): 15--30. doi:10.1080/13645579.2011.594293.

Morse, J.M. (2007), Sampling in Grounded Theory. In Bryant, A. and Charmaz, K. (eds.) *The Sage Handbook of Grounded Theory*, pp.229-244.

Motoyama, Yasuyuki. 2008. "What Was New About the Cluster Theory? What Could It Answer and What Could It Not Answer?" *Economic Development Quarterly* 22 (4): 353-363.

Munnich, Lee W., Greg Schrock, and Karen Cook. 2002. "Rural knowledge clusters: The challenge of rural economic prosperity." *Reviews of Economic Development Literature and Practice* 12 (August): 1--31.

Muscio, Alessandro. 2005. "The impact of absorptive capacity on SMEs collaboration." *Economics of Innovation and New Technology* 16 (8): 653-668.

Myers, Michael, and Franklin Liu. 2009. "What Does The Best Is Research Look Like? An Analysis Of The Ais Basket Of Top Journals." Paper presented at Pacific Asia Conference on Information Systems (PACIS), Tokyo.

National Industrial Clusters Development Program. "Home." Copyright 2012. Accessed February 28, 2014. http://www.ic.gov.sa/.

National Industrial Clusters Development Program. "Industrial Clusters Program Support." Copyright 2012. Accessed February 28, 2014. http://www.ic.gov.sa/index.php?option=com_content&view=article&id=26&Itemid=123.

Neiman, D. 1990. "Technological Considerations For Industrial Expert Systems Applications." 1990. *International Journal of Computer Applications in Technology* 3 (1): 183. doi:10.1016/0950--7051(91)90033--x.

Newbert, Scott L. 2008. "Value, rareness, competitive advantage, and performance: A conceptual--level empirical investigation of the resource--based view of the firm." *Strategic Management Journal* 29 (7): 745--768. doi:10.1002/smj.686.

Niedergassel, Benjamin. 2011. *Knowledge Sharing In Research Collaborations*. Wiesbaden: Gabler Verlag.

Nieves, Julia, and Javier Osorio. 2012. The role of social networks in knowledge creation. *Knowledge Management Research & Practice journal* 11 (1): 62-77.

Niglas, Katrin. 2004. "The combined use of qualitative and quantitative methods in educational research." *International Journal of Special Education* 18 (2): 62-72.

Nigro, Stefanie C., Darren Luon, and William L. Baker. 2013. "Lorcaserin: A novel serotonin 2C agonist for the treatment of obesity." *Current Medical Research and Opinion* 29 (7): 839--848. doi:10.1185/03007995.2013.794776.

Ninan, Abraham. 2005. "What are the roles of networks and clusters in the operation of an industry?" PhD diss., Queensland University of Technology. http://eprints.qut.edu.au/16090/.

Niosi, Jorge, and Majlinda Zhegu. 2005. "Aerospace Clusters: Local Or Global Knowledge Spillovers?" *Industry and Innovation* 12 (1): 5--29. doi:10.1080/1366271042000339049.

Nonaka, Ikujiro, and Hirotaka Takeuchi. 1995. The Knowledge--Creating Company: How Japanese Companies Create the Dynamics of Innovation. New York, NY: Oxford University Press.

Nonaka, Ikujiro, and Noboru Konno. 1998. "The Concept of 'Ba': building a foundation for Knowledge creation." *California Management Review* 40 (39): 40--54.

Nooteboom, Bart, Hans Berger, and Niels G. Noorderhaven. 1997. "Effects of trust and governance on relational risk." *Academy of Management Journal* (40): 308-338.

Nsimbi, Catherine. 2008. "Creating competitive advantage in developing countries through business clusters: A literature review." *African Journal of Business Management* 2 (7): 125--130.

Oakley, Ann. 1999. "Peoples way of knowing: gender and methodology." In: *Critical issues in social research*, edited by Suzanne Hood, Berry Mayall, and Sandy Oliver, 154-170. Buckingam: Open University Press.

Olsen, Marvin Elliott, and Dora G. Lodwick, and R. R Dunlap. 1992. *Viewing the world ecologically*. Boulder, CO: Westview.

Olsen, Wendy. 2004. "Triangulation in social research: Qualitative and quantitative methods can really be mixed." In *Developments in Sociology*, 1--30. Ormskirk: Causeway Press.

Oprime, Pedro C., Hélcio Martins Tristão, and Márcio Lopes Pimenta. 2011. "Relationships, Cooperation And Development In A Brazilian Industrial Cluster." *International Journal of Productivity and Performance Management* 60 (2): 115--131. doi:10.1108/17410401111101467.

O'Reilly, M. and Parker, N. (2013), 'Unsatisfactory Saturation': a critical exploration of the notion of saturated sample sizes in qualitative research. *Qualitative Research*, *13*(2), pp.190-197.

Otterstad, Ann Merete. 2013. "Editorial." *Reconceptualizing Educational Research Methodology* 4 (1): 1--1. doi:10.7577/rerm.683.

Ozola, Elena, and Andris Ozols. 2012. Mechanism of Knowledge Sharing In Triple Helix Model of University--Industry government Relations In Latvia. *Profesinės Studijos: Teorija ir Praktika* 10 (10): 85--92.

Pala, Irene. 2014. "Reviewer Acknowledgement 2013." *BMC Medical Research Methodology* 14 (1): 12-16. doi:10.1186/1471--2288--14--12.

Palazzolo, Edward T. 2005. "Organizing for information retrieval in transactive memory systems." *Communication Research* 32 (6): 726-761.

Palit, Debajit. 2013. "Solar Energy Programs For Rural Electrification: Experiences And Lessons From South Asia." *Energy For Sustainable Development* 17 (3): 270--279. doi:10.1016/j.esd.2013.01.002.

Pamulu, Muhammad. 2010. "Strategic management practices in the construction industry: a study of Indonesian enterprises." PhD diss., Queensland University of Technology. http://eprints.qut.edu.au/41570/.

Panahi, S., Watson, J. and Partridge, H., 2013. Towards tacit knowledge sharing over social web tools. *Journal of Knowledge Management*, *17*(3), pp.379-397.

Park, H.J., 2016. Recasting Strategic Opportunities and Challenges for Development in Saudi Arabia. In *Handbook of Research on Comparative Economic Development Perspectives on Europe and the MENA Region* (pp. 406-417). IGI Global.

Parkhe, Arvind. 1993. "Strategic alliance structuring: a game theoretic and transaction cost examination of interfirm cooperation." *Academy of Management Journal* 36 (4): 794-829.

Partington, David. 2000. "Building Grounded Theories of Management Action." *British Journal of Management* 11(2): 91--102.

Patlak, Margie, Sharyl J. Nass, and Erin Balogh. 2010. *Extending The Spectrum Of Precompetitive Collaboration In Oncology Research*. Washington, D.C.: National Academies Press.

Paulsen, Jan, and Kjell Hjerto. 2010. "Organizational knowledge transfer: Introducing a multi--level perspective." Paper presented at Academy of Management Annual Meeting, Montreal, April 2010.

Pavón, Juan, Jorge J. Gómez-Sanz, Rubén Fuentes-Fernández. "The INGENIAS Methodology and Tools." In *Agent-Oriented Methodologies*, edited by Brian Henderson-Sellers and Paolo Giorgini, 236–276. Pennsylvania,: Idea Group Publishing, 2005.

Pearson, J., Pitfield, D. and Ryley, T., 2015. Intangible resources of competitive advantage: Analysis of 49 Asian airlines across three business models. *Journal of Air Transport Management*, 47: 179--189. http://dx.doi.org/10.1016/j.jairtraman.2015.06.002

Peltoniemi, Mirva. 2011. "Reviewing Industry Life--Cycle Theory: Avenues For Future Research." *International Journal Of Management Reviews* 13 (4): 349--375. doi:10.1111/j.1468--2370.2010.00295.x.

Perry, David M., Kazuyuki Kitatani, Patrick Roddy, Mohamad El--Osta, and Yusuf A. Hannun. 2012. "Identification And Characterization Of Protein Phosphatase 2C Activation By Ceramide." *The Journal Of Lipid Research* 53 (8): 1513--1521. doi:10.1194/jlr.m025395.

Pessoa, Argentino. 2011. "The cluster policy paradox: Externalities vs. comparative advantages." FEP Working Paper 431, Faculdade de Economia -- Universidade do Porto, Porto.

Petrov, Alexandr P., and Alexandr A. Petrov. 2011. "Concept Of The Ural Pharmaceutical Cluster Formation." *Economy of Region* 4 (October): 213--220. doi:10.17059/2011--2--26.

Plano Clark, Vicki L, and John W Creswell. 2008. The Mixed Methods Reader. Mixed Methodology Combining Qualitative and Quantitative Approaches. Thousand Oaks, CA: SAGE Publication.

Polyani, Michael. 1966. *The Tacit Dimension*. London: Routledge & Kegan Paul.

Popping, Roel 2012. "Qualitative Decisions In Quantitative Text Analysis Research." *Sociological Methodology* 42 (1): 88--90. doi:10.1177/0081175012460854.

Porter, Michael E. 2000. "Location, Competition, and Economic Development: Local Clusters in a Global Economy". *Economic Development Quarterly February* 14 (1): 15--34.

Porter, Michael E. 2009. "Competitiveness and the State of Entrepreneurship in Saudi Arabia". Presentation at Institute for Strategy and Competitiveness, Riyadh, January 2009.

---. 1990. The Competitive Advantage of Nations. London: Macmillan.

---. 1998a. "Clusters and the new economics of competition." *Harvard Business Review* 76 (6): 77--90.

---. 1998b. *On Competition*. Boston: Harvard Business School Press.

---. 2003. "The economic performance of region." *Regional Studies* 37 (6 --7): 549--578.

Póvoa, Luciano Martins Costa, and Márcia Siqueira Rapini. 2010. "Technology Transfer From Universities And Public Research Institutes To Firms In Brazil: What Is Transferred And How The Transfer Is Carried Out." *Science And Public Policy* 37 (2): 147--159. doi:10.3152/030234210x496619.

Prabhakara, S.S., and N.V. Raghavendra. 2013. "Industrial Cluster And Technological Dynamism: Study Of Bangalore Machine Tool Cluster." *International Journal of Business and Systems Research* 7 (2):158 -- 167. doi:10.1504/ijbsr.2013.053758.

Pu, Ida Mengyi. 2006. *Fundamental Data Compression*. Oxford: Butterworth--Heinemann.

Qing--Hua, Song, Zhao Cheng--Zhang, Shi Yuan--Chun, Du Jing, Wang Ji--Wei, and Chen Jing. 2015. "Trade--Off Between Root Forks And Link Length Of Melica Przewalskyi On Different Aspects Of Slopes." *Chinese Journal Of Plant Ecology* 39 (6): 577--585. doi:10.17521/cjpe.2015.0055.

Quigley, Narda, Paul Tesluk, Edwin Locke, and Kathryn Bartol. 2007. "A Multilevel Investigation of the Motivational Mechanisms Underlying Knowledge Sharing and Performance." *Organization Science Journal* 18 (1): 71--88.

Racino, Julie Ann. 2002. "Community Integration and Statewide Systems Change: Qualitative Evaluation Research in Community Life and Disability." *Journal of Health & Social Policy* 14 (3): 1-25.

Ragin, Charles C. 2014. The comparative method: Moving beyond qualitative and quantitative strategies. Oakland: University of California Press.

Raid. M. Al-Adaileh Muawad S. Al-Atawi, (2011),"Organizational culture impact on knowledge exchange: Saudi Telecom context*." Journal of Knowledge Management* 15 (2): 212 - 230. http://dx.doi.org/10.1108/13673271111119664.

Redding, Gordon. 2005. "The Thick Description and Comparison of Societal Systems of Capitalism." *Journal of International Business Studies* 36 (2): 123-155. http://sfx.library.curtin.edu.au

Read, Harold. 2004. Knowledge management in the malayisan multimedia super corridor. PhD diss., University of South Australia. http://search.ror.unisa.edu.au/record/UNISA_ALMA51112391870001831

Reichardt, Charles S., and Sharon F. Rallis. 1994. "Qualitative and Quantitative Inquiries Are Not Incompatible: A Call for a New Partnership." *New Directions for Program Evaluation* 1994 (61): 85-91. doi:10.1002/ev.1670.

Remenyi, Dan, Brian Williams, Arthur Money, and Ethné Swartz. 1998. *Doing research in business and management: An introduction to process and method*. 1st ed. London: Sage Publications Ltd.

Remenyi, Dan. 1998. "Central ethical considerations for masters and doctoral research in business and management studies." *South African Journal of Business Management* 29 (3): 109.

Rempel, John K., John G. Holmes and Mark P. Zanna. 1985. "Trust in close relationships." *Journal of Personality and Social Psychology* 49 (1): 95-112.

Reychav, Iris, and Jacob Weisberg. 2010. "Paved with good intentions: Discrepancies in knowledge sharing among high--tech workers." *International Journal of Knowledge Management Studies* 4 (3): 233--248. doi:10.1504/ijkms.2010.038167.

Rhodes, Jo, Richard Hung, Peter Lok, Bella Ya-Hui Lien, and Chi-Min Wu. 2008. "Factors influencing organizational knowledge transfer: implication for corporate performance." *Journal of Knowledge Management*, 12 (3): 84--100.

Richardson, Christopher. 2013. "Knowledge--sharing through social interaction in a policy--driven industrial cluster." *Journal of Entrepreneurship and Public Policy* 2 (2): 160--177. doi:10.1108/jepp--08--2011--0010.

Rimmer, James H., David Braddock, and Beth Marks. 1995. "Health Characteristics and Behaviors of Adults with Mental Retardation Residing in Three Living Arrangements." *Research in Developmental Disabilities* 16 (6): 489--499.

Ritchie, Jane and Jane Lewis. 2003. Qualitative Research Practice. A Guide for Social Science Students and Researchers. Thousand Oaks, CA: Sage Publications.Creswell, John W. 2003. Research design: Qualitative, quantitative, and mixed method approaches. 2nd ed. Thousand Oaks, CA: SAGE Publication.

Ritvala, Tiina, and Birgit Kleymann. 2012. "Scientists As Midwives To Cluster Emergence: An Institutional Work Framework." *Industry & Innovation* 19 (6): 477--497. doi:10.1080/13662716.2012.718875.

Rivera-Vazquez, J.C., Ortiz-Fournier, L.V. and Rogelio Flores, F., 2009. Overcoming cultural barriers for innovation and knowledge sharing. *Journal of Knowledge Management*, *13*(5), pp.257-270.

Robson, Colin. 2002. Real World Research: A Resource for Social Scientists and Practitioner--Researchers, 2nd ed. Hoboken, N.J.: Wiley.

Rodriguez, Karina, and Ahmed Al--Ashaab. 2005. "Knowledge Web--Based System Architecture For Collaborative Product Development." *Computers In Industry* 56 (1): 125--140. doi:10.1016/j.compind.2004.07.004.

Rosenfeld, Stuart A. 1997. "Bringing Business Clusters into the Mainstream of Economic Development." *European Planning Studies* 5 (1): 3--23.

Rosu, Sebastian. M., George Dragoi, and Marius Guran. 2009. "A Knowledge Management Scenario To Support Knowledge Applications Development In Small And Medium Enterprises." *Advances In Electrical And Computer Engineering* 9 (1): 8--15. doi:10.4316/aece.2009.01002.

Rougier, Loic. 2008. Reach & Richness: towards a theory of knowledge sharing mechanism selection. Master's thesis. National University of Singapore. http://scholarbank.nus.edu/bitstream/handle/10635/15807/RougierL.pdf.

Royer, Susanne, and John Burgess. 2013. "Towards a better understanding of value creation in clustered firms." Paper presented at TCI Annual Global Conference, Comwell Kolding.

Ruiz, Juan Carlos. 2013. "Situating Everyday Life." *International Journal Of Social Research Methodology* 16 (6): 550--552. doi:10.1080/13645579.2013.823293.

Rulke, Diane L., and Joseph Galaskiewicz. 2000. "Distribution of knowledge, group network structure, and group performance." *Management Science* 46 (5): 612-625.

Rumizen, Melissie Clemmons. 2002. *The complete idiot's guide to knowledge management*. Madison, WI: CWL Publishing.

Ruscio, John, and Brendan Roche. 2012. "Variance Heterogeneity In Published Psychological Research." *Methodology* 8 (1): 1--11. doi:10.1027/1614--2241/a000034.

Rutten, Roel. 2004. "Inter--firm knowledge creation: A re--appreciation of embeddedness from a relational perspective." *European Planning Studies* 12 (5): 659--673. doi:10.1080/0965431042000220002.

Sachdeva, J. K. 2009. *Business Research Methodology*. Mumbai: Himalaya Pub. House.

SAGIA. "About." Copyright 2015. Accessed February 16, 2015. https://www.sagia.gov.sa/en/AboutSAGIA/Pages/default.aspx

---. "Why Saudi Arabia." Copyright 2013. Accessed February 16, 2015. https://www.sagia.gov.sa/en/WhySaudiArabia/Pages/default.aspx

Salat, Serge, and Loeiz Bourdic. 2014. "Spatial growth and urban densities in China: Trends and impacts on economic and energy efficiency." *International Journal of Sustainable Building Technology and Urban Development* 5 (2): 100--108. doi:10.1080/2093761x.2014.908813.

Samargandi, Nahla, Jan Fidrmuc, and Sugata Ghosh. 2014. "Financial Development And Economic Growth In An Oil-Rich Economy: The Case Of Saudi Arabia". Economic Modelling 43: 267-278. doi:10.1016/j.econmod.2014.07.042.

Sarirete, Akila, and Azeddine Chikh. 2010. "A Knowledge Management Process In Communities Of Practice Of Engineering Based On The SECI Model For Knowledge." *International Journal Of Web--Based Learning And Teaching Technologies* 5 (1): 27--42. doi:10.4018/jwltt.2010010103.

Saudi Arabian Monetary Agency. "Annual reports." Copyright 2016. Accessed December 2, 2015 http://www.sama.gov.sa.

Saudi Downstream Forum. "National Industrial Clusters." Copyright 2016. Accessed December 28, 2015. http://www.saudidownstream.com/sponsor/national--industrial--clusters/.

Saudi Network. "Business Center." Copyright 2015. Accessed July 13, 2015 http://www.the-saudi.net/business-center/

Saudi Vision 2030. "Home." Copyright 2016. Accessed December 16, 2015. http://vision2030.gov.sa/en

Saunders, Mark, and Paul Tosey. 2012. "The layers of research design." *Rapport: The Magazine for NLP Professionals* 30 (Winter): 58--59.

Saunders, Mark, Philip Lewis, and Adrian Thornhill. 2003. *Research Methods For Business Students*. Harlow: Prentice Hall.

Sawhney, Mohanbir and Emanuela Prandelli. 2001. "Communities of Creation: Managing Distributed Innovation in Turbulent Markets." *California management review*, 42 (4), 24-54.

Schamp, Eike W., Bernd Rentmeister, and Vivien Lo. 2004. "Dimensions of proximity in knowledge--based networks: the cases of investment banking and automobile design." *European Planning Studies* 12 (5): 607-618.

Scheel, Carlos. 2002. "Knowledge Clusters Of Technological Innovation Systems." *Journal Of Knowledge Management* 6 (4): 356--367. doi:10.1108/13673270210440866.

Seale, Clive. 1999. "Qualitative inquiry quality in qualitative research." *Qualitative Inquiry* 5 (4): 465-78. doi:10.1177/107780049900500402.

Seale, Clive. 2004. *Qualitative Research Practice*. London: SAGE.

Seely Brown, John, and Paul Duguid. 2001. "Knowledge and organization: a social--practice perspective." *Organization Science* 12 (2): 198-213.

Seetzen, Heidi. 2013. "The science of evaluation: A realist manifesto." *International Journal of Social Research Methodology* 16 (6): 547--548. doi:10.1080/13645579.2013.823286.

Sekaran, Uma and Roger Bougie. 2013. *Research methods for business: A skill--building approach*. 6th ed. United Kingdom: John Wiley & Sons Ltd.

Sekaran, Uma. 2003. *Research methods for business: A skill building approach.* 4th ed. Hoboken, NJ: John Wiley & Sons, Inc.

Sethumadhavan, R. 2007. "Importance of knowledge sharing for organisations." *The Indian MBA* (blog), Accessed October 22, 2014, http://www.indianmba.com/faculty_column/fc653/fc653.html

Shang, Hai Yang, and Fang Su. 2010. "Evaluation And Forecasting: Urban Sustainable Development Of Wuwei City In Gansu Province." *Advanced Materials Research* 113--116 (June): 343--346. doi:10.4028/www.scientific.net/amr.113--116.343.

Shayan, Fatemeh, Heather Hillsburg, and Anna Riggall. 2012. "Book Reviews." *International Journal Of Social Research Methodology* 15 (1): 81--86. doi:10.1080/13645579.2012.633813.

Shen, Weiming. 2003. "Editorial Of The Special Issue On Knowledge Sharing In Collaborative Design Environments" *Computers In Industry* 52 (1): 1--3. doi:10.1016/s0166--3615(03)00064--2.

Shneiderman, Ben, and Catherine Plaisant. 2006. "Strategies for Evaluating Information Visualization Tools: Multi--Dimensional in--Depth Long--Term Case Studies." In *Proceedings of the 2006 AVI Workshop on Beyond Time and Errors Novel Evaluation Methods for Information Visualization BELIV 06*, 54: 1--7. doi:10.1145/1168149.1168158.

Silverman, David. 2000. *Doing qualitative research: A practical handbook*. Thousand Oaks, CA: SAGE.

Sima, Qing, and Yu Bo Wang. 2011. "Research On Remanufacturing Industrial Cluster Promoting Sustainable Development Of Regional Economy" *Advanced Materials*

Research 347--353 (October): 621--626. doi:10.4028/www.scientific.net/amr.347--353.621.

Simmie, James. "The contribution of clustering to innovation: from Porter I agglomeration to Porter II export base theories." In *Handbook of Research on Innovation in Clusters*, edited by Charlie Karlsson, 19--32. Cheltenham: Edward Elgar, 2008.

Siqueira, Ivan. 2013. "Ethnic Information Literacy As Education Methodology." *Journal Of Educational And Social Research* 3 (2): 9--14. doi:10.5901/jesr.2013.v3n2p9.

Smedlung, Anssi. 2006. "The roles of intermediaries in a regional knowledge system. Journal of Intellectual Capital," *Journal of Intellectual Capital,* 7 (2), 204-220.

Smith, Claire. 2005. "Epistemological Intimacy: A Move to Autoethnography." *International Journal of Qualitative Methods* 4 (2): 68-76. doi:10.1177/0002764204271497.

Smith, Elizabeth A. 2001. "The Role of Tacit and Explicit Knowledge in the Workplace." *Journal of Knowledge Management* 5 (4): 311-321

Song, Qiang, and Ke Su. 2014. "The Research Of Market Risk Identification For Product Development And Design With The Industrial Design Innovation Promote The Economic Development Of Agricultural Machinery Manufacturing Industry." *Applied Mechanics and Materials.* 668--669 (October): 1655--1658. doi:10.4028/www.scientific.net/amm.668--669.1655.

Soule, Deborah, and Lynda M. Applegate. 2005. "Beyond Knowledge Transfer: A Typology of Knowledge Sharing Behavior in Virtual Teams." Proceedings of the European Conference on Organizational Knowledge, Learning and Capabilities, Bentley.

Sreejesh, S, Sanjay Mohapatra, and M. R Anusree. *Business Research Methods*. New York: Springer.

Stoerring, Dagmara. 2007. Emergence and growth of high technology clusters. PhD diss., Institut for Erhvervsstudier, Aalborg Universitet. http://vbn.aau.dk/en/publications/emergence--

and--growth--of--high--technology--clusters(6b70be50--15f3--11dd--91e4--000ea68e967b).html.

Stojetz, Robert J. 1978. "A Cluster Concept Approach To Curriculum Revision." *NASSP Bulletin* 62 (414): 149--152. doi:10.1177/019263657806241432.

Sureephong, Pradorn, Nopasit Chakpitak, Yacine Ouzrouty, Gilles Neuberty, and Abdelaziz Bouras. 2006. "Knowledge management system for cluster development in small and medium enterprises." Proceedings of International Conference on Software, Knowledge, Information Management and Applications (SKIMA), Chiang Mai.

Sureephong, Pradorn, Nopasit Chakpitak, Yacine Ouzrouty, Gilles Neuberty, and Abdelaziz Bouras. 2006. "Knowledge management system for cluster development in small and medium enterprises." Proceedings of International Conference on Software, Knowledge, Information Management and Applications (SKIMA), Chiang Mai.

Sureephong, Pradorn, Yacine Ouzrout, L. Buzon, and Abdelaziz Bouras. 2010. 'Knowledge Management System Enabling Collaboration In Industry Cluster'. *International Journal Of Manufacturing Research* 5 (4): 478--497. doi:10.1504/ijmr.2010.035815.

Szulanski, Gabriel, and Rossella Cappetta. 2003. "Stickiness: conceptualizing, measuring and predicting difficulties in the transfer of knowledge within organization." In *Blackwell Handbook of Organizational Learning and Knowledge Management*, edited by Mark Easterby-Smith, Marjorie A. Lyles, 513-534. Thoas Oaks: Sage.

Szulanski, Gabriel. 1996. "Exploring internal stickiness: impediments to the transfer of best practice within the firm." *Strategic Management Journal* 17 (Winter Special Issue): 27-43.

---. 2000. "The process of knowledge transfer: a diachronic analysis of stickiness." *Organizational Behavior and Human Decision Processes* 82 (1): 9-27.

Taheri, Seyed Mohsen, Amir Homayoun Sarfaraz, and Seyed Mohsen Seyed Ali Akbar. 2014. "Investigating The Effects Of Knowledge Management And Organizational Innovation

On Organizational Strategy: Evidence From Insurance Industry." *Management Science Letters* 4 (11): 2399--2406. doi:10.5267/j.msl.2014.10.008.

Tallman, Stephen, Mark Jenkins, Nick Henry and Steven Pinch. 2004. "Knowledge, Clusters, and Competitive Advantage." The Academy of Management Review 29 (2): 258--271.

Tan, Bertram, and Hsiang--chin Hung. 2006. "A Knowledge Management System Introduction Model For Small-- And Medium--Sized Enterprises." *International Journal Of Management And Enterprise Development* 3 (1--2): 53--69. doi:10.1504/ijmed.2006.008242.

Tang, Houxing. 2015. "Modelling And Simulation On Evolution Effect Of Knowledge Sharing On Industry Cluster Based On Social Network." *The Open Cybernetics & Systemics Journal* 9 (1): 1183--1188. doi:10.2174/1874110x01509011183.

Tang, W.K., N. Tang, C.D. Liao, H.J. Liang, V.C.T. Mok, G.S. Ungvari, and K.S. Wong. 2013. "Serotonin receptor 2C Gene polymorphism associated with post--stroke depression in Chinese patients." *Genetics and Molecular Research* 12 (2): 1546--1553. doi:10.4238/2013.may.13.8.

Tashakkori, Abbas, and Charles Teddlie. 1998. *Mixed methodology: Combining qualitative and quantitative approaches*. Thousand Oaks, CA: SAGE Publication.

Terre Blanche, Martin, Kevin Durkheim, and Desmond Painter. 1999. "Research Design." In *Research in Practice: Applied Methods for the Social Sciences*, 29-35. Cape Town: University of Cape Town Press.

Tewksbury, Richard. 2009. "Qualitative versus Quantitative Methods: Understanding Why Qualitative Methods Are Superior for Criminology and Criminal Justice." *Journal of Theoretical and Philosophical Criminology* 1 (1): 38-58.

The Pew Research Centre. "About." Copyright 2011. Accessed December 16, 2015. http://www.pewresearch.org/about/

Thomas, Michael L. 2012. "The Evolution Of Statistical Methodology In Longitudinal Research." *Psyccritiques* 57 (19). doi:10.1037/a0027938.

Thorpe, Richard, and Robin Holt. 2008. *The Sage Dictionary Of Qualitative Management Research*. London: Sage Publications.

Thuy, Lai Xuan and Truong Quong. 2005. "Relational capital and performance of international joint ventures in Vietnam." *Asia Pacific Business Review* 11 (3): 389-410.

Timberlake, Michael. Review of The Comparative Method: Moving beyond Qualitative and Quantitative Strategies, by Charles C. Ragin. Social Forces 67 (March 1989): 827--829.

Trading Economics. "Saudi Arabia government." Copyright 2016. Accessed December 16, 2015. http://www.tradingeconomics.com/saudi-arabia/government-budget

Trochim, William M. K. 2006. "Introduction to Validity." *The Research Methods Knowledge Base* (blog) Accessed October 22, 2014, http://www.socialresearchmethods.net/kb/introval.php

Tsai, Wenpin, and Sumantra Ghoshal. 1998. "Social capital and value creation: the role of intrafirm networks." *Academy of Management Journal* 41 (4): 464-476.

Tsoukas, Haridimos. 1996. "The firm as a distributed knowledge system: a constructionist approach." *Strategic Management Journal* 17 (Winter, Special Issue): 11-25.

Tsui, Lilly. 2006. A Handbook on Knowledge Sharing: Strategies and Recommendations for Researchers, Policymakers, and Service Providers. Alberta: Community -- University Partnership for the Study of Children, Youth, and Families.

Uprichard, Emma. 2013. "Sampling: Bridging Probability And Non--Probability Designs." *International Journal Of Social Research Methodology* 16 (1): 1--11. doi:10.1080/13645579.2011.633391.

Uzzi, Brian and James J. Gillespie. 2002. "Knowledge spillover in corporate financing networks: embeddedness and the firm's debt performance." *Strategic Management Journal* 23 (7): 595-618.

Uzzi, Brian. 1996. "The sources and consequences of embeddedness for the economic performance of organizations: the network effect." *American Sociological Review* 61 (4): 674-698.

---. 1999. "Embeddedness in the making of financial capital: how social relations and networks benefit firms seeking financing." *American Sociological Review* 64 (August): 481-505.

Vajjhala, N.R., 2013. *Cultural factors and knowledge sharing in medium-sized enterprises in Albania: A qualitative, multisite case study* (Doctoral dissertation, University of Phoenix).

van Wijk, Raymond, Justin J. P. Jansen, and Marjorie A. Lyles. 2007. "Organizational knowledge transfer: a metaanalytical review of its antecedents and outcomes," *Academy of Management Proceedings* 1 (August): 1-6.

Vargas--Hernández, José G. 2012. "Research Methodology Strategies In Strategic Management." *The JPAIR Multidisci plinary Journal* 7 (1): 165--169. doi:10.7719/jpair.v7i1.163.

Verweij, Stefan, and Chaim Noy. 2013. Review of Set--Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis, by Carsten Q. Schneider and Claudius Wagemann. International Journal Of Social Research Methodology 16 (9): 165--169. doi:10.1080/13645579.2013.762611.

Visram, Shelina. 2012. "Interpreting Interviews." *International Journal Of Social Research Methodology* 15 (6): 545--546. doi:10.1080/13645579.2012.723345.

Von Krogh, Georg, and Simon Grand. "From economic theory toward a knowledge-based theory of the firm." In *The strategic management of intellectual capital and organizational knowledge*, edited by Chun Wei Choo, Nick Bontis, 163-184. Oxford: Oxford University Press, 2002.

Vormoor, Oliver. 2002. "Large Scale Fractal Aggregates Using The Tunable Dimension Cluster-Cluster Aggregation." *Computer Physics Communications* 144 (2): 121--129. doi:10.1016/s0010--4655(02)00142--x.

Walker, Gordon, Bruce Kogut, and Weijian Shan. 1997. "Social capital, structural holes and the formation of an industry network." *Organization Science* 8 (2): 109-125

Walsham, Geoff. 1993. Interpreting information systems in organizations. Hoboken, NJ: Wiley.

---. 1995a. "The emergence of interpretivism in IS research." *Information Systems Research* 6 (4): 376-394. doi:10.1287/isre.6.4.376.

---. 1995b. "Interpretive Case--Studies in IS Research -- Nature and Method." *European Journal of Information Systems* 4 (2): 74-81. doi:10.1057/ejis.1995.9.

---. 2006. "Doing Interpretive Research." *European Journal of Information Systems* 15 (3):320--330. doi:10.1057/palgrave.ejis.3000589.

Wang, Fen. 2012. "Development Status And Competitiveness Analysis Of Automobile Industrial Cluster In Xiangyang." *Advanced Materials Research* 442 (January): 172--175. doi:10.4028/www.scientific.net/amr.442.172.

Wang, Zhongzhi, and Yongqing Zhang. 2015. "Research On Development Mechanism Of Tourism Industrial Cluster Based On The 'Three Chains' Collaboration." *International Journal of Business Administration* 6 (3): 113--120. doi:10.5430/ijba.v6n3p113.

Watson, Sharon, and Kelly Hewett. 2006. "A Multi--Theoretical Model of Knowledge Transfer in Organizations: Determinants of Knowledge Contribution and Knowledge Reuse." *Journal of Management Studies* 43 (2): 141--173.

Weathington, Bart L., Christopher J. L. Cunningham, and David J. Pittenger. 2012. *Understanding Business Research*. Hoboken, N.J.: John Wiley & Sons.

Weber, Ernst H. 1834. De Pulsu, Resorptione, Auditu et Tactu: Annotationes Anatomicae et Physiologicae... Leipzig: C.F. Koehler.

Wegner, Daniel Paula Raymond, and Ralph Erber. 1991. "Transactive memory in close relationships." *Journal of Personality and Social Psychology* 61 (6): 923-929.

Wegner, Daniel. "Transactive memory: a contemporary analysis of the group mind." In *Theories of Group Behavior*, edited by Brian Mullen and George R. Goethals, 185--205. New York, NY: SpringerVerlag, 1986.

Weick, Karl E., and Karlene H. Roberts. 1993. "Collective mind in organizations: heedful interrelating on flight decks." *Administrative Science Quarterly* 38 (3): 357--381.

Weiss, Leigh. 1999. "Collection and connection: The anatomy of knowledge sharing in professional service firms." *Organizational Decelopment Journal*, 17 (4), 61-77.

Welch, D.E. and Welch, L.S., 2008. The importance of language in international knowledge transfer. *Management International Review*, *48*(3), pp.339-360.

Wells, Denise. 2000. *Strategic Management for Senior Leaders: A Handbook for Implementation*. Arlington: Department of the Navy Total Quality Leadership.

Welman, Chris, Fanie Kruger, and Bruce Mitchell. 2005. *Research methodology*. Capetown: Oxford University Press.

Wengraf, Tom. 2001. Qualitative Research Interviewing: Biographic Narratives and Semi-structured Methods. Sage: London.

Westhuizen, Christi Van Der. 2006. *Trade and Poverty : A Case Study of the SA Clothing Industry*. Cape Town: The Southern Africa Labour and Development Research Unit.

Whiddett, D., Tretiakov, A. and Hunter, I., 2012. The use of information technologies for knowledge sharing by secondary healthcare organisations in New Zealand. *International journal of medical informatics*, *81*(7), pp.500-506.

Wickham, Mark. 2005. Regional economic development: exploring the 'Role of Government' in Porter's Industrial Cluster Theory. Paper presented at CRIC Cluster Conference, Ballarat Victoria.

Wildemuth, Barbara M. 2009. Applications Of Social Research Methods To Questions In Information And Library Science. Westport: Libraries Unlimited.

Williams, Malcolm, and Paul W. Vogt. 2011. *The SAGE Handbook Of Innovation In Social Research Methods*. Los Angeles: SAGE.

Willig, Carla, and Wendy Stainton Rogers. 2008. *The SAGE Handbook Of Qualitative Research In Psychology*. Los Angeles: SAGE Publications.

Willis, Brian E. 1995. "APM Project--Management Body of Knowledge: The European View." *International Journal of Project Management* 13 (2): 95--98. doi:10.1016/0263--7863(95)00006--C.

Wilson, Rodney. 2008. "The Political Economy Of Saudi Arabia". Middle Eastern Studies 44 (4): 637-639. doi:10.1080/00263200802080836

Woerter, Martin. 2011. "Technology Proximity Between Firms And Universities And Technology Transfer' "*The Journal of Technology Transfer* 37 (6): 828--866. doi:10.1007/s10961--011--9207--x.

Wolff, Gary. 2006. "Beyond Payback: A Comparison Of Financial Methods For Investments In Green Building." *Journal Of Green Building* 1 (1): 80--91. doi:10.3992/jgb.1.1.80.

Wong, Stanley Kam Sing. 2012. "Environmental Requirements, Knowledge Sharing And Green Innovation: Empirical Evidence From The Electronics Industry In China." *Business Strategy And The Environment* 22 (5): 321--338. doi:10.1002/bse.1746.

World Bank. 2009. *World Development Report*. Washington: World Bank.

---. 2010. *Economic Integration in the GCC*. Washington: World Bank.

---. 2012. *Knowledge Assessment Methodology*. Washington: World Bank.

World Trade Organization. "Saudi Arabia – Accessions." Copyright 2016. Accessed December 16, 2015. https://www.wto.org/english/thewto_e/acc_e/a1_arabie_saoudite_e.htm

Wu, Susie R., and Defne Apul. 2015. "Framework for integrating indoor air quality impacts into life cycle assessments of buildings and building related products." *Journal Of Green Building* 10 (1): 127--149. doi:10.3992/jgb.10.1.127.

Wu, Xiaobo, Zhigang Gu, and Wei Sang. 2008. "The construction of innovation networks and the development of technological capabilities of industrial clusters in China." *International Journal of Innovation and Technology Management* 5 (2): 179--199. doi:10.1142/s0219877008001321.

Xu, Anfeng, and Yuhua Li. 2011. "The Evaluation For Competitiveness Of High--Techology Zone On Creative Industrial Cluster With Uncertain Linguistic Information." *International Journal Of Advancements In Computing Technology* 3 (5): 243--248. doi:10.4156/ijact.vol3.issue5.28.

Xu, Dongbei, and Jianmin Wang. 2015. "Strategic emerging industries in China: Literature review and research prospect." *American Journal of Industrial and Business Management* 5 (7): 486--506. doi:10.4236/ajibm.2015.57049.

Yamamoto, Kenji. 2006. "The Industrial Cluster Plan Of The Japanese Government And The Realities Of Regional Economies In Japan." *Raumforsch.Raumordn.* 64 (1): 28--40. doi:10.1007/bf03183104.

Yan, Xiao Min. 2013. "Finance mechanism of industrial risk preventing based on knowledge sharing: A dissipative theory perspective." *Applied Mechanics and Materials* 409--410 (September): 1515--1523. doi:10.4028/www.scientific.net/amm.409--410.1515.

Yavas, Ugur. 1997. "Management Know-How Transfer To Saudi Arabia: A Survey Of Saudi Managers". *Industrial Management & Data Systems* 97 (7): 280-286. doi:10.1108/02635579710192959.

Yeo, Roland K. and Jeff Gold. 2014. "Knowledge sharing attitude and behaviour in Saudi Arabian organisations: why trust matters." *International Journal of Human Resource Development and Management* 14 (1--3): 97-118.
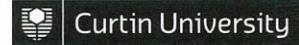
Yeo, Roland K. and Michael J. Marquardt. 2013. "To share or not to share: self-perception and knowledge sharing intent." *Knowledge Management Research and Practice*, 13 (3): 311-328.

Yin, Robert K. 2003. "Designing Case Studies." In *Case Study Research: Design and Methods,* 19-56. Thousand Oaks, CA: SAGE Publication.

---. 2009. "Case Study Research: Design and Methods." *Essential guide to qualitative methods in organizational research* 5 (5): 219--219. doi:10.1097/FCH.0b013e31822dda9e.

---. 2013. "Designing Case Studies." In *Case Study Research: Design and Methods*, 19-56. Thousand Oaks, CA: SAGE Publication.

---. 2014. *Case study research: Design and methods*. SAGE Publications. USA.

Yokakul, Nattaka, Girma Zawdie, and Peter Booth. 2010. "The role of social capital, knowledge exchange and the growth of indigenous knowledge--based industry in the Triple Helix system: The case of SMEs in Thailand." Proceedings Papers of the Triple Helix IX Conference, Stanford University.

Yuan, Connie Y., Janet Fulk, and Peter R. Monge. 2007. "Access to information in conncective and communal transactive memory systems." *Communication Research* 34 (2): 131-154.

Yuan, Y. Connie, Janet Fulk, and Peter R. Monge. 2005. "Social capital and transactive memory systems in work groups: a multilevel approach." *Academy of Management Proceedings* 1 (August): C1-C6.

Yusuf, Shahid. "Can Clusters be Made to Order?" In: *Growing Industrial Clusters in Asia: Serendipity and Science*, edited by Shahid Yusuf, Kaoru Nabeshima, and Shoichi Yamashita, 1--37. Washington: The World Bank, Washington DC, 2008.

Zanutto, Alberto. 2013. "Handbook Of Constructionist Research." *International Journal Of Social Research Methodology* 16 (1): 87--89. doi:10.1080/13645579.2013.755374.

Zeller, Christian. 2004. "North Atlantic innovative relations of Swiss pharmaceuticals and the proximities with regional biotech arenas." *Economic Geography* 80 (1): 83-111.

Zhang, Yanli, Yawei Wang, William Colucci, and Zhongxian Wang. 2011. "The paradigm shift in organizational research." *International Journal of Knowledge--Based Organizations* 1 (2): 57--70.

Zhu, Lijun, Chen Shi, and Jianfeng Guo. 2014. "Mapping Discovery Modeling And Its Empirical Research For The Scientific And Technological Knowledge Concept In Unified Concept Space." *Cluster Computing* 18 (1): 103--112. doi:10.1007/s10586--013--0339--7.

Zucker, Lynne G. "The production of trust: institutional sources of economic structure 1840-1920." *Research in Organisational Behaviour*, edited by Barry Staw and Larry L. Cummings, 53-111. Boulder, CO: JAI Press, 1987.

Zuhur, Sherifa. 2011. Saudi Arabia. 1st ed. Santa Barbara, Calif.: ABC-CLIO.

Zwick, Rami, and Amnon Rapoport. 2002. *Experimental Business Research*. Boston: Kluwer Academic Publishers.

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Appendixes

Appendix A: Ethical Approval form

Curtin University

Memorandum

Office of Research and Development

Human Research Ethics Committee

To	Ms Aliah Mohammed Zafer, PhD Student ID# 14520550, School of Management, CBS
From	Tonia Geneste, Research Officer, School of Management, CBS
Subject	Protocol Approval **SOM-17-13**
Date	20 November 2013
Copy	Prof Fuming Jiang, Deputy Head of School and HDR and Ethics Co-ordinator, School of Management, CBS
	Prof Julia Connell and Prof John Burgess, Supervisors, CBS
	BCC: Ethics Reviewer, School of Management, CBS

Telephone   9266 2784
Facsimile   9266 3793
Email   hrec@curtin.edu.au

Thank you for your "Form C Application for Approval of Research with Low Risk (Ethical Requirements)" for the project titled *"The Role of Industry Clusters in Promoting Competitive Advantage: An Investigation of Knowledge Sharing in Selected Saudi Arabia Based Cluster"*.

On behalf of the Human Research Ethics Committee, I am authorised to inform you that the project is approved.

Approval of this project is for a period of four years (20 November 2013 to 20 November 2017).

Your approval has the following conditions:

(i)   Annual progress reports on the project must be submitted to the Ethics Office.

(ii)   It is your responsibility, as the researcher, to meet the conditions outlined above and to retain the necessary records demonstrating that these have been completed.

The approval number for your project is **SOM-17-13.** Please quote this number in any future correspondence. If at any time during the approval term changes/amendments occur, or if a serious or unexpected adverse event occurs, please advise your supervisor(s) and myself immediately.

Regards

Tonia Geneste
Research Officer
Tel: 9266 7729
T.Geneste@curtin.edu.au

Please Note: The following standard statement must be included in the information sheet to participants:

This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number SOM-17-13). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.

Appendix B: Interview Questions

*Semi-structured interviews – illustrations of the questions to be asked – it is expected that these questions will generate discussion on knowledge sharing processes.

1.1 Facilitators Questions

During the introductory stage of the city, what are some of the key government roles positively influenced the SAM cluster's development?

What benefits have you gained from being physically here in SAM cluster?

How does the government support the clusters?

What are the governmental factors effects upon member relationships within the cluster?

Could you describe the governmental aspects of the developments of the clusters and why? (i.e. what was the facilitator for its formation?)

In your view, is there sufficient connection between you as a government's facilitator and clusters? Please explain how it works and the benefits received.

How do you encourage cluster's members to share knowledge within cluster regarding your regulations?

Is there anything else you would like to add with the regard to facilitation of knowledge sharing in clusters? For example, would you like to see knowledge sharing encouraged in a different way by the cluster?

What are the specific mechanisms that you use to share knowledge i.e. (emails, formal and informal meetings etc.)? and does knowledge sharing typically occur one-on-one or with larger groups?

How do you encourage your staff to share knowledge within/outside the ECA?

Are you reliant on key clients in the clusters? Local, regional, international markets – how important are they to the clusters?

What do you consider are the main barriers for the governmental role?

1.2 University Questions

*Semi-structured interviews – illustrations of the questions to be asked – it is expected that these questions will generate discussion on knowledge sharing processes.

Research Issue 1: What is the role of industry clusters in facilitating knowledge sharing (Role of training, consultants, in accessing information)?

What do you think assist you in facilitating the collaborations with SAM cluster?

How do you encourage cluster's members to share knowledge within clusters?

How do people meet to arrange collaborations between the horizontal actors and the university?

Is there anything else you would like to add with the regard to facilitation of collaborations? For example, would you like to see collaborations encouraged in a different way by the cluster?

Have you developed more formalised relationships with SAM cluster? If so can you explain?

What benefits have you gained from collaborating with SAM cluster so far?

Research Issue 2: What is the role of government within industry clusters?

How does the government support the collaboration and which government agencies provided support?

What is the effect upon member relationships by external factors?

(i.e. such as governments and environmental factors?)

Could you describe how the relationships developed and why?

(i.e. what was the facilitator for its collaboration including governmental aspects?).

In your view, is there sufficient connection between you and SAM cluster? Please explain how it works and the benefits received.

Research Issue 3: What are the key factors facilitating knowledge sharing between organisations within the cluster and how is knowledge being accessed and protected within organisations/cluster?

What types of knowledge do organisations/cluster are willing to share?

What has been the result of the collaborations within clusters in your experience so far?

What are the specific mechanisms that the university uses to develop collaborations i.e. (emails, formal and informal meetings etc.)?

Do collaborations arrangements typically occur one-on-one or with larger groups?

How do you go about learning from SAM cluster, regard to: Formal mechanisms – training (in house, external); role of research and development; consultants

Informal mechanisms– meetings; social events

Research Issue 4: How does being a cluster member contribute to growth and development)?

How do you communicate your businesses capabilities and competencies?

How does collaboration assist in increasing your overall business performance within the university / with other clusters' actors?

What is the main influence on collaboration?

Research Issue 5: What are the facilitators / barriers of knowledge sharing? Or (What is the role of R&D)?

What are some of the outcomes of collaboration?

What do you consider are the main barriers that could minimise the collaboration?

1.3 Vertical actors Questions

*Semi-structured interviews – illustrations of the questions to be asked – it is expected that these questions will generate discussion on knowledge sharing processes.

What benefits have you gained from being physically here in the cluster?

How does the V firm/Seaport support the cluster's firm?

In your view, is there sufficient connection between you as the Vfirm/port represents and cluster's actors? Please explain how it works and the benefits received.

How do cluster's members share knowledge regarding your services?

Is there anything else you would like to add with the regard to facilitation of knowledge sharing in clusters? For example, would you like to see knowledge sharing encouraged in a different way by the cluster facilitators?

What are the specific mechanisms that you use to share knowledge with firms i.e. (emails, formal and informal meetings etc.)? and does knowledge sharing typically occur one-on-one or with larger groups?

How do you encourage your staff to share knowledge within/outside the Vfirm,Seaport?

Are you reliant on key clients in the clusters? Local, regional, international markets – how important are they to the clusters?

What do you consider are the main barriers for sharing knowledge with clusters' actors?

1.4 Firms (Horizontal actors) Questions

What do you think assist you in facilitating firm's collaborations?

How do you encourage cluster's members to share knowledge within clusters?

How do people meet within the cluster and determine whether they would like to work together?

Is there anything else you would like to add with the regard to facilitation of knowledge sharing in clusters? For example, would you like to see knowledge sharing encouraged in a different way by the cluster?

Interviews with participants of firm's members (CEO/Manager(s) and Supervisors)

Have you developed more formalised relationships with other clusters members? If so can you explain?

What benefits have you gained from being a member of cluster?

Research Issue 2: What is the role of government within industry clusters?

Interview with industry clusters participants (CEO/Manager, Director of Partner Relations and Clusters facilitators)

How does the government support the cluster and which government agencies provided support?

What is the effect upon member relationships by external factors?

(i.e. such as governments and environmental factors?)

Could you describe how the cluster developed and why?

(i.e. what was the facilitator for its formation including governmental aspects?).

In your view, is there sufficient connection between government's facilitator and clusters? Please explain how it works and the benefits received.

Research Issue 3: What are the key factors facilitating knowledge sharing between organisations within the cluster and how is knowledge being accessed and protected within organisations/cluster? What types of knowledge do organisations/cluster are willing to share?

Appendix C: Thematic Analysis Using Nvivo

| FILE | HOME | CREATE | DATA | ANALYZE | QUERY | EXPLORE | LAYOUT | VIEW |

Nodes

- Nodes
- Cases
- Relationships
- Node Matrices

Nodes

Name	Sources	References
Barriers to web-level Knowledge Sharing in the S	0	0
Cost of research and development	1	1
Intellectual property concerns	1	5
Lack of commitment among participants	1	2
Rigidity of laws and regulations	1	2
Factors Influencing Knowledge Flows in the Clust	0	0
Absorptive capacity	1	5
Accessibility	1	2
Inter-Organisational Trust	1	3
Knowledge of expertise location	1	4
Knowledge sharing through the ICP to the SA	1	4
Social Capital	1	4
Forms of web-level knowledge sharing in the SA	0	0
Explicit knowledge	1	4
Tacit knowledge	1	3
Knowledge sharing mechanisms	0	0
Formal mechanisms	1	11
Informal mechanisms	1	7
Mechanisms of knowledge sharing at firm level	0	0
Formal knowledge sharing at firm level	1	5
Informal knowledge sharing at firm level	1	3

- Sources
- **Nodes**
- Classifications
- Collections
- Queries
- Reports

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Appendix D: Sources of Documents Analysis

Annual Report of SAM Cluster 2014

Board of director reports 2013

CU Cluster Brochure 2013

CU Newsletter 2013

CU fact sheet 2013

CU official Facebook page 2013

Economic City fact sheet 2013

ED - Investor Relations Presentation 2014, 2013

Exhibit A Official Website (Accessed September 13)

Exhibit B Official Website (Accessed November 13)

Exhibit C Official Website (Accessed November 13)

HMF2 Company Profile

HMF4 Company Profile

HMF5 Company Profile

HMF6 minute of meetings 2013

HMF1 Official Website 2013 (Accessed August 14)

HMF3 Official websites 2013(Accessed August 14)

HMF6 Official websites (Accessed August 14)

SAM Cluster Newsletter (2013).

SAM Cluster Brochure (2012).

SAM cluster quarterly magazines (2012, 2016).

V2 Company profile (2013).