THE INFLUENCE OF SOCIO-TECHNICAL FACTORS ON KNOWLEDGE-SHARING TOWARDS INNOVATION IN SAUDI ARABIA: A KNOWLEDGE-BASED INNOVATION CAPABILITY PROSPECTIVE

A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF

DOCTOR OF PHILOSOPHY

BY

FAHAD ASAAD AL. OTHMAN
Bachelor of Computer Systems Engineering, Master of Information Technology

FACULTY OF ENGINEERING AND INFORMATION

TECHNOLOGY

UNIVERSITY OF TECHNOLOGY, SYDNEY

CITY CAMPUS

PhD Thesis 2014

This thesis is dedicated to my mother and my father, my wife, and my children

CERTIFICATE OF ORIGINAL AUTHORSHIP

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Signature of Student:

Production Note:
Signature removed prior to publication.

Date: 14//08/2014

Acknowledgement

First, and foremost, I would like to thank you Allah for everything you have bestowed upon me.
Sincere thanks go to my wife Hana and my children Lujin, Asaad and Abdulellah for their motivation, patience, and for sharing this journey with me. Also, I am very thankful to my beloved mother, father, brothers, sisters, father-in-law, and mother-in-law (may Allah bless his soul) for their continuous prayers and encouragement.

I am very grateful to my principle supervisor Prof. Igor Hawryszkiewycz for having been such a supportive supervisor. Right from the beginning, Prof Igor has been very enthusiastic, energetic and consistent in providing me guidance, encouragement, and unlimited mentoring support. I have been very fortunate to have him as my supervisor. I am also grateful for the generous support of my co-supervisor Dr. Kyeong Kang, who has provided me with invaluable knowledge and suggestions since the first day I met her and continuously throughout the course of my study. Both supervisors have always been my role models.

I would like to thank (HRH) Prince Khalid Bin Sultan AL-SAUD for his infinite support since I started my journey in Australia. A very special thanks to Dr. Yousef Seraj (King Saud University).

I would like to thank Eng. Ahmed Badhris, my friend since childhood who helped me to continue my studies here in Australia, Eng. Mohammed Abbad, Dr. Hassan Alhazmi (MOHE) and Dr. Mohammed Alnatheer (KACST), Eng. Abdullah Alsaab, Eng. Sultan Alsunaid, , Eng. Ahmed Alkhiari (YASSER), Mohammed Alattas, Osama Sohaib, Dr Moammed Khursheed (KACST), Dr.Amnah Abu Hajar for their invaluable comments and suggestions during the early stages of my study and help in the analysis of my survey questionnaire as well as Eng. Kusai Kaddura and Omar Besiso. Many thanks are also due to all the individuals and their respective organisations who willingly participated in the questionnaire surveys. Also I would like to thank to Belinda Glynn for providing editorial services, which included proofreading and advice on presentation and use of clear language.

The Ministry of Higher Education and Saudi Cultural Mission have provided the opportunity and support that enabled me to continue this degree. Last but not least, I would like to thank all of those friends who accompanied me on the PhD journey and who were there when I needed them.

Abstract

The Saudi Arabian Government has recognised the need for an alternative path to national development in the form of a knowledge-based economy (KBE). So that they can achieve this aim, it is important to understand the socio-technical enablers (STE) of a KBE initiative, particularly with regards to the phenomenon of knowledge-sharing. One of the key drivers of a knowledge-based economy KBE is innovation. A must-have core competency for the adopting organisation is the ability to manage their innovation capability.

A conceptual model developed in the thesis to investigate what is required to achieve that organisational innovation capability contains four construct domains: socio-technical enablers (STEF); diffusion of innovation (DOI) dimensions; knowledge-sharing processes (KSP); and organisational innovation capability (OIC). This thesis demonstrates the extent to which STE combine with the dimensions of the DOI to result in processes of knowledge-sharing. Ultimately, successful OIC will depend on the interrelation of these factors.

This empirical research study was conducted to provide a better understanding on the model interrelationships among the key constructs: knowledge-sharing, socio-technical factors, DOI adoption characteristics, KSP and OIC, within the Saudi Arabian organisational context. The key participants for this study are both managers and employees. Participants were selected from different levels in the organisation because it is very important to understand the current knowledge sharing processes underpinning innovation across the different layers and structures in the organisation. Moreover, including employees from both different levels relates to both top-down and bottom-up decision-making processes in Saudi organisations. As a result, the main objective of this study was to develop a research model that depicts the relationships between the enablers, processes and outcome constructs in Saudi Arabian firms.

To empirically validate the conceptual model, this research study deployed a sequential mixed method that incorporated both quantitative and qualitative approaches of analysis. Phase one of the research study employed a quantitative method to develop the conceptual model, based on the collected data from a questionnaire targeting Saudi Arabian firms from different sectors and industries. The quantitative method used

Exploratory Factor Analysis (EFA), a Confirmatory Factor Analysis (CFA), and Structural Equation Modelling (SEM). EFA and CFA were carried out to find the suitable model structures and then SEM and correlation analysis were performed to assess and refine the conceptual model by evaluating the relationships and test the hypotheses between the constructs.

The results reveal three statistically significant relationships:

> STF→ KSP→ OIC, which shaped an essential part of the final empirical model as the relationships among the Enablers → Processes → Outcomes.

Based on the phase one results, a qualitative research method was carried out as a second phase of the analysis phase, which supports the validity of the structural and measurement final model. Thus, explanatory case studies were conducted of six different Saudi Arabian organisations using semi-structured, face-to-face interviews with key personnel within the firms. The purpose out of this phase was to discover whether the empirical model can be validated by a sequential qualitative data collected from certain organisational work settings. This phase was accomplished through a technique called pattern matching, where the patterns of relationships between the constructs depicted in the empirical model was compared with those identified from the case studies.

The case studies all demonstrated overall good matches between the patterns of relationships uncovered from the case studies and the relationships hypothesised in the empirical model. These findings provided support for the validity of the research model in terms of representing the current phenomena of this research study. From these empirical findings, the study is able to offer a number of implications that are beneficial to Saudi Arabia's initiative towards adoption of KBE seeking to enhance the Saudi organisations to enable knowledge-sharing and enrich the company's OIC. Finally, future research directions were identified to extend the final results of the current research study.

Table of Contents

List of Figures

List of Tables

Glossary		
Abbreviation	Description	Definition
CFA	Confirmatory Factor Analysis	A type of factor analysis used in social research to test whether measures of a factor (or construct) are consistent with a researcher's understanding of the nature of that construct
DOI	Diffusion of Innovation	A theory developed by E.M. Rogers (1962) to explain the spread (diffusion) of an idea or product over time through a specific population or social system
EFA	Exploratory Factor Analysis	A technique in factor analysis where a statistical method is used to expose the structure underpinning a large set of variables
HRM	Human Resources Management	A mode of management that focuses primarily on employees and their importance to organisational outcomes
ICT	Information Communication Technology	Communication and telecommunication systems used to retrieve, store, transmit, and manipulate information
IS	Information Systems	A system comprising people and computers that processes or interprets information
IT	Information Technology	Computers and telecommunications systems for storing, retrieving, and sending information
KBE	Knowledge-based economy	An economic system based on the consumption and production of intellectual capital (knowledge)
KSP	Knowledge-sharing processes	The process of exchanging knowledge in the form of skills, experience, and/or understanding among a individuals with a common purpose
NIE	National Innovation Ecosystem	The economic dynamics of the relationship between individuals or organisations whose goal is to facilitate technology development and innovation
OIC	Organisational Innovation Capability	The capabilities of the organisation to deliver superior value to its customers through innovation
R&D	Research and Development	Industry /organisational initiatives to support innovation and the improvement and/or introduction of products and services
STF	Socio-technical enablers	Social systems combined with information technology support to support knowledge sharing
SEM	Structural Equation Modelling	The term used to refer to two computer based statistical fit software packages: PLS-PA and LISREL/AMOS
TPB	Theory of Planned Behaviour	A theory proposed by Icek Ajzen to explore the relationship between beliefs and behaviour
TMS	Top Management Support	The degree to which the top management support the organisational climate of knowledge-sharing by providing sufficient resources and influencing the employee willingness to share knowledge

1. Chapter 1
Introduction

1.1 Research Background

Innovation has been defined in many ways to refer to new goods, services, precludes, processes and organisational applications (Darroch & McNaughton, 2002). However, regardless of what definition is used, innovation is generally viewed positively because of its association with the creation of value for firms and individuals (Brown, Fazzari & Petersen, 2009). The theory of the firm (Coase, 1937) posits that firms are composed because of the expectation from the forming individuals that the company will increase the return on their investment. As such, stakeholders associate an increase in the innovativeness of firms with an increase in their potential rate of return (Coase, 1937).

Governments have a key role in increasing the ability of innovation for both private and public companies (Ellin, 1981). This is due to the perception that innovation not only enriches firms but also has a positive economic return for the host state (Ellin, 1981). The Kingdom of Saudi Arabia is one state whose government has identified that increasing innovation is required in order to meet the strategic economic goals of the government (Alothman & Busch, 2009). Saudi Arabia's participation in the World Trade Organisation is a clear indication that it wishes to be a major participant to the global economies. It can only occur if it is supported by careful policies constructed on the basis of access to information about how other countries engaged in similar processes of change. Other countries will mostly have developed a knowledge-based economy (KBE) from a far more balanced and strong foundation in terms of social, technological and economic development than exists in Saudi Arabia. Saudi Arabia should examine the successes and failures that other countries experienced in their transition to a knowledge base. However, research specifically oriented to the problems of Saudi Arabia is also a precondition for success in restructuring Saudi Arabia to compete internationally.

One of the factors that have been positively associated with innovation is knowledge (Darroch & McNaughton, 2002). Knowledge can be simply defined as information that enables action to be taken (Alavi & Leidner, 2001). Although there are other

definitions, this definition is sufficient for the purpose of understanding knowledge and attempting to develop tools that increase the level of knowledge within a firm or a society. Knowledge has been shown to evolve in a cyclical fashion (Boisot & Griffiths 1999) and can be the result of interaction between agents (e.g. individuals or firms) (Preece et al., 2001). Thus, the interaction of agent-specific knowledge cycles may be influential in the development of knowledge within a society.

The government of Saudi Arabia associates the development of a knowledge economy with increasing innovative output from that society (Alothman & Busch, 2009). Although knowledge has been studied at the inter-firm (Rivkin, 2001) and intra-firm levels (Grant, 1996), the association of the level of knowledge in the wider community with the innovativeness of firms is not clear. It may be posited that a society with a higher level of knowledge will be more innovative than a society with a lower level of knowledge (Evangelista, Sandven, Sirilli & Smith, 1998); however, it is not clear how knowledge within a society contributes to increasing innovation by firms that exist as part of that society. Specifically, it is not clear how the knowledge cycles of individuals within a society interact in order to positively influence the innovative output of firms and individuals within that society.

This research will address the existing gap in the knowledge by studying the interaction of individual and firm knowledge cycles within a society in order to determine how that interaction influences innovation. This study investigates the critical factors associated with knowledge-sharing and innovation. The focus of this research is the social and technical factors critical to knowledge-sharing, knowledge-sharing processes (KSP) and organisational innovation capability (OIC) and how these influence Saudi Arabia's efforts to develop a knowledge-based innovative economy. This thesis examines organisational settings as a part of an innovation framework that is working towards a KBE initiative.

1.2 Statement of Research Problem

Successful and sustainable innovation is difficult to achieve for many organisations. Innovation is as one of the key pillars of KBE. It is defined as the adoption of a system, policy, program, device, process, product or service that is new to the adopting organisation. In an increasingly competitive global environment, firms turn to innovations to increase their market exposure and revenue-earning potential. However,

the stakes are high (Scantlebury & Lawton, 2007), because while success in innovation may lead to greater revenues, profits and market shares (Hurley, Hult & Knight, 2003), mistakes can lead to the complete breakdown of a firm's carefully crafted business strategy (Cozijnsen, Vrakking, & van Ijzerloo, 2000). It is therefore imperative that firms develop the capability to innovate at a fast rate and at a sustainable level (Fruhling & Siau, 2007). Furthermore, despite the benefits innovation can provide, many organisations find successful and sustainable innovation difficult to achieve. A must-have core competency for the adopting organisation is the ability to manage the innovation capability. Firms are increasingly investing more resources on research and development (R&D), yet studies have shown that investment by itself does not guarantee the development of OIC and knowledge-sharing, much less the improvement of organisational performance (Wolff, 2007). In particular, organisations' investment commitment to innovation may not produce valuable outcomes unless the leaders know how external and internal factors relate to firms' innovation capability (Drake et al., 2006).

1.3 Purpose of the Study

The purpose of this study is to investigate how the influence of socio-technical factors on knowledge-sharing can support or limit the innovation capability of an organisation, in particular in Saudi Arabian organisations. Innovation is the application of resources to create and deliver value for the enterprise and the customers by developing, improving and commercialising new and existing products, services and processes (Salvendy 1992; PricewaterhouseCoopers, 2012). This research is a multi-site case study of Saudi Arabian organisations that examines the influence of the socio-technical factors of knowledge-sharing on innovation. By studying the relationships between knowledge-sharing's critical factors, processes and OIC, this research investigates how Saudi Arabian organisations can promote a knowledge-sharing environment that will sustain their innovation capabilities. The study focuses on the influence of knowledge-sharing factors from a socio-technical perspective, using a DOI framework to examine staff preferences about KSP with the aim of sustaining OIC in the context of organisations in Saudi Arabia.

1.4 Research Objectives

Having identified the above knowledge gaps and research demands, this study was conducted with the following objectives:

- To identify the critical socio-technical factors of innovation;
- To examine the selected dimensions of the DOI theory by Rogers (2003) that were used in this research as the applicable theoretical background in examining with the developed socio-technical factors, constructs which constitute knowledge-sharing to enrich innovation capability within Saudi Arabian firms and to examine the relationships between them;
- To empirically examine the influence of socio-technical factors and DOI constructs as enablers in the processes of knowledge-sharing in Saudi firms;
- To empirically examine the influence of the outcomes of KSP on the innovation capability of Saudi firms;
- To develop an empirically-tested model that encapsulates the above identified constructs and the uncovered relationships between them, which can be then used to depict the mechanisms of enhancing innovation and business performance towards the knowledge economy through fostering the innovation capability of Saudi firms;
- To validate the developed model using a qualitative approach by doing case studies of selected Saudi firms; and
- To contribute knowledge to the research area of innovation management within the Saudi context and to provide practical information to Saudi firms about achieving improved knowledge-based innovation.

1.5 Research Questions

The following research questions have been formulated to address the research gaps related to the current study.

RQ1: How do socio-technical factors influence knowledge-sharing in Saudi Arabian organisations?

a. To what extent do socio-technical factors influence knowledge-sharing in Saudi Arabian organisations?

b. Do socio-technical factors influence, support or limit organisational innovation capability in Saudi Arabian organisations?

RQ2: In what way and to what extent do the affected knowledge-sharing processes influence Saudi Arabian organisational innovation capability?

1.6 Significance of the Study

The government of Saudi Arabia has developed a plan to transition from a natural resources economy to a KBE (Alothman & Busch, 2009). The three supporting pillars of a KBE are the socio-technical imperative, knowledge-sharing and an OIC. Socio-technical factors or enablers support the ability to share knowledge and increase the ability to share knowledge, in large measure through top management support (TMS), information systems (IS) infrastructure, interpersonal trust and the presence of a reward system. DOI is the theoretical framework adopted in this research and it relates to the effectiveness of sharing knowledge. The processes of donating and collecting knowledge are also key elements in a move towards OIC.

Previous studies have indicated that the successful adoption of innovation often needs enabled KSP that can enrich innovation capability. This thesis argues that a combination of contextual factors or enablers (e.g., social and technological) and various innovation characteristics has the potential to influence an organisation's intention to share knowledge towards innovation. This research introduces a conceptual model featuring four unique constructs, with each construct representing a single theoretical variable of interest. No existing research has examined these relationship practices in the different industries and sectors in a developing country like Saudi Arabia. This study will provide significant data and background information to address the current gap in the knowledge.

Practical recommendations will be provided in line the preferences of staff and their organisations. The recommendations will also assist in the more effective use of enabled KSP to facilitate innovation in Saudi Arabian organisations

1.7 Scope

The case studies examined in this study are limited to Saudi Arabian firms. The primary reason for choosing Saudi Arabia was the convenience of working with a broad

population of firms from different sectors and industries who have addressed the need to change to a knowledge-based system. The study was conducted within the following confines:

- The study was limited to the context of Saudi Arabian organisations (the terms 'organisation' and 'firm' are used interchangeably throughout the thesis);
- The study examined selected STF and used the dimension of DOI theory as the applicable theoretical background in examining socio-technical factors influencing KSP towards innovation capability;
- The study emphasised the examination of organisational-level factors; therefore, it did not take into account any of the external national (country level) factors; and
- The study focused only Saudi Arabian employees' perspectives of the enabled knowledge-based innovation.

1.8 Research Plan

1.8.1 Knowledge Compilation and Research Problems

A literature review is an ongoing process that continues throughout the research's life cycle. A basic literature review has been conducted in this research. However, any updated information that can sharpen the direction of this research in the future in the following areas should be considered:

- Knowledge and knowledge management
- Knowledge-sharing and its processes
- Knowledge-sharing enablers and critical factors
- Innovation, creativity and innovation capability
- Saudi Arabia and its national systems
- The innovation ecosystem of Saudi Arabia and social systems
- The organisational settings of Saudi Arabia

This stage was concerned with clearly defining the research borders in order to investigate the influence of influence of four socio–technical factors (TMS, interpersonal trust, organisational rewards system and IS infrastructure) on knowledge-sharing process and OIC. Validated models of some countries who have focused on

developing their organisational systems concerning KSP and OIC were also examined in relation to Saudi Arabia.

Once the literature review was completed, it was clear that there were gaps in the knowledge and, specifically, that no scholar had attempted a research stream that addresses knowledge-sharing and diffisuion of innovation in Saudi Arabian organisations working toward the KBE intiative.

1.8.2 The Development of the Research's Theoretical Model

After the literature review discovered a gap in the knowledge, a hypothesis was developed and research questions devised. The second stage involved developing a model that could investigate the research questions. To do this, a conceptual model was proposed (see Figure 1-1). The interrelationship among the constructs was the basis of developing the hypotheses were used in the development of the model's questionnaire. The details of the constructs and their relationships are discussed extensively in Chapter 3.

1.8.3 Development of Questionnaire and Pilot Study

A questionnaire instrument was developed as an approach or strategy for conducting research that involves a quantitative empirical investigation. An evaluation of each item on the survey questionnaire based on its relevancy and consistency with each definition in the model was also included. After the initial questionnaire study was completed, a pilot study was conducted in particular organisations in Saudi Arabia in order to refine the approach and techniques of the research model. The aim of this stage is to design a framework that can be implemented later in other organisations in Saudi Arabia.

The final survey was constructed after the outcomes of the survey instrument were evaluated. A survey can elicit detailed information not forthcoming from the pilot study. The details of the pilot study are discussed in Chapter 3.

1.8.4 Data Collection

After the survey was designed, the participants were carefully selected based on determining organisations that were able to contribute to a KBE intitive in Saudi Arabia, for example universities, public organisations, private IT companies, research centres and consulting firms. The results of the different sectors and the industries is

discussed in detail in Chapter 4. Once the required number of participants had agreed to take part in the study, the addresses of the participants was determined. The participants were notified that the survey had been sent and it was distributed as a hard copy to their physical address. Since the researcher was based at an Australian university and this research was conducted in Saudi Arabia, it was important there was enough time allowed for each participant to complete the survey and return it. Therefore, the research used a Saudi Arabian address and supplied a local postage paid envelope so that the participants could easily drop the survey into local mailbox. The survey could also be pysically collected by the researcher from the organisation's public relations office.

1.8.5 Data Analysis

After receiving the returned questionnaires and organising them into specific folders based on the industry and the sector that the surveyed individual beloings in, the surveys were stored in hard boxes to send it to the researcher in Sydney, Australia (as per the details in the ethics application approved by the University of Technology Sydney (UTS)'s ethics comittee). Once the data had arrived at UTS, specific statistical techniques were implemented to analyse the data gathered from the field surveys. The data analysis serves to fulfill three main aims: obtaining a feel for the data by checking the central tendency and dispersion; testing the sufficiency of the data by measuring reliability and validity; and testing the hypotheses which were developed for the research (Sekaran, 2006). The questionnaire was created based on the operationally defined constructs and variables and was pre-tested and validated in previous studies sharing a similar nature to the current research. Quantitative analysis was conducted using the data obtained from 257 participants from different industries and sectors working in Saudi Arabia. The central tendency and the dispersion of the data were examined using the implementation of basic statistics concepts, including mean, standard deviation and variance.

The first stage of the analysis procedure was compiling the descriptive statistics of the demographic information to ensure that the data set was appropriately advanced, used statistical techniques and could be considered as a single data set. Then, a measurement scale analysis was employed to find Cronbach's alpha. Correlation also involved performing EFA and confirmatory factor analysis (CFA) for each of the model constructs/variables to determine the reliability and the best factor structures, which led

to the development and confirmation of valid model constructs. Structural equation modelling (SEM) was conducted to initially evaluate and uncover the significance of the relationships between the constructs of the study model. The model was further refined by removing non-significant items and was reassessed to produce the final validated empirical model from quantatitive diminsion.

1.8.6 Validation of the Data

The results from the collected data analysed using the above stated statistical methods allowed the researcher to examine and consequently establish the internal validity of the model. In this way, the robustness of the model can be improved.

Following the quantitative analysis and refinement, a qualitative validation was sequentially conducted to determine whether the relationships illustrated in the model could be sufficiently explained by the actual phenomena among the selected Saudi Arabian firms. Achieving this needs an explanatory case study research, which focuses on addressing the hypothesis testing and answering the research questions. Case studies were conducted within six Saudi Arabian firms using semi-structured, face-to-face interviews as the primary data collection technique.

1.8.7 Recommendations and Submissions

The resultswere interpreted accordingly to match the hypothesis and the research questions were answered. A report of the findings and recommendations was constructed and fed the closure of the thesis.

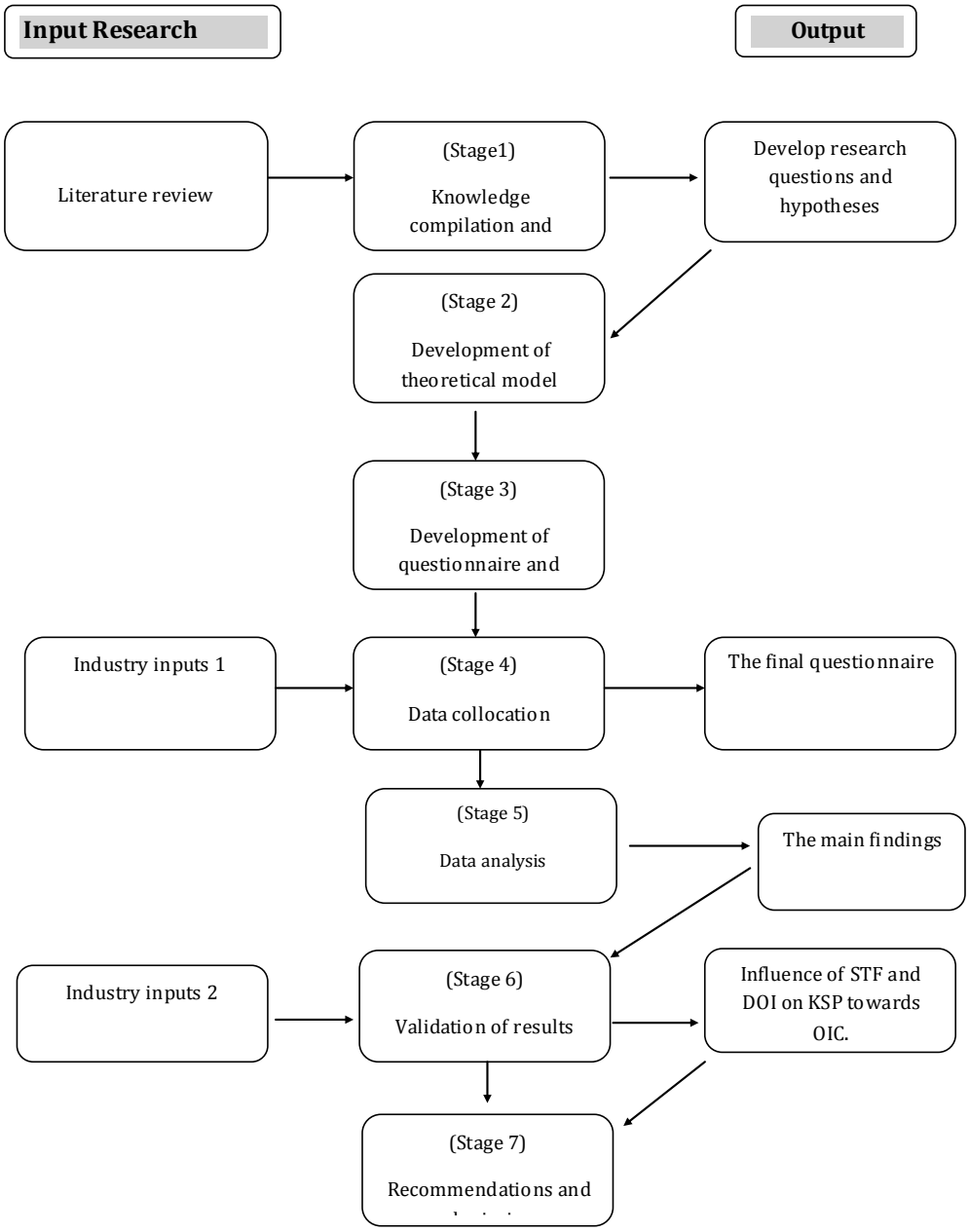


Figure 1-1: Preliminary Outline of the Research Process

1.9 Thesis Layout

This thesis consists of eight chapters. The current chapter is a presentation of the research study that addresses the problem statement, the purpose of the study and the nature and scope of the study. An overview of the research method and an outline of the thesis layout was also provided.

Chapter 2 reviews the literature pertinent to the field of innovation and knowledge management, focusing on knowledge-sharing phenomena and its enablers and processes towards the capability to innovate within the organisations. This task includes a critical review of recent publications concerning knowledge-sharing concepts, innovation capability approaches, the factors that influence innovation via knowledge-sharing, the DOI and the outcomes from innovation capability in Saudi Arabian organisational settings. The chapter also reviews the knowledge-based innovation-related literature published in the domain of developing countries, stressing the initiative of adopting a KBE in Saudi Arabia. It also addresses how this study will contribute the innovation ecosystem of Saudi Arabia, as in this research the initiative is examined in the context of Saudi Arabian society and was focused specifically on knowledge-based innovation in the Saudi Arabian organisational setting. An in-depth review was also conducted of all related validated and tested models and frameworks on knowledge-sharing and innovation capability. It should be noted that the focus of the study on Saudi Arabian organisations is aimed towards helping the country achieve the smooth adoption of a KBE by evaluating the enabled KSP on the capability to innovate in Saudi organisations from different sectors and industries, thus adding a remarkable contribution to the country's economy. The chapter identified several gaps that currently exist in the knowledge, with only one academic study examining this the knowledge-sharing phenomena in Saudi Arabia.

Chapter 3 describes the construction of the conceptual model for the current study. It begins by reviewing all relevant theories and validated models on knowledge-sharing enablers, KSP and innovation capabilty, therefore identifying the theoretical framework most suitable for the current research. A conceptual model based on the knowledge gaps discovered in the literature review and the highlighted research models and frameworks was developed. The research questions were then formulated as a response to the identified research gaps. In order to answer the research questions, a developed

conceptual model was developed based on the established theoretical frameworks.The research hypotheses were then associated with the causal relationships between the model's constructs. The chapter also includes details of the suitable research methodology, which addresses all the issues related to the research approach, starting with the research design and relevant analytical techniques adopted in this study. Specifically, this part of the chapter describes the procedures of sequential mixed-method research related to both the quantitative and qualitative analysis methods, which were integrated in one research design to validate and assess the current conceptual model. At the end, an operational process of the model constructs was implemented to produce viable measurement variables which capture the underlying meaning of each construct.

Chapter 4 outlines the details and results of the descriptive analysis of the data collected from the questionnaires conducted with employees from Saudi Arabian firms. The profiles of the survey respondents are presented and the survey data is screened to ensure that it was suitable for the following multivariate statistical analysis. In addition, the descriptive statistics of each constrsuct used in the study presents the standard deviation, mean and vairance.

Chapter 5 presents the results of the measurement scale analysis, starting with the analysis results of scale reliability, which helped to measure the internal consistency of the measurement scales in the survey. The EFA and CFA approaches are then listed and the results presented. The EFA helped to show the appropriate number of factors for each model constructs, while the CFA confirmed the identified factor structures, thus further strengthening the validity of each construct and its factors.

In Chapter 6, the model assessment was sequentially adopted based on the results of the analysis discussed in Chapter 5. The chapter starts with an overview of the SEM technique used in the assessment process. This is followed by the initial assessment results demonstrating the statistical significance of the relationships between the constructs of the model which implied the acceptance or rejection of the hypotheses stated in Chapter 3. After this step, the model was refined and the results based on the degree of the selected fit indices to be as good as possible. Finally, a tested and validated model was presented based on the quantitative analysis. Specifically, this chapter illustrates the procedure of finding the relationships between the constructs and the variables of the conceptual model, therefore testing the hypotheses and finding

answers to the research questions from an empirical side. SEM and correlation analysis are types of exploratory approaches that reveal the strength of the relationships between the constructs.

Chapter 7 shows the validation of the empirically tested model discussed in previous chapters. Particularly, this chapter details the qualitative research technique and outcomes based on explanatory case studies of six Saudi Arabian firms. That process includes developing the predicted relationship patterns, which were matched to the results of the pattern analysis of the six organisations. The results from this process indicate that the model can be validated by the actual organisational dimension. The chapter concluded with a deep and extensive discussion of the potential factors that may represent the the reconfirmation of the results and the variance between the experts' view, which were extracted during the face-to-face interviews with some experts in Saudi Arabia, and the results in the empirical model.

The final chapter, Chapter 8, summarises the general outcomes of this research, identifying the contributions made by this study to the existing body of knowledge as well as the implications of the findings of this research for Saudi firms. It also suggests recommendations for future research and notes the limitations of the study. Subsequently, the reference list, additional information (e.g., the survey tools of the questionnaire survey and the case studies protocols and results) is provided in Appendices A through to F.

2. Chapter 2
Literature Review

2.1 Introduction

Chapter 1 defined the research problem, outlined the scope of the research and described the research plan of this thesis. This chapter contains the literature review of the material relevant to this study. Firstly, Saudi Arabia's move towards a KBE is described. Then, an overview of existing information on knowledge management and knowledge-sharing is discussed and innovation is looked at as a critical factor in an active, ongoing organisational capability. This chapter contains the valuable and necessary background for the original thesis work that begins with Chapter 3.

2.2 Saudi Arabia and a Knowledge-Based Economy

Saudi Arabia is the largest economy in the Middle East and the world's leading oil exporter, with one-fourth of the world's proven oil reserves and 25 per cent of the gross domestic product of the Arab world (Alnatheer, 2012). The discovery of these huge oil resources has meant oil prices have had an enormous impact on Saudi Arabia's fiscal health and nearly 90 per cent of state revenues come from the petroleum industry (SABB 2007; SAMBA 2008).

However, the presence of these natural resources has created a heavy reliance on oil production and export in the Saudi Arabian economy (Niblock 2013). There is also strong reliance on the role of developed countries experience in the Saudi Arabia. Having the financial resources to recruit foreign professional services has gone hand in hand with a lack of incentive for Saudi citizens, a predominantly young population, to strive to keep pace with global professional and educational standards.

Saudi Arabia's economic goals are outlined in the form of Five Year Plans (Ministry of Economy and Planning, 2005). The strategic target of transforming Saudi Arabia into a knowledge-based society was first outlined by the Ministry of the Economy and Planning in 2005 (2008; Shin et al. 2012). The eighth Five Year Plan (2006-2010) called for a greater emphasis on education as well as the inclusion of Saudi women in society. It planned for the construction of new technological and research institutions,

with explicit reference to the government's resolve to realise a vision of Saudi Arabia as a developed country, leapfrogging the Western pattern of industrial economy progression to knowledge economy (Easton 2007) based on the World Bank's Institute Framework, which will be discussed in the next section.

Due to its abundant natural and financial resources, the Kingdom of Saudi Arabia is in an enviable position in comparison with developing countries in general. To consider options for future development beyond dependence on natural resources, an economy based on manufacturing would be very problematic. Global manufacturing is highly competitive and tied to a pool of skills and experience. It is also generally dependent on plentiful resources of cheap labour that do not exist in Saudi Arabia.

Historically, human societies have taken centuries to progress from agricultural or animal husbandry-centred economies to manufacturing, then production-based economies (e.g., the oil-based economy in Saudi Arabia), and finally knowledge economies, whose major product is knowledge. To attempt to create an industrialised economy as a key to viable economic development would be an out-dated move with not only unpredictable results but also would be a policy that places Saudi Arabia in direct competition with other developing nations such as Bangladesh who have low labour costs and existing infrastructure for manufacturing in place. With a generally young population and oil-backed financial security enabling large-scale investment including the purchase of international intellectual assets in education and technology, Saudi Arabia is well suited to developing a knowledge-centred economy. Recognising this, the government of Saudi Arabia have set a strategic target to achieve transformation from being a comparatively undeveloped economy into a knowledge society. In an emerging climate of globalisation, knowledge economies have developed to add to and even replace industrial economies in Western countries (Easton, 2007). Opting for a KBE is a major transition that requires social, technological and economic inputs. Saudi Arabia has the financial resources to do this and, in doing so, has the potential to offer its people a sustainable way of life where pride in occupational and professional achievement relate to a prosperous way of life.

In order to achieve this transformation, the government is employing a number of strategies. As well as the development of education mentioned earlier, it is also allying itself with innovative organisations and with other countries. The Saudi plan is not to base its development plans directly on policies of self-reliance; rather, it aims to

optimise co-operation with countries that have already developed a knowledge-centred economy in order to achieve its ultimate goals of comparative self-dependence.

The logic behind the move from an oil production-based economy to a KBE is further strengthened by the issues of over-reliance on oil production in the longer term (Ministry of Economy and Planning, 2008). In the Saudi Arabian government's ninth Five Year Plan (2011-2015), Information Communication Technology (ICT) is identified as a basis for Saudi Arabia's economic revolution. The Kingdom of Saudi Arabia joined the World Trade Organisation (WTO) in 2005 and, although their participation has so far been limited to energy production, membership in this organisation indicates an interest in participation in a global trade. These moves are part of the shift to a knowledge economy. The Saudi Arabian government has opted for a solution that will leverage the existing resources base and financial capacity of the nation to acquire the largely intangible assets of education and information that will enable Saudi Arabia to become a KBE.

2.2.1 Socio-Technical Imperatives

Progress towards a knowledge economy demands a very clear picture of what a knowledge economy is, what benchmarks exist and how such an economy will relate to the global economy. Once this is done, a roadmap is required in order to plan a path to get there. If one is to describe the present economy of Saudi Arabia as an oil-based economy, the task is then to plan what steps are required to transform it to a knowledge economy.

Therefore, in planning for such a transformation, Saudi Arabia should examine other successful knowledge-based countries. Research on the status of progress of knowledge economies in other countries is invaluable, particularly in relation to the education and training of the younger generation. To remove the dependence on foreign technology and expert workers requires progress and the development of Saudi Arabian colleges and universities. The nation needs to optimise access to specialised education and training. It needs foreign staff to come to Saudi Arabia to research and teach. Universities and public libraries also need to be made available (Davidson, 2013). The selection of the socio-technical factors that influence the KSP will be discussed further in Chapter 3.

2.2.2 The Knowledge-Based Economy Initiative

A KBE, or knowledge economy, is an economy that relies on the creation, distribution and implementation of knowledge as a key engine of growth and wealth production (Dahlman & Thomas, 2000; Dahlman & Jean-Eric, 2001; Dahlman & Anuja, 2005; Martiradonna, 2014). The World Bank defines a knowledge economy as existing when knowledge is the main product that stimulates growth in the economy (Chen & Dahlman, 2005). The World Bank recognises that the development of knowledge economies is vital internationally and has set up the World Bank Institute (WBI) Knowledge for Development Program to assist member countries to build a capacity to access, create and use knowledge in relation to competitiveness and economic incentives (Martiradonna, 2014).

The WBI identifies four pillars of the knowledge economy as targets for national economic development. These four pillars are:

- An economic and institutional regime providing incentives and policies to support the creation, dissemination, and utilisation of existing knowledge;
- An educated and skilled population that flexibly upgrades the capacity to employ knowledge efficiently;
- An effective innovation system of firms, research centres, universities, consultants and other organisations that can keep up with the knowledge revolution and tap into the growing stock of global knowledge and assimilate and adapt it to local needs; and
- A dynamic and modern information infrastructure that can facilitate the effective communication, dissemination, and processing of information and knowledge (Chen & Dahlman, 2005).

The focus in this study is the third pillar: the innovation system and how the enabled KSP affect OIC.

2.2.3 Saudi Arabia's Innovation Ecosystem

Saudi Arabia has developed a National Innovation Ecosystem (NIE) framework in line with the vision of a global innovative source of sustainable economic development. The NIE framework consists of six pillars that are aimed at solutions to enrich a culture of innovation and business environment to facilitate productive interactions (KACST &

Al-Aghar Group, 2009). Each of the six NIE pillars is composed of several sub-components that further define important areas in which substantial effort must be exerted in order to create a hospitable environment for innovation in the Kingdom. It is important to note that, as in a building, the pillars of the NIE framework are dependent on each other: the strength or weakness of one pillar necessarily affects the overall strength of the system. Changes or improvements in one pillar often result in ripple effects on the other pillars. The six pillars of the NIE framework are:

1. *Infrastructure*: physical, institutional and digital infrastructure in the sense of an organisational perspective on the range of ICT instruments.
2. *Human capital* in the form of a knowledgeable, skilled and flexible workforce. This study focuses on human capital through the knowledge-sharing function within organisations.
3. *Governance*, in terms of the policies, administration and organisation of the Kingdom of Saudi Arabia. In this study, governance operates as a framework holding together the socio-technical operation of each organisation from the aspect of knowledge-sharing towards an innovation capability.
4. *Innovative capacity* relates to the systems and mechanisms available to support the transformation of a broad range of new ideas in a pipeline, emerging with marketable products and services. Innovative capacity is seen in business dynamism (entrepreneurial activity) and specifically in types of research output, technology transfer and diffusion as well as processes of commercialisation.
5. *Networks and social attitudes* encourage risk-taking and creative values and reward creative people and environments where concepts can be discussed freely. This includes collaboration and linkages between enterprises; market and customer orientation; and openness to change and new ideas. The application to the present study may be in the STE of innovative activity in an active creative sense.
6. *Finance and capital*. This is of fundamental importance to a projected future in which Saudi Arabia evolves a fully functioning domestic and international commercial system.

In line with policies of lessening dependence on oil, the Saudi Arabian government is increasing employment opportunities and intends to increase expenditure on job training and education, infrastructure development and government salaries. It has also started to allow private sector and even foreign investor participation in the power generation and telecommunication sectors (Political and Economic Reform, 2005). In 2000, the Saudi Arabian General Investment Authority (SAGIA) was established to attract foreign investment. This is the fertile ground of policy practice in Saudi Arabia, where socio-technical factors, knowledge-sharing and innovation are in dynamic combination.

2.3 Socio-Technical Enablers

STE are the general factors in a society which impinge on the processes of creation of information and acquisition of technologies, leading to bodies of knowledge that will include such factors as know-how in industry and the kinds of personal and professional skills that working people bring to their jobs. These factors also form a background set of information-oriented activities that contribute to the profile of a society. Social and technical factors are isolated for attention here because they are most relevant to the phenomenon of knowledge-sharing and to the resultant organisational elements of innovation capability that follow. Other factors do exist, for example, in the Saudi Arabian context the religion of Islam is an essential component of any image of the nation that could be drawn by a qualitative study. This study focuses on STE because they are more easily identified and employed in statistical research. In addition, this study discusses the initiative towards a knowledge society in Saudi Arabia from a technical prospective – as this is the researcher's area of specialisation. As such, focusing on STE from this technical perspective will make a valuable contribution to current knowledge on the effects of such enablers. In particular, there is the opportunity to gain important insights into the ways in which STE support KSP and an organisation's innovation capability. Such insights will be of interest to senior staff or managers in organisations who are seeking to promote a knowledge-sharing environment.

The focus on socio-technical factors is a refinement of an original draft approach in terms of selected cited models and theories of focused socio-technical dimensions in quite similar studies in natures and aims, which is a catch-all descriptive characterisation of the socio-technical system inside the organisations. Socio-technical

factors, however, do not include all the potentially interactive elements that may affect social and technical outcomes. The role of the religion of Islam in particular is discussed below in Section 2.4.4.

2.4 Towards Knowledge-sharing

The acquisition of information and the implementation of knowledge management is the first stage. After this, it is necessary to follow through with attitudes to knowledge that are open and handled with a view to innovative practices in society and in organisations generally.

2.4.1 Information, Knowledge Management and Innovation

Nonaka (1994) identifies four modes of knowledge creation: socialisation, externalisation, internalisation and combination. Social interaction (socialisation) results in the renewing of tacit knowledge, externalisation codifies tacit knowledge into explicit concepts, internalisation converts new explicit knowledge back into tacit knowledge and combination. Alavi and Leidner (2001) noted that these four modes are interdependent and argue that new tacit knowledge for individuals' results from an increased level of exposure to information. It will be shown in due course that there is a hypothetical cumulative effect here through an absorptive capacity.

In the 1990s, there was a great deal of discussion of the processes of knowledge creation but not much empirical work was done (Raven & Prasser, 1996). One of the goals of the present research is to contribute to the body of work on knowledge creation at the societal level. As a general proposition, it can be confidently asserted that there is a very high level of knowledge creation in society today. However, scholarly work on analysis of the process of social creation of knowledge has yet to fully examine this subject. This research will make a contribution in this regard.

2.4.2 Knowledge Management

Existing research visualises knowledge management in different ways. Szulanski (1996), for example, holds that a knowledge management framework should contain initiation, implementation, ramp-up and integration activities. Davenport and Prusak (1997) include requirements, capture, distribution and uses of knowledge in their

framework. Alavi and Leidner (2001) picture a set of domains of the socially enacted knowledge processes of strategy, creation, reuse (storage/retrieval) and transfer.

It has been argued that knowledge management in an organisation should be linked to the creation of economic value and competitive advantages (Zack, 1999). Hansen (1999), however, argues that the choice of approach should relate to an organisation's service to its clients and to the relevant business model. In some companies a codified, automated approach may be appropriate, where using a codification strategy will involve storing explicit knowledge in databases where it can readily be accessed, transferred and managed, while in other companies, a personalised approach will be appropriate where staff share knowledge and where personal networks are able to facilitate knowledge transfer creatively rather than to store it. In this thesis, this work is taken as a valuable guide to knowledge management as the current study focuses on the enabled sharing of knowledge among the workers in organisations that are working toward innovation.

2.4.3 Knowledge-sharing

Knowledge-sharing has been approached by scholars from different perspectives and dimensions. Nonaka and Takeuchi (1995) see knowledge as information, where knowledge is a flow of messages and at the same time a creative process that maintains the flow while expressing meaning given to the flow by the possessor of knowledge. Tiwana (2000) expresses knowledge as an actionable information with an emphasis on people Davenport and Prusak (2000) add to the data concept by describing knowledge is a set of discrete, objective facts about events that serves as a body of data as raw material which are used to create information, while knowledge becomes more detailed than data or information itself. Chan (1999) sees wisdom as more valuable than knowledge. Toumi (1999) envisages a sequence of knowledge leading to data leading to information to understand certain phenomena. Alavi and Leidner (2001), however, see knowledge as a hierarchical process where data leads to knowledge. Lakemeyer and Levesque (2000) have a positivist view of knowledge as a relationship between a knower and a proposition. Other views of knowledge are as the fact of knowing (Schubert et al., 1998), a disembodied reality or a process (reasoning from McQueen, 1998; Zack, 199() or a condition where there is access to knowledge (McQueen, 1998). It can be expected that defining knowledge in terms of other words will inevitably result

in highly circular argument and ultimately will involve fundamental epistemological questions. The focus in this thesis is on knowledge within the context of knowledge management, where knowledge will include know-how as well as data.

Nonaka (1994) sees knowledge as both tacit and explicit. Tacit knowledge is unarticulated and based on actions and experiences in context, while explicit knowledge is articulated in some symbolic form. Tsoukas (2003) and Grant (1996) note that tacit (knowledge in people's minds) and explicit (the registered knowledge) categories of knowledge are not mutually exclusive. Spender (1996) sees knowledge in terms of two dimensions, explicit-implicit and individual-social respectively, leading to four sub-categories (Table 2-1).

Table 2-1: A Classification of Knowledge

	Individual	**Social**
Explicit	Conscious	Objectified
Implicit	Automatic	Collective

2.4.4 Knowledge-sharing in Organisations

Knowledge-sharing has become a key concern for organisations because of the growing recognition that tacit knowledge is more valuable than explicit knowledge (Marouf, 2007). Recently, many companies have recognised that the tacit knowledge of their employees represents invaluable organisational intellectual capitals (Riege, 2005). Dixon (2000) emphasises that the selection of the appropriate knowledge-sharing strategy within an organisation is based on the type of knowledge (explicit or tacit), the routine and frequency of the sharing process and the knowledge collector (individual, group or whole organisation).

There are many knowledge management studies that reveal that one of the biggest challenges in knowledge-sharing is the dissemination of the right knowledge from the right people (donators) to the right people (collectors) at the right time (Riege, 2005). Yang and Wu (2007) find that even if the best management styles are implemented and effective communication techniques are put in place, related working knowledge might still not be shared and distributed to the right people.

KSP can be either people-driven or technology-driven. Researchers in management studies usually refer to knowledge-sharing as being mostly about people and adaptations

to the social systems of the workplace rather than as a technology-based activity. However, information technology (IT) studies always refer to knowledge-sharing in terms of IT systems. Knowledge-sharing plays an important role in support functions, as without the sharing practices IT would be less effective and applications less timely (Riege, 2005). However, as noted by Al-Alawi, Al-Marzooqi and Mohammed (2007), what has not been clearly defined is the importance of knowledge-sharing for the success of the organisation.

In contrast, most organisations that choose the personalisation strategy link employees through networks to ease personal contacts and face-to-face interactions. These sharing processes of knowledge are the main objective in sharing knowledge and McDermott (1999) states that tacit knowledge is exchangeable through a concrete situation, problem or question that allows a person to reflect on and make sense of her or his experience. Practices for the sharing of such knowledge are identified in Table 2-2.

Table 2-2: Organisational Knowledge-sharing Approaches

Informal knowledge workshops	Knowledge exchange seminars
Departmental meetings	Site visit program
Summary reports	Project award scheme
Coaching and mentoring	Brainstorming
Face-to-face interactions	Training

Source: (Graham and Thomas, 2006)

As noted by Bock et al. (2005), knowledge-sharing is a behavioural attitude. Therefore the motivation of individual behaviour must be considered. Different types of motivations, like competition, reciprocity, reputation, ego satisfaction and organisational culture, can enable employees to share their knowledge with others. An individual may consider the trade-off between individual and organisational interests when making the decision to share knowledge with others (Yang and Wu, 2007). Many organisations use large number of resources in their organisations to develop knowledge management systems (KMS) and facilitate the KSP but fail to facilitate knowledge-sharing. It is or can be considered a negative outcome when knowledge is perceived as a competitive advantage and strategic resource within an organisation. Thus, it is then a

source of profit and advantage for the people who own it, namely specific benefits or a unique organisational or social positions (Yang & Wu, 2007). As a result, employee focus is on those tasks that provide more benefits (Husted and Michailova, 2003).

On other hand, a study by Yang and Wu (2007) found that some employees believe that sharing their knowledge with other co-workers may affect them personally by contributing to losing their earned positions, which might in turn result in conflict and lower job satisfaction. Therefore, some of the staff in lower level positions prefer not share their knowledge because they suspect that their senior officials may not support them if they appear more knowledgeable (Riege, 2005).

Literature by Goh (2002) suggests that knowledge donors in a workplace should always share the complete situation of any case, not just only in specific situations. Ellis (2001) argues that sales people tend do not want to share hot selling tips, as they want documentation of product solutions. They like to share only their successes, not their successful methods. Therefore, the issue of sharing knowledge in an organisation revolves around the social aspects, with strong interactions between employees and organisational policies which support knowledge-sharing strategies (Yang & Wu, 2007). Given that individuals hold knowledge, then the sharing of experiences, ideas and thoughts between other people is based on the knowledge-sharing behavioural willingness to share knowledge. Additionally, knowledge can be exchanged if a source (donor) and a recipient (collector) have established or do establish a good relationship. More specifically, knowledge-sharing relies on people's gathering and interacting (Hartmann & Naaranoja, 2006).

2.4.5 Knowledge-sharing Processes

Most studies on knowledge-sharing focus on the process where individuals exchange (implicit and/or explicit) knowledge and jointly create new knowledge. This explains the process of dissemination among individuals that turns individual knowledge into organisational knowledge (Van den Hooff and De Ridder 2004).

Van den Hooff and De Ridder (2004) look at knowledge-sharing from a different perspective than the other researchers discussed so far. They distinguish two forms of knowledge-sharing: donating knowledge and collecting knowledge. Other researchers differentiate between similar processes but mostly in terms of one or more active and passive process (Van den Hooff & De Leeuw van Weenen, 2004. For example, Van der

Rijt (2002) made a distinction about the process by differentiating between donating and receiving knowledge. Ardichvili et al. (2003) similarly argue that that knowledge-sharing consists of both the provision of new knowledge and the requirement for new knowledge. In all of this work, there is a distinction between a knowledge source and a knowledge receiver in KSP and Oldenkamp (2001) illustrates how knowledge-sharing involves both a knowledge carrier and a knowledge requester by focusing on four behavioural or social factors which lead to help in easing the process of giving and taking the knowledge as shown in Figure 2-1.

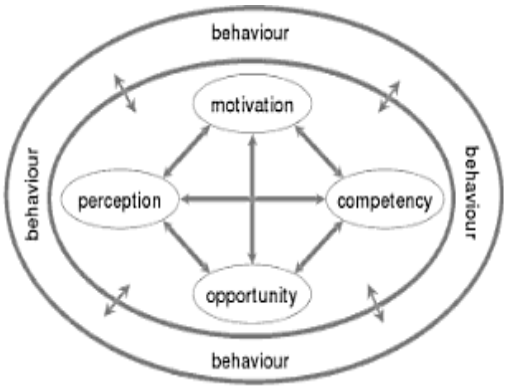


Figure 2-1: Behavioural Factors

Van den Hooff and De Ridder (2004) combine all the above perspectives by labelling the KSP as follows:

- *Knowledge donation*, which refers communication to others what one's personal knowledge (intellectual capital) is; and
- *Knowledge collection*, means consulting other colleagues in order to get them to share their knowledge (intellectual capital).

Both of these processes are active-type processes—either communicating actively to others what one knows or consulting actively others in order to learn what they know. In the next section, the common socio-technical knowledge-sharing enablers that are used in the current study are identified.

2.4.6 Knowledge-sharing Enablers

Gupta and Govindarajan (2000) conceptualise the multiple factors of knowledge-sharing into five different elements: the perceived value of the source unit's knowledge;

the motivational disposition of the source; the existence and richness of transmission channels; the motivational disposition of the receiving unit; and the absorptive capacity of the receiving unit.

However, there are numerous examples which demonstrate that currently utilised knowledge-sharing practices have not been successful in their objective to manage companies' knowledge assets and skills (Riege, 2005). To foster knowledge-sharing, an understanding of the factors that are preventing knowledge-sharing occurring are required. These factors can be categorised into three different levels: the individual or employee, the organisation and the technology (Riege, 2005; Yang & Wu, 2007). These different levels have barriers to the sharing of knowledge. The following summary by Riege (2005) argues that the knowledge-sharing barriers on an individual or employee level are frequently related to a lack of communication skills and social networks. Differences can be due to national culture, an overemphasis on position status and/or a lack of time and trust. On the organisational level, however, barriers are tends to be linked to economic viability, deficient infrastructure and resources as well as the accessibility of formal and informal meeting spaces and the physical environment. At a technological level, barriers seem to be correlated with factors such as the refusal to use applications, improper coordination of requirements, unrealistic expectations of IT systems and difficulties in integrating and modifying technology-based systems.

Factors that affect knowledge-sharing can include a number of different variables, from 'hard' issues such as technologies and tools (Hlupic, 2003) to 'soft' issues such as motivations (Ardichvili et al., 2003). This was explained very effectively by Lin and Lee (2006), who find that the organisational climate significantly influences the perceived relative advantage, compatibility and complexity of knowledge-sharing. These findings indicate that social-oriented organisational climates (i.e. TMS, open communication, stimulus to develop new ideas and reward systems in inducing knowledge-sharing) are likely to have a positive effect and promote the compatible beliefs about knowledge-sharing in general (Lin and Lee 2006).

As identified by Davenport (2005), knowledge-sharing as a process does not operate in a vacuum. He notes that different local and organisational factors influence the modes of knowledge-sharing. This view encourages the idea that knowledge is deeply shared in the technological and social context of an organisation, which in turn creates and reproduces knowledge (Nonaka & Konno 1998). The literature that focuses on common

socio-technical factors in the area of knowledge-sharing are discussed in the following sections.

2.4.6.1 Top Management Support

Top management has a close relationship to knowledge-sharing. Many researchers have acknowledged that the success of sharing knowledge or experiences among staff fundamentally depends on the support of the senior managers' adoption of knowledge-sharing initiatives (Gupta & Govindarajan, 2000; MacNeil, 2001; Hislop, 2003). Additionally, TMS is a very important resource that can influence how employees deal with knowledge inside organisations (Connelly & Kelloway, 2003). Lin (2006) finds that TMS is essential to provide an organisational climate with sufficient resources.

A study by Stoddart (2001) focuses on top managers' perceptions as an important antecedent to the establishment of an organisational knowledge-sharing environment. He identifies several essential factors in launching a successful knowledge-sharing strategy: it must fit organisational needs and must convey the organisation's strategic objectives. The key challenge faced by top managers is to transform tacit knowledge into a usable experience that can be shared to arouse innovation and create new products and services (Al-Aama, 2014).

From an employee perspective, it is possible for employees to figure out top management's support for sharing knowledge by looking for the appropriate symbols. If the social system inside the organisation of such openly and collectively accepted meanings operating for a given group at a given time then symbols, which can be in a form of objects, acts or relationships, lead to actions and push the staff to act positively. This process can play a very important role in an organisation's social system development and progress (Nonaka & Takeuchi, 1995; Pettigrew, 1987). Therefore, looking at the opinions about top management's support for knowledge-sharing is potentially necessary for the creation and maintenance of positive KSP in an organisation (Connelly & Kelloway, 2003).

2.4.6.2 Rewards System

The existence of an organisational reward system it is seen as important in supporting knowledge-sharing activities within organisations (Lin, 2007). Smith and McKeen (2003) state that incentives, a bonus system and promotion based on knowledge-sharing will strengthen attitudes towards sharing knowledge within an organisation. An

organisational reward system that is based on knowledge-sharing can create knowledge access inside an organisation (Andriessen 2006; Aulawi & Sudirman et al., 2009)

2.4.6.3 Interpersonal Trust

The major component for an organisation to be successful is to have good trusting relationship between workers in the organisation. Trust is an essential factor in the social exchange process (Blau 1964; Munch 1993; Pai 2005). Interpersonal or co-worker trust is vital to successful knowledge-sharing. If a relationship based on trust is established, then it will facilitate knowledge-sharing among co-workers. Interpersonal trust is defined as co-workers having a good level of faith in each other in terms of intentions and behaviours (Whitener 2001, Politis 2003).

Interpersonal trust between workers is an important factor in organisations and is believed to be a strong contributor to sharing knowledge (Choi & Lee, 2002). The authors examined the absence of trust among staff as one of the key barriers preventing KSP. Teams in any organisation need the existence of trust between co-workers to act openly in sharing their knowledge (Gruenfeld et al., 1996). When co-workers have high trust relationships, the co-workers become more willing to support the knowledge-sharing process (Abrams et al., 2003; Lucas, 2005). Building an effective team provides a good foundation for developing the basic fundamentals of the organisation and mutual collaboration. It allows a company to develop further from the traditional organisation model to a modern organisation based on sharing knowledge. The next section examines how providing an organisation with information is also structural and allows employees to facilitate the ideas in the organisation for the benefit of organisations and individuals.

2.4.6.4 Information Systems Infrastructure

Information systems (IS) infrastructure can refer to the arrangement of employees, data and processes which interact together in order to support day-to-day operations, problem-solving and decision-making from an organisational prospective (Khorsheed & Al-Fawzan, 2013). The IS infrastructure of a company has an important role in facilitating KSP in the organisation (Brink, 2003). IS/IT infrastructure enables the process of exploring, accessing and retrieving information to be faster.

As required by any organisation, the use of IS infrastructure can facilitate knowledge-sharing via applications such as groupware and intranet virtual communities. There are

many different technological methods available that can work towards achieving more collaboration in sharing knowledge. Within organisations, different systems can be used to enable the sharing of knowledge through denoting or acquiring knowledge via knowledge bases, where employees share knowledge electronically and access to shared practices becomes available to other staff members (Khorsheed & Al-Fawzan, 2013). As was found by Kim and Lee's (2006) research, IS/IT infrastructure positively influences significantly the knowledge-sharing process and the application of the company.

However, the role of IT / IS is constantly growing and changing as in the past, IS/IT only functioned to store static data. Currently, it is the bridge of information and knowledge among staff. To gain a more in-depth view on the IT and the information system component of knowledge-sharing, an understanding of the DOI model is required to provide evidence of how the innovation emerges into IT/IS through the communication process. This will be explained further in Chapter 3.

2.5 Towards Organisational Innovation Capability

In order to successfully transition to a KBE, Saudi Arabia needs to adopt innovative practices and, beyond this, it needs to evolve a creative capability to achieve desirable change. The following sections discuss OIC.

2.5.1 Innovation

A comprehensive definition that adequately addresses the intangible aspect of innovation as well as its physical manifestations is given by Salvendy (1992), who says that innovation is a multifaceted process implying creative activity and involving new understanding and insights, the development of a new product or process or the creation of new capital and markets. Innovation is often a procedural activity that integrates the process from research to final delivery of a product or service in order to meet a common objective. Innovation has been defined in the following terms:

> Innovation transforms insight and technology into novel products, processes and services that create new value for stakeholders drive economic growth and improve standards of living. Innovation certainly can be a creative process in these terms (Donofrio, 2004).

However, it is not difficult to identify cases of innovation that occur through limited problem-solving adaptation or through a systematic but not particularly creative application of an existing product or process to a new use. Thus, the definition needs to be broadened. In particular, innovation does not necessarily equate to creativity.

Cumming (1998) noted that to become innovative an organisation needs time and it needs support for a creative team environment. This is supported by Pervaiz (1998), who states:

> Employees can engage in creative problem solving and knowledge creation as long as the working conditions within an enterprise are flexible enough and conducive to individual and group creativity.

Helen (2004) agrees, stating "truly innovative organisations are those that exhibit innovative behaviour consistently over time." In this section, the factors crucial to innovation in terms of management support, team climate and underlying motivation are established.

Innovation plays a focal role in this thesis. This is because the whole point of introducing the concept of knowledge management into a prospective knowledge economy is to find ways to break out of the existing conservative mould. That conservative mould, if left as it is, would inevitably ensure a slow, arithmetically conceived progress that will not be able to keep pace with the geometrically measured growth of industry leaders globally. It would not be able to interface with the exponential growth of knowledge. It is even conceivable that conservative thinking that persists in thinking within its own box might not even be able fully to imagine those universes of knowledge and might deny that they even exist.

Innovation may be a current fascination of writers in business journals and it may be constantly on the lips of board members in companies, but what does it mean precisely? This section will identify how at various points erroneous and damaging interpretations of what is said about innovation have produced misconceived solutions proposed for industry, commerce and professional practice in the construction of a new knowledge economy for Saudi Arabia.

The meaning of the word 'innovation' needs to be carefully analysed. Innovation is defined by the Oxford English Dictionary (OED) in distinguishable terms: as an abstract noun, usually without a definite or indefinite article; the action of innovating; the

introduction of novelties; and the alteration of what is established by the introduction of new elements or forms.

A more specific meaning can denote either a change or a new practice or method, or a concrete object that is newly introduced that embodies change. This definition is not precise because it does not distinguish between these options. Yet this confusion does in fact accurately convey the ambiguity in the use of the word 'innovation' that pervades the literature.

The OED supplies a second definition is as follows: a change made in the nature or fashion of anything; something newly introduced; a novel practice, method, etc.. As an additional note that applies to the second definition here, the OED adds a sense: "The action of introducing a new product into the market; a product newly brought on to the market". However, reference to the actual usage in English where the syntax is correctly expressed will show that the context does in the main logically show whether to reference is to the process or to the result in introducing something new.

Creativity is a term that is constantly associated with innovation and the relationship between the two terms is crucial to an understanding innovation and a knowledge economy. The 2005 Oslo Manual, a document issued by the Organisation for Economic Co-operation and Development (OECD) that contains guidelines for collecting and using data in industrial innovation, divides innovation within an organisation into four main types: product, process, organisation and marketing. Product innovation relates to the improvement of business goods and services or the development of new goods or services and includes product specifications, components and functions. Process innovation relates to production and methodology, aiming to optimise cost-efficient operation through attention to productivity, cost and quality. Organisational innovation is directed to improving business practices and stakeholder relations. Marketing innovation addresses promotion, pricing, packaging and presentation and aims to deliver value through positioning the organisation to serve consumer needs (OECD, 2005).

Damanpour and Gopalakrishnan (1998) argue that an innovation that is an imitation or adaptation of something from another organisation that may be a highly feasible proposition for an organisation. This does not necessarily involve any creative thinking on the part of the receiving organisation: it is a commercial acquisition that has yet to be integrated into the new host. An acquired innovation—acquired through purchase,

royalty, licensing, or merger—may well also come with a good track record. There are also incubative sources that have been developed by the organisation through its own resources and expertise. This is a useful way of regarding the processes involved in innovation and, further, of assessing the value of an innovation to a company user. It underlines the fact that specific innovations cannot universally or automatically be seen as instances of creative activity within the organisation that acquires them and that there is no guarantee that such innovations will be effectively integrated within the host organisation, or efficiently put to work in the interest of the receiving enterprise.

2.5.2 An Organisational Perspective on Innovation

The Oslo Manual (OECD, 2005) defines innovation as "a new organisational method in business practices, workplace organisation or external relations." An enterprise may adopt innovations within the sphere of its operations because decision-makers in the enterprise observe the importance of efficient operation and high-quality products and services and they see that new ways of operating are likely to achieve that goal. This motive lies behind the adoption of innovations, as a firm sees the current state of the business and derives a business strategy. As innovative approaches are diffused within an organisation, Franke et al. (2006) argue that before it can judge how an innovation is working in practice, management should keep in mind two factors: the pre-existing business structure and operation (with whatever problems exist there) and the business strategy it is adopting to drive the innovation. In addition to the focus on the needs of the enterprise itself for innovation, there also is an external context related to whatever level of open competition exists for a company's operations. This context may be seen as 'global,' 'local,' or, to use a serviceable portmanteau term, 'glocal,' pointing to the widely perceived need for many multinational companies in a globalising world to marry local needs with global opportunities (Abdullah & Tudor 2003).

When an organisation sees a need to introduce innovative technologies or techniques in order to pursue an attractive option, two questions need to be asked. The first question concerns the nature of the innovations that are introduced. For example, how is an innovative package identified from among all the potential sources of innovation? Is the package an optimal one? And how should that package be used to further the firm's business strategy in its specific sphere of operation? These questions will be discussed in detail in a following section.

The second question concerns the relationship between the innovation and the organisation. Organisations have a business strategy that has evolved out of perceived business needs (Manley & McFallan 2005) and when making the decision to utilise innovation, they must consider their business strategy with respect to the introduction of innovations. However, as the firm researches the innovations that can be applied, how can it be sure that the recommended business strategy is the best strategy to take full advantage of the optimal innovation package?

In order to answer these questions, two approaches need to be pursued in tandem, thus determining the optimal innovation package in the optimal business strategy. A process is required to arrive at conclusions that are valid and accurate at the same time. Managers may find reasoning through to a viable solution for a difficult task. This thesis introduces here a hypothesis: innovations and business strategies will fail where decision-makers are either incapable or unwilling to consider both approaches. Another aspect of the problem may be the 'groupthink' syndrome, where the collective impulse can lead to collectively agreed upon conclusions that may not have been reached by an individual. This is well expressed by the riddle: What is the definition of a camel? A horse designed by a committee.

The integration of innovation with a business and business strategy is not a simple process. In order to marry business strategy with an innovation package, an optimal solution needs to be derived through creative thinking; however, at the same time the results of that creative thinking need to be rationally analysed. This can be thought of as a liaison between creative imagination and scientifically based analysis.

In deciding on the elements that are essential in the selection—or ideally the construction—of an effective package, infrastructural and resource considerations should be taken into account. Although it is possible to adopt specific innovative techniques on an eclectic or ad hoc basis, an innovative model also needs to be carefully considered. Alateyah et al. (2013) put forward a threefold set of criteria that is of value in assessing the potential of specific innovations or innovative packages for an organisation.

2.5.3 Diffusion of Innovation

Diffusion of innovation is a theory that seeks to explain how, why and at what rate new ideas and technology spread through cultures. A fundamental question that is closely

tied to the DOI is the matter of technology transfer, which includes soft as well as hard technology, and—often more importantly—transferred know-how.

It is useful here to look at the example of a commercial organisation capable of producing or acquiring innovation relevant to its business purposes and able effectively to manage innovative processes in terms of product, process, organisation and marketing. All other factors being equal, such an enterprise will have a competitive advantage defined in terms of the criterion of innovation. Surveys on innovation, and qualitative and quantitative reviews of innovative outcomes, are useful in assessing a company's rate of success in innovation (OECD 2005). Yet, it does not necessarily follow that such an organisation will inevitably be successful. To follow this line of thinking a step further, there is a need to explore—from the process of inception of an innovation through to the final marketed product—the way in which innovation actually works in real environments. As said by Pervais (1998):

> Innovation is the engine of change and in today's fiercely competitive environment, resisting change is dangerous changes. It brings uncertainty and risk, but along with it creates several opportunities.

The DOI model provides an understanding of how the DOI process works as a result of the four elements: an innovation; communication channels through which the idea is communicated; the time required for this communication process; and the members of a social system between whom the communication takes place (Rogers, 2003). Rogers finds that the time taken for this diffusion depends on the nature of the adopters, which are categorised as innovators, early adopters, early majority, late majority and laggards respectively. Finally, the social system factor plays an important role in innovation adoption or diffusion and can be divided into three factors: opinion leadership, change agent and the critical mass. Innovations with higher relative advantage (compatibility) that are amenable to be trialled and have observability and lower complexity will be adopted sooner than those with contrary features (Rogers 2003).

2.5.4 DOI Theory: The Innovation Characteristics Model

An organisational innovation adoption is any idea, practice, method, or process, product or market opportunity that the manager of the innovating unit perceives as new (Rogers, 1995; Nahria and Gulati, 1996). Kanter (1983) views an organisational innovation as the process of implementing new problem-solving ideas. Thus, an organisation is

engaged in innovation behaviours when it recognises the introduction of a new human resource management practice or changes.

The organisational promotion of knowledge-sharing involves changing traditional ideas about managing intellectual resources and employee work styles by providing new processes, disciplines and cultures; thus, constituting an organisational innovation (Darroch and McNaughton, 2002). This study attempts to examine how socio-technical factors affect organisational predisposition toward knowledge-sharing through shaping organisational perceptions. The socio-technical factors include two variables: organisational climate and IT support, while organisational perceptions of knowledge-sharing are derived primarily from innovation diffusion theory (Rogers, 1995).

Innovation diffusion theory (Rogers, 2003) posits that there are five perceived innovation characteristics that influence adoption: relative advantage, compatibility, complexity, observability and trialability. Of these characteristics, only relative advantage, compatibility and complexity were included in the research model. Firstly, since knowledge-sharing has a long-term impact, management is less concerned with observability of knowledge-sharing. Secondly, knowledge-sharing involves significant organisational change and it is difficult to reverse its effects. Thus, trialability is unlikely be a major managerial consideration. Thirdly, these three characteristics have consistently been found to be important influences on behavioural intention (Verhoef & Langerak, 2001; Sia et al., 2004).

In this part of the study, the DOI adoption model will be examined based on OIC. Hence, this study examines the extent to which these three perceived innovation characteristics can predict organisational predisposition and affect knowledge-sharing toward innovation as defined below to be aligned with the research objectives:

- *Relative advantage*: the degree to which encouraging knowledge-sharing is perceived to benefit the conduct of business
- *Compatibility*: the degree to which encouraging knowledge-sharing fits into existing business process
- *Complexity*: The degree to which encouraging knowledge-sharing is a difficult effort

2.5.5 Organisational Determinants of Innovation

Along with factors such as technological development, innovative technologies can change over time. In addition to this, there are other factors at work within the boundaries of an organisation (Hartmann & Naaranoja 2006), which may include organisational structure and strategy but also be influenced by local culture (Amabile et al. 1996; Damanpour 1991; Scott & Bruce, 1994, Saleh & Wang, 1993). A general schema of such factors as set out by Constantine (2001) is shown in Figure 2-2. This diagram demonstrates that even within an organisation, a complex picture can emerge if the overall progress of innovation within an organisation is conceived in creative terms.

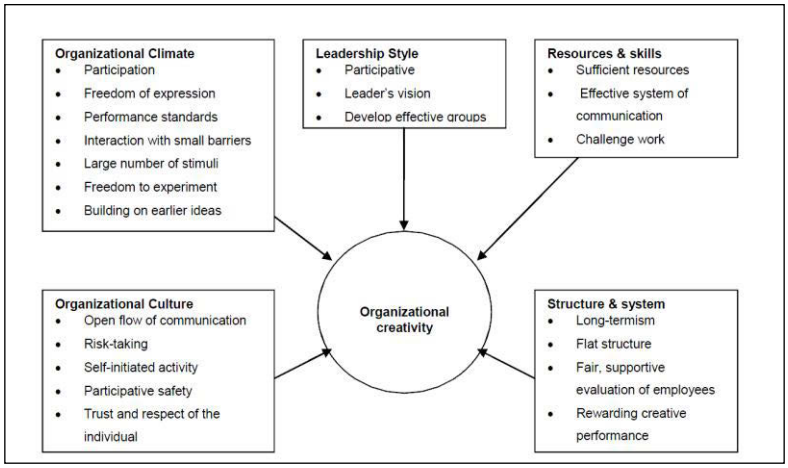


Figure 2-2: Factors Affecting Organisational Creativity (Adapted from Constantine, 2001)

Organisational structure may encourage or discourage innovation. Further, the value attached to the concept of innovation within a firm is likely to be positively related to the success of specific innovations (Martins & Turbulence, 2003; Franke et al., 2006). A highly integrated organisation with a large scale of organisational integration should focus on coordination, planning and management strategies, as a more flexible organisation that empowers staff may be more likely to be responsive to radical innovation policies (Khorsheed & Al-Fawzan 2013). Delegation of work to staff and the use of adaptive approaches is often seen in firms that do not have rigid formal job descriptions or that employ job rotation programs (Martins & Terblanche 2003).

A conceptual dichotomy of organisational structures from the point of view of innovation-friendliness distinguishes mechanistic structures that have achieved stability but may not be inclined towards innovation and organic organisations that tend not only to be innovative but also risk-taking, such as which exist in less stable business

environments (Damanpour & Gopalakrishnan 1998). It follows that the typical organisational structure found in Saudi Arabia, which is mechanistic in nature, is likely to be an obstacle to the successful deployment of new processes or practices (Al-Shehry et al. 2006).

Where an organisation has a straightforward hierarchical decision-making structure, as is often the case in the manufacturing industry, top-down policies can be readily used. In an organisation where decision-making is more complex—in an academic establishment for example, with a range of stakeholders that includes government, lecturers, students, parents and an educational board—the structure will be more bureaucratic (Khorsheed & Al-Fawzan 2013; Franke et al. 2006). The Islamic Work Ethic (IWE) in most Saudi organisations stresses consultation through co-operative management systems aimed at overcoming obstacles and avoiding mistakes (Darwish 2000). This may not be conducive for the adoption of innovations, but it is nevertheless an efficient system that, if an innovation was accepted, would give it an increased chance of success. However, a study conducted by Idris (2007) finds that organisational structures in Saudi Arabia, where the manager tends to make all the decisions generally, are not conducive to change.

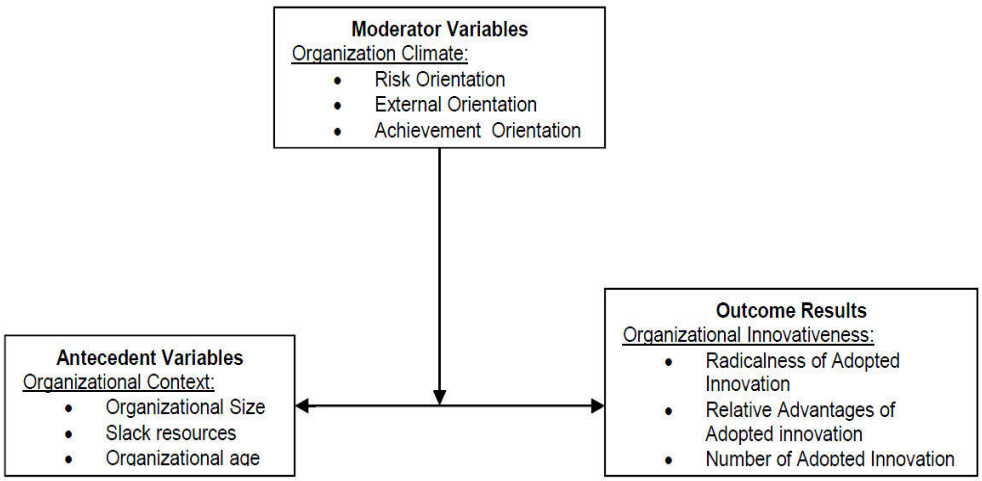
However, innovation can still occur even in environments that are not conducive to change. A study by Al-Ohali and Shin (2013) finds that organisational culture in academic institutions tends to be resistant to direct manipulation by management. Organisational culture is deeply rooted in an organisation and is closely related to the work style and lifestyle of its members. Yet, despite this resistance, the introduction of new technology—including educational theory, computer-based instruction and interactive teaching methodology—has occurred in the process of educational diffusion. Effective DOI will generally depend on whether innovations are seen to meet the needs of the organisation in a situation where successful adoption depends on the stability of management stability as well as confidence that there will be support of an innovation by management (Carr, 1999).

The social context of innovation is important. As a general principle, in order to operate in today's marketplace an enterprise will need to adopt computer and Internet technology (Al-Ohali & Shin, 2013). Where cultural or social considerations or organisational culture affects the adoption of an innovative technology, and where

particular users benefit from that innovation, a factor of the personal recommendation or word of mouth is likely to result in a positive spread of acceptance (Franke et al., 2006).

Looking at the Saudi Arabian situation, the distinction between cultural factors, social factors and factors of organisational culture can be usefully analysed in order to assess what goes on at the country level and in a particular organisation when innovation takes place. These three factors will overlap in some ways. In general, the organisational culture/social system relates to values and norms as basic routines within an organisation, while organisational climate will tend to relate to channels of communication and interaction between employees (Schneider & Rentsch 1988; Chandler et al., 2000; Constantine, 2001; Isaksen et al., 2001). Organisational climate relates to organisational productivity and efficiency (Malik & Wilson, 1995) and in the present study organisational climate is the focus of an investigation of how knowledge is shared within an organisation (Khorsheed & Al-Fawzan, 2013).

Similar research undertaken by Nystrom et al. (2002) shows the relationship between variables influencing the DOI within an organisation. Figure 2-3 illustrates how factors in the organisational climate, such as risk orientation, external orientation and achievement orientation, moderate the relationship between context and innovativeness.



Source: (adapted from Nystrom et al., 2002)

Figure 2-3: Organisational Climate Moderates the Relationship between Context and Innovativeness

Rice (2003) finds that in Arabian Gulf organisations "those who strongly support the Islamic work ethic are more committed to their organisations and more satisfied with their jobs." However, it is difficult to know precisely how support for the Islamic work

ethic is measured, what the precise definition of the Islamic work ethic is, and how committed and job satisfaction are measured and, finally, with whom the comparison is made. And yet Idris (2007) writes that in Saudi Arabia, people with misguided interpretation of Islamic teachings have a strong influence on the country's business environment. As Arab countries in general, and especially in the more conservative nation of Saudi Arabia, comply with Islamic law, the religion of Islam pervades the sphere of human activity, including work and business activity. The precise nature of the relationship of Islam to organisational issues is an important but sensitive subject. In Saudi Arabia, there are challenges for enterprises to improve their business performance and ensure that work practices do not hinder employee productivity. At the same time, the nation as a whole needs to build its human resources (Sie & Aho et al., 2014). Saudi Arabia needs to adopt and maintain innovative practices that will achieve more efficient industries and more effective use of human resources.

Denison (1996) notes that within an organisational culture, management will influence staff views. Management support and a teamwork culture will impact on innovation processes, particularly if there are employee committees and other indicators of positive attitudes towards employee participation in the work of the organisation (Sie & Aho et al., 2014). Leaders who are able to calculate risk factors and actually take risk and who are open to new ideas are important components of an innovative culture (Mohamed, 2003).

The value system inherent in a management structure will be a key factor in assigning specific jobs to the right person and thus influencing performance (Hunt & At-Twaijri, 1996). Management support for innovation relates directly to success in the diffusion process and the rate of adoption of innovations (Dai & Wells 2004). Academic instructors in schools and companies who are able to use computers for the benefit of the organisation are a clear model for members of the organisation as a whole (Franke et al., 2006). Studies on the Saudi Arabian work environment have found that inadequate management support is a major problem for organisations when it comes to adopting new technology (Al-Turki & Tang, 1998; Al-Shehry et al., 2006). Abdul-Hadi et al. (2005a) finds middle manager resistance to change one of the strongest barriers to the implementation of Business Process Re-engineering in Saudi Arabia.

Understanding the social factors that influence different work environments' relationship to innovation is especially important in the Saudi Arabian concept, given

the high number of foreign citizens and multinational corporations that work there. Multinational corporations that intend to operate in Saudi Arabia need to understand how Saudi managers think and work. They should acquire a verifiable knowledge of the realities of the Saudi managerial environment before they commit the investment of their time and funds in the country (Abdul-Gader, 1997). A multinational corporation will have prior information concerning the influence of Saudi managers on the acquisition and implementation of innovative techniques. Like all management, Saudi Arabian managers' attitudes influence behaviour toward innovation. It is not enough simply to characterise Saudi managerial behaviour in terms of generalised association with Islamic behaviour: Bjorn and Al-Meer (1993) have already noted in a briefing session a tendency for Saudi managers to make decisions "autocratically and paternalistically." Such a practice of arbitrary decision-making does not fit with Islamic teachings, which instead encourage consultation. Similarly Ali (1993, cited in Rice, 2003) also reports reluctance by Arab managers to take risks to the point where there is a virtual unwillingness to take any risks at all. Yet, as Bjerke and Al-Meer (1993) point out, Saudi managers do not exist in a social vacuum but are influenced by beliefs and values that characterise the society in which they live and work. If a multinational corporation is interested in operating in Saudi Arabia, there is a need to achieve a comprehensive understanding of the corporate culture that it is likely to encounter.

Puleo (2004) argues that the management team plays a major role in supporting organisational projects with compliance to required standards and leading the relevant organisation as a whole in the direction of improvement. There is no question that Saudi enterprises face challenges of globalisation and international competition. In line with the valid and cogent arguments surveyed in this chapter for managerial expertise combined with a focused strategic approach, this is no time to hope for gradual collective awareness within organisations of the importance of change through innovation. Thus, this thesis posits that decisive managerial action is needed to implement change through innovation in Saudi Arabian organisations and that a top-down dynamic program of change must come from senior management. Otherwise, Saudi organisations will continue to stagnate, missing business opportunities that would provide great side benefits for the business infrastructure and the development of human resources in the country as a whole.

Team climate relates to innovation through the process of sharing knowledge and skills within the working team of an organisation (Nijstad & de Dreu, 2002; Ekvall et al., 1983; Nystrom, 1990). Abdullah and Tudor (2003) state:

An environment perspective indicates that perceived differences to team climate arise from structural features of the work, rather than to the personality of individuals.

The study concludes that team members in Saudi Arabia have little opportunity to be innovative and there was sometimes no positive attitude towards creative activity. Their study also suggested that many researchers have identified that an organisation's climate, in which teams function, is important in terms of achieving its objectives and improve its processes. As Afiouni et al. (2014) also note, the Saudi business environment is controlled by rigid rules.

There is risk associated with innovation and so the way an organisation deals with mistakes will influence innovative behaviour among employees, either encouraging or discouraging any creative enthusiasm. Martins and Terblanche (2003) suggest a pro-active risk-taking agenda with the following elements:

- Expected results being spelt out in advance;
- Responsibility for monitoring and measuring risk being assigned to a specific person in the organisation;
- A tolerant atmosphere where mistakes are accepted as part of an innovative initiative;
- Mistakes provide material for a learning experience; and
- An assumption that there is a fair chance of a risk having a successful outcome.

The relationship of team climate to innovation becomes clear when there is disagreement within an organisation over an issue. The fact of disagreement provides an opportunity to expose paradoxes, conflicts and dilemmas. Understanding different individual thinking styles and training personnel in the process of constructive confrontation will create a culture supportive of creativity and innovation (Martins and Terblanche, 2003). Unfortunately, however, Saudi Arabian managers have been characterised as having an authoritarian approach and not liking to see conflict (Bjerke and Al-Meer 1993), a behaviour that is a hindrance to creative innovation among employees. An ultimate state of accord is desirable, but in order to achieve meaningful

change on the basis of innovations that will tend to challenge the existing technological or economic order, conflict should have a leading role.

This leads to an important question concerning the Saudi Arabian technological situation. Given that management leadership is a key factor in achieving an innovative system of corporate development, do other employees still have an essential role in this process? The answer is yes. While what the leader decides is crucial, at the same time whether or not the workforce wholeheartedly follows the leader is also fundamental and necessary. Therefore, effective and clear communication within an organisation is needed. One way to do this is to make sure there is a positive team climate. Team climate is the name that is given to the way that employees act in terms of management policies and is the context in which motivation grows and affirms the value of innovation.

2.5.6 Organisational Innovation Capability

Innovation capability refers to the ability to generate innovations at a fast rate, achieving competitive advantages for the organisation concerned (Hurley and Hult, 1998). Another definition of innovation capability is "the ability to create innovations in responding to contextual changes and opportunities without organisational disruption, excessive time and costs, or loss of performance" (Buganza & Verganti, 2006). The concept implies not only the capacity to create new ideas but the ability to implement them.

An organisation can be thought of as an intangible asset that is in effect a valuable body of knowledge and a source of competitive advantage (Nelson & Winter, 1982). Xerox and Hitachi, for example, have begun to share their knowledge skills to sustain competitive advantage in the market (Calantone et al., 2002; Du Plessis, 2004). Knowledge-sharing is an innovation imperative that can take the form of scanning environments for opportunities, generating ideas and solving problems. The practice of knowledge-sharing can identify techniques to structure knowledge and identify tools for knowledge storing and retrieval as well as using knowledge to create new knowledge (Cook & Hunsaker, 2001; Baker, 2002; Assink, 2006; Hargadon & Sutton, 2000; Wan et al., 2005, Du Preez et al., 2006; Leiponen, 2006). Various authors argue that shared knowledge should be widely and interactively disseminated within an organisation and with external groups (Ahmed, 1998a; Patton & Carlsen, 1998; Clark, 1998; Hargadon &

Sutton, 2000; Frombach, 2003; Cormican & O'Sullivan, 2004; Dismukes, 2005; Wan et al., 2005; Du Preez et al., 2006). To implement this requires setting up special interest groups and encouraging an open social sharing climate (Le Bihan, 2006). Groups with external participants can introduce broader perspectives and suggest ways to facilitate collaborative interaction (Zairi, 1995). The result can be shared terms of reference and a knowledge structure amenable to interactive communication. Such knowledge-sharing could bring benefits to Saudi Arabia in terms of altered perspectives and understanding of global challenges.

The success of sharing knowledge or experiences among staff fundamentally depends on the support of the senior managers' adoption of knowledge-sharing initiatives (Gupta and Govindarajan, 2000; MacNeil, 2001; Hislop, 2003). A realistic view of innovation-oriented motivation in the workplace needs to see motivation as the result of reward structure, delegation of decision-making power and skilled workmanship (ASH, 1997). Innovation diffusion will tend to relate to effective participation in company work by workers in a team climate (OECD 2005). Human Resources Management (HRM) is as a distinct mode of management that has a strongly employee focus, rather than the continuing tradition of mainstream management, which maintains a central concern with the profitability of the enterprise. As stated by Daft, "Today, every company must change and innovate to survive" (2007, p. 399). The development of strategic HRM plans and policies for a changing organisation is the framework that would most effectively facilitate organisational change and innovation. In discussing a framework of change for HRM, it is important to accept that theoretical and practical work outside the HRM framework may be used to build up knowledge and experience, rather than using only HRM sources.

The knowledge industry attracts a great deal of interest from academics and business people alike, but disastrous events like the global financial crisis can easily distract attention from the steady progress that has been made in the fields of knowledge management and IT/IS in general. There are questions that are highly relevant even to small and medium-sized enterprises in the area of HRM, such as whether a firm would prefer Microsoft as a model and how might a firm take measures that follow from the success of Google? Companies may wonder how much greater risk there is in the human resources field after being badly affected by the global financial crisis.

2.6 Summary of the Literature Review

This literature review has discussed theories of innovation and also identified the ability of organisations to utilise knowledge-sharing. It thus lays a good foundation for the analytical work initiated in Chapter 3 to analyse the three pillars of socio-technical imperative, knowledge-sharing and OIC. On that edifice with its threefold support, a platform is mounted, awaiting the conceptualisation of a viable working model for a Saudi Arabian knowledge society.

3. Chapter 3

Model Development and Research Methods and Design

3.1 Objectivism and Structure of the Chapter

The previous chapter reviewed the literature on a KBE, identifying the socio-technical factors that enable innovation in Saudi Arabia. In this chapter, the relevant literature on different success factors towards DOI is reviewed in order to enable the development of the research conceptual model, research questions and hypothesis. Frequently cited theoretical models or frameworks on knowledge-sharing enablers and processes and innovation or innovation capability are investigated and evaluated, while other related models are examined. Finally, the relevant constructs are identified, and justification of their selection for the current study's conceptual model provided. The research questions are then delineated before a conceptual model is proposed based on the literature review presented in the previous chapter.

This chapter then details the research methodology employed in this study in relation to the research questions, and in examining the developed hypotheses. Section 3.2 discuses existing research model and provides a foundation of our research model. Section 3.3 elaborates the conceptual model. Section 3.4 describes the development of the hypotheses and Section 3.5 outlines the research approach. Section 3.6 describes the research design, Section 3.7 presents the data collection methods and Section 3.8 identifies the data gathering instruments. Section 3.9 details the data analysis methods and the chapter is summarised in Section 3.10.

3.2 Theoretical Development

In this section, all of the existing models related to knowledge-sharing and innovation from an organisational perspective towards adoption of knowledge-based organisation, with a focus on social technical factors, DOI theory and KSP are reviewed. Although the models are discussed independently, when their common elements are considered they help to consolidate the relationships among the constructs of the researcher's model. For example, one of the validation models was used to ensure there is an

existing relationship between the selected DOI variables and knowledge sharing wherever the position of the two constructs relate to each other. Also, the models support the achievement of the study objectives by allowing the study to focus on the relationships between the constructs. For instance, even if the expected rewards construct was not statically significant in previous studies it may still demonstrate some significance in this study, as the reward system is a very important construct in any organisation's social system to promote knowledge sharing.

3.2.1 A Model for Knowledge-sharing, Absorptive Capacity and Innovation Capability: An Empirical Study of Taiwan's Knowledge-intensive Industries

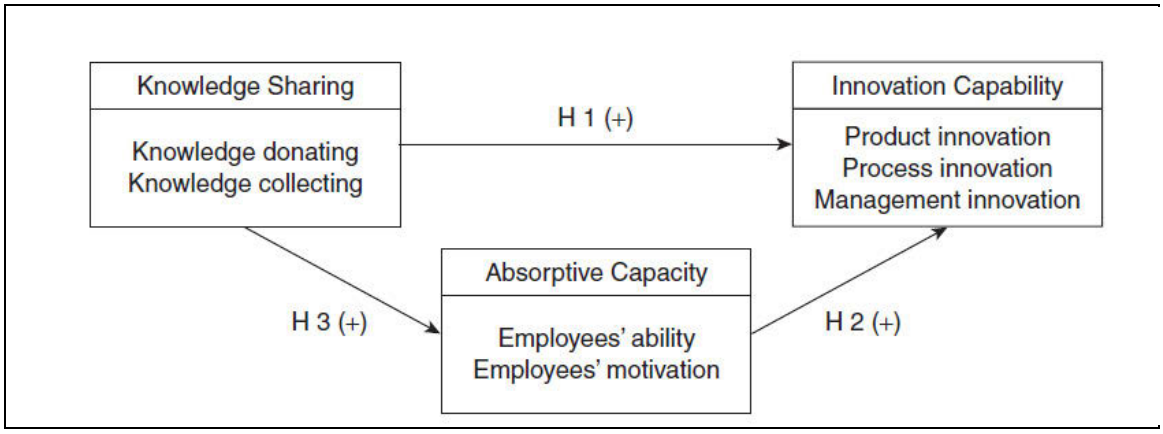


Figure 3-1: Knowledge-sharing, Absorptive Capacity and Innovation Capability in Taiwan's Knowledge-intensive Industries Conceptual Framework

The conceptual knowledge-sharing framework illustrated in Figure 3-1 was developed and empirically tested by Liao et al. (2007). It was designed to investigate the relationships between knowledge-sharing, absorptive capacity and innovation capability in Taiwan's knowledge-intensive industries. The study was based on data sampled from 170 Taiwanese firms, including electronic, financial, insurance and medical industries and yielded 355 valid returned research samples. The study found that absorptive capacity is the intervening factor between knowledge-sharing and innovation capability. Additionally, this study has shown the positive effect on absorptive capacity and mediating model exhibits both model generalisation and extension characteristics through multiple model comparisons in different industry population sampled.

3.2.2 Knowledge Management Enablers, Processes, and Organisational Performance: An Integration and Empirical Examination

The second model presented in Figure 3.2) below is adopted from Choi and Lee (2000). The model is based on the relationship between knowledge enablers, processes and the outcomes. It was developed to build incorporating knowledge management processes into organisational performance.

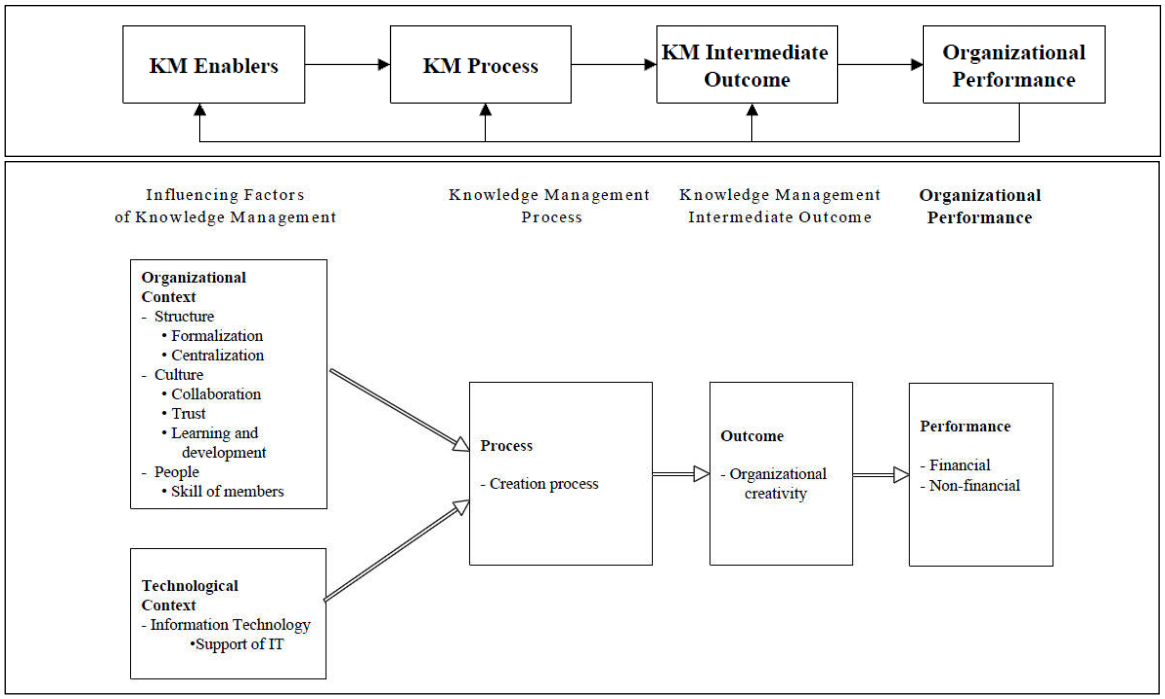


Figure 3-2: Knowledge Management Enablers, Processes

The model was developed by Choi and Lee (2003) to examine the relationship between knowledge management processes and enablers such as organisational structure, culture, and information technologies. This model was generated to define the correlation between knowledge management processes and organisational creativity. Both non-financial and financial performance measures were adopted to measure the impact of knowledge management. The study finds that knowledge management processes are significant predictors for organisational creativity, meaning that business organisations can achieve the strategic and economic benefits of knowledge management by utilising organisational creativity in an effective manner. Including the structure and organisational culture is found to be significant in predicting the knowledge management processes. It was also noted that technology factors were not related to the knowledge management. Lee and Choi's (2003) study shows not only a theoretical research model for knowledge management but also the relationships among

knowledge management components. It also establishes a generic research model by providing an integrated view of knowledge management. The findings of the study can help business organisations sharpen their knowledge management strategies.

3.2.3 Knowledge-sharing, Innovation and Firm Performance

Wang and Wang's (2012) research investigates the quantitative relationship between knowledge-sharing, innovation and performance in an organisational setting. Wang and Wang posit that knowledge-sharing not only has positive relationship with performance directly but it also influences innovation, which in turn contributes to firm performance. The model presented as Figure 3.3 is adopted from Wang and Wang 2012) and was empirically tested using data collected from 89 high technology firms in the Jiangsu Province of China. The study found that both explicit and tacit knowledge-sharing practices support innovation and performance. Explicit knowledge-sharing has more significant effects on innovation speed and financial performance while tacit knowledge-sharing has more significant effects on innovation quality and operational performance.

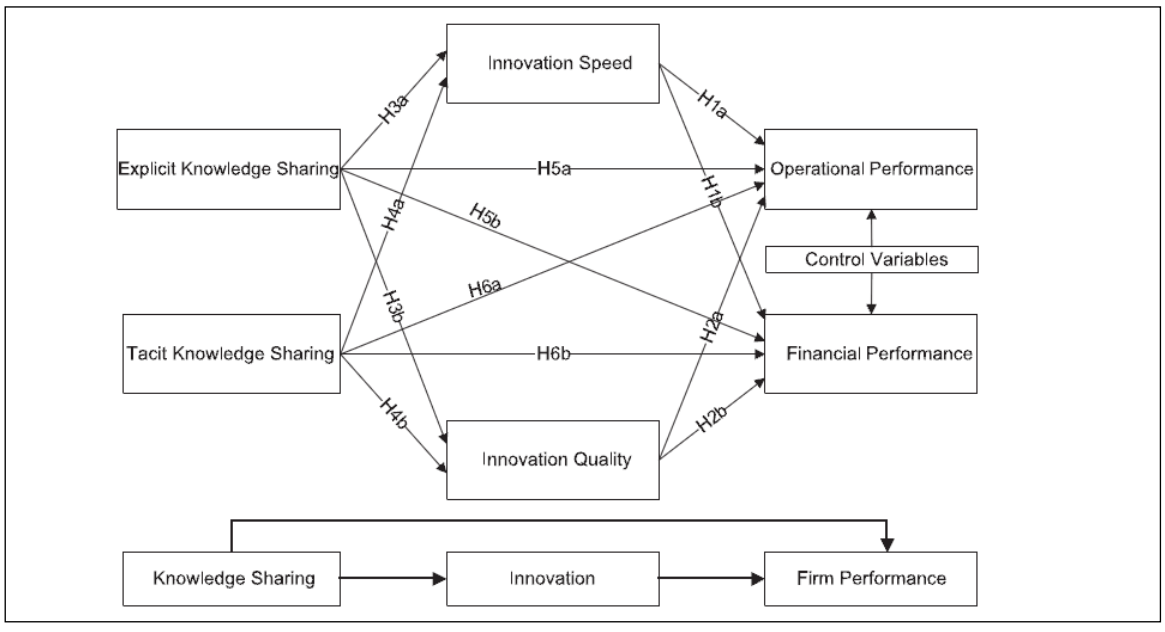


Figure 3-3: Knowledge sharing, innovation and firm performance

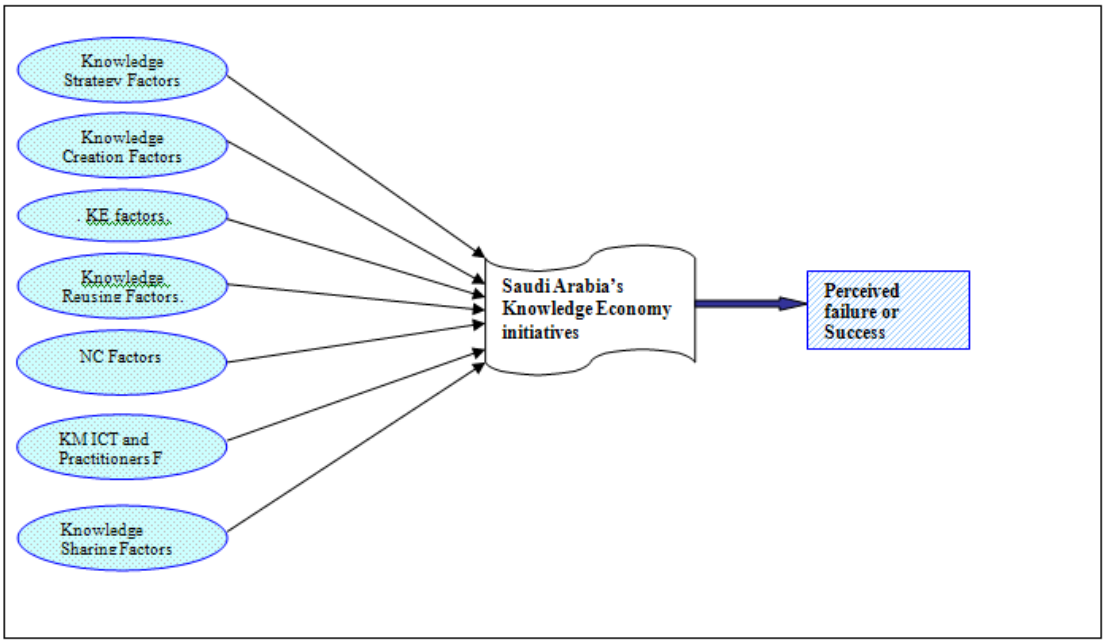


Figure 3-4: Development of a Critical Factors Model for the Knowledge Economy in Saudi Arabia

Alothman and Busch (2009) designed a model to investigate the role of all critical factors associated with the adoption and dissemination of a knowledge economy initiative. Figure 3-4 above is adopted from the Alothman and Busch (2009) model. The focus of their research is on how knowledge management, national culture and other country-specific factors are influencing Saudi Arabia's efforts to develop a knowledge economy. The study describes the theoretical foundations and methods of a planned investigation of the critical factors associated with the adoption and dissemination of a knowledge economy initiative in Saudi Arabia. The study also discussed Saudi Arabia's efforts to implement a knowledge economy system by integrating frameworks which help users identify various issues with the knowledge economy system, also making of use of knowledge management and acknowledging cultural factors.

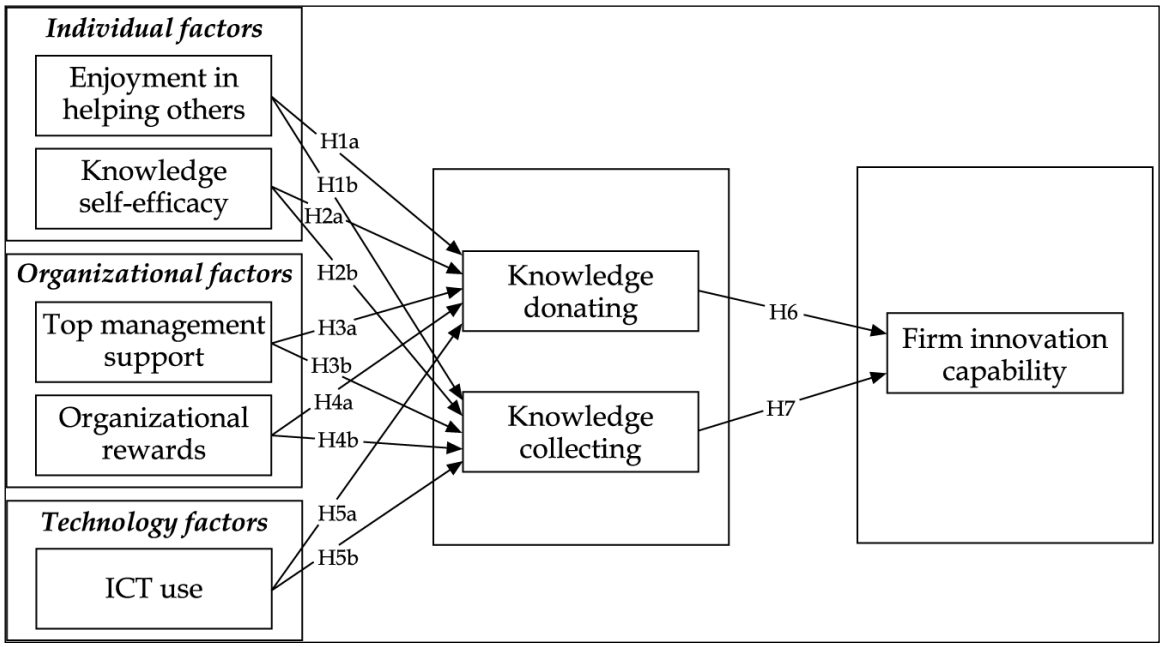


Figure 3-5: Knowledge-sharing and firm innovation capability: an empirical study model with hypothesis

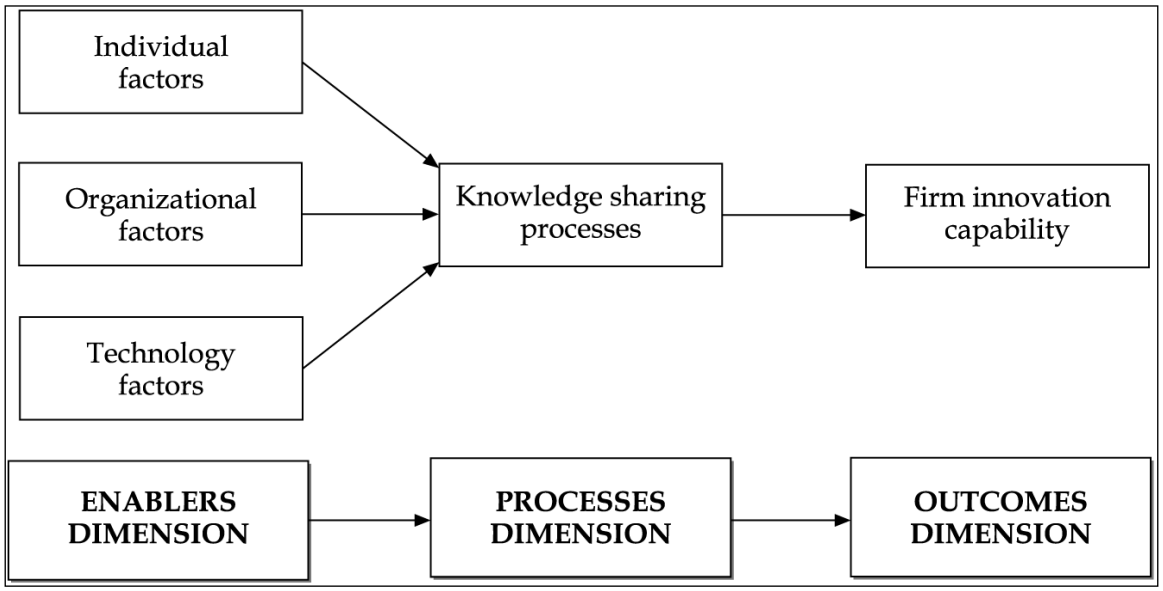


Figure 3-6: Knowledge-sharing and firm innovation capability: an empirical study model

The fourth model that examines knowledge-sharing is an empirical model developed by Lin (2007). Figure 3-6 shows the overview of model, while Figure 3-5 shows the constructs analysed in the study. A direct study came out with a model designed to examine the influence of individual, organisational and technology factors on KSP and whether having more processes leads to superior firm innovation capability. The model was designed to evaluation the knowledge-sharing based on a survey of 172 employees

from 50 large organisations in Taiwan. The results show that organisational factors (what is defined in this research as TMS) significantly influence KSP. The results also indicate that employee willingness to both donate and collect knowledge enables the firm to improve its innovation capability. In its examination of the relationships among knowledge-sharing enablers, processes and firm innovation capability, this research may provide information regarding how firms can promote a knowledge-sharing culture to sustain their innovation performance. Therefore, the findings of Lin's (2007) study provide a theoretical basis for this research and can simultaneously be used to analyse relationships among knowledge-sharing factors, including enablers, processes, and firm innovation capability. As it included a managerial perspective, this study identified several factors essential to successful knowledge-sharing and discussed the implications of these factors for developing organisational strategies that encourage and foster knowledge-sharing.

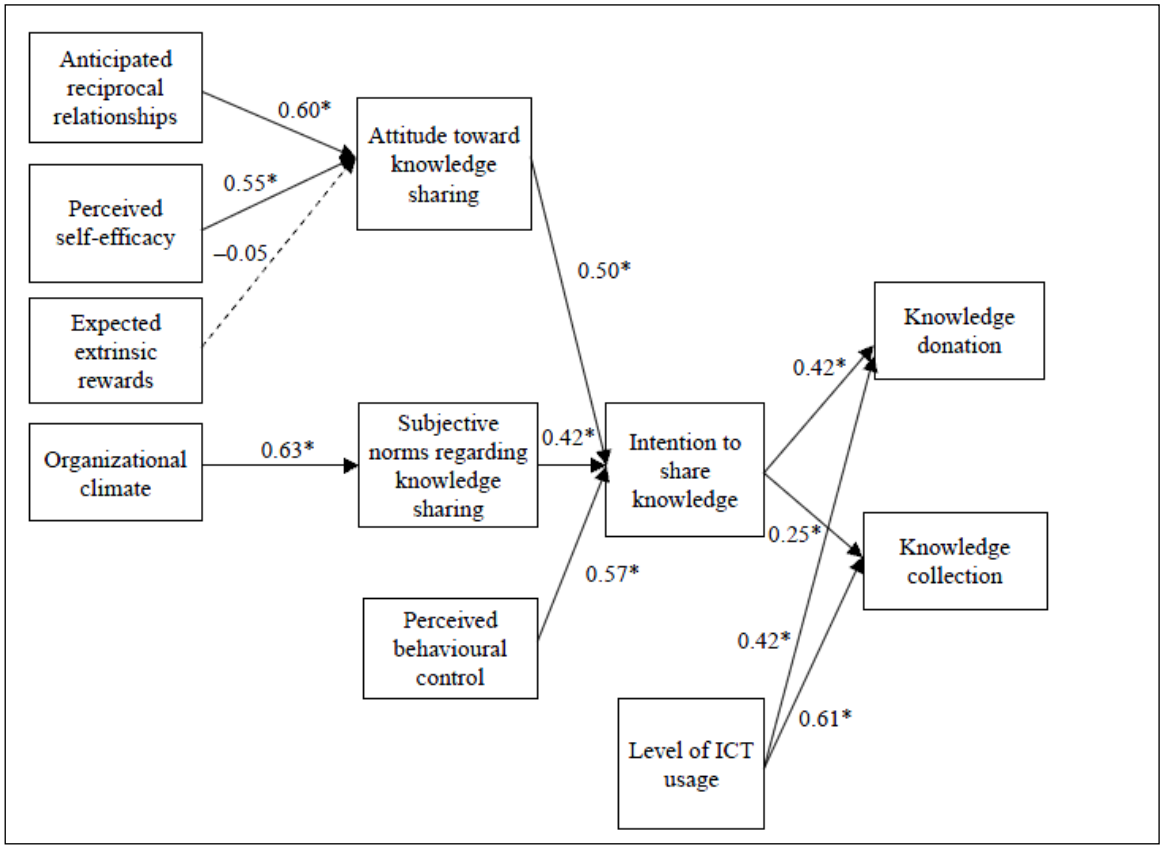


Figure 3-7: Knowledge-sharing behaviour and its predictors model

The model illustrated in Figure 3-7 is adopted from the model developed and empirically tested by Tohidinia and Mosakhani (2010). The aims of their model were to evaluate the influence of different factors on knowledge donation and collection. The

study shows comprehensive understanding about knowledge-sharing facilitators in the oil industry. Since there was a lack of such research in an Iranian context, Tohidinia and Mosahkani's (2010) research has provided the theoretical basis for future researches as well as practical implications for managers and practitioners. The examined factors look at those determinants that comprise different aspects of knowledge-sharing behaviour in an organisational context. The model covered different individual and organisational factors. Responses to a total of 502 questionnaires were considered in the study. The results showed that self-efficacy and anticipated reciprocal relationships had a positive impact on attitudes toward knowledge-sharing and that expected extrinsic rewards did not show a significant relationship with this variable. It also finds that in the organisational climate had a positive impact on subjective norms towards knowledge-sharing. Additionally, the level of information and communication technology usage reflected a positive effect on knowledge-sharing behaviour. Significant relationships were found to be true in between the knowledge-sharing and that expected extrinsic rewards.

To understand knowledge-sharing behaviour and it impacts, it is important to have completed thorough research analysis on the research framework. The first research framework was developed by Aulawi et al. (2009) and was based on a view that employees' capability to innovate is a significant factor for a company to survive in competition.

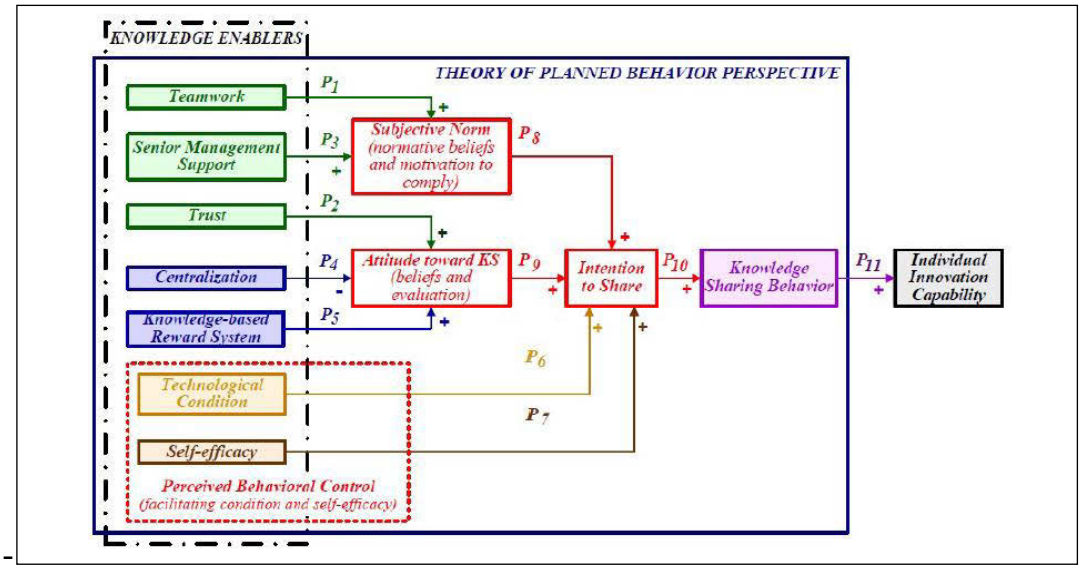


Figure 3-8: Knowledge-Sharing Behaviour, Antecedents and their Impact on the Individual Innovation Capability Framework

Employees' capability to innovate in a company is enabled through the development of knowledge sharing, since that activity identifies knowledge can be spread, implemented and developed. Knowledge sharing can motivate an individual to think more critically and more creatively, encouraging them to produce new knowledge, which is beneficial for the company. Therefore, this model was intended to investigate the relationship among knowledge enablers, knowledge-sharing behaviour and individual innovation capability. Through the analysis of those three concepts, understanding is produced among practitioners or academics about the benefits gained from the development of knowledge sharing activity and knowledge enablers about what is support is effective for the development of knowledge sharing activity in a company (see Figure 3-8). The research uses the Theory of Planned Behaviour (TPB) to explain the relationship between knowledge enablers and knowledge-sharing behaviour. Through a field survey of 125 employees in an Indonesian telecommunication company, it was found that knowledge sharing behaviour had a positive impact on individual innovation capability. Further, teamwork, trust, senior management support and self-efficacy are found to be knowledge enablers and are very positive in forming employees' knowledge sharing behaviour.

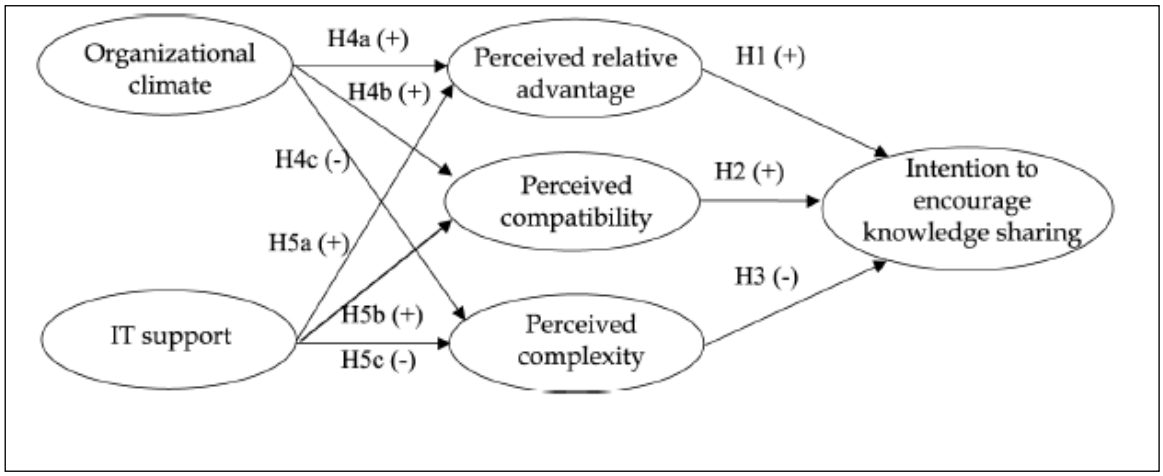


Figure 3-9: Effects of Socio-technical Factors on Organisational Intention to Encourage Knowledge-sharing

Another model is illustrated in Figure 3-9 above. It was by developed Lin and Lee (2006) to examine how two socio-technical factors (organisational climate and IT support) affect the intention to encourage knowledge-sharing through their effects on three innovation characteristics: perceived relative advantage, compatibility and complexity. The data was collected from a survey of 154 senior executives in Taiwan.

The results showed that an organisational climate significantly influences perceived relative advantage, compatibility and complexity, which in turn positively affected the intention to encourage knowledge-sharing. In contrast to previous studies, this study found that IT support did not significantly affect the three innovation characteristics of knowledge sharing. The limitation of this study was that it only examined the perceptions of top managers regarding knowledge-sharing. Therefore, a similar research model should be developed in order to predict and explain the determinants of organisational intention to encourage knowledge-sharing by discovering the perceptions of employees. Lin and Lee's (2006) study suggests that an increased effort should be made to allow employees to suggest ideas for new opportunities and foster a positive social interaction culture before introducing knowledge-sharing initiatives. Specifically, creating an organisational climate characterised by TMS, open communication, stimulus to develop new ideas and respond rapidly to new opportunities is likely to encourage both management and employees to socialise and interact frequently with each other, thus driving knowledge-sharing intentions. Therefore, the socio-cultural factors become evident factors to support the organisation, evaluate the perceptions of employees and encourage intention-sharing in the organisational environment.

The critical summary of the previous models discussed above are summarised in Table 3-1. This provides the foundation of the conceptual model used in this study. First, the key concepts used in the proposed model are defined and then the model is proposed.

Table 3-1: Critical Summary of the Models

Reference	Examined factors	Method	Influence on Knowledge-sharing and Innovation Capability (Significant Factors)
Liao et al., 2007	• KSP (donation and collection) • Innovation capability	Quantitative surveys of Taiwanese employees	Knowledge donating and knowledge collecting → Innovation capability
Choi and Lee, 2000	• Knowledge management enablers (trust) • Knowledge management processes	Quantitative surveys in Korea organisational settings	Trust→ Knowledge management processes
Wang and Wang, 2012	• Knowledge sharing (tacit and explicit) • Innovation	Quantitative surveys of firms in China	• Knowledge sharing • Innovation
Alothman and Busch, 2009	• KSF	Development of KE model of Saudi Arabia	Knowledge-sharing factor → knowledge economy (innovation)
Lin, 2007	• Organisational factors (TMS) • Organisational reward • Knowledge donating • Knowledge collecting • Firm innovation capability • Trust (trustworthiness of e-government)	Quantitative surveys of 172 employees from different organisations in Taiwan	• TMS→knowledge donating TMS→knowledge collecting • Rewards→knowledge donating • Rewards→knowledge collecting • Knowledge donating→innovation capability • Knowledge collecting→innovation capability

Reference	Examined factors	Method	Influence on Knowledge-sharing and Innovation Capability (Significant Factors)
Tohidiniaand and Mosakhani, 2010	• Level of ICT usage • Knowledge donation • Knowledge collection	Quantitative study of 502 respondents from an Iranian petroleum firms	• ICT→ knowledge donating • ICT→knowledge collection
Aulawi et al., 2009	• Senior Management Support • Trust • Knowledge based rewards System • Technological condition • Knowledge-sharing behaviour • Individual innovation capability	Quantitative surveys for 125 Indonesian telecom companies	• Management support • Trust • Rewards → knowledge-sharing technology but it were mediated by the intention of sharing knowledge usage • Knowledge sharing→ innovation capability
Lee and Lin, 2005	• DOI (Perceived relative advantage, perceived compatibility and perceived complexity) • Knowledge sharing • IT support	Quantitative surveys of 154 Taiwanese senior managers	Significant factors: • Relative advantage → Knowledge sharing • Compatibility → Knowledge sharing • Complexity → Knowledge sharing • IT support through DOI → Knowledge sharing
Choi and Lee, 2000	• Knowledge management enablers (Trust) • Knowledge management processes	Quantitative surveys in Korea organisational settings	Trust → Knowledge management processes

3.3 Conceptual Model

After reviewing the different theories and models discussed above, a conceptual model was developed to answer the research questions. The proposed model comprises of four constructs (see Figure 3-10):

1. Socio-technical factors (STF)
2. Diffusion of innovation (DOI)
3. Knowledge-sharing processes (KSP)
4. Organisational innovation capability (OIC)

Each of these constructs is briefly explained below.

Socio-technical factors are the factors from social and technical dimensions that provide the support needed to increase the ability to share knowledge. The four STF constructs examined in this research are:

- TMS: refers to the degree to which the top management support the organisational climate of knowledge-sharing by providing sufficient resources and influencing the employee willingness to share knowledge.
- *IS infrastructure*: refers to the level to which facilitating knowledge-sharing through knowledge repositories, enhancing the techniques of storing and retrieving the knowledge and developing systems can enhance the collaboration and communication around the organisation.
- *Interpersonal trust* (trust): refers to the degree to which the trust between co-workers exists concerning sharing feelings and perceptions, sharing personal information and experiences and the level of trust between employees and their trustworthy relationships. It also includes the existence of trust policies and procedures to protect the action of sharing the knowledge between co-workers.
- *Reward system* (Rew): refers to the degree to which a reward system to share any new and creative ideas and effectiveness knowledge-sharing impacts on collaborations and team-working rather than individual effort rewards exists.

Diffusion of innovation characteristics refers to dimensions that can be used to analyse the characteristics of new phenomena in the organisation (Rogers, 2003). In the context of this study, the following dimensions identified by Rogers (2003) are used because

they are considered as the most significant constructs in relationship of knowledge-sharing and DOI.

- *Perceived relative advantage* (RA): The degree to which encouraging knowledge-sharing is perceived to benefit the conduct of business.
- *Compatibility* (Com): The degree to which encouraging knowledge-sharing fits into existing business process.
- *Complexity* (Cox): The degree to which encouraging knowledge-sharing is difficult or an effort.

KSP are the processes of donating and collecting knowledge. They are defined by Rogers, 2003) as:

- *Knowledge donation* (Don) refers: to the action of employees to pass on their intellectual capital in an organisation.
- *Knowledge collection* (Col) refers: to the action of employees asking for advice from each other in order to build intellectual capital.

The OIC is the organisation's intention of increasing their ability to develop new and creative ideas in order to bring new innovative products or services that will increase the organisation's competitive edge (Rogers, 2003).

3.4 Hypotheses Development

The proposed conceptual model, presented in Figure 3-10, broadly depicts the possible relationships connecting the four constructs (STF, DOI, KSP and OIC). To confirm these relationships, a literature search was conducted to find the theoretical evidence through which the hypothetical relationships of the above constructs were linked. These relationships were proposed as a set of research hypotheses to address the research questions. The conceptual model (see Figure 3-10) indicates the potential relationships between STF and DOI to KSP (donation and collections) towards OIC. However, these relationships were based on a theoretical understanding from the literature review and there is limited direct empirical evidence that examines this. The constructs of DOI (perceived relative advantage, compatibility and complexity) are applied in this study as independent variables in relation to dependent variable knowledge-sharing. This is consistent with Lin and Lee's (2007), in which the authors used 'perceived relative advantage', 'compatibility' and 'complexity' as independent variables to dependent

variable ‘intention to encourage knowledge sharing’ and the results shows the relationship were significant. Therefore, the concept of DOI is adopted as independent variable. The sample for Lin and Lee’s (2007) proposed model was drawn from Taiwanese company senior executives. However, a further study is required as cultural differences exist among organisation, in particular, in Saudi organisations. The other independent variables for social-technical factors (top management support, IS infrastructure, interpersonal trust and reward system) are consistent with Aulawi et al. (2009) and Tohidinia and Mosakhani (2009). These studies found a statistically significant relationship of social-technical factors towards knowledge-sharing. Therefore, in this study social-technical factors (top management support, IS infrastructure, interpersonal trust and reward system) are adopted as independent variables and positive significant relationship with knowledge-sharing is proposed. The literature review helped to formulate three research hypotheses linked to research questions:

RQ1: How do socio-technical factors influence knowledge-sharing in Saudi organisations?

a. To what extent do socio-technical factors influence knowledge-sharing in Saudi Arabian organisations?

b. Do socio-technical factors influence support or limit organisational innovation capability in Saudi Arabian organisations?

H1: Knowledge-sharing factors or enablers positively influence knowledge-sharing processes (donation and collection).

a: Socio-technical factors positively influence knowledge-sharing processes (donation and collection).

b: Diffusion of innovation positively influences knowledge-sharing processes (donation and collection)

RQ2: In what way and to what extent do the affected knowledge-sharing processes influence Saudi Arabian organisational innovation capability?

H2: Employees’ willingness to share knowledge (donation and collection) positively influences organisations’ innovation capability and knowledge-sharing processes and acts as a mediator for the relationship between

knowledge-sharing factors (Socio-technical factors and Diffusion of innovation) and organisational innovation capability.

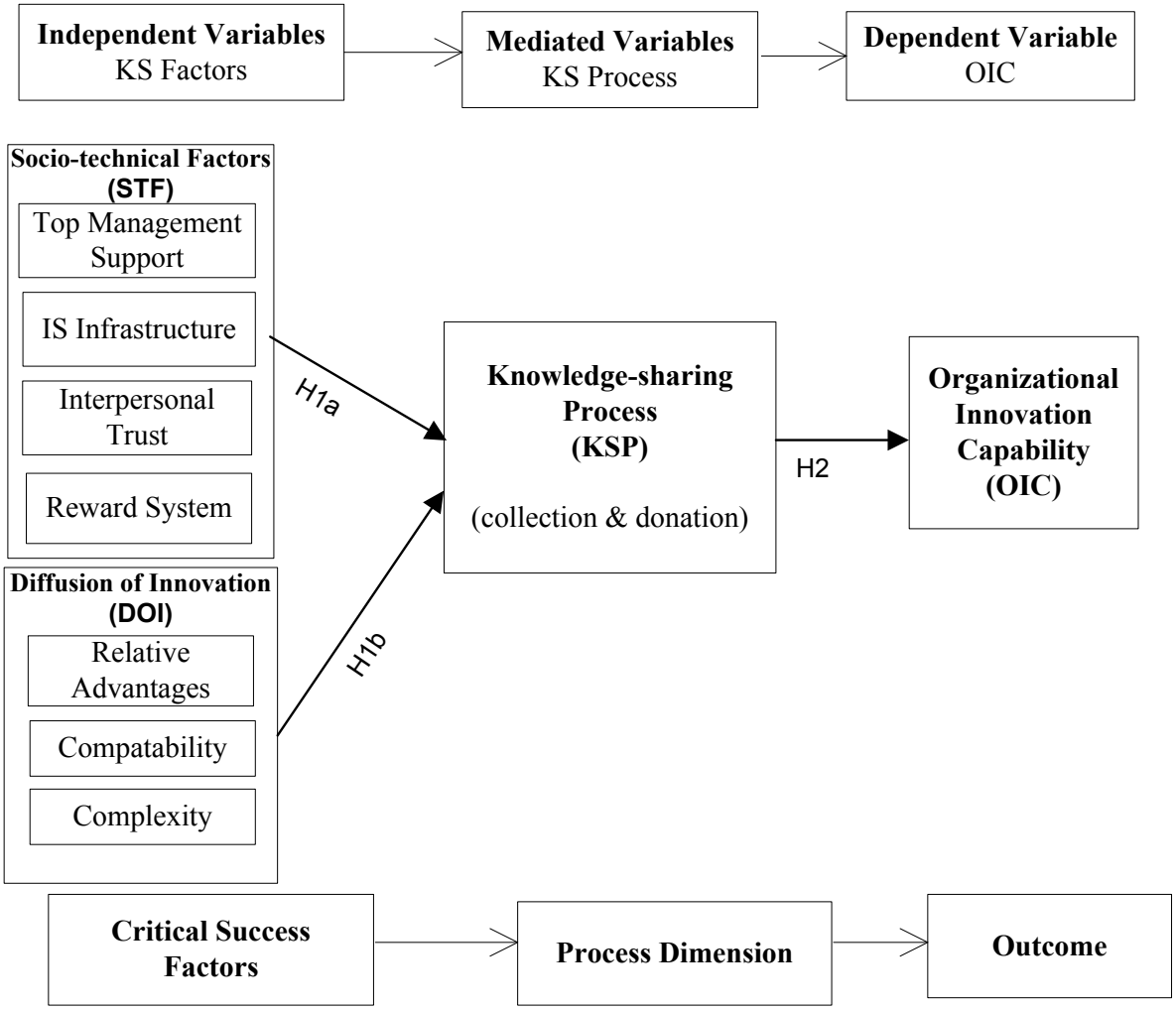


Figure 3-10: Proposed Conceptual Model and Hypotheses

3.5 Research Design

The design of research is very important, as it is the map that guides the research towards meeting the study aims. It also directs the research on how to address the study hypotheses and the research questions by providing a logical flowchart of the study from early stages till finalisations (Mohamed, 2003).

Figure 3-11 shows the research activities that were designed for the present study.

3.5.1 Knowledge Compilation and Research Problems

The literature review is an ongoing process that continues throughout the research life cycle. The first stage of knowledge compilation involved doing a broad literature review on the field of knowledge-sharing and innovation. As the research project progressed, the literature review became more focused. Research was conducted in the following areas:

- Knowledge and knowledge management.
- Knowledge sharing and its processes
- Knowledge-sharing enablers and critical factors
- Knowledge economy
- Innovation, creativity and innovation capability
- Saudi Arabia and its organisations.
- The organisational settings of the above areas

This stage required defining the research borders clearly in order to investigate the influence of socio-technical factors (TMS, interpersonal trust and organisational rewards system), technical (IS infrastructure) and DOI innovation characteristics (relative advantage, compatibility and complexity) on KSP and whether that influence leads to superior OIC in Saudi Arabia.

3.5.2 Development of the Research Conceptual Model

Once the literature review had been completed and the research borders established, the research questions and hypotheses needed to be developed. This stage focused on clarifying the relevant research questions and hypotheses to fill the knowledge gaps uncovered by the literature review. In order to answer these questions, a conceptual model was proposed (see Figure 3-10). The interrelationship among the constructs identified in the literature review was the basis of developing the hypotheses and the development of the questionnaire in the next step.

3.5.3 Development of the Questionnaire and Pilot Study

A questionnaire instrument was then developed as an approach or strategy for conducting research. A questionnaire involves a quantitative empirical investigation, where an evaluation for each item on the survey questions is conducted based on its

relevancy and consistency with each definition in the model. After that, a pilot study was conducted of particular organisations in Saudi Arabia in order to refine the approach and techniques. The aim of this stage is to design a framework that can be implemented later in other organisations in Saudi Arabia. The result of this study will be expanded in the next chapters.

The final survey was constructed after recovering the outcome of the survey instrument (the pilot study). The survey can elicit detailed information not forthcoming from the pilot study.

3.5.4 Data Collection

After designing the survey, the physical addresses of the participants were determined. The participants were notified of the survey's upcoming delivery and then the survey was sent in their address. The participants were carefully selected based on the organisations which can contribute to a KBE intitive in Saudi Arabia, for example universities, public organisations, private IT companies, research centres and consulting firms. Since this research was conducted overseas, it was important that enough time was given to allow the participants to fill out the surveys and return them to the researcher. It was decided that the surveys would be returned to the author's local address in Saudi Arabia rather than return them to a university in Australia in order to save time and make it easier for the participants to conduct this study.

3.5.5 Analysis Phase 1: Quantitative Data Analysis

3.5.5.1 Data Analysis Approach

After receiving the survey from the participants, specific statistical techniques were used to analyse the data gathered. The data analysis serves to address three main aims: having a feel for the data by checking the central tendency and the dispersion; testing the sufficiency of the data by measuring reliability and validity; and testing the hypotheses which were developed for the research (Sekaran, 2006).

Basic statistics concepts including mean, standard deviation and variance were implemented to examine the central tendency and the dispersion of the data. To measure reliability and validity, factor analysis and Cronbach's alpha were used. At the end of this stage, the developed hypotheses were tested using several statistical analysis methods, such as correlation analysis, which was used to assess the degree to which

particular items/variables/constructs belonged to its scale to find the influence of different factors in each. Most of the discriptive statistical calculations were performed through the Statistical Package for the Social Sciences (SPSS) (Version 18.00) program after cleaning and cleansing the data. This analysis also included an examination of the participants' demographics and a screening of data by assessing normality, mean, standard deviations and standard errors of the mean. A preliminary analysis of the means was also conducted in order to have a broad picture of the participants' perceptions about selected constructs, within the population of the survey.

Reliabilty and validity were then assesed through Cronbach's alpha and item correlations.

3.5.6 Validation of the Data

The results from the collected data were analysed using the above stated statistical methods to examine and consequently establish the internal validity of the model. In this way, the robustness of the model can be improved.

3.5.7 Recommendations and Submissions

The results were interpreted accordingly to match the hypothesis and a report of the findings was developed along with recommendations for future research.

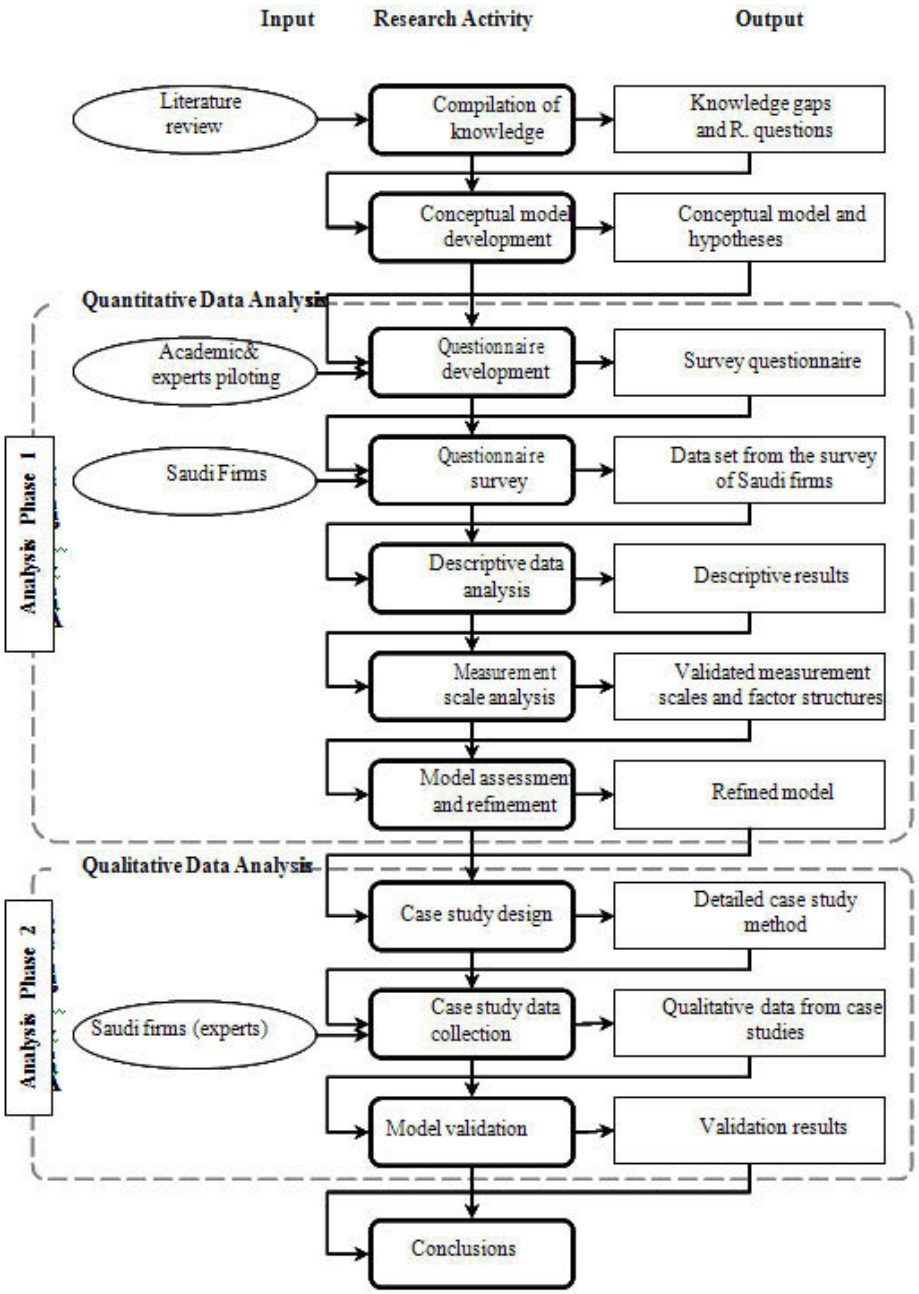


Figure 3-11: Schematic Diagram of Research Design

3.6 Research Design Instrumentation

This research has a descriptive and casual research design nature. This type of design is usually used to collect information about existing conditions. According to Calderon and Gonzales (1993), descriptive research is a purposive process of collecting, analysing, classifying and tabulating data around the conditions, practices, beliefs, trends, processes and causes and their effects and then coming up with accurate and adequate explanation about data that has been analysed with statistical methods. Churchill and Brown (2004) also note that the casual research design can help in determining the cause-and-effect relationships that match the aims of this research project. This method was used primarily to describe the profile of the employees inside the organisation through investigating the relationship between knowledge-sharing and its effective socio-technical factors (TMS, interpersonal trust, IS infrastructure and reward systems), innovation characteristics (perceived relative advantage, compatibility, and complexity) and the OIC.

3.7 Research Instrumentation

3.7.1 Measures

In this research study, items operationally used the selected constructs, which were mainly adapted from previous studies, translated and modified for the use of knowledge-sharing and innovation contexts. All constructs were measured using a set of items and then measured by using five-points Likert-scale statistical measures (ranging from 1 = strongly disagree to 5 = strongly agree). The definitions and theoretical constructs are described carefully below.

TMS was measured using four items derived from Tan and Zhao (2003) and Lin (2007), which measure the extent of the employees to perceive support and encouragement from higher level of management.

The five-item scale implemented to measure interpersonal trust was adapted from Al-Alawi et al. (2007), which measures the degree to which the trust between co-workers exists to share feelings, experiences, perceptions and knowledge.

Reward system was measured using two-item scale adapted from Al-Alawi et al. (2007). This was defined as the extent to which employees receive incentives (such as extra salary, bonuses or promotions) for sharing knowledge with other colleagues.

IS infrastructure was measured based on three items taken from Al-Alawi et al. (2007) and Lin and Lee (2006), which referred to the level to which facilitating knowledge-sharing through knowledge repositories, enhancing the techniques of storing and retrieving the knowledge and developing all the systems that can enhance the collaboration and communication around the organisation.

Perceived relative advantage was measured using a three-item scale adapted from Song (2002), Lee and Choi (2003) and Lin and Lee (2006), which was measuring the degree to which encouraging knowledge-sharing is perceived to benefit the conduct of business through increasing problem-solving, improving team worker performance and job effectiveness, and enabling rapid reaction to new experiences and knowledge.

Perceived compatibility was measured using three items that were adapted from Nadler and Tushman (1998), Chow et al. (2000), Sia et al. (2004) and Lin and Lee (2006), which measure the degree to which supporting knowledge-sharing matches the existing business processes via accepting the organisational management to share knowledge.

Perceived complexity was measured by using three items adapted from Huysman and de Wit (2004), Sia et al. (2004) and Lin and Lee (2006), which measure the degree to which encouraging knowledge-sharing is an effort.

KSP were measured using ten items adapted from Bock et al. (2005), Yeh et al. (2006) and Lin (2007), and Van den Hooff and De Ridder (2004) These measurements were divided into two processes: donation (which assesses the degree of employee willingness to share knowledge to colleagues) and collection (which refers to collective behavioural routines related to the spread experiences among colleagues). Each process of knowledge-sharing had five items for assessment.

OIC was measured using eight items derived from Calantone et al. (2002) and Lin (2007) which focus on an organisation's intention to increase the ability to develop new and creative ideas in order to bring new innovative products or services, thus increasing the organisation's competitive edge.

3.8 Survey Instrument

The instrument of this project was developed based on a literature review of related previous studies on knowledge-sharing and its motivation, social, technical and limiting factors as well as the KSP, organisational climate and culture, innovation, and OIC. The data collection instrument is divided in three sections consisting of quantitative scaled response questions, which can help to collect the data in a short period of time with a high response rate (Sekaran, 2006).

Each of the three sections collected information with respect to the feedback of the employees from their current organisational settings. The first major section was composed of questions addressing the profile of the employees inside the organisation through investigating the relationship between knowledge-sharing and its effective socio-technical factors, innovation characteristics and the innovation capability. The second section covered the selected organisational profiles such as level of knowledge-sharing and some knowledge-sharing techniques, and innovative person characteristics. The third and final section collected general background profile information such as the type of organisations and the number of people working in the organisation. Demographic information such as the level of education of interviewees was also asked in this section.

The first major section of the survey explored the three constructs that cover the social affecting factors of knowledge-sharing. These are discussed in the following three subsections.

3.8.1 Top Management Support

This subsection of the questionnaire gathered information concerning TMS. It was composed of questions concerning the extent to which employees perceive they receive support and encouragement from higher levels of management. This subsection was also included in the following indicators: creating supportive climate to share knowledge and providing sufficient resources and the influences provided by higher level of management to support employees' willingness to share knowledge (Table 3-2).

Table 3-2: Top Management Support (TMS)

Variable Name	Item
TMS1	The top management level think that encouraging sharing knowledge with colleagues is very important.
TMS2	Top managers always encourage and support staff to share their knowledge with other colleagues.
TMS3	Top management level provides most of the necessary environment, help and resources to help the staff to share their knowledge with other staff.
TMS4	Top managers are keen to see that the staff are happy to share their knowledge with colleagues.

3.8.2 IS Infrastructure

This subsection of the questionnaire was designed to assess the capability of the information system infrastructure among the selected organisations to gather the level to which knowledge-sharing was facilitated through knowledge repositories, enhancing the techniques of storing and retrieving the knowledge and developing all the systems that can enhance the collaboration and communication around the organisation.

Table 3-3: IS infrastructure

Variable Name	Item
IS1	My company provides various tools and technologies to facilitate knowledge-sharing and exchange experiences (e.g., email, intranet and groupware).
IS2	Employees use expensive electronic storages to access data/information/ knowledge (such as online databases and knowledge bases).
IS3	The technological tools available attract the staff to collaborate by sharing their knowledge.

3.8.3 Interpersonal Trust

This subsection of the survey was designed to gather the information on interpersonal or co-worker trust. In this subsection, the respondents were asked to rate their agreement on interpersonal trust among co-workers inside the designated organisations in Saudi Arabia in regard to the country's general image. This category examined attributes regard to the degree of trust and trustworthy relationships among employees, trust about

sharing feelings and perceptions, trust in sharing personal information and experiences, the level of trust experience, and the existence of trust through polices and rules to protect sharing knowledge against harmful actions.

Table 3-4: Interpersonal Trust (Trust)

Variable Name	Item
Trust1	I don't hesitate to share my feelings and point of views with my colleagues.
Trust2	I believe co-workers should not share personal information.
Trust3	Our company maintains certain rules and procedures to protect the employees from sharing their knowledge with harmful intentions towards others.
Trust4	In our company a considerable level of trust exists between co-workers.
Trust5	Most of my colleagues are people whom I know and thus consider trustworthy.

3.8.4 Reward System

This subsection of the questionnaire was created to discover the degree to which a reward system to share any new and creative ideas on collaborative and team working settings rather than individual effort reward existed.

Table 3-5: Rewards System (Rew)

Variable Name	Item
REW1	Our company rewards employees for sharing knowledge experience with their colleagues.
REW2	The knowledge-sharing rewards available are effective in motivating staff to spread their knowledge.

3.8.5 Diffusion of Innovation characteristics of knowledge-sharing

The DOI theory (Rogers, 2010) states that five perceived innovation characteristics influence adoption: relative advantage, compatibility, complexity, observability and trialability. Only the first three characteristics were included in theresearch model. First, since knowledge-sharing has a long-term impact, management is less concerned with observability of sharing knowledge. Second, knowledge-sharing includes significant organisational improvements but it is intangible. Therefore, trialability is unlikely to be a major consideration by the management of the organisations. Third, these three

characteristics (relative advantage, compatibility, complexity) have consistently been noticed to be important influences on knowledge-sharing (Verhoef & Langerak 2001; Sia et al. 2004; Lin & Lee, 2006). Thus, this study examines the extent to which these characteristics can predict the effect on knowledge-sharing.

3.8.6 Perceived Relative Advantages

This subsection of the survey was designed to gather the degree to which encouraging knowledge-sharing fits into existing business strategies. This subsection evaluated knowledge-sharing as an advantage to the organisation and included the following indicators that test the participants' beliefs about the advantages of sharing knowledge.

Table 3-6: Perceived Relative Advantages

Variable Name	Item: "In my organisation, I believe sharing knowledge with colleagues will . . ."
RA1	Increase solving-problem capability.
RA2	Improve team worker performance.
RA3	Quickly react to new information about the industry or market.
RA4	Be effective in their jobs.

3.8.7 Perceived Compatibility

In this subsection of the survey, compatibility refers to the degree to which encouraging knowledge-sharing fits with the business strategies. When organisations perceive sharing knowledge as compatible with their strategies, policies and directions they are more likely to be positively promoting them. This subsection composed of quotations assessing the compatibility with its current organisational situations, organisational policies, and organisational work styles.

Table 3-7: Perceived Compatibility

Variable Name	Item: "In my organisation, I believe sharing knowledge with colleagues . . ."
COM1	Compatible with the organisational situation.
COM2	Do not contradict the organisational policies.
COM3	Fitted their work style.

3.8.8 Perceived Complexity

In this subsection of questionnaire, complexity is defined as the degree to which encouraging knowledge-sharing is a difficult effort. Complexity is widely recognised as a key barrier to sharing knowledge. Thus, this subsection was examined the attributes that cover the complexity from perspective what employees believe the KSP will lead to difficulty in.

Table 3-8: Perceived Complexity

Variable Name	Item: "Application of knowledge-sharing by my organisation will lead difficulties in . . ."
COX1	Building employee commitment to the organisation
COX2	Controlling work quality
COX3	Support learning processes

3.8.9 Knowledge-sharing Processes

This section consisted of questions about KSP. These questions were categorised into categories. The first category included knowledge donating, which aims to see individual knowledge become group knowledge, and organisational overtime, which improves the organisation's knowledge stock. An organisation that encourages employees to contribute knowledge within groups and firms is likely to come up with new ideas and bring new business opportunities. The second category includes knowledge collecting, which consists of processes and techniques in how the knowledge can be gathered from internal and external resources. This process exists when organisational knowledge becomes group and individual knowledge (Lin, 2007). Thus, both categories cover items such as sharing new working skills, sharing new acquired information, whether sharing is a normal attitude in the organisation and knowledge of working (experiences, best practices) between sender and receiver in the organisation.

Table 3-9: Knowledge-sharing processes (Donation and Collection)

Variable Name	Item
DON1	I often share with my colleagues the new working skills that I learn. D*
DON2	My colleagues often share with me the new working skills that they learn. D*
DON3	I often share with my colleagues the new information I acquire. D*
DON4	My colleagues often share with me the new information they acquire. D*
DON5	Sharing knowledge with my colleagues is regarded as something normal in my company. D*
COL1	My colleagues often share with me the working skills they know when I ask them. C*
COL2	I often share with my colleagues the working skills I know when they ask me. C*
COL3	My colleagues often share with me the information they know when I ask them. C*
COL4	I often share with my colleagues the information I know when they ask me. C*
COL5	Our company staff often exchanges knowledge of working skills and information. C*

D* Donation of knowledge
C* Collection of knowledge

3.8.10 Organisational Innovation Capability

Innovation capability refers to the ability to generate innovations at a fast rate that gains the organisation competitive advantages (Hurley & Hult, 1998). Buganza and Verganti (2006; 2013) define innovation capability as the ability to create innovations in responding to contextual changes and opportunities without organisational disruption, excessive time and costs or loss of performance. The concept of this ability involves not only the creation of new ideas but also the implementation of new ideas. In this study, OIC is defined as an organisation's intention to increase their ability to develop new and creative ideas in order to bring new innovative products or services, thus increasing the organisational competitive edge. This section included questions investigating the ability to develop new and creative ideas/products/services, sharing knowledge to be

faster in problem-solving, sharing knowledge to generate new ideas, developing new business opportunities through individuals and groups and sharing knowledge to enhance reactions to new ideas/information/knowledge.

Table 3-10: Organisation Innovation Capability

Variable Name	Item
OIC1	Our company frequently tries out new ideas.
OIC2	Our company seeks new ways of doing things.
OIC3	Our company is creative in its operating methods.
OIC4	Our company is frequently the first to market new products and services.
OIC5	Innovation is perceived as too risky in our company and is resisted.
OIC6	Our new product/service introduction has increased during the last five years.
OIC7	Our company often develops new products/services that are well accepted by the market.
OIC8	The new products or services developed by our company always arouse imitation from competitors.

3.9 Instrument Translation

The scales implemented in this survey were developed originally in English. However, it was necessary that they were translated in Arabic to be used in Saudi Arabia's organisations. Based on the cross-cultural development work of Sperber et al. (1994) and the organisational learning culture and climate study in Jordan by Bates and Khasawneh (2005), in order to maintain a high quality of translation in order to ensure the functional equivalence between the English and Arabic items, a forward translation procedure with subjective evaluation was used. After this, the final English/Arabic version that was used in the pilot test was sent to a group of ten experts whose first language is Arabic but who use English as the language of communication in their organisations, which are in different industries in Saudi Arabia. The objective of producing Arabic items was the meaning or the functional equivalence be used rather than providing an identical word-by-word translation for the English items. The functional equivalence helps to ensure that the translated measures can deliver the core meaning as the English statements and had the appropriate form of readability. The translation stages are described in the following sections.

3.9.1 Forward Translation

Two English-Arabic certified translators translated the English version to Arabic one. Both translators were instructed to maintain the meaning of the statements as close as possible to the English items. The two Arabic translated versions were compared item by item to assess the accuracy of the translation and the most accurate translation was placed in the final version of the questionnaire.

3.9.2 Subjective Evaluation

The researcher then evaluated the final translated version after the first translation stage to ensure that equivalence of the meaning as in the English version. If any meaning differences were found between items, these items were sent back to both translators so they could look at it and refine it to the best translated meaning until the researcher was satisfied.

3.9.3 Pilot Test

The English/Arabic final version of the survey was piloted among group of experts, as will be discussed extensively below in the next section.

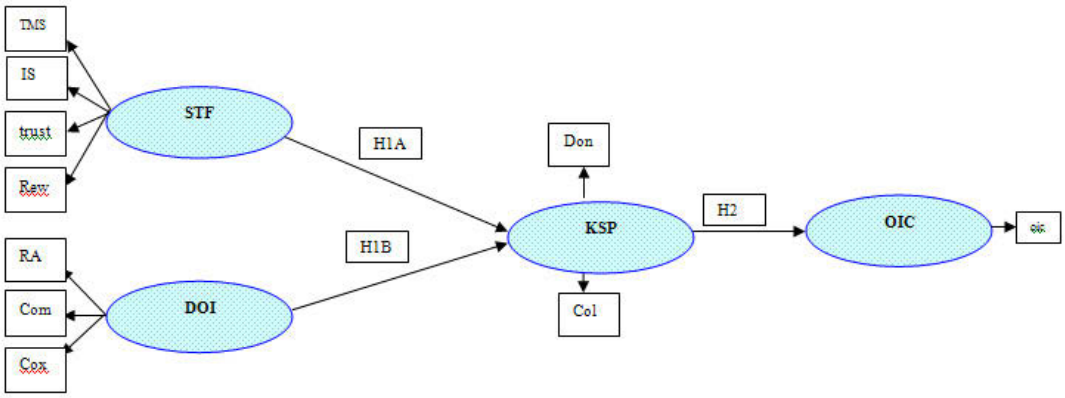


Figure 3-12: Conceptual Model

Table 3-11: The alignment among the construct, dependency, research question, and indicators of existence

Factors	Hypotheses	Research Questions	Indicators of Existence
TMS	H1.1: TMS positively influences KSP (donation and collection)	RQ1: How do socio-technical-cultural factors influence knowledge-sharing in Saudi Arabian organisations? a. To what extent do socio-technical-cultural factors influence knowledge-sharing in Saudi Arabian organisations? b. Do socio-technical factors influence support or limit OIC in Saudi Arabian organisations?	1. Creating supportive climate to share knowledge and providing sufficient resources. 2. Influence of employees' willingness to share knowledge. **Related studies: Davenport et al. (1998) MacNeil (2004), Lin and Lee (2004), Lin (2006)**
Interpersonal Trust	H1.2: Interpersonal trust-reward system positively KSP (donation and collection)	How and to what extent the influence of socio-technical factors on knowledge-sharing which wither can support or limit the OIC?	1.Trust to share feelings and perceptions 2.Trust in sharing personal information and experiences 3. The existence of trust through polices and rules to protect sharing knowledge against harmful actions. 4. The experience and level of trust. 5.Trustworthy relationships **Related studies: Mishra and Morrisay (1990), Ford (2001), Reyes et al.(2004), Roberts et al.(2004)**
Rewards Systems	H1.3: Reward systems positively influences KSP (donation and collection	RQ2: How and to what extent does the influence of socio-technical factors have on knowledge-sharing which can support or limit the OIC?	1. Existence of rewards for knowledge-sharing of new and creative ideas. 2. Effectiveness of knowledge-sharing rewards between individuals and groups. **Related studies: Bartol and Servatava (2002), Goh**

Factors	Hypotheses	Research Questions	Indicators of Existence
			(2002), Syed-Ishkan and Rowland (2004)
IS infrastructure	H1.4: IS Infrastructure positively influences KSP (donation and collection).	RQ1: How do socio-technical cultural factors influence knowledge-sharing in Saudi Arabian organisations? a. To what extent do socio-technical cultural factors influence knowledge-sharing in Saudi Arabian organisations? b. Do socio-technical factors influence support or limit OIC in Saudi Arabian organisations?	1. Facilitate knowledge-sharing through managing knowledge repositories. 2. Store and retrieve organisational information/knowledge. 3. Support communication and collaboration around organisation (systems). **Related studies: Connelly and Kelloway (2003), Pan and Leinder (2003), Huysman and Wulf (2006)**
Perceived Relative Advantage	H1.5: A perceived relative advantage positively influences KSP (Donation and Collection).	RQ1: How do socio-technical cultural factors influence knowledge-sharing in Saudi Arabian organisations? a. To what extent do socio-technical cultural factors influence knowledge-sharing in Saudi Arabian organisations?	The degree to which encouraging knowledge-sharing fits into existing business processes. Increase problem-solving capability. Improve team worker performance. Quickly react to new information about the industry or market. Be effective in their jobs **DOI Rogers (2003)**
Perceived Compatibility	Compatibility positively influences KSP (Donation	RQ1: How do socio-technical cultural factors influence knowledge-sharing in Saudi	The degree to which encouraging knowledge-sharing fits into existing business process through

Factors	Hypotheses	Research Questions	Indicators of Existence
	and Collection).	Arabian organisations?	
Perceived Complexity	Complexity positively influences KSP (donation and collection).	How and to what extent the influence of socio-technical factors on knowledge-sharing which wither can support or limit the organizational innovation capability?	The degree to which encouraging knowledge-sharing is a difficult effort via: 1. Building employee commitment to the organisation 2. Controlling work quality 3. Support learning processes **DOI Rogers (2003)**
KSP (Donation and Collection)	H2 Employees' willingness to Share knowledge (Donation and Collection) positively influences organization innovation capability.	1. How and to what extent the influence of socio-technical factors on knowledge-sharing which wither can support or limit the organizational innovation capability? 1 .In what way and to what extent each of the KSP influence on organizational innovation capability?	1. Sharing new working skills. 2. Sharing new acquired information. 3. Sharing can be normal attitude in the organization. 4. Knowledge of working (experiences, best practices, et cetera) **Related Studies: Krogh (2002), Wenger et al. (2003), Syed-Ishkan and Rowland (2004)**
OIC (aligned with knowledge sharing)	H2 Employees' willingness to share knowledge (donation and collection) positively influences OIC.	RQ2: In what way and to what extent do the affected KSP influences Saudi Arabian OIC?	1.The ability to develop new and creative ideas/products/services 2.The ability to increase the organisation's competitive advantage 3. Sharing knowledge to be faster in problem-solving. 4. Sharing knowledge to generate new ideas and developing new business opportunity trough individuals

Factors	Hypotheses	Research Questions	Indicators of Existence
			and groups. 5. Sharing knowledge to enhance reaction to new ideas/ information/ knowledge. **Related studies: Hurley and Hult (1998), Davenport and I Darroch and MacNaughton (2002) Liebowitz (2002), Jant (2006), Buganza and Verganti (2006)**

3.10 Pilot Study

The validity of the survey was established in previous studies. A pre-test recommended by Burns and Bush (2003) was conducted in order to identify issues that needed to be revised before executing the major questionnaire. Thus, as suggested by Zikmund et al. (2012), the instrument was pretested in different stages with small sample of participants to identify problems that may be encountered and to ensure the questions and the translation were clearly understood.

Therefore, after a draft survey was developed, three validating-stage practices were conducted. Firstly, the questionnaire was reviewed by the author's supervisor and panel members for comments and suggestions through one-on-one consultations and a doctoral assessment report and presentation. Secondly, the researcher received the required approval from the University of Technology, Sydney (UTS) Human Ethics committee. The committee received completed modules of the survey and submitted the required ethics forms including a consent form clarifying the title, purpose, procedure, confidentiality, the participant's rights, and statement of the ethical conduct of this research. Lastly, a total of ten participants from ten organisations in the designated industry in Saudi Arabia examined the revised questionnaire. Those participants were given the survey and asked to examine it for meaningfulness, relevance and clarity.

3.11 Sample and Sample Size

A realistic sampling method was used. The survey was distributed to employees in different organisations from the selected industries in Riyadh, Saudi Arabia between July 2011 and February 2012. There is no direct and solid method in the literature to define survey complexity and sample size; therefore, recommendations provided Hair et al. (2006) were utilised. Hair et al. suggests five points may affect the required sample size for structure equation modelling (SEM) statistical analysis: multivariate distribution of the data; estimation technique; model complexity; amount of missing data; and amount of average error variance among reflective indicators. Also, Hair et al. recommends that the sample size of SEM studies should range from 100-200 participants

3.12 Data Collection

The data was collected via formal survey. A questionnaire was the main data-gathering instrument for this project and was divided to three major sections. An English/Arabic questionnaire was used in this research. The items were randomly dispersed in the survey and a Likert-scale type was implemented to detain the employee's level of agreement with the questions.

3.12.1 Survey Administration

The survey was distributed to employees who work in selected organisations between July 2011 and February 2012. A cover letter and self-administrated questionnaire was sent in hard copy with a postage-paid envelope attached so the survey could be returned to the researcher in Saudi Arabia. The staff members in the selected organisations were instructed to complete the survey and return it using the prepaid postage envelope during the time frame outlined in the cover page of the survey. The respondents were asked to return the completed questionnaire by dropping it in a domestic postal box. Support was given from assigned staff from the organisations if aid and motivate respondents in filling out the survey was needed. Follow–up calls to the selected organisations were placed about three weeks after the initial mailing. A total of 20 organisations were randomly selected from the top 1000 firms listed in Saudi Arabia's Ministry of Labor. 600 questionnaires were distributed, 257 completed and returned, which represents a response rate of 42.83%.

3.13 Data Analysis Statistical Methods

3.13.1 Phase 1: Quantitative Data Analysis

The data methods were classified according to the aims of the study. The statistical methods chosen to analyse and evaluate the data gathered from the survey are discussed in this section. A multivariate statistical approach was implemented to quantitatively analyse data collected from the questionnaires. The quantitative analysis (phase 1 of the study) went through three stages as follows.

3.13.1.1 Descriptive Data Analysis

The descriptive data analysis was conducted using the SPSS (Version 16.00) software to find if the data was ready to continue to the multivariate data analyses step. This analysis contained an examination of the participants' profiles and data screening by studying normality, means, standard deviations and standard error of the mean.

3.13.1.2 Measurement Scale Analysis

The measurement scale analysis was used in the questionnaire to capture the meaning of each model construct through an assessment of reliability and validity. To measure reliability a Cronbach's alpha assessment was worked out, which helped to show the consistency of the responses across the items within the Likert scale. In addition to this, item-total correlations were used to assess the degree to which a particular item belonged to its scale. The validity of the measurement scale was assessed as well by using factor analysis, which was carried out using two sequential techniques: EFA to identify the appropriate set of variables and to explain the variables in terms of a common objective and CFA to confirm the results in order to provide the grounds for further model assessment and refinement. The CFA is considered the best-known technique for testing how well a pre-determined (hypothesised) factor structure matches the actual data (Hair et al., 2006). Both the EFA and CFA analysis results were found by using SPSS. More details and results of the measurement scale analysis are presented in Chapter 5.

3.13.1.3 Structural Equation Modelling

The SEM technique was used to investigate the causal relationships of the model (Hair et al., 2006). SEM was used as an extension of the previous technique factor analysis because SEM helps to integrate path analysis and factor analysis by involving two steps in this process: validating the measurement model; and fitting the structural model after the CFA and through path analysis (Garson 2006). The SEM was performed on IBM-AMOS (version 20), which is an extension to the use of SPSS. The SEM analysis and results are presented in Chapter 6.

3.13.2 Phase 2: Qualitative Data Analysis

3.13.2.1 Analysis Approach

The main purpose of this analysis was to validate qualitatively the research model, which was assessed and refined from the preceding model assessment stage. The analysis guaranteed that the model adequately represented the actual phenomenon within the Saudi Arabian organisational context.

In this study, a case study research approach was employed based on qualitative analysis commonly used in social science research (Yin, 2011). It is the preferred strategy in this situation as it is suitable for the nature of this research. Moreover, the explanatory type of the case study helped to revalidate the research model for generalisation purposes (Sekaran, 2006).

To achieve this, the generalisation of the research model could not be fully covered by the statistics phase because the objective of this study is purposive rather than statistical. In order to support the generalisation, multiple case studies were implemented using the developed model template, the outcomes of which were compared to find whether the same findings and results were reliable (Yin, 2011). Also, the results from this stage were also strengthening the understanding of how well the model presented Saudi Arabia's current status towards a KBE initiative.

3.13.2.2 Case Study Design

According to Yin (2011), the case study method can be designed to a single case study or multiple cases. The single case study design uses in-sight study and extensive description about a single phenomenon and is suitable for studying critical cases or unique conditions. Multiple case studies have more than one case, which can be more expensive and time consuming. The multiple cases follow replication logic, where the result of the studies either predicts similar results or contrasting results. This study adopted a multiple cases approach since replication logic was used in order to achieve analytical generalisation. The selection of organisations, which were included in the study, was based on similar criteria used in the statistics stage. Case studies can be classified as explanatory, descriptive or exploratory. Exploratory case studies focus on theory and/or hypothesis development; descriptive case studies focus on finding what needs to be described or any information gathered about a situation; and explanatory case studies focus on concepts and hypothesis testing. In this study, an explanatory

approach was used to satisfy the purpose of validating the research model that derived from the (Yin, 2011) assessment stage. Specifically, the explanatory approach validates the derived model after the quantitative assessment process by allowing the revised concepts/hypotheses to be tested again.

3.13.3 Data Collection

The case studies approach has different data collection methods including interviews, observations and documentations, and questionnaires. In order to increase the validity of the results, different methods should be implemented as sources of evidence. This study relied on interviews and documentation (where available). According to Yin (2011), interviews can be one of the main sources of information in the case studies approach. Semi-structured interviews were adopted in this study to maintain the flexibility with an interview guide developed to direct the interviews and relevant lines of enquiry. All the interviews were held face to face and were digitally recorded to resolve any ambiguity issues and obtain complete and accurate descriptions of the interviewee's response and comments.

A documentation method was adopted focused on relative organisational and demographic background information to support the relative details of the organisations.

With regard to conducting the interviews in research, informed consent is essential. In each firm, the researcher provided the HR manager with information on the research problem statement, the research method, research significance and the nil/negligible risks associated while conducting interviews (see Appendix B). The researcher also informed participants via HR managers that the participants may choose not to answer any questions and were free to withdraw at any time. The participants were also informed that their privacy and anonymity would be guaranteed.

3.13.4 Data Analysis

Data analysis consists of examination, categorisation and tabulating, and testing or gathering the evidence that satisfy the objectives of the study. Yin (2011) stated that this is one of the most difficult steps in case studies. In this study, the analysis of data followed two main steps: a within-case analysis and a cross-case analysis (Elisenhardt, 1989). A within-case analysis provides descriptions which can be treated as central to the generation of insights in and to the case (Elisenhardt, 1989). Specifically, the

information provides insight into how the model and its constructs were perceived within the Saudi context. Thus, this component included descriptive details as well as the findings for each case, with a qualitative rating for each factor and construct. Also, this analysis type helped to provide better basis for the data as the data could be linked to in the model (Mitchell & Bernauer, 1998). A cross-case analysis can validate the results down from the multiple case studies by using a pattern matching technique which links the collected data to the theoretical propositions by comparing patterns of the actual values of variables to those predicted in the propositions (McCutcheon & Meredith; Yin 2011). For the purposes of this study, pattern matching compared the patterns of the actual constructs to those predicted by the model in the quantitative phase. The patterns can be judged based on the statistical criteria. The results of this stage are presented in Chapter 8.

3.14 Summary of Chapter

This chapter draws from the work of other researchers to establish a basis for this research. It takes the constructs identified as relevant in the literature review (socio-technical factors, DOI and KSP) and puts forward a conceptual model that is designed to trace these constructs in relation to the development of OIC in Saudi Arabia. As a primarily quantitative study, results will only be accurate and valid if the research has been well designed. The approach in this chapter, coming out of a thorough literature review and sourcing information from a wide variety of documentary sources, aims throughout to be of practical use to the development of a knowledge economy in Saudi Arabia. This chapter is followed by findings and analysis of research proceeding on the basis of the research approach outlined in this chapter.

4. Chapter 4
Descriptive Data Analysis

4.1 Introduction

Previous chapters have introduced the thesis, provided a literature review, outlined the scope of the project and described the development of the research instrument. This chapter contains the preliminary stage of the quantitative phase of the study: the descriptive data analysis. The principal aim of this part of the study is to investigate the elemental criteria of the information to ensure that it was appropriate for the statistical techniques engaged in the consequent analysis phases. Section 4.1 introduces the chapter. Section 4.2 presents the details of the questionnaire survey and the respondents' profiles. In Section 4.3, the results are illustrated in terms of normality and outliers of the data set, standard deviation and standard error of the mean. Initial findings are introduced in Section 4.4 as decoded from the mean values of each assessed variables. A summary of the chapter is then provided in Section 4.5.

4.2 Questionnaire Survey and Respondents' Profiles

4.2.1 Questionnaire Survey

As discussed in Chapter 3, it was determined that a questionnaire was the most appropriate way to collect the data for this study because it is the quickest and most reliable method for data collection. A hard-copy questionnaire survey was mailed to employees who worked in selected Saudi Arabian organisations between July 2011 and February 2012. The chosen organisations were 20 companies that were randomly selected from the top 1000 firms listed by Saudi Arabia's Ministry of Labor. 600 questionnaires were distributed. Of these, 280 were completed and returned and a total of 256 questionnaires were used in the analysis after managing the missing data analysis, representing a 45.23% response rate. The questionnaire survey sent included a cover sheet with instructions on how to complete and return the survey, a self-administered questionnaire and a postage-paid envelope that had been addressed to the Saudi Arabian address of the researcher. The staff members in the organisations that were participating in the survey were directed to complete the survey and return it via

the postage-paid envelope during the assigned time frame as explained in the cover page of the survey. The completed questionnaires could be returned by dropping them in a domestic postal box. The human resource and administration department in each organisation recommended senior and expert staff who offered support by aiding and motivating the respondents filling out the survey. Follow–up calls to each organisation were placed about three weeks after the initial mailing.

4.3 Respondents' Profiles

An evaluation of the respondents' profiles was done to reveal the ability of the sample to sufficiently exhibit the survey population. Respondents were categorised as follows:

- The size of organisation and job titles;
- Type of organisation and organisation's industry;
- Level of knowledge-sharing within the organisation; and
- Employee's educational level, gender and years of experience.

The results showed an almost equal percentage of employees from either gender (49% of respondents were male and 51% were female) (Figure 4-1). 29% of the respondents were employed in the education industry, 24% in the health industry, 16% in the financial industry, 10% in wholesale and 5% in the investment sector. The remaining respondents worked in the insurance and construction industries (4%), IT industry (3%), consulting (2%) and finally retail (Figure 4-2).

51% of the participants worked in the private sector while 47% worked in public-related sectors (25% public, 20% semi-public and 2% government-supported non-profit organisations) (Figure 4-3). The educational level of the respondents ranged, with 59% having a bachelor's degree, 19% a master's degree, 14% a diploma and 5% a doctoral degree (Figure 4-4).

There was a good variety in the size of the organisations of respondents, with 45% of participants working at small to medium firms (between 20 and 200 employees) and 55% at large organisations (more than 200 employees) (Figure 4-5). The participation level of employees with one to five years working experience was 51%, six to 10 years was 27%, 11-20 years was 15% and 7% of the employees had over 20 years of working experience (Figure 4-6).

Job titles of the participants involved in the survey were General Manager (2%), Project Manager (5%), Division Head (8%), Supervisor (9%), Team Leader (8%), Coordinator (9%), Consultant (2%), Engineer (2%), Administrator (20%), Instructor/Lecturer (12%), with 'Other Occupations' representing (23%) of the respondents' job titles (Figure 4-7).

The evaluation of the knowledge-sharing level represented in Figure 4-8 revealed that 58% of employees reported their level was good, 31% that it was excellent and only 11% reported a poor sharing level.

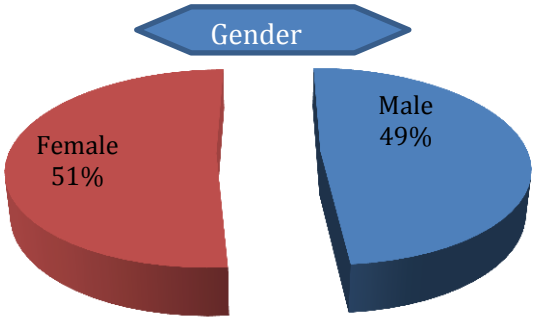


Figure 4-1: Gender of Participants

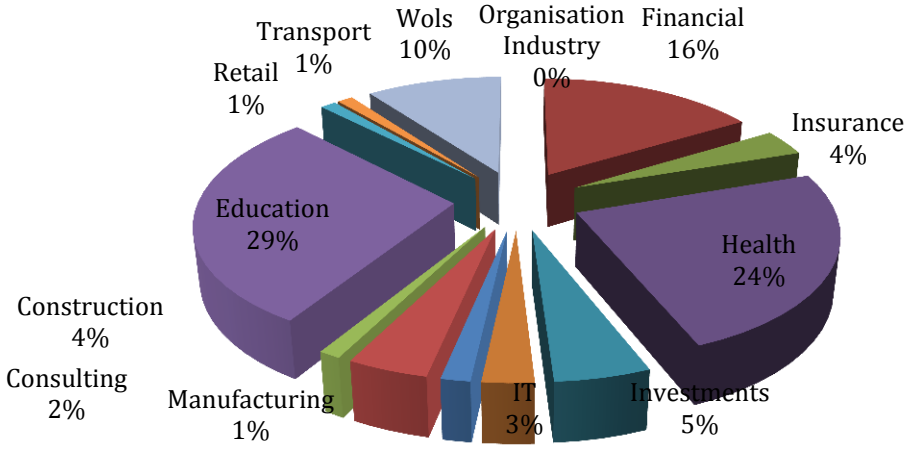


Figure 4-2: Organisation by Industry

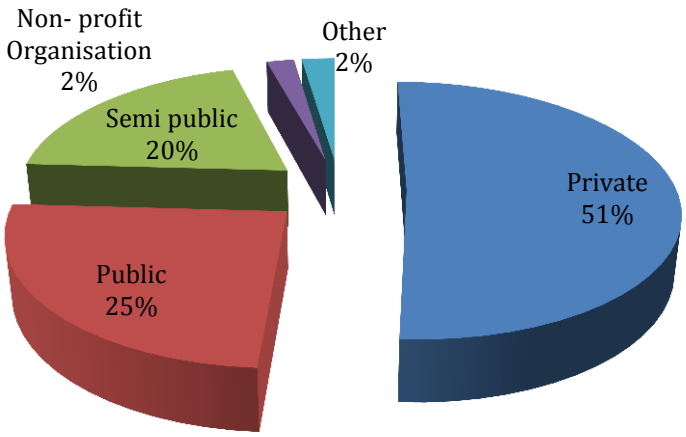


Figure 4-3: Type of Organisation

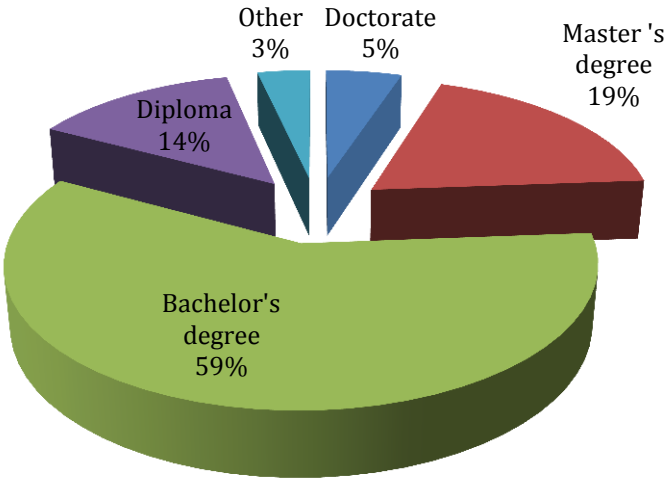


Figure 4-4: Education Level

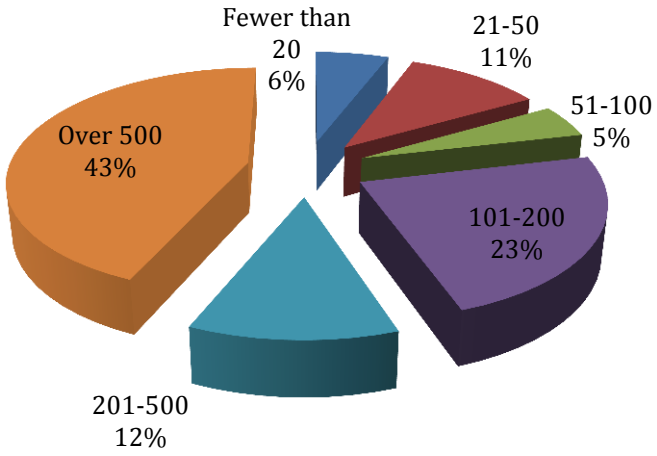


Figure 4-5: Organisation Size (Number of Employees)

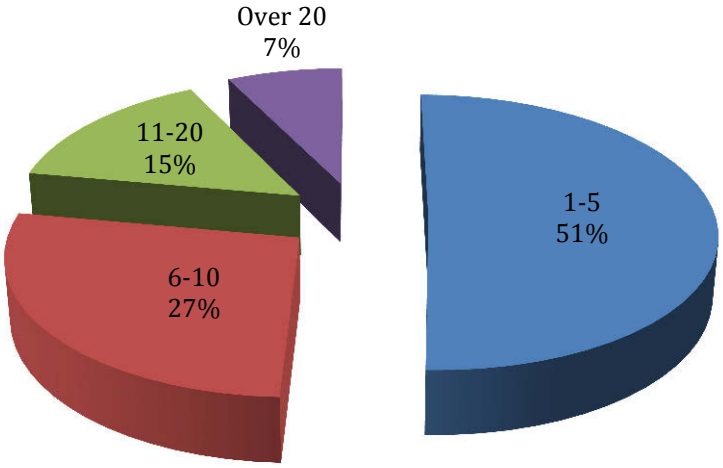


Figure 4-6: Employee's Years of Experience

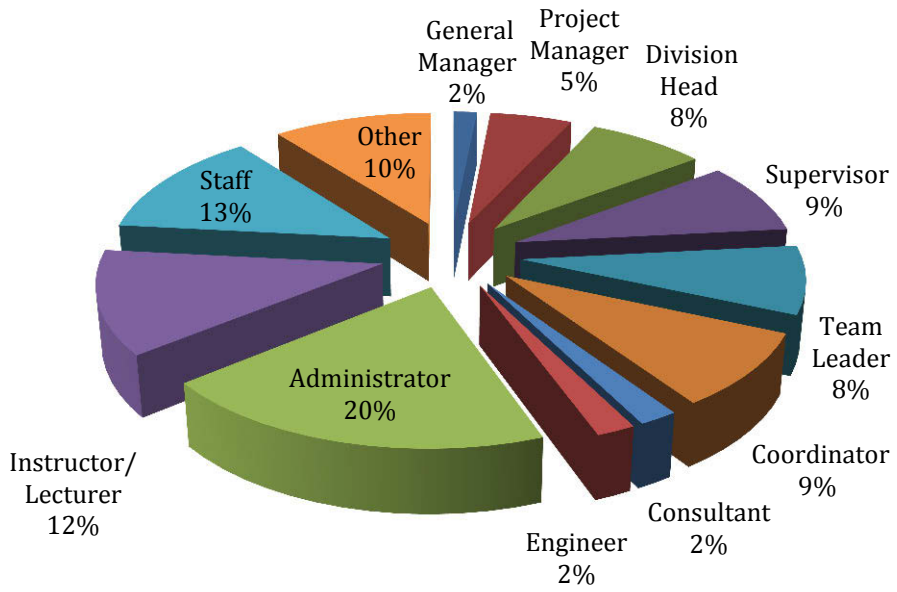


Figure 4-7: Job Titles

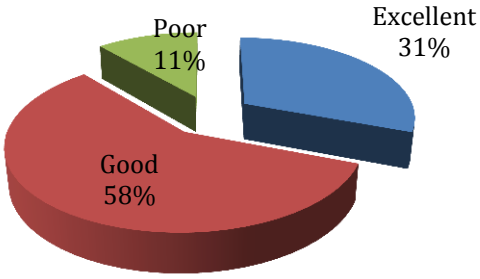


Figure 4-8: Level of Knowledge-Sharing

4.4 Preliminary Findings

4.4.1 General Assessment of Standard Deviations and Standard Errors of the Means

Standard deviation (SD) is a measure of how well the mean represents the collected data, while the standard error of the mean (SE) is an indication of how well a criterion sample can represent the population (Field 2009). A large SD indicates that the scores cluster more widely around the mean, thus the mean is not a good representation of the data. However, a small SD indicates less dispersed data points about the mean, therefore the data will be adequately represented. SE can show the variability of sample mean. A large SE means that there is a high level of variation between the means of the different samples, which suggests that the sample is a poor representative of the population. On the other hand, a small SE represents a level where most sample means are similar to the population mean.

In this study, the SD values of all variables were not large, whilst the values of SE were relatively small when compared with the means (Tables 4-1 to 4-10). Thus, it can be reasonably concluded that the mean value can be used as a representative edge for each variable for the collected data. Finally, the small values of the SE suggest that the sample used in this study sufficiently represents the population.

4.1.1 Detailed Assessment Based on the Mean Values and their Effects

As described in the previous section, the values of standard deviation of all variables were not large (clustered closely around the mean); therefore, the mean values were determined to adequately represent the overall response of each variable. This section focuses on evaluating and interpreting the mean values of all 65 variables, calculated from the entire sample. The mean values presented in Tables 4-1 to 4-4 relate to the STF construct; Tables 4-5 to 4-7 relate to the construct DOI; Tables 4-8 and 4-9 relate to the construct KSP and finally Table 4-10 relates to the outcome OIC, as described in Chapter 3. The interpretation of mean values was carried out with reference to the five-point scale response format for all questionnaire items (variables). A value of five (5) represented the highest score and one (1) indicated the lowest score.

Table 4-1: Top Management Support Descriptive Statistics

Top Management Support	Item	Mean	Std. Error	Std. Deviation	Variance
	TMS1	3.87	0.065	1.040	1.081
	TMS2	3.54	0.064	1.030	1.061
	TMS3	3.47	0.066	1.064	1.133
	TMS4	3.35	0.072	1.153	1.330

All of the four *t* variables associated with the TMS scale were perceived to be relatively medium, according to the mean values that ranged from 3.35 to 3.87 (as presented in Table 4-1). The highest mean value belonged to variable TMS1 (The top management level think that encouraging sharing knowledge with colleagues is very important: 3.87), whilst the lowest value belonged to variable TMS4 (Top managers are keen to see the staff are happy to share their knowledge with colleagues: 3.35). Overall, it can be concluded that the average perception of the level of TMS for KSP among the employees of the sampled organisations was above the medium level.

Table 4-2: IS Infrastructure Descriptive Statistics

IS Infrastructure	Item	Mean	Std. Error	Std. Deviation	Variance
IS	IS1	4.04	0.056	0.896	0.803
	IS2	3.72	0.065	1.039	1.079
	IS3	3.74	0.065	1.046	1.094

The mean values of the IS infrastructure variables were above the medium level of 3.00, ranging from 4.02 to 3.72 (Table 4-2). Overall, participants of the survey displayed medium to high feedback about whether the IS infrastructure factor enabled KSP in their organisation. More specifically, they reported being highly confident in their beliefs and very persistent when facing obstacles, as indicated by the highest mean value of variables IS1 (My company provides various tools and technologies to facilitate knowledge-sharing and exchange experiences (e.g., email, intranet and groupware): 4.04). However, the lowest mean value was variable IS2 (My company provides various tools and technologies to facilitate knowledge-sharing and exchange experiences (e.g., email, intranet and groupware): 3.72) and relatively IS3 (The technological tools available attract the staff to collaborate by sharing their knowledge: 3.74) was the second lowest with a very minor variance.

Table 4-3: Interpersonal Trust Descriptive Statistics

Interpersonal Trust	Item	Mean	Std. Error	Std. Deviation	Variance
Trust	Trust1	3.75	0.067	1.075	1.156
	Trust2	3.19	0.078	1.258	1.582
	Trust3	3.35	0.068	1.088	1.183
	Trust4	3.42	0.065	1.039	1.080
	Trust5	3.44	0.063	1.006	1.012

The mean values of all of the variables of the interpersonal trust construct were above the medium level of 3.00, ranging from 3.75 to 3.19 (Table 4-3). More specifically, the highest mean value in variables (Trust5: Most of my colleagues are people whom I know and thus considered trustworthy) indicated that the sampled organisations were very close and had a significant high level of trust. The lowest value that was still in the range of 3.00 (moderate effect) is Trust2 (I believe co-workers should not share personal information). This result occurred because there was a high variance among the respondents, where most of the respondents reported feeling that sharing personal information will not be of any value to the progress of the work; however, some disagreed. The other items, Trust3 and Trust4, still show a moderate impact based on the sample of the study. Overall, the impact of this factor showed a moderate impact on the sampled organisations and showed significance for further statistical investigation.

Table 4-4: Rewards System Descriptive Statistics

Rewards System	Item	Mean	Std. Error	Std. Deviation	Variance
Rew	Rew1	2.81	0.075	1.196	1.431
	Rew2	3.91	0.067	1.078	1.163

Based on the survey's responses, the organisations appeared to not have clear systems regarding knowledge-sharing in place that would reward staff when they share knowledge and experience, as the mean value of variable Rew1 (enough knowledge-sharing reward; 2.81) was below 3.00. However, variable Rew2 (3.91) indicated the opposite situation occurs when it comes to motivating the staff to share their knowledge and experiences.

Based on the results from the respondents, the STF shows a moderate contribution to the model through its mean values and can be treated as a balanced construct that can be used in further advanced analysis.

The mean values of the variables in the DOI scale were presented in three aspects: perceived relative advantage, compatibility and complexity. Thus, the mean values will be discussed in relation to each of these aspects.

Table 4-5: Relative Advantage Descriptive Statistics

Relative Advantage: In my organisation, I believe sharing knowledge with colleagues will…	Item	Mean	Std. Error	Std. Deviation	Variance
RA	RA1	4.18	0.055	0.889	0.791
	RA2	4.27	0.057	0.911	0.830
	RA3	4.12	0.056	0.904	0.817
	RA4	4.23	0.055	0.874	0.763

As Table 4-5 shows, the respondents perceived that the staff in their organisations believe that knowledge-sharing between each other will have a strong effect, as the values were high mean and above 4.00 in each item: RA2 (improve team worker performance: 4.27), RA4 (affect their jobs: 4.23), RA1 (increase solving-problem capability: 4.18) and RA3 (quickly react to new information about the industry or market: 4.12).

Table 4-6: Compatibility Descriptive Statistics

Compatibility: In my organisation, I believe sharing knowledge with colleagues…	ITEM	Mean	Std. Error	Std. Deviation	Variance
COM	COM1	3.80	0.050	0.803	0.644
	COM2	3.80	0.054	0.869	0.756
	COM3	3.84	0.052	0.841	0.708

The compatibility factor shows moderate high values of mean among the surveyed organisations. The mean values are almost the same for each of the values (all above 3.8), which means that the respondents agree that knowledge-sharing between staff in their organisations (ordered according the mean values):

I. COM3 (fitted their work style: 3.84)
II. COM1 (is compatible with the organisational situation: 3.80)
III. COM2 (does not contradict the organisational policies: 3.80)

Table 4-7: Complexity Descriptive Statistics

Complexity: Application of knowledge-sharing by my organisation will lead difficulties in…	ITEM	Mean	Std. Error	Std. Deviation	Variance
COX	COX1	3.19	0.075	1.197	1.434
	COX2	3.22	0.072	1.159	1.343
	COX3	3.28	0.077	1.231	1.515

For the complexity factor, the mean values of all of the variables were above the medium level of 3.00. The results showed that respondents believed that the application of knowledge-sharing will lead difficulties in: COX3 (supporting learning processes: 3.28), COX2 (controlling work quality) and COX1 (building employee commitment to the organisation: 3.19).

Overall, these results show that the construct DOI as an enabler of KSP was considered of a relatively high degree. However, as shown in the following chapters, moderations can show some significance in the further multivariate analysis. The results suggest removing it from the DOI construct in future analysis.

The results concerning the KSP construct are divided into two tables. Table 4-8 contains the details about the knowledge donation process and Table 4-9 covers the collection dimension of KSP.

Table 4-8: Knowledge-Sharing Process (Donation) Descriptive Statistics

Knowledge-Sharing Process (Donation)	Item	Mean	Std. Error	Std. Deviation	Variance
Don	Don1	3.95	0.059	0.947	0.896
	Don2	3.67	0.065	1.036	1.074
	Don3	3.87	0.061	0.974	0.948
	Don4	3.75	0.062	0.989	0.979
	Don5	3.72	0.065	1.045	1.091

The mean values of donation based on the survey results varied between 3.67 and 3.95. Don1 (I often share with my colleagues the new working skills that I learn: 3.95) was the highest and the second highest was Don3 (I often share with my colleagues the new information I acquire: 3.87), which covers the core activities of donating the knowledge from each respondent side by sharing working skills and new information. However, Don4 (My colleagues often share with me the new information they acquire: 3.75) and Don5 (Sharing knowledge with my colleagues is regarded as something normal in my company: 3.72) had similar values and are considered as high moderate variables that describe the process of donating knowledge is a part of the organisational culture. They demonstrate that knowledge donation from other employees is regarded well. Don2 scored the lowest mean among the respondents' profiles but still showed high moderate impact among the total number of respondents.

Table 4-9: Knowledge-Sharing Process (Collection) Descriptive Statistics

Knowledge-Sharing Process (Collection)	Item	Mean	Std. Error	Std. Deviation	Variance
Col	Col1	3.96	0.054	0.865	0.748
	Col2	4.07	0.055	0.881	0.776
	Col3	3.90	0.055	0.890	0.791
	Col4	4.01	0.054	0.866	0.750
	Col5	3.78	0.061	0.972	0.945

The mean values of KSP collection are represented in Table 4-9 and show mixed results. Two variables, Col2 and Col4, had mean values greater than 4.00, while two other variables showed the mean values above average (Col3: 3.90 and Col1: 3.96). Col5 received the lowest mean value of 3.78. Thus, this factor shows strong to moderate high effect on its construct and the collection process is very well regarded.

The overall assessment of the KSP construct is preliminarily showing a presence and can show significant results for further studies as shown in the next chapters.

Table 4-10: Organisational Innovation Capability Descriptive Statistics

Organisational Innovation Capability	Item	Mean	Std. Error	Std. Deviation	Variance
OIC	OIC1	3.50	0.070	1.118	1.251
	OIC2	3.56	0.066	1.052	1.107
	OIC3	3.51	0.070	1.129	1.274
	OIC4	3.28	0.070	1.125	1.265
	OIC5	3.34	0.061	0.984	0.968
	OIC6	3.56	.065	1.048	1.098
	OIC7	3.50	.064	1.024	1.048
	OIC8	3.49	.068	1.083	1.173

All eight variables associated with levels of OIC scale were perceived to be relatively moderate, according to the mean values that ranged from 3.28 to 3.56 (Table 4-10). The highest mean value belonged to variables OIC2 and OIC6 (Process innovation and product/service introduction has increased during the last five years: 3.56), whilst the lowest value belonged to variable OIC4 (Innovation as a risk: 3.28). Overall, it can be concluded that the average level of business performance among the sampled firms has a moderate impact and can be used for further advanced statistical investigation.

4.5 Chapter Summary

This chapter displayed the results of the descriptive data analysis of survey respondents. Descriptive data analysis was carried out to offer a comprehensive insight to the characteristics of the data collected through the questionnaire survey. Firstly, examining the profiles of the 257 respondents revealed that the opinions given by these respondents provided reliable and unbiased information according to their personal qualifications, the characteristics of the firms by which they were employed and the types of organisations in which they were involved. The data set was screened and found to have an acceptable normal distribution, without extreme outliers. A further assessment for the standard deviation and standard error of the mean indicated that a mean value could be used as a representative score for each variable and that the sample

used in the study sufficiently represented the population. Interpretations of the variables' mean values provided preliminary findings, which indicated that the overall levels of climate for innovation, innovation diffusion outcomes and business performance, as perceived by the respondents, were moderate to high. Thus, it was thus considered suitable as an input for the subsequent measurement scale analysis, which is presented in the following chapter.

5. Chapter 5
Measurement Scale Analysis

5.1 Introduction

The previous chapter, Chapter 4, discussed the preliminary stage of the quantitative phase of the study: the descriptive data analysis. In this chapter, the results of the analysis of the measurement scales used in the questionnaire to determine the constructs suggested in the conceptual model are presented. The model has four constructs: socio-technical, KSP, DOI and organisational innovation capacity. Each of these constructs is represented by measurement scales that were evaluated in order to establish the model's overall reliability. Each scale was also factor-analysed to reveal and verify factor structures standing for each distinctive model construct. This is an important step that must be completed before evaluating the conceptual model. Section 5.2 introduces the results and details of the analysis of scale reliability by evaluating interior constancy and item-total correlations. In Section 5.3, the results of the EFA are presented to reveal the appropriate factor structures of the model construct in addition to evaluating the common method variance. Section 5.4 shows the results and details of the CFA that was utilised to verify and polish the identified structure of the model construct to guarantee its validity and reliability and Section 5.5 summarises the chapter.

5.2 Scale Reliability

The data for the study were collected using a survey questionnaire. Ten different scales relating to four constructs were used through the survey questionnaire to gauge the suggested construction of the conceptual model. These were:

- *STF*: TPS, IS infrastructure, interpersonal trust and reward system;
- *DOI*: relative advantage, compatibility and complexity;
- *KSP:* donation and collection; and
- *OIC.*

An analysis of scale reliability was carried out to guarantee that such a set of measurement scales constantly and precisely detailed the meaning of the model's constructs through an evaluation of internal consistency and item-total correlations. All

assessment processes and results are shown in Sections 5.2.1 and 5.2.2.

5.2.1 Internal Consistency

Internal consistency is the degree to which responses are consistent across the entries (variables) within a single measurement scale. Internal consistency is measured by the Cronbach's alpha coefficient, which indicates that variables may be so heterogeneous that they perform poorly in representing the measure (Kline, 2011). As a measurement tool, Hair et al. (2006) states that values of 0.60 to 0.70 are the minimum baseline of acceptability.

Table 5-1 presents the Cronbach's alpha measurement scales for the 10 constructs used in the survey questionnaire. The values of the alpha coefficient of all the scales ranged from 0.695 to 0.744, indicating a sufficient level of acceptability. As a result, the measurement scales appear to consist of a set of consistent variables for capturing the meaning of the model constructs.

Table 5-1: Cronbach's Alphas of Measurement Scales

N	Measurement Scale	Number of Variables	Corrected Item-Total Correlation	Cronbach's Alpha) α)
Socio-technical factors (STF)				
1	TMS	5	0.618	0.728
2	IS infrastructure	3	0.656	0.734
3	Interpersonal trust	5	0.672	0.723
4	Rewards systems	2	0.516	0.744
DOI				
5	Relative advantage:	4	0.468	0.738
6	Compatibility	3	0.595	0.739
7	Complexity	3	0.348	0.744

Knowledge-sharing process (KSP)				
8	Donation	5	0.691	0.717
9	Collection	5	0.620	0.725
10	**Organisational innovation capability (OIC)**	8	0.723	0.695

5.2.2 Item-total Correlations

Churchill (1979) stated that correlation between variables is usually referred to as the item-total correlation, with the composite score of all variables forming the measure of the construct. When variables share a common core of the same construct, the score of each variable and that of the entire construct should be highly correlated. The analysis is conducted to purify the measure via removing 'trashed items' before defining the construct. That way the unnecessary production of other factors can be prevented more than conceptually defined (Churchill 1979).

In SPSS, Koufteros (1999) shows that the value of the item-total correlation is corrected and the correlation excludes the score of a variable of interest when calculating the composite score. According to Pallant (2010), a value of the corrected item-total correlation scale of lower than 0.30 indicates that the variable is measuring something different from the construct as a whole. The results of item-total correlations presented in Table 5-2 to Table 5-11 show that all of the variables within each construct appear to measure the same concept, as their corrected item-total correlations were greater than 0.30.

Table 5-2: STF-Top Management Support Variables

N	Variable Description	Corrected Item-Total Correlation	Cronbach's Alpha (α)
1	The top management level think that encouraging sharing knowledge with colleagues is very important (encouragement of KS)	0.711	0.807
2	Top managers always encourage and support staff to share their knowledge with other colleagues (encouragement of KS)	0.824	0.790
3	Top management level provides most of the necessary environment, help and resources to help the staff to share their knowledge with	0.820	0.788

	other staff (environment of KS)		
4	Top managers are keen to see the staff are happy to share their knowledge with colleagues (commitment)	0.748	0.794

Table 5-3: STF-IS Infrastructure Variables

N	Variable Description	Corrected Item-Total Correlation	Cronbach's Alpha (α)
1	My company provides various tools and technologies to facilitate knowledge-sharing and exchange experiences (e.g.. email, intranet and groupware) (technological systems presence)	0.698	0.817
2	Employees use expensively electronic storages to access data/ information/ Knowledge (such as online databases and knowledge bases) (technological systems presence)	0.783	0.777
3	The technological tools available attract the staff to collaborate by sharing their knowledge (technological systems attractiveness)	0.734	0.792

Table 5-4: STF-Interpersonal Trust Variables

N	Variable Description	Corrected Item-Total Correlation	Cronbach's Alpha (α)
1	I don't hesitate to share my feelings and point of views with my colleagues (feelings and personal info)	0.470	0.747
2	I believe co-workers should not share personal information (feelings and personal info)	0.438	0.748
3	Our company maintains certain rules and procedures to protect the employee sharing his/her knowledge against harmful intentions of others (policy and procedures of trust)	0.654	0.718
4	In our company a considerable level of trust exists between co-workers (trust and relationships)	0.727	0.710
5	Most of my colleagues are people whom I know and thus considered trustworthy (trust and relationships)	0.748	0.712

Table 5-5: STF-Reward System Variables

N	Variable Description	Corrected Item-Total Correlation	Cronbach's Alpha (α)
1	Our company rewards employees for sharing knowledge experience with their colleagues (reward system existence)	0.803	0.628
2	The knowledge-sharing rewards available are effective in motivating staff to spread their knowledge (rewarding as a motivation driver)	0.856	0.574

Table 5-6: DOI-Relative Advantage Variables

N	Variable Description	Corrected Item-Total Correlation	Cronbach's Alpha (α)
1	Increase problem-solving capability (problem solving)	0.798	0.841
2	Improve team worker performance (teamwork performance)	0.790	0.880
3	Quickly react to new information about the industry or market (reaction to new information)	0.804	0.794
4	Be effective in their jobs (job effectiveness)	0.795	0.873

Table 5-7: DOI-Compatibility Variables

N	Variable Description	Corrected Item-Total Correlation	Cronbach's Alpha (α)
1	Compatible with the organisational situation (current situation)	0.795	0.783
2	Do not contradict the organisational policies (organisational policy)	0.795	0.754
3	Fitted their work style (work style)	0.807	0.721

Table 5-8: DOI-Complexity Variables

N	Variable Description	Corrected Item-Total Correlation	Cronbach's Alpha (α)
1	Building employee commitment to the organisation (employee's commitment)	0.831	0.811
2	Controlling work quality (quality	0.817	0.886

	control)		
3	Support learning processes (learning support)	0.809	0.885

Table 5-9: KSP-Knowledge-sharing Donation Variables

N	Variable Description	Corrected Item-Total Correlation	Cronbach's Alpha (α)
1	I often share with my colleagues the new working skills that I learn (learned new working skills)	0.784	0.791
2	My colleagues often share with me the new working skills that they learn (learned working skills)	0.772	0.851
3	I often share with my colleagues the new information I acquire (learned new information)	0.783	0.783
4	My colleagues often share with me the new information they acquire (learned new information)	0.776	0.843
5	Sharing knowledge with my colleagues is regarded as something normal in my company (KS as a norm)	0.783	0.748

Table 5-10: KSP-Knowledge-sharing Collection Variables

N	Variable Description	Corrected Item-Total Correlation	Cronbach's Alpha (α)
1	My colleagues often share with me the working skills they know when I ask them (working skills on demand)	0.775	0.823
2	I often share with my colleagues the working skills I know when they ask me (working skills on demand)	0.773	0.831
3	My colleagues often share with me the information they know when I ask them (information on demand)	0.773	0.825
4	Often share with my colleagues the information I know when they ask me(information on demand)	0.778	0.798
5	Our company staff often exchanges knowledge of working skills and information (habits of knowledge-sharing)	0.786	0.672

Table 5-11: OIC-OIC Variables

N	Variable Description	Corrected Item-Total Correlation	Cronbach's Alpha (α)
1	Our company frequently tries out new ideas (adoption of new ideas and processes)	0.756	0.741
2	Our company seeks new ways of doing things (adoption of new ideas and processes)	0.757	0.753
3	Our company is creative in its operating methods (market pioneering)	0.755	0.753
4	Our company is frequently the first to market new products and services (market pioneering)	0.753	0.786
5	Innovation is perceived as too risky in our company and is resisted (innovation and risk)	0.776	0.458
6	Our new product/service introduction has increased during the last five years (ROI/returns progress)	0.757	0.763
7	Our company often develops new products/services that are well accepted by the market (market acceptance)	0.756	0.790
8	The new products or services developed by our company always arouse imitation from competitors (edge of competition)	0.755	0.764

5.3 Exploratory Factor Analysis

After the evaluation of scale reliability was done, EFA was then conducted to minimise the large number of variables into a lesser, more controllable set of factors (Hair et al., 2006). Gerbing and Anderson (1988) stated that EFA is mostly useful as a preliminary analysis in the absence of a sufficiently detailed theory about the relations of the variables to the underlying constructs. Although most measured variables in the constructs were derived from previous research and an extensive literature review, the EFA was deemed necessary since these variables had not been operated extensively within the construction context. The EFA was conducted separately for each individual construct. Sections 5.3.1 to 5.3.5 provide further details of the analysis.

5.3.1 Data Factorability

Data factorability refers to the suitability of the data to be factorised in terms of the inter correlation between the variables. Because the analysis concluded that the variables were considered to measure the same underlying construct, a correlation matrix that was factorable needed to include sizable values for the correlation (Field, 2009; Tabachnick and Fidell 2007). According to Coakes et al. (2006) and Pallant (2010), the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and Bartlett's test of sphericity could be generally applied to determine the factorability of such a matrix.

As shown in Table 5-12, the values of Kaiser-Meyer-Olkin (KMO) of each sub-construct ranged from 0.600 to 0.899, meaning all of them were above the minimum acceptable level of 0.600 (Coakes et al. 2006; Tabachnick and Fidell 2007), signifying sampling satisfaction.

Finally, Bartlett's test of sphericity statistic for each construct was highly significant at $p < 0.001$ level, indicating that there were adequate relationships between the variables included in the analysis (Field, 2009). These results confirmed the factorability of the EFA conducted for each construct (Hair et al. 2006).

Table 5-12: KMO and Bartlett's Test of Sphericity

N	Construct	Bartlett's Test of Sphericity			
		KMO*	Approx. Chi-Square	df	Sig
	STF	0.678			
1	TMS	0.793	469.750	6	0.000
2	IS infrastructure	0.690	194.902	3	0.000
3	Interpersonal trust	0.729	245.860	10	0.000
4	Rewards systems	0.600	158.973	1	0.000
	DOI	**0.752**			
5	Relative advantage.	0.844	681.158	6	0.000
6	Compatibility	0.690	216.018	3	0.000
7	Complexity	0.721	465.873	3	0.000
	KSP	**0.835**			
8	Donation	0.855	775.454	10	0.000
9	Collection	0.815	802.781	10	0.000
	OIC	**0.899**			
10	OIC	0.899	1138.756	28	0.000

5.3.2 Factor Extraction and Rotation

EFA must follow two basic steps in order to generate the proper solution needed to clarify an adequate number of factors representing a construct. These two steps are factor extraction and factor rotation and interpretation (Pallant 2010). In the first step, factors are revealed based on a particular technique and criterion to determine the adequacy of the number of factors, where in the second technique improving the interpretation of a given factor solution is the main target (Field, 2009; Tabachnick and Fidell 2007).

To perform the factor extraction, this study used principal component analysis (PCA), which is an extraction method used widely for defining the factors needed to represent the structure of the variables. To achieve this, a combination of the following criteria must be met (Hair et al. 2006):

- *Latent root (eigenvalue)*: where the factors with an eigenvalue bigger than 1 are important while those with less than 1 should be discarded;
- *Catell's scree test*: this test employs a graphical plot of eigenvalues against the number of factors in their order of extraction. The point where there is a sudden change of slope in the curve indicates the maximum number of factors to be extracted. Derived factors that explain specific amount of variance are significantly practical based on;
- *Percentage of variance*: where Hair et al. (2006) suggest that a solution that accounts for 60% (or less) of the total variance in social science research is quite common, since the information in this area, by nature, is often less precise; and
- A priori *criterion*: a simple criterion where the number of factors is known prior to undertaking the factor analysis. It is a particularly appropriate criterion if the purpose of the analysis is to replicate another researcher's findings by extracting the same number of factors.

As Hair et al. (2006) recommend, the researcher should combine the conceptual foundation with some empirical evidence to determine the appropriate number of factors to extract or retain, rather than relying solely on the results produced from the specific criterion.

After the factor extraction, determining the degree to which the variables load onto these factors becomes possible and can be conducted through examining factor loadings

(Field, 2009). In most cases, apart from the used extraction method, the initial factor solution does not provide an adequate interpretation, since most variables will have high loadings on the most important factors and small loadings on the other factors (Field, 2009; Hair et al. 2006; Tabachnick and Fidell 2007). Therefore, a factor rotation is conducted to achieve simpler and more meaningful solutions. The most simple and commonly used rotation technique is the Varimax orthogonal rotation (Tabachnick and Fidell 2007). After the factors have been rotated, specific criteria are employed to justify the significance of the factor loadings, thus ensuring a meaningful correlation between the variable and the factor (Hair et al. 2006; Tabachnick and Fidell 2007). To ensure that the variables in each factor had practical significance, the recommended cut-off factor loading of 0.50 was used (Hair et al. 2006). The results of the EFA are presented in Sections 5.3.3 to 5.3.5.

5.3.3 Exploratory Factor Analysis Results

EFA was conducted individually for each of the four constructs with their variables based on the above techniques and criteria using the SPSS version 18 statistical software program. The patterns of rotated factor loadings, shown in Table 5-13, indicate that all variables were significant (factor loadings greater 0.50), without being loaded equally highly on more than one factor (i.e. cross loadings).

The criterion for extracting factors for the variable TMS was *a priori*. As shown in Table 5-13, all loadings of the five variables met the threshold level of 0.50. Ranging from 0.783 to 0.809, they were significant without cross loadings.

Table 5-13: Rotated Factor Loadings of the STF-Top Management Support

Factor Description	Rotated Component 1
TMS	**0.836**
The top management level think that encouraging sharing knowledge with colleagues is very important (encouragement of knowledge-sharing)	0.783
Top managers always encourage and support staff to share their knowledge with other colleagues (encouragement of knowledge-sharing)	0.879
The top management level provides most of the necessary environment, help and resources to help the staff to share their knowledge with other staff (environment of knowledge-sharing)	0.873
Top managers are keen to see the staff are happy to share their knowledge with colleagues (commitment)	0.809

Cumulative variance explained = 70.086%; Cronbach's alpha =0.728

The factor loadings of the three variables of the IS infrastructure construct were found to exceed the threshold level of 0.50, and ranged from 0.803 to 0.858 (Table 5-14).

Table 5-14: Rotated Factor Loadings of the STF-IS Infrastructure

Factor Description	Rotated Component 1
IS infrastructure	**0.823**
My company provides various tools and technologies to facilitate knowledge-sharing and exchange experiences (e.g., email, intranet and groupware) (technological systems presence)	0.803
Employees use expensive electronic storages to access data/information/knowledge (such as online databases and knowledge bases) (technological systems presence)	0.858
The technological tools available attract the staff to collaborate by sharing their knowledge (technological systems attractiveness)	0.809

Cumulative variance explained = 67.816%; Cronbach's alpha = 0.734

The loading patterns of all five variables of interpersonal trust, presented in Table 5-15, show that all of the variables, except for the *2 (*I believe co-workers should not share personal information*) have met the 0.50 cut-off loading. They were thus significant. As a result, five variables with factor loadings ranging from 0.500 to 0.847 were retained.

Cronbach's alpha coefficient was calculated based on these variables yielding a value of 0.723, indicating that the modified scale was reliable.

Table 5-15: Rotated Factor Loadings of the STF-Interpersonal Trust

Factor Description	Rotated Component 1
Interpersonal trust	**0.675**
I don't hesitate to share my feelings and point of views with my colleagues (feelings and personal info)	0.547
I believe co-workers should not share personal information (feelings and personal info)	0.500*
Our company maintains certain rules and procedures to protect the employee sharing his/her knowledge against harmful intentions of others (policy and procedures of trust)	0.771
In our company a considerable level of trust exists between co-workers (trust and relationships)	0.847
Most of my colleagues are people whom I know and thus considered trustworthy (trust and relationships)	0.710

Cumulative variance explained =46.29 %; Cronbach's alpha = 0.723

As presented in Table 5-16, the factor loadings of both variables for the reward system were well above the 0.50 threshold level without any cross loadings. The rotated factor loading for the reward system variable is 0.785.

Table 5-16: Rotated Factor Loadings of the STF-Reward Systems

Factor Description	Rotated Component 1
Reward systems	**0.785**
Our company rewards employees for sharing knowledge experience with their colleagues (reward's system existence)	0.785
The knowledge-sharing rewards available are effective in motivating staff to spread their knowledge (rewarding as a motivation driver)	0.785

Cumulative variance explained = 61.557%; Cronbach's alpha =0.74

As shown in Table 5-17, the factor loadings of the four variables of perceived relative advantages were well above the 0.50 threshold level and Cronbach's alpha is equal to

0.738. Thus, the relative advantage rotated factor loading is equal to 0.884. The total factor loading for the STF construct is 0.780.

Table 5-17: Rotated Factor Loadings of the DOI-Relative Advantage

Factor Description	Rotated Component 1
Relative advantage	**0.884**
Increase solving-problem capability (problem-solving)	0.881
Improve team worker performance (teamwork performance)	0.911
Quickly react to new information about the industry or market (reaction to new information)	0.837
Be effective in their jobs (job effectiveness)	0.908

Cumulative variance explained = 78.292%; Cronbach's alpha =0.738

As shown in Table 5-18, the factor loadings of the three variables of compatibility were well above 0.50. Cronbach's alpha is equal to 0.739 and with a rotated factor loading equal to 0.833.

Table 5-18: Rotated Factor Loadings of the DOI-Compatibility

Factor Description	Rotated Component 1
Compatibility	**0.833**
Compatible with the organisational situation (current situation)	0.864
Do not contradict the organisational policies (organisational policy)	0.831
Fitted their work style (work style)	0.804

Cumulative variance explained = 69.452%; Cronbach's alpha = 0.739

Table 5-19 shows the factor loadings of the three variables of complexity were well above 0.50. Cronbach's alpha is equal to 0.744 and the rotated factor loading is equal to 0.904. Therefore, based on these calculations, the rotated factor loading for the DOI construct is 0.874.

Table 5-19: Rotated Factor Loadings of the DOI-Complexity

Factor Description	Rotated Component 1
Complexity	**0.904**
Building employee commitment to the organisation (employee commitment)	0.863
Controlling work quality (quality control)	0.927
Support learning processes (learning support)	0.923

Cumulative variance explained = 81.849%; Cronbach's alpha = 0.744

Tables 5-20 and 5-21 show the factor loading of KSP. Table 5-20 refers to the donation process, with five variables meeting the threshold value of 0.500 and Cronbach's alpha equal to 0.717. The rotated factor loading of donation is 0.843. Table 5-21 presents the rotated factor loading values of the collection process of knowledge-sharing. Five variables were above 0.50 and Cronbach's alpha was equal to 0.725. The total rotated factor loading is equal to 0.833. As a result, the rotated factor loading for KSP construct is 0.838.

Table 5-20: Rotated Factor Loadings of the Knowledge-Sharing Process (Donation)

Factor Description	Rotated Component 1
KSP (donation)	**0.843**
I often share with my colleagues the new working skills that I learn (learned new working skills)	0.836
My colleagues often share with me the new working skills that they learn (learned working skills).	0.885
I often share with my colleagues the new information I acquire (learned new info)	0.828
My colleagues often share with me the new information they acquire (learned new info)	0.878
Sharing knowledge with my colleagues is regarded as something normal in my company (knowledge-sharing as a norm)	0.788

Cumulative variance explained =71.201%; Cronbach's alpha = 0.717

Table 5-21: Rotated Factor Loadings of the Knowledge-Sharing Process (Collection) Construct

Factor Description	Rotated Component 1
KSP (collection)	**0.833**
My colleagues often share with me the working skills they know when I ask them (working skills on demand)	0.862
I often share with my colleagues the working skills I know when they ask me (working skills on demand)	0.877
My colleagues often share with me the information they know when I ask them (information on demand)	0.867
I often share with my colleagues the information I know when they ask me(information on demand)	0.850
Our company staff often exchange knowledge of working skills and information (habits of knowledge-sharing)	0.707

Cumulative variance explained = 69.726%; Cronbach's alpha = 0.725

Table 5-22 shows the rotated factor loading patterns of all eight variables of OIC. All of the OIC variables except for the ***5* (*Innovation is perceived as too risky in our company and is resisted*) met the 0.50 cut-off loading but were still with the safe zone; consequently, they were significant. As a result, five variables, with factor loadings ranging from 0.500 to 0.847, were retained. Cronbach's alpha coefficient based on these variables yielded a value of 0.723 and the total rotated factor loading of the OIC construct is equal to 0.764.

Table 5-22: Rotated Factor Loadings of the Organisational Innovation Capability (OIC)

Factor Description	Rotated Component 1
Organisational innovation capacity	**0.764**
Our company frequently tries out new ideas (adoption of new ideas and processes)	0.781
Our company seeks new ways of doing things (adoption of new ideas and processes)	0.796
Our company is creative in its operating methods (market pioneering)	0.789
Our company is frequently the first to market new products and services (market pioneering)	0.817

Innovation is perceived as too risky in our company and is resisted (innovation and risk)**	0.500
Our new product/service introduction has increased during the last five years (ROI/returns progress)	0.799
Our company often develops new products/services well accepted by the market (market acceptance)	0.828
The new products or services developed by our company always arouse imitation from competitors (edge of competition)	0.801

Cumulative variance explained =59.134%; Cronbach's alpha = 0.695

5.3.4 Summary of EFA Results

Based on the eigenvalue, the screen test and the *a priori* criterion, the constructs of STF (TMS, IS infrastructure, interpersonal trust and reward system), DOI (relative advantage, compatibility and complexity), KSP (knowledge-sharing donation and knowledge-sharing collection) has significant effects on OIC. Table 5-23 shows that these factor solutions were supported by the cumulative percentage of the variance extracted, which ranged from 46% to 81%. Finally, the Cronbach's alpha coefficients of all scales were moderate at around the 0.70 threshold level, ranging from 0.695 to 0.744, thus the results demonstrated internal consistency. These results therefore confirmed that the developed scales comprised reliable and valid items, which adequately captured the meaning of the model constructs and their related factors.

Table 5-23: KMO and Bartlett's Test of Sphericity

No	Factors	Variable(s) Removed	Factors Extracted	Cronbach's Alpha	Cumulative Variance (%)	Factor: Description
1	TMS.	-	1	0.728	70.086	TMS (four variables)
2	IS Infrastructure	-	1	0.734	67.816	IS infrastructure (three variables)
3	Interpersonal trust	-	1	0.723	46.291	Interpersonal trust (five variables)
4	Reward Systems	-	1	0.744	61.557	Reward systems (two variables)
5	Relative advantage	-	1	0.738	78.292	Relative advantage (three variables)
6	Compatibility (DOI)	-	1	0.739	69.452	Compatibility (three variables)
7	Complexity	-	1	0.744	81.849	Complexity (three variables)
8	KSP (donation)	-	1	0.717	71.201	Donation (five variables)
9	KSP (collection)	-	1	0.725	69.726	Collection (five variables)
10	OIC	-	1	0.695	59.134	OIC (eight variables)

5.3.5 Test of Common Method Variance

Not only was EFA capable of revealing the numbers of factors, it was also used in this research to assess the common method variance through Harman's one-factor test. In this technique, the presence of a substantial amount of common method variance is indicated when either a single factor emerges from the factor analysis or one general factor accounts for the majority of the covariance in the dependent and criterion variables (Podsakoff and Organ 1986).

To undertake the test, EFA was performed on all 40 variables based on criteria similar to the above analysis. The results, presented in Table 5-24, show that there were nine components (factors) extracted, with the first factor accounting for only 30.037%. This finding suggests that the common method variance was not a concern in this study.

Table 5-24: Results for Common Method Variance Test

Component	Initial Eigenvalues		
	Total	Variance of %	Cumulative %
1	12.615	30.037	30.037
2	3.993	9.508	39.544
3	2.707	6.446	45.990
4	2.241	5.335	51.325
5	2.027	4.827	56.152
6	1.597	3.801	59.953
7	1.247	2.969	62.922
8	1.144	2.724	65.646
9	1.106	2.634	68.280

5.4 Confirmatory Factor Analysis

As demonstrated in the previous section, EFA can reveal factor structures (the number of factors) and confirm the reliability of the measurement scales that underpin the model constructs. Nevertheless, those examinations are only considered useful as preliminary techniques. An evaluation of construct validity and unidimensionality, which are significant factors in the measurement theory, is not provided by EFA (Gerbing and Anderson 1988; Hair et al. 2006). Construct validity is where the level of a set of measured variables reflects the theoretical construct, whereas unidimensionality refers

to the existence of a single construct underlying a set of measured variables (Gerbing and Anderson 1988; Hair et al. 2006).

To check construct validity and unidimensionality, CFA is used. CFA is a major part of the SEM technique used in this chapter. In general, CFA tests how well an *a priori* factor structure and its respective pattern of loadings match the gathered data (Hair et al. 2006). Moreover, CFA can be used to refine an existing conceptual perspective or support an existing structure (DiStefano and Hess, 2005). Sections 5.4.1 and 5.4.2 provide the details of the CFA analysis for this study.

5.4.1 Assessment of Model Fit and Estimation Methods

The CFA technique has the ability to find how well any factor represents the data. This can be done by examining the model fit indices. In general, if the fit indices prove to be good, the model is consistently accepted. However, instead of rejecting fit indices that are not good, a model with unsatisfactory fit indices will be re-enhanced till reaches a balanced index. The fit indices used in this study were:

- *Chi-square* (χ^2) is one of the most basic index of absolute fit indices that include in general the degree of freedom (*df*) value and (*p*-value) (Kline, 2011);
- *Common indices:* Relative Chi-square (χ^2/df); goodness-of-fit index (GFI); adjusted-goodness-of-fit index (AGFI) standardised root mean square residual (SRMR); and root mean square error of approximation (RMSEA) (Shah and Goldstein, 2006); and
- *Incremental fit indices:* normed-fit index (NFI), Tucker-Lewis index (TLI); comparative-fit index (CFI), and incremental-fit index (IFI) (Shah and Goldstein 2006).

For the model to be considered as having an acceptable fit, all six indices were measured against the following benchmarking criteria:

- $\chi^2/df < 3.0$ (Hair et al. 2006; Kline, 2011);
- GFI, TLI, CFI, and IFI > 0.90 (Garson 2006; Hoyle and Panter, 1995); and
- RMSEA < 0.08 (Garson, 2006; Hair et al., 2006).

5.4.2 Assessment of Construct Validity and Unidimensionality

The assessment construct validity using the CFA involved an examination of the convergent validity, which refers to the extent to which the measured variables of a specific construct share a high proportion of variance in common, and the discriminant validity, which refers to the extent to which a construct is truly distinct from other constructs (Hair et al. 2006).

The assessment of the convergent validity focuses on the magnitude of the standardised factor loadings and their significance level. As a guideline, Hair et al. (2006) suggest that factor loadings should be greater than 0.5. In addition to significant loadings, variables should also have adequate reliability, which can be determined by inspecting the R^2 (or squared multiple correlation [SMC] values).

Bollen (1998) recommends that in order to demonstrate an acceptable reliability, a variable should have an R^2 value greater than 0.50. As a result, if the fit indices of the model, with all the factors specified to be loaded on only a single construct, are satisfactorily based on the above-mentioned criteria, then the unidimensionality can be recognised. The following section presents the results of the CFA for each construct.

5.4.3 Confirmatory Factor Analysis Results

CFA was conducted on each construct using the IBM-AMOS (Version 20.0) software. The results of each construct are presented in Tables 5-25 to Table 5-27. As mentioned earlier, the factor loading, *t*-value and significance level for each variable, as shown in these tables, provided a measure for the convergent validity; the value of R^2 provided a measure with which to assess the reliability of the variables; and the value of the correlation between the factors provided an indication of the discriminated validity. The model fit indices were also addressed for the purpose of unidimensionality assessment.

The CFA results of the STF constructs (TMS, IS infrastructure, interpersonal trust and reward system) are presented in Table 5-25. The model (Figure 5-1) shows an adequate fit: χ^2=193.949; *df*= 71; χ^2/df = 2.73; GFI = 0.899; TLI = 0.877; CFI = 0.904; IFI = 0.905; and RMSEA = 0.082. The *t*-value for all items is over 1.96 and most of theR^2 values were either greater than or close to 0.50, indicating the reliability of the variables. All the correlation coefficients between each pair of factors, ranging from 0.52 to 0.79, were less than 0.85, thus supporting the discriminated validity of the

construct. Finally, since the model fit indices proved to be good, unidimensionality was established.

Table 5-25: CFA Results for the STF Construct

Factor	Factor Loading	*t*-value	R^2	Correlations Between Factors
TMS				
The top management level think encouraging sharing knowledge with colleagues is very important.	0.69	10.521***	0.48	TMS – IS =0 .65 TMS–Trust = 0.68 TMS– Rew = 0.65 IS-Trust =0.60 IS– Rew = 0.52 Trust– Rew = 0.79
Top managers always encourage and support staff to share their knowledge with other colleagues.	0.82	12.900***	0.67	
Top management level provides most of the necessary environment, help and resources to help the staff to share their knowledge with other staff.	0.84	13.123***	0.71	
Top managers are keen to see the staff members are happy to share their knowledge with colleagues.	0.75	Fp	0.56	
IS infrastructure				
My company provides various tools and technologies to facilitate knowledge-sharing and exchange experiences (e.g., email, intranet and groupware).	0.67	8.422***	0.45	
Employees use expensive electronic storage to access data/ information/knowledge (such as online databases and knowledge bases).	0.74	9.425***	0.55	
The technological tools available attract the staff to collaborate by sharing their knowledge.	0.74		0.55	
Interpersonal trust				
I don't hesitate to share my feelings and point of views with my colleagues.	0.41	5.415***	0.19	
I believe co-workers should not share personal information.	0.32	4.331	0.10	
Our company maintains certain rules and procedures to protect the employee sharing his/her knowledge against the harmful intentions of others.	0.76	7.810***	0.58	

Our company maintains certain rules and procedures to protect the employee sharing his/her knowledge against harmful intentions of others.	0.78	8.560***	0.61
Most of my colleagues are people who I know and thus considered trustworthy.	0.56	Fp	0.36
Reward systems			
Our company rewards employees for sharing knowledge experience with their colleagues.	0.64	3.824***	0.41
The knowledge-sharing rewards available are effective in motivating staff to spread their knowledge.	0.36	Fp	0.64

Model fit indices $\chi^2 = 193.949$, $df = 71$, $\chi^2/df = 2.73$, GFI = 0.899, TLI = 0.877, CFI = 0.904, IFI = 0.905, RMSEA = 0.082, Fd., fixed parameter for estimation, correlation between each pair of factors ***$p < 0.001$

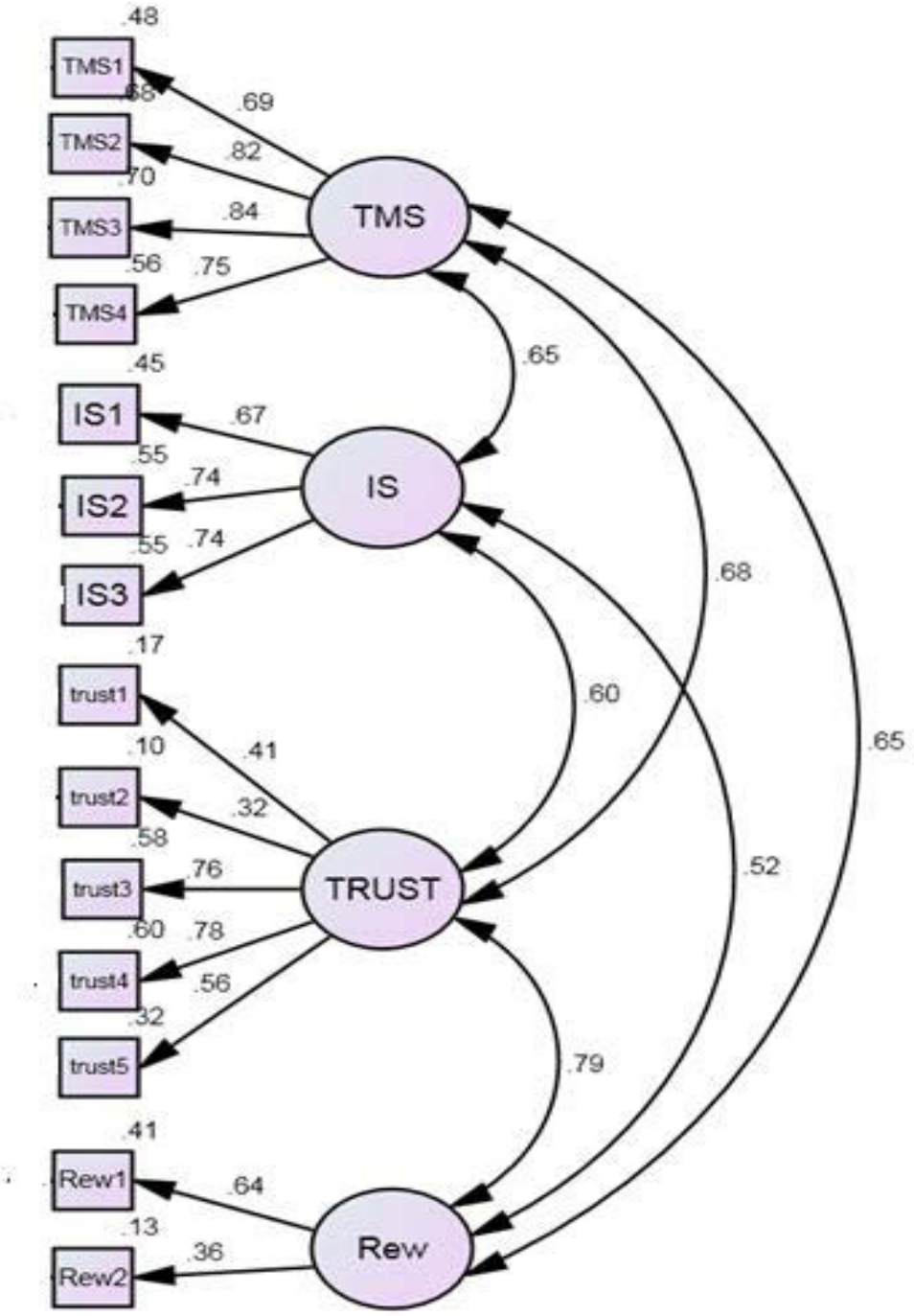


Figure 5-1: Model of the STF Constructs

Table 5-26 and Figure 5-2 present the CFA results for the DOI constructs (relative advantages, compatibility and complexity). All of the fit indices for this construct suggest that the CFA model of the construct (Figure 5-2) has a good level of fit: χ^2=253.481, *df* = 32, χ^2/df = 1.6, GFI=0.959; TLI = 0.979; CFI = 0.985; IFI = 0.986; and RMSEA = 0.051.

Additionally, all the factor loadings were relatively high, ranging from 0.68 to 0.91 and they were all significant at $p < 0.001$ level, suggesting convergent validity. The R^2 values were all either greater than or close to 0.50, indicating the reliability of the variables. The correlation coefficients between each pair of factors, ranging from 0.04 to 0.63, were all less than 0.850, thus confirming the discriminated validity of the construct. Finally, the acceptable level of the fit indices confirmed that the specified factor model of this construct possessed unidimensionality.

Table 5-26: Results of the DOI (RA, Compatibility and Complexity) Constructs

Factor	Factor Loading	*t*-value	R^2	Correlations Between Factors
Relative advantages				
Increase solving-problem capability	0.84	17.945***	0.71	RA – Com =0.63
Improve team worker performance	0.88	19.304***	0.77	RA-Cox=0.04
Quickly react to new information about the industry or market	0.76	14.923***	0.58	Com-Cox=0.15
Be effective in their jobs	0.89	Fp	0.79	
Compatibility				
Compatible with the organisational situation	0.81	9.830***	0.66	
Compatible with the organisational situation	0.73	9.330***	0.53	
Fitted their work style	0.68	Fp	0.46	
Complexity				
Building employee commitment to the organisation	0.75	14.491***	0.56	
Controlling work quality	0.91	18.264***	0.83	
Support learning processes	0.90	Fp	0.81	

Model fit indices $\chi^2 = 53.481$,*df* = 32, χ^2 */df* = 1.67, GFI=0.959, TLI=0.979, CFI = 0.985, IFI=0.986, RMSEA = 0.051 Fd., fixed parameter for estimation, correlation between each pair of factors ***$p < 0.001$

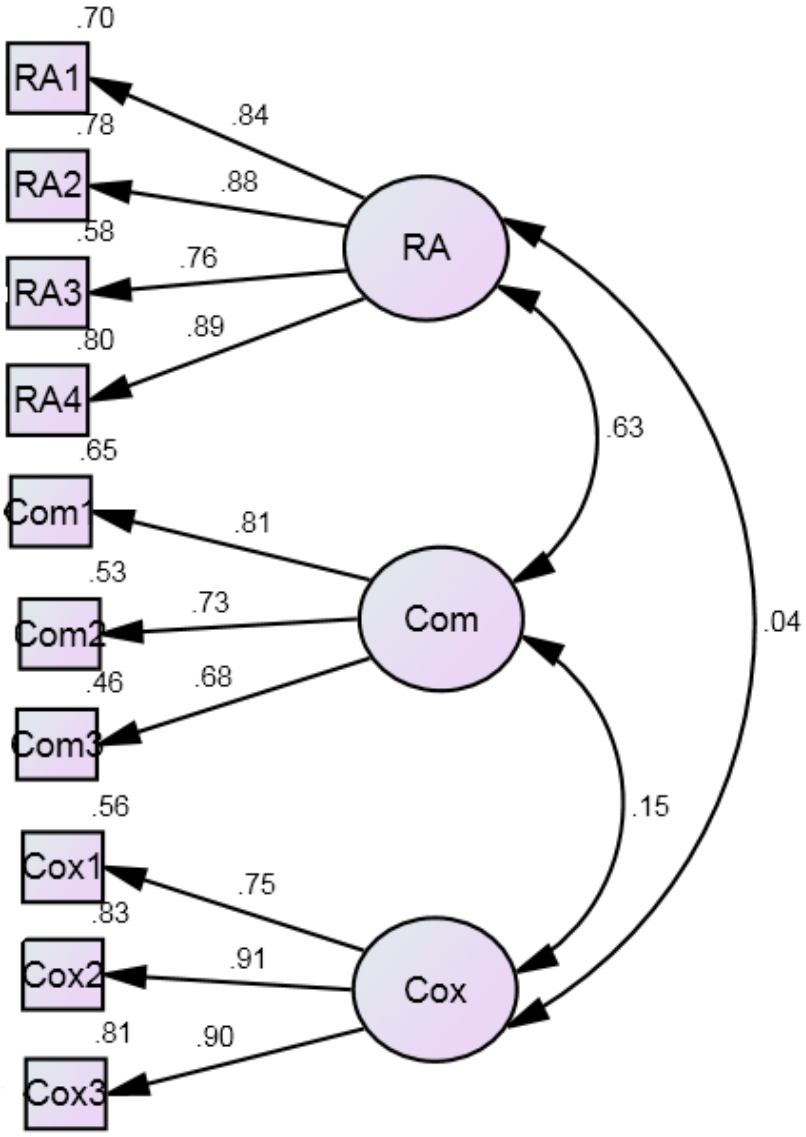


Figure 5-2: Model of the DOI (Relative Advantages, Compatibility and Complexity) Constructs

The CFA results of the KSP constructs (KS donation and KS collection) are presented in Table 5-27. The final fit indices of the model (Figure 5-3) demonstrated a good level of fit: $\chi^2 = 200.296$, df =34, χ^2/df = 5.89, GFI=0.849, TLI=0 .872, CFI=0.903, IFI=0.904, RMSEA = 0.138. All the factor loadings, ranging from 0.62 to 0.87, were greater than the threshold level of 0.50 and were all significant at $p < 0.001$ level, demonstrating convergent validity. Almost all of the variables had R^2 values greater than or close to 0.50. The variables with low R^2 values were retained since they had substantial and highly significant loadings. The correlation coefficients between each pair of factors were 0.62 and less than 0.850, thus confirming discriminated validity.

Finally, since the fit indices of the respecified model proved to be good, the unidimensionality of this construct was upheld.

Table 5-27: Results of the KSP (Donation and Collection) Constructs

Factor/Variable	Factor Loading	*t*-value	R^2	Correlations Between Factors
KSP (Donation)				Don – Col =
I often share with my colleagues the new working skills that I learn.	0.78	11.965***	0.61	0 .62
My colleagues often share with me the new working skills that they learn.	0.87	13.575***	0.76	
I often share with my colleagues the new information I acquire	0.76	11.785***	0.56	
My colleagues often share with me the new information they acquire.	0.86	13.551***	0.74	
Sharing knowledge with my colleagues is regarded as something normal in my company.	0.73	Fp		
KSP (Collection):				
My colleagues often share with me the working skills they know when I ask them.	0.80	10.448***	0.64	
I often share with my colleagues the working skills I know when they ask me.	0.86	10.172***	0.74	
My colleagues often share with me the information they know when I ask them.	0.82	10.483***	0.67	
I often share with my colleagues the information I know when they ask me.	0.83	9.910***	0.69	
Our company staff often exchanges knowledge of working skills and information.	0.62	Fp	0.38	

Model fit indices $\chi 2=200.296$, *df* =34, $\chi 2/df$ = 5.89, GFI=0.849, TLI=0.872, CFI = 0.903, IFI=0.904, RMSEA =0.138, Fd., fixed parameter for estimation, correlation between each pair of factors ***$p < 0.001$

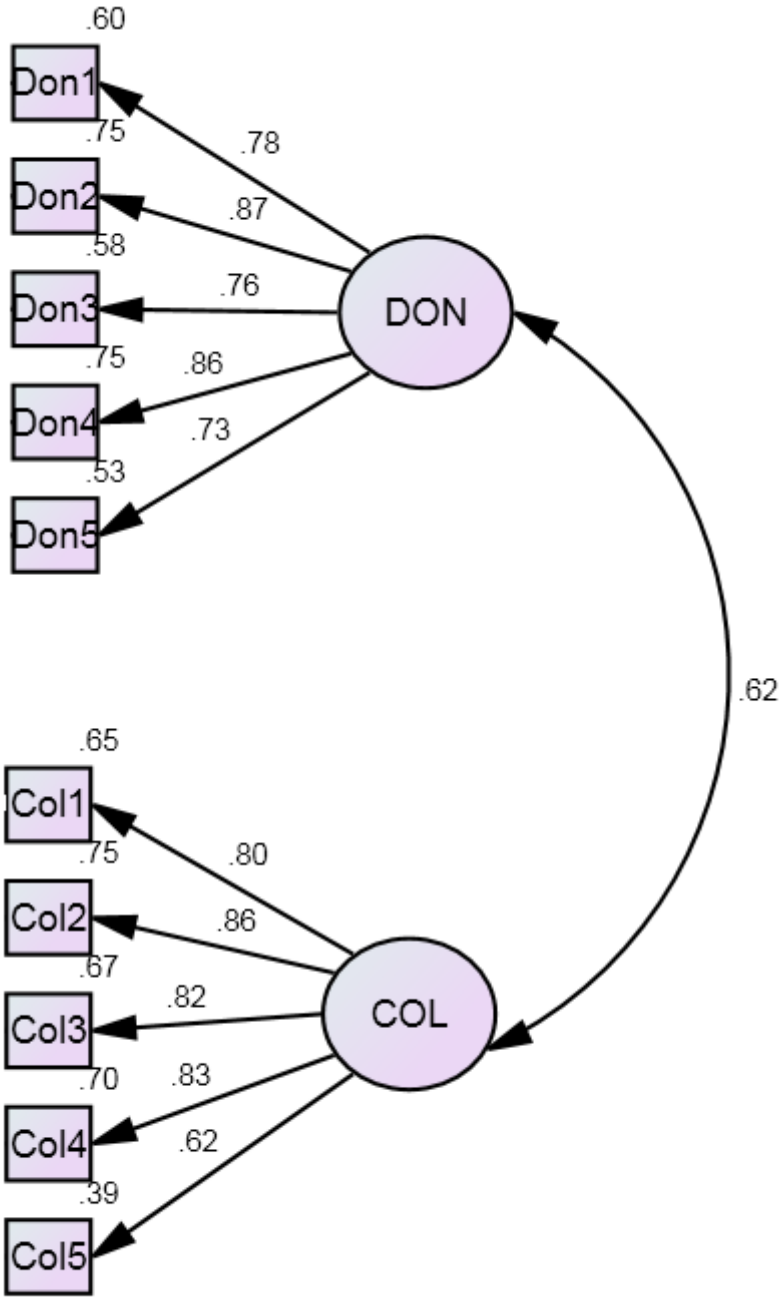


Figure 5-3: Model of the Donation and Collection Constructs

Table 5-28 and Figure 5-4 present the CFA results for the KSP constructs (KS donation and KS collection) and the OIC constructs. Two constructs have been included in this model to show the entire relationship between the KSP construct variables and the OIC construct. This helps to demonstrate the correlation results as stated in the previous Table 5-27.

All of the fit indices for these constructs show that the CFA model of the construct had a good level of fit: $\chi 2$=1094.434, *df* =134, $\chi 2$/df = 8.16, GFI=0.649, TLI= 0.632, CFI=0.678, IFI=0.680, RMSEA =0.167

Additionally, all the factor loadings were relatively high for the most of the variables, ranging from 0.44 to 0.89 and they were all significant at $p < 0.001$ level, suggesting convergent validity. The R^2 values were all either greater than or close to 0.50, indicating the reliability of the variables. The correlation coefficients between each pair of factors, ranging from 0.28 to 0.63, were all less than 0.850, thus confirming the discriminated validity of the construct. Finally, the acceptable level of the fit indices confirmed that the specified factor model of this construct possessed unidimensionality.

Table 5-28: Results of the Donation, Collection and OIC Constructs

Factor	**Factor Loading**	***t*-value**	**R^2**	**Correlations Between Factors**
KSP (donation)				OIC – Don =0.28
I often share with my colleagues the new working skills that I learn.	0.73	11.760***	0.53	OIC – Col = 0.66
My colleagues often share with me the new working skills that they learn.	0.87	13.482***	0.76	
I often share with my colleagues the new information I acquire.	0.76	11.698***	0.58	
My colleagues often share with me the new information they acquire.	0.87	13.471***	0.76	
Sharing knowledge with my colleagues is regarded as something normal in my company.	0.77	fp	0.59	
KSP (collection)				
My colleagues often share with me the working skills they know when I ask them.	0.66	8.258***	0.44	
I often share with my colleagues the working skills I know when they ask me.	0.44	7.325***	0.19	
My colleagues often share with me the information they know when I ask them.	0.54	8.015***	0.29	
I often share with my colleagues the information I know when they ask me.	0.49	6.647***	0.24	

Our company staff often exchanges knowledge of working skills and information.	0.56	fp	0.31
OIC			
Our company frequently tries out new ideas.	0.81	11.903***	0.66
Our company seeks new ways of doing things.	0.89	12.318***	0.79
Our company is creative in its operating methods.	0.80	11.809***	0.64
Our company is frequently the first to market new products and services.	0.81	12.061***	0.66
Innovation is perceived as too risky in our company and is resisted.	0.46	6.099***	0.21
Our new product/service introduction has increased during the last five years.	0.80	11.981***	0.64
Our company often develops new products/services well accepted by the market.	0.85	12.988***	0.72
The new products or services developed by our company always arouse imitation from competitors.	0.81	fp	0.66

Model fit indices $\chi 2$ =1094.434, *df* =134, $\chi 2$/df = 8.16, GFI.649, TLI= .632, CFI=.678, IFI.680, RMSEA =.167 Fp, fixed parameter for estimation, correlation between each pair of factors ***P < .001

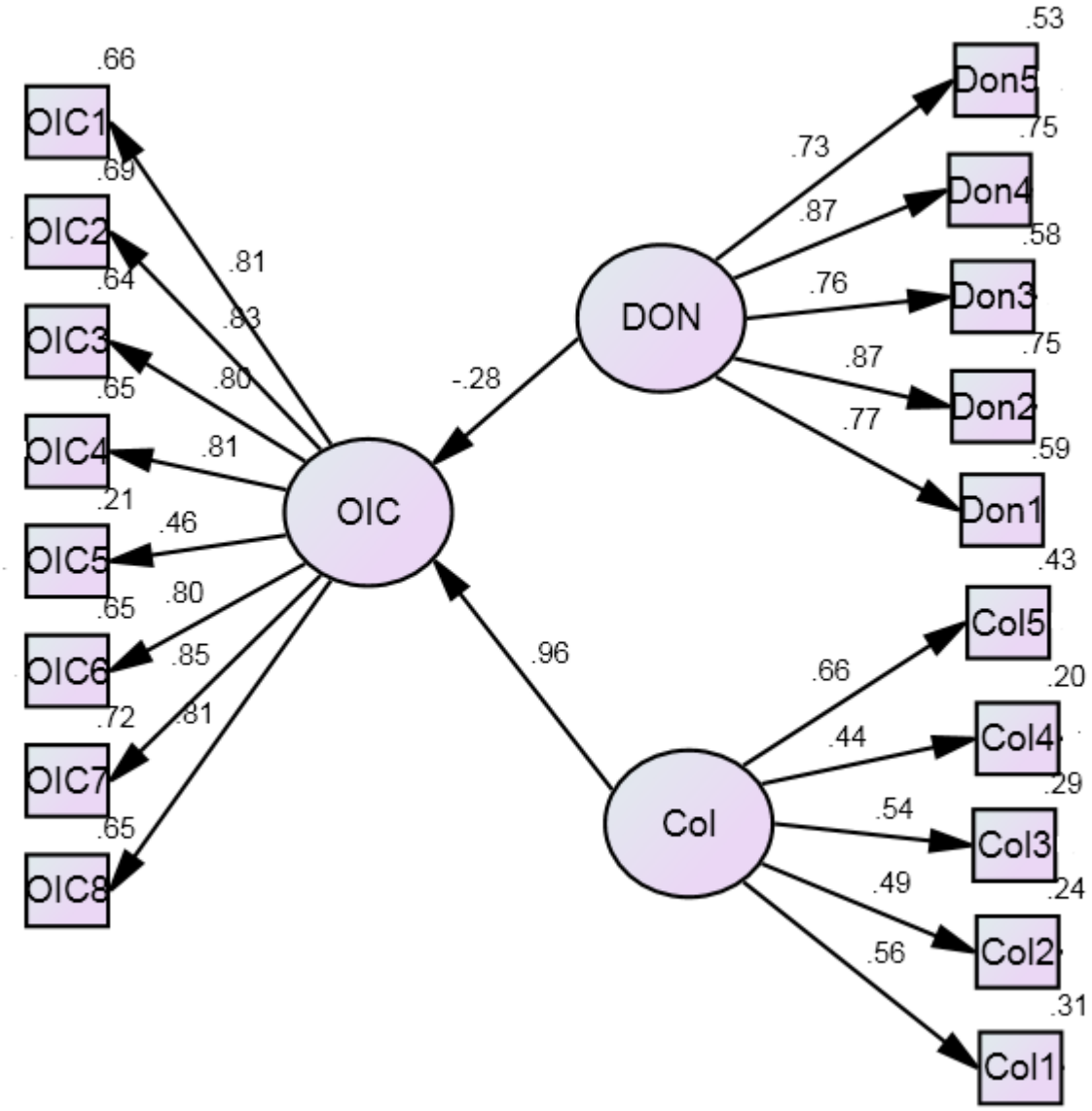


Figure 5-4: Model of the Constructs

Table 5-29: CFA Results of the Constructs with the Fit Indices

Model	Construct/Factor	No of Variables	Final factor loading	Model Fit Indices							
				χ2	*df*	*χ2/df*	GFI	TLI	CFI	IFI	RMSA
1	TMS	4	0.859	193.949	71	2.73	0.899	0.877	0.904	0.905	0.082
STF	Infrastructure	3									
	Interpersonal trust	5									
	Rewards Systems	2									
2	Relative advantage	4	0.797	53.481	32	1.067	0.959	0.979	0.985	0.986	0.051
DOI	Compatibility	3									
	Complexity	3									
3	Donation Collection	5	0.912	200	34	5.89	0.849	0.872	0.903	0.904	0.138
KSP		5									
4	KSP Donation	5	0.919	1094.434	134	0.816	0.649	0.623	0.678	0.680	0.167
KSP and OIC	KSP (collection) OIC	5									
		8									

5.5 Chapter Summary

This chapter presented the details of the measurement scale analysis details. The results were demonstrated according to the assessment of scale reliability, EFA and CFA of the survey. To begin with, scale reliability assessment revealed that the measurement scales, which were used to capture the meaning of the model constructs, were reliable, as indicated by the high values of Cronbach's alpha for each individual construct. Additionally, the item-total correlations of all the variables were substantial, indicating that each variable adequately measured its underlying construct. Following this, the EFA was conducted for each individual construct to uncover the appropriate number of latent factors (factor structures). Additionally, through Harman's one-factor test, the EFA was performed on the entire variables to assess the problem of common-method variance. The results of this test showed that common-method variance was not a major concern in relation to the reliability of the scale. The factor structures derived from EFA were then examined by the stricter CFA technique to confirm the validity. For each construct, the results of the CFA provided the final factor structures that demonstrated adequate reliability, validity and unidimensionality. These results also formed a basis for creating the aggregated factors to ease the subsequent model assessment, which is presented in the following chapter.

6. Chapter 6

Structural Equation Modelling and Correlation Analysis

6.1 Introduction

This chapter presents the process used to identify the relationships between the constructs of the conceptual model. Section 6.2 introduces the SEM used to test and validate the model constructs. Section 6.3 presents correlation analysis of the exploratory study. Section 6.4 employs the correlation to analyse the relationships between the constructs in the theoretical model. The objective of this was to reveal if these constructs were associated with each other and, if they were, whether these associations were strong enough so that the variance of one or two constructs could be used to predict that of another. The section also outlines the assessment of the relationships between the factors of one specific construct with those of another. Section 6.5 concludes the chapter.

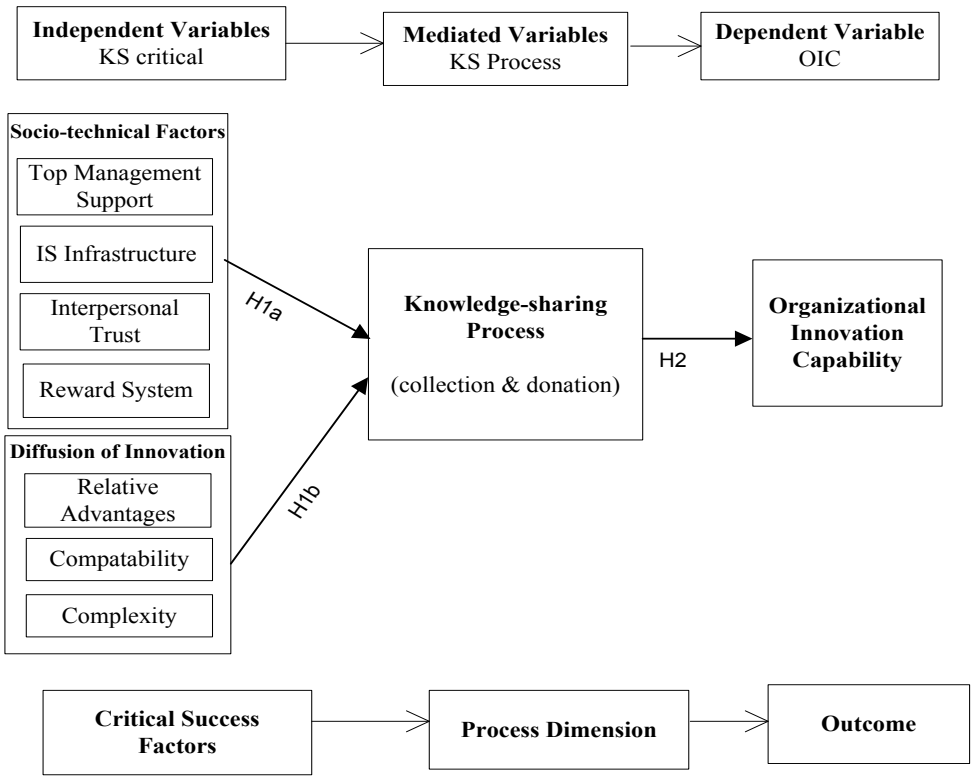


Figure 6-1: Conceptual Model and Hypotheses

The proposed conceptual model, presented in Figure 6-1 and the hypothesis development are explained in Chapter 3, Section 3.3.

6.1.1 Structural Equation Modelling Overview

The SEM approach is an extension of the multivariate assessment techniques, such as regression analysis, that allow the use of multiple indicators to measure the model variables or constructs whilst taking into account measurement errors when statistically analysing data (Hair et al., 2012). Generally, SEM is employed to determine whether a theoretical model is valid or not by estimating and evaluating the relationships among a set of observed and unobserved variables (Shah and Goldstein, 2006). These relationships involve causal paths, whose estimated path coefficients can be used as the basis for testing the research hypotheses. Basically, the model that is used in an SEM assessment can be viewed as a group made up of a measurement model and a structural model (Figure 6-2). The measurement analysis depicts the relationships between the variables and the constructs, which will be used to find whether the constructs are accurately measured or not. The structural analysis represents the relationship between the constructs only and is used to test the research hypotheses (Mohamed 2003). In this study, the SEM procedure followed the two-steps approach; firstly specifying and assessing the measurement model in order to establish the validity and then examining the structural model to assess the relationships between the constructs (Hair et al. 2006). Both steps required an assessment of the model fit indices and parameter estimates, which were based the similar procedures and criteria to those used in the CFA analysis in the previous chapter.

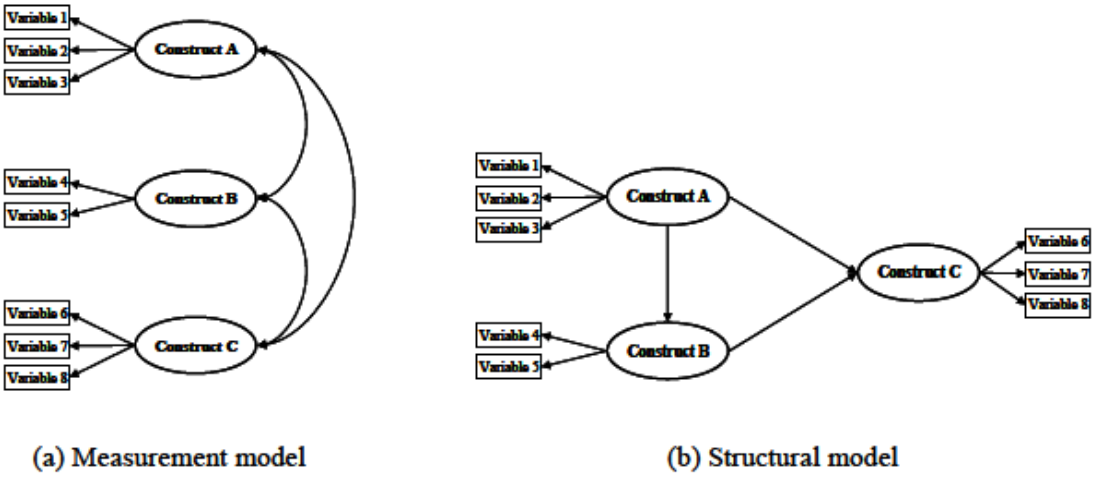


Figure 6-2: Two Key SEM Components

6.2 Measurement Model Assessment

6.2.1 Measurement Model Specification and Assessment Criteria

The measurement model was assessed and conducted using the CFA technique similar to that performed in Chapter 5. The assessment of the model fit, the convergent and discriminant validity and the unidimensionality were based on the following rubric:

- *Model fit indices*: $\chi 2/df$< 3.00; GFI, TLI, CFI, and IFI > 0.90; and RMSEA < 0.08(Garson 2006; Hair et al. 2006; Hoyle and Panter 1995; Kline, 2011);
- *Convergent validity*: factor loadings > 0.50; *t*-values > 1.96 (significant at p < 0.05level); and R^2> 0.50 (Bollen 1998; Hair et al. 2006; Koufteros 1999);
- *Discriminant validity*: correlation coefficients for each pair of construct less than 0.850 (Kline, 2011); and
- *Unidimensionality*: fit indices of the factor model, specified as unidimensional, satisfy the above model fit criteria (Koufteros 1999; Lu et al. 2007).

Additionally, the reliability of the model was assessed using a more accurate measure of composite reliability and average variance extracted, rather than the traditional Cronbach's alpha. Composite reliability refers to the degree to which a set of two or more variables share in their measurement of a construct (Koufteros 1999; Lu et al. 2007).

6.2.2 Structural Model Assessment

After establishing and assessing the validity and unidimensionality of the measurement model, the structural model was tested by examining the relationships between its constructs. The structural model was constructed to replace all the double-headed arrows that represent the correlations between the constructs of the model and replace it with single-headed (causal) arrows (Figure 6-3). These causal arrows indicated the hypothesised relationships between the model constructs, as presented in the conceptual model. Figure 6-3 shows the full structural model, defining the factor structures and the hypothesised relationships.

Overall, the model specified the STF and DOI as exogenous (independent) constructs, whereas the KSP was specified as a mediating construct and OIC was specified as endogenous (dependent) constructs. The assessment procedure for the structural model included an examination of the model fit indices and the standardised path coefficients. This approach was taken to provide a basis upon which to accept or reject the hypothesised relationships. The criteria for the model fit indices adopted in this analysis were similar to those used in the measurement model assessment. For the hypothesised relationships to be supported, the standardised path coefficients were required to be significant at the $p < 0.05$ level and greater than 0.30 to be considered meaningful (Byrne, 2001).

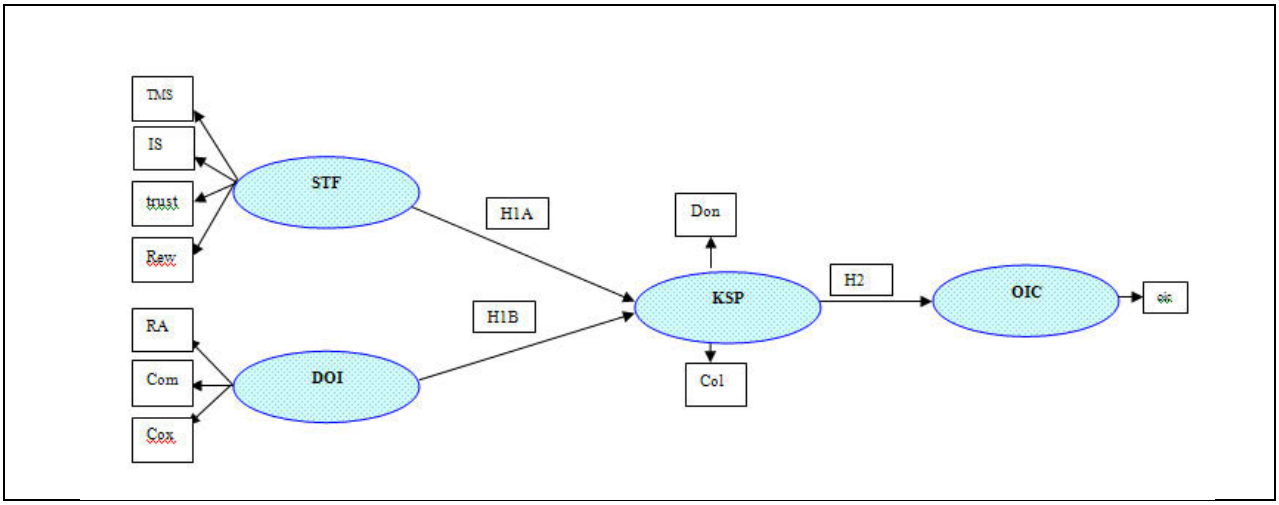


Figure 6-3: Structural Model with Hypotheses

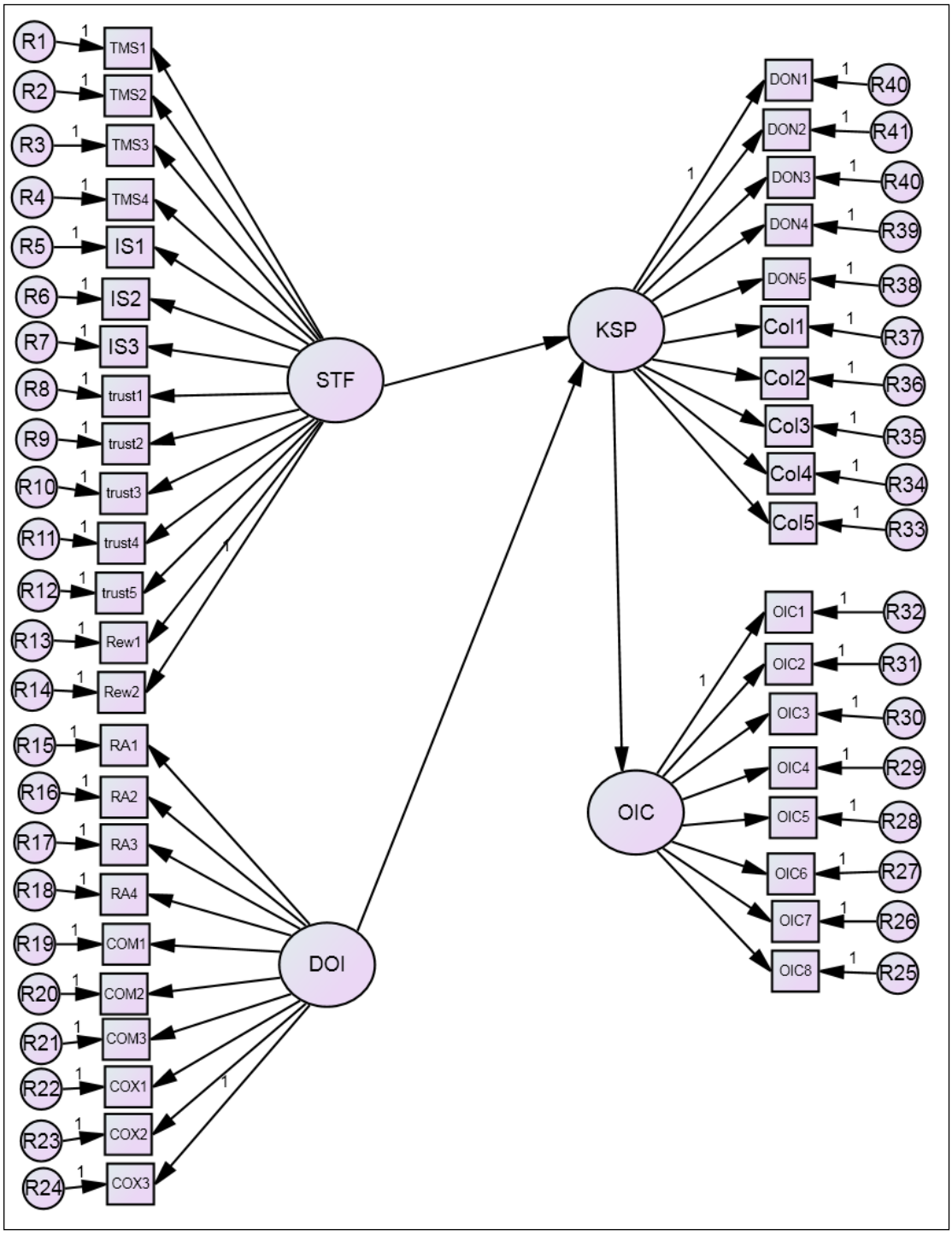


Figure 6-4: Original Structural (Conceptual) Model As presented in AMOS

6.2.3 Structural Model Results

The results of the structural model assessment were evaluated against the criteria listed above are presented in Table 6-1. The results derived to a not acceptable level of fit: $\chi 2 = 2886.516$; $df = 816$; $\chi 2/df = 3.537$; GFI = 0.62; TLI = 0.66; CFI = 0.67; IFI = 0.67; RMSEA = 0.10. One construct with three factors, DOI, was not significant with a high

error level and a *t*-value of 0.77, which is not accepted as it leads to insignificant path and needs to be removed. It was recommended to remove the DOI construct to increase the level of significance and the values of fit indices as all the indicators (factors) had a significant loading ($p < 0.001$) on their respective constructs. The results of goodness-of-fit indices exhibited a very low and needs iteration procedure to increase the level of significance and the stated above fit indices.

Table 6-1: Measurement Model (First Round Results)

Path (Hypothesis)	**Standardised Path Coefficient**	***t*-value**	**Hypothesis testing result**
STF → KSP	0.551	4.459	Supported
DOI →KSP	0.303	0.771	Not supported
KSP →OIC	0.526	7.392	Supported

Notes: $\chi 2 = 2886.516$; df= 816; $\chi 2/df = 3.537$; GFI = 0.62; TLI = 0.66; CFI = 0.67; IFI = 0.67; RMSEA = 0.10

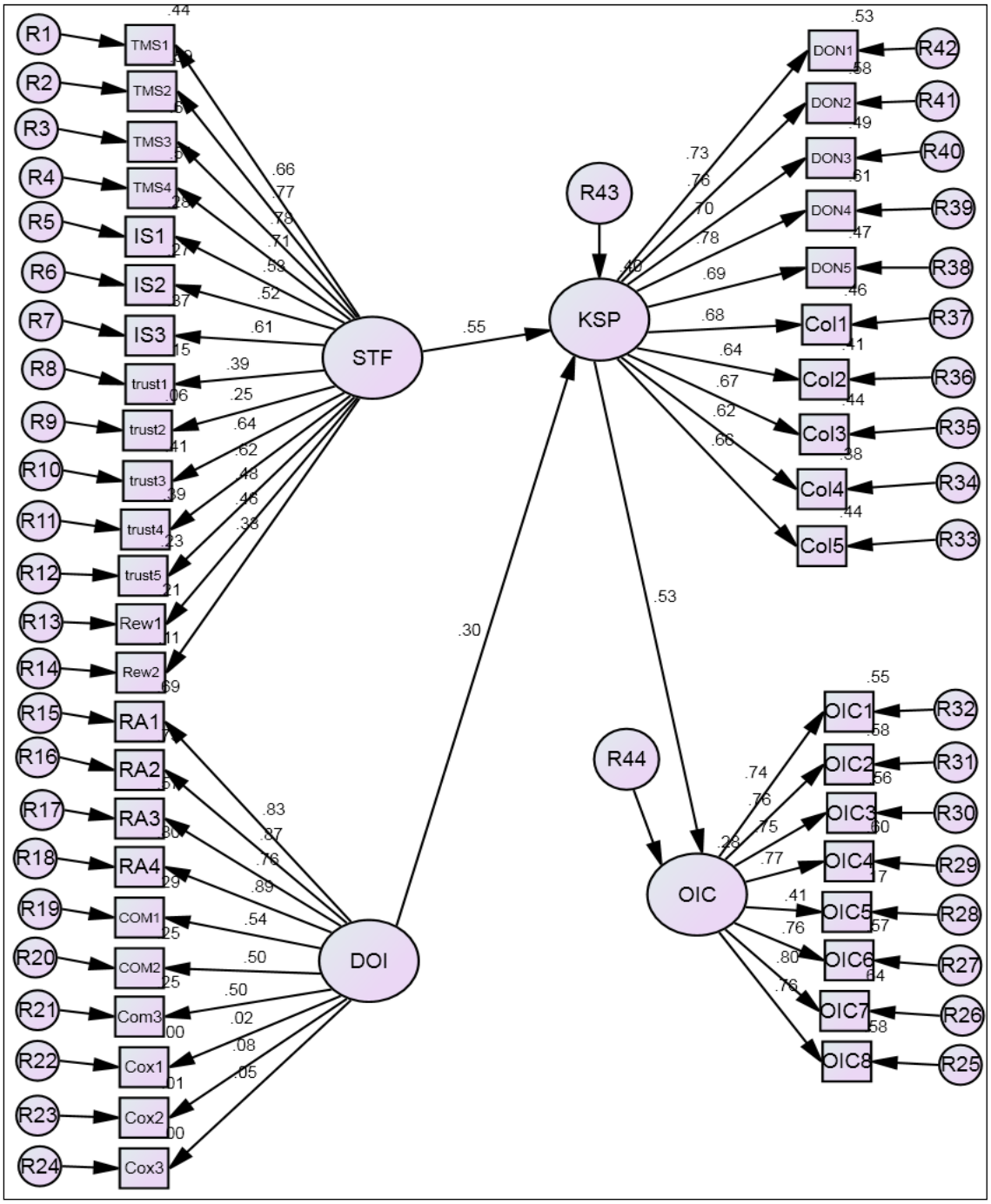


Figure 6-5: First Round of the Structural Model as Presented in AMOS

Table 6-2: Measurement Model (Second Round Results)

Path (hypothesis)	Standardised path coefficient	*t*-value	Hypothesis testing result
STF ARROW KPS	0.64	4.81	Supported
DOI ARROW KSP	p.r.	p.r.	Not supported
KSP ARRPW OIC	0.55	7.37	Supported

$\chi 2 = 1623.14$; $df = 462$; $\chi 2/df = 3.51$; GFI = 0.68; TLI = 0.73; CFI = 0.75; IFI = 0.75; RMSEA = 0.10

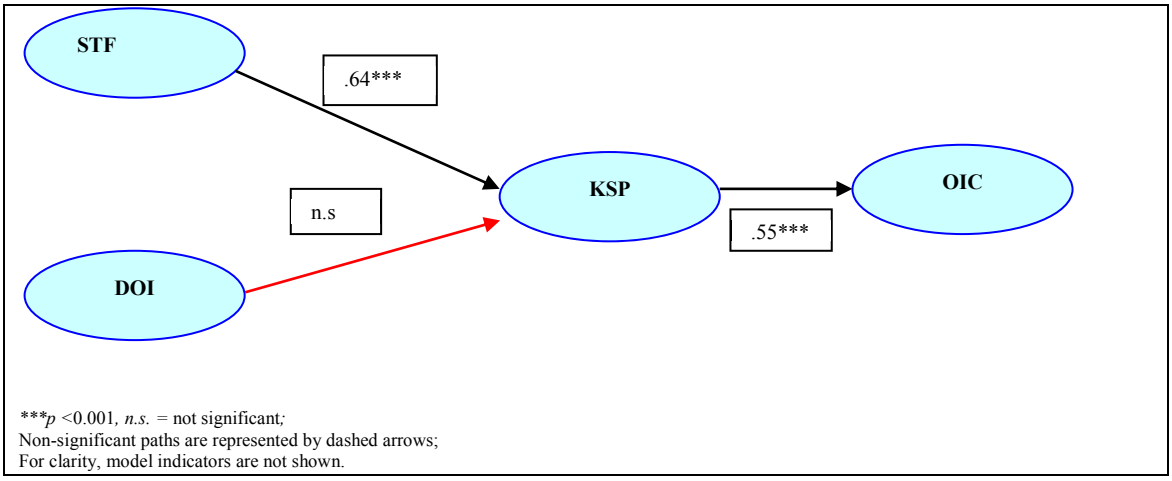


Figure 6-6: Initial Structural Model with Standardised Path Coefficients after the Second Round

As shown in Table 6-2 and Figure 6-5, after the path between DOI and KSP was removed the results showed there was a low significance level. The fit of indices needed to be improved by deleting the items that showed stand error rate**.**

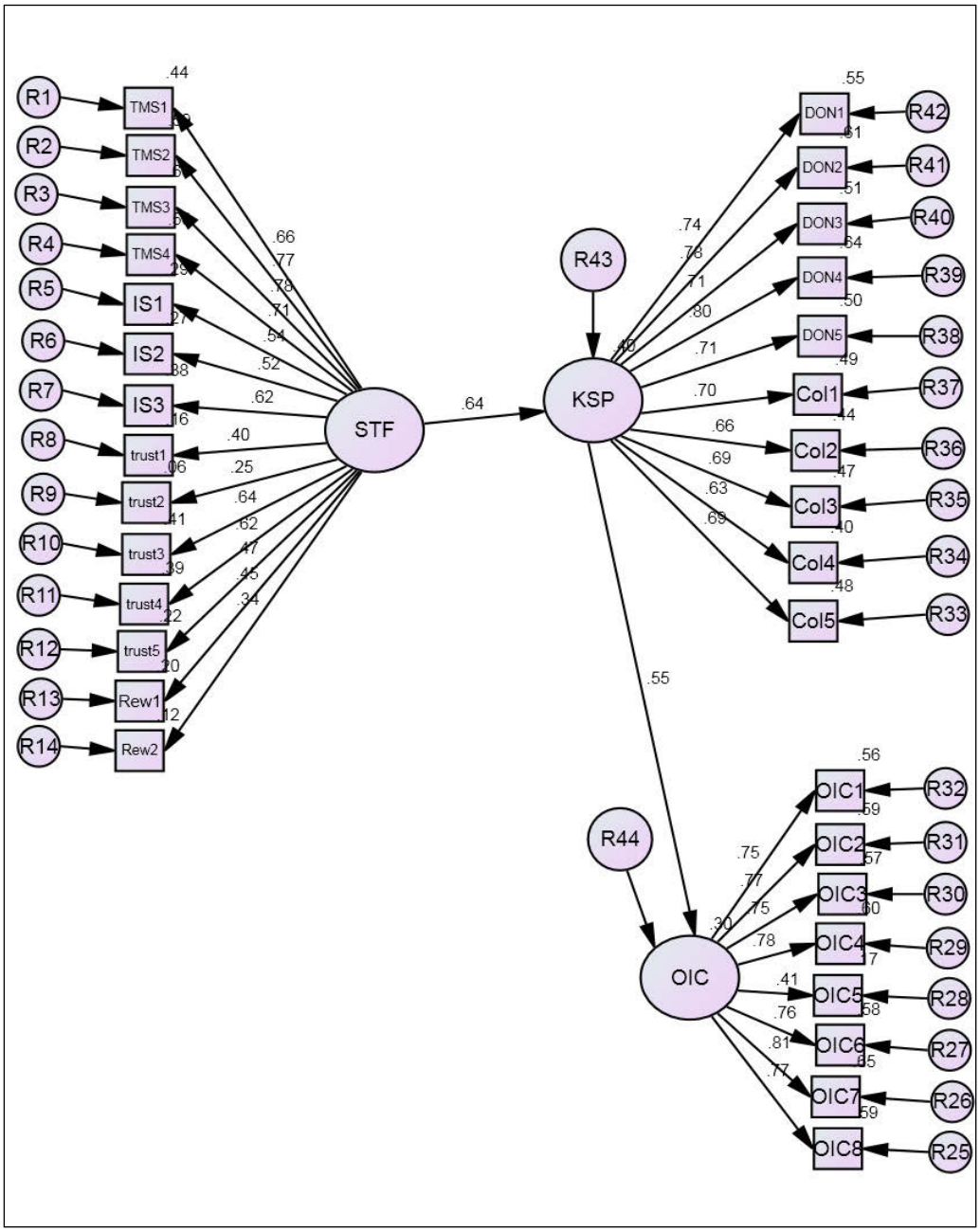


Figure 6-5: Structural Model with Standardised Path Coefficients after the Second Round after Removing the DOI construct as shown in AMOS

6.2.4 Exploring the Mediating Role of the KSP Construct

Baron and Kenny (1986) state that a given variable may be said to function as a mediator to the extent that it accounts for the relationship between the predictor and the criterion. In the other words, a mediator clarifies 'how' or 'why' a variable has certain effect on another variable or variables (Frazier et al. 2004). Hopwood (2007) recommends using SEM to test the mediating influences and to differentiate them from

the indirect effects, as there is an important distinction between variables and this distinction may significantly affect the validity of the model. In the case of an indirect effect, the direct path between the predictor and the outcome variable is not significant (that is, the correlation between both variables is not significant); however, the paths between the predictor to the mediator and the mediator to the outcome variable are significant. In this case, the mediator does not account for the relationship between the predictor and the outcome variable. Yet, in relation to the mediating influence, the direct path from the predictor to the outcome variable is initially significant. When the mediator is controlled for, the relationship tends to lose its significance. In this study, a test was conducted on the mediating role of the KSP construct in determining the effect of the STF and DOI constructs on the OIC construct.

6.2.5 Measurement Model Results

The results of the measurement model assessment were evaluated against the criteria listed above. The model yielded an acceptable level of fit: $\chi 2 = 455.052$; *df*= 207; $\chi 2/df$= 2.20; GFI = 0.86; TLI = 0.89; CFI = 0.90; IFI = 0.90; TLI = 0.89; RMSEA = 0.07. Only one construct with three factors (DOI) was not significant with a high error level and it was recommended to remove it to increase the level of significance and the values of fit indices. All of the indicators (factors) had a significant loading ($p < 0.001$) on their respective constructs. The results of goodness-of-fit indices exhibited a moderate but acceptable level of overall model fit and, therefore, provided support to the overall validity of the structural model. Furthermore, all of the correlation coefficients between each pair of the constructs were less than 0.850, suggesting an adequate discriminate validity (Kline, 2011).

Table 6-3 compares the fit-indices of the three hierarchical models. All the differences of the chi-square were not significant at $p < 0.05$, suggesting that all the model parameters did not differ significantly. The results, however, showed that the Model B was not admissible, since it contained offending parameter estimates and less acceptable fit indices, which included a value of the standardised path coefficient that was greater than 1.00 (Kline, 2011). As a result, only Models A and C were compared. The fit indices of both models were equivalent, indicating that they had equal explanatory power. As mentioned above, the principle of parsimony suggests that when there are two different models with similar explanatory grounds, the simpler one is preferred with

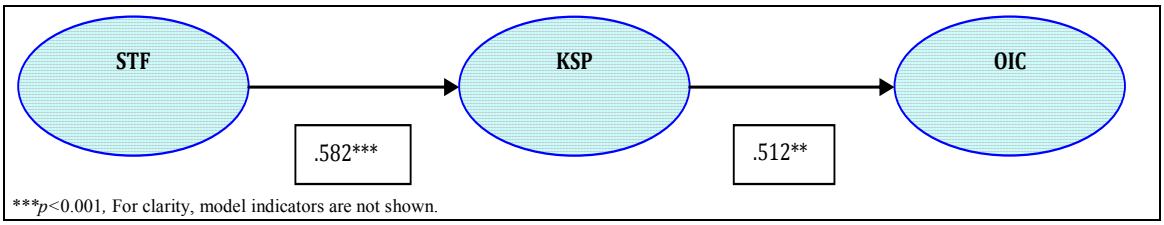
acceptable level of fit indices. Thus, as the Model C was simpler and more parsimonious (i.e. fewer paths and a higher degree of freedom), it was the better choice. Its lower AIC index of 547.05, compared with the value of 3060.52 for Model A, also supported the choice. Consequently, Model C was chosen as the final model that best represented the strongest survey variables and constructs.

6.2.6 Final Structural Model Summary Discussion

The second step in the model assessment was to examine the significance of each hypothesised path in the research model. The results of the analysis are depicted in Figure 6-6 (significant paths depicted by bold lines and insignificant path with red line) and summarised in Table 6-4. Hypothesis H1A of this study examined the effects of the socio-technical knowledge-sharing factors (STF) on KSP. The results found that STF (which represents the variables TMS, IS infrastructure, interpersonal trust and reward systems) was found to positively influence KSP (represented by knowledge donating and knowledge collecting). However, hypothesis H1B, which posits that DOI adoption theory (which represents relative advantage, compatibility, and complexity) positively influences KSP, was not supported. The results show DOI had no significant relationship with KSP in terms of donating and collecting knowledge. Finally, the impact of OIC was found to be moderately positively associated with employee willingness to donate and collect knowledge, supporting Hypothesis 2. From a practical perspective, the relationships among knowledge-sharing enablers, processes, and firm innovation capability may provide information regarding how firms can promote knowledge-sharing culture to sustain their innovation performance.

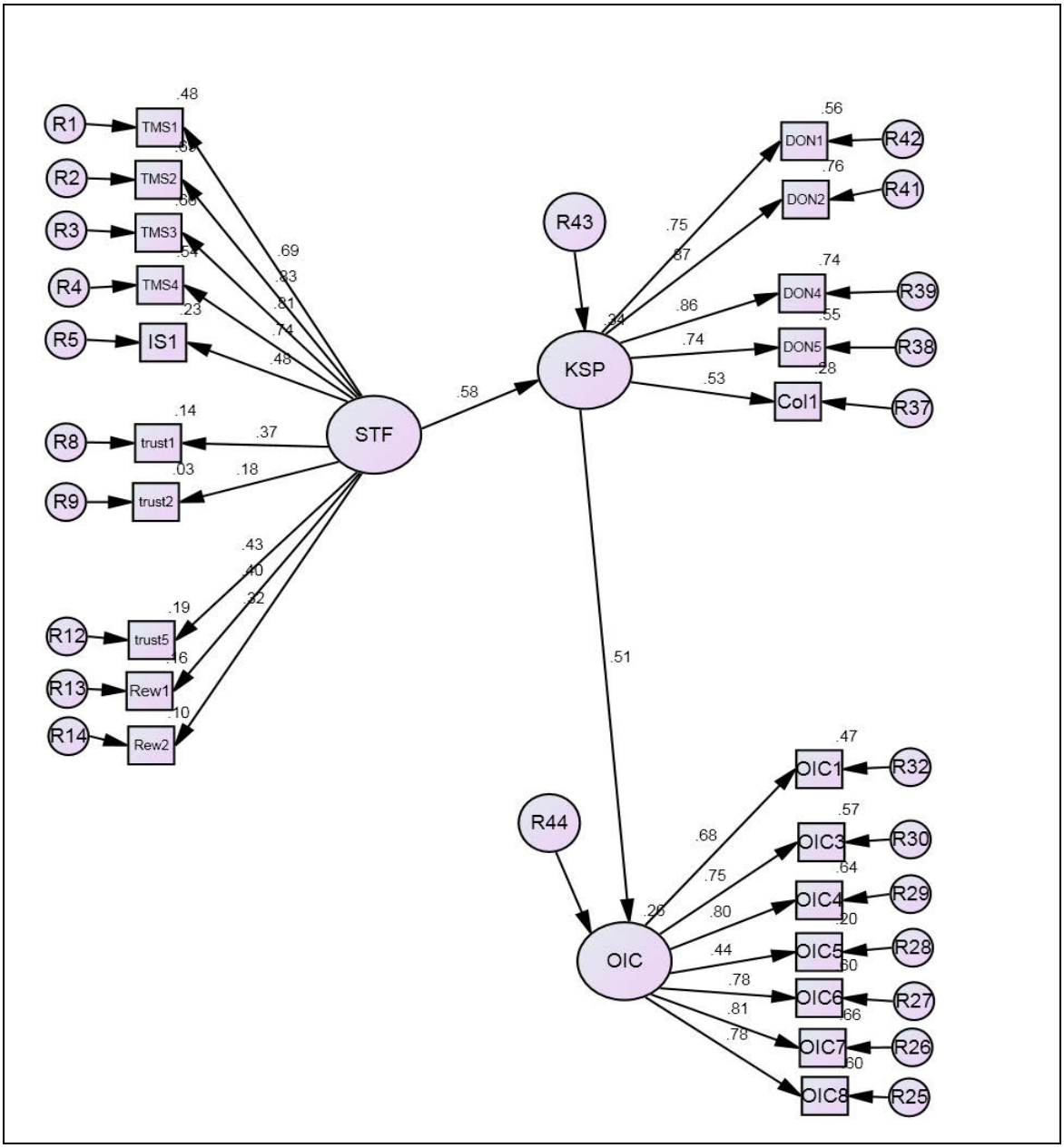
Table 6-3: Hypothesis testing

Path (hypothesis)	**Standardised path coefficient**	***t*-value**	**Hypothesis testing result**
STF →KSP	0.582	4.416	Supported
KSP →OIC	0.512	6.706	Supported



***p<0.001, For clarity, model indicators are not shown.

Figure 6-7: Final Round Structural Model with Standardised Path



Model Fit Indices: $\chi 2$= 98.97, *df*= 50, $\chi 2/df$ = 1.98, GFI = 0.91,
TLI = 0.92, CFI = 0.94, IFI = 0.94, RMSEA = 0.07;
**p <0.01, ***p <0.001, *n.s.* = not significant;
Non-significant paths are represented by dashed arrows.
For clarity, model indicators are not shown.

Figure 6-8: Detailed final model as shown in AMOS

However, as shown in Table 6-5, the final structural model has discriminant validity in that the square root of the average variance extracted for each construct is greater than the level of correlations involving the constructs. It shows the comparison between squared correlations of two constructs (off-diagonal elements) and the average variance extracted for each construct (diagonal elements). The results of the inter-construct correlations show that each construct shares a larger variance with its own measures than with other measures and all of the three constructs show evidence of significant discriminate validity.

6.3 Correlation Analysis Overview

The variables within this study were quantitative, with five values being measured on a level that, at least, approximates interval characteristics. The statistical technique called Pearson's correlation was used to determine the extent to which the constructs and variables are linearly related (Field, 2009; Hair et al., 2006; Jaccard & Becker, 1997; Pallant 2010). This analytical technique, developed by Karl Pearson, uses the coefficient of correlation to describe the strength of the relationship between two sets of variables (Chen, 2007). The extent of linear approximation between two variables is indexed by a statistic known as the Pearson correlation coefficient r (Field 2009; Jaccard & Becker 1997; Pallant, 2010), which can assume any value from -1.00 to +1.00 inclusive. The size of the absolute value provides a sign of the strength of the relationship. A correlation coefficient of 1.00 or +1.00, and -0.70 or +0.70, indicates a perfect and moderate correlation respectively (Pallant, 2010). However, in behavioural science research, where complex behaviours are studied, statistically significant correlations of 0.20 to 0.50 (and -0.20 to -0.50) are often considered important (Field, 2009; Jaccard & Becker, 1997; Mason et al., 1998; Pallant, 2010). In the current study, the existence of a linear relationship between two variables was tested through a t-test. When a null hypothesis (there was no correlation) was rejected at $\alpha = 0.001$ or 0.05 level; the result was concluded with 99% or 95% confidence respectively. Hence, there was evidence of an association between the pair of variables (Berenson & Levine, 1996; Field, 2009; Pallant, 2010). The variable that was identified with significant associations to several other variables was further analysed through a regression process. The process reveals if it (as a criterion) could be predicted or explained by

those variables (as predictors). In this study, 14 dimensions were used to test the hypotheses and answer the research questions.

6.3.1 Correlation Analyses (Influence of Knowledge-sharing Factors on Knowledge-sharing Processes)

The first hypothesis (H1) concerns the relationships between socio-technical factors and KSP. As presented in Table 6-6, the Pearson correlation r value between the KSF and KSP constructs was 0.58. The result reflected a moderate positive correlation between KSF and KSP, while the r values were significant at the 0.01 level.

The correlation analyses on the variables of the STF construct and the factors of the KSP construct (see Table 6-7) suggest the significant factors were TMS from the KSF construct and Don from KSP. Donation is correlated with most of the factors of the KSF and mainly with all the variables of TMS. On the other hand, TMS was correlated with all the variables of KSP, demonstrating that these two factors and their variables are very important and support H1. Also, IS infrastructure (represented by the variable IS1) was significantly correlated with all of the variables of KSP donation. However, interpersonal trust (by the variable trust5) was significantly correlated with donation (D4) and rewards system (Rew1) was significantly correlated with donation (Don2; Don4). Finally, the variables Trust1, Trust2 and Rew2 did not correlate significantly with any KSP preference variables.

These findings suggest that the STF construct appears to have a moderate positive influence with/to the KSP construct and its factors. Additionally, all factors of the STF were significantly correlated with three factors of the KSP construct at the 0.01 level.

Table 6-4: **Correlation between KSF and KSP constructs**

Construct	Pearson Correlation
	KSP
STF	0.58**

** Correlation is significant at the 0.01 level

Table 6-5: Correlations between STF and KSP Factors/Variables

KSF/KSP	Col1	Don5	Don4	Don2	Don1
TMS1	0.22	0.30	0.35	0.35	0.30
TMS2	0.26	0.36	0.42	0.42	0.36
TMS3	0.25	0.35	0.41	0.41	0.35
TMS4	0.26	0.31	0.37	0.37	0.32
IS1	-	0.20	0.24	0.24	0.21
Trust1	-	-	-	-	-
Trust2	-	-	-	-	-
Trust5	-	-	0.22	-	
Rew1	-	-	0.20	0.20	-
Rew2	-	-	-	-	-

(TMS)-Top Management Support:
TMS1: The top management level think that encouraging sharing knowledge with colleagues is very important
TMS2: Top managers always encourage and support staff to share their knowledge with other colleagues.
TMS3: Top management level provides most of the necessary environment, help and resources to help the staff to share their knowledge with other staff.
TMS4: Top managers are keen to see the staff members are happy to share their knowledge with colleagues.

(IS)- IS Infrastructure:
IS1 My company provides various tools and technologies to facilitate knowledge-sharing and exchange experiences (e.g. email, intranet and groupware.

(Trust) Interpersonal trust
Trust1 I don't hesitate to share my feelings and point of views with my colleagues .
Trust2 I believe co-workers should not share personal information.
Trust5 Most of my colleagues are people whom I know and thus considered trustworthy.

(Rew)-Rewards Systems:
REW1 Our company rewards employees for sharing knowledge experience with their colleagues.
Rew2 The knowledge-sharing rewards available are effective in motivating staff to spread their knowledge.

(KSP) Knowledge-sharing Processes:
(Don)- Knowledge-sharing Process (Donation):
K1D- I often share with my colleagues the new working skills that I learn.
K2D.- My colleagues often share with me the new working skills that they learn.
K4D- My colleagues often share with me the new information they acquire.
K5D- Sharing knowledge with my colleagues is regarded as something normal in my company.

(Col)- Knowledge-sharing Process (Collection):
K6C- My colleagues often share with me the working skills they know when I ask them.

6.3.2 Testing the Influence of Knowledge-sharing Processes on Organisational Innovation Capability

6.3.2.1 Correlation Analyses

As presented in Table 6-6, the Pearson correlation r value between the KSP and OIC constructs was 0.51, reflecting a moderate positive correlation between KSP and OIC. r values were significant at the 0.001 level.

The correlation analyses on the factors of these two constructs (see Table 6-7) reveals that both factors within the KSP construct (the knowledge-sharing process of donation represented by the variables Don1, Don2, Don4 and Don5 and the knowledge-sharing process of collection represented by the variable Col1) had a moderate positive correlation. The correlations were significant at the 0.001 level. The knowledge-sharing process of donation was positively correlated with the OIC variable with a maximum correlation r = 0.36 and minimum of r = 0.20. However, the knowledge-sharing process of collection variable was positively correlated with most of OIC variables except OIC1 and OIC5.

The correlation analyses on the variables level of the KSP construct and the factors of the OIC construct (see Table 6-4) was fully correlated except in three areas as shown below in Table 6-8. This suggests that the significant factor was Don2 because it was correlated with all the variables of OIC and received values of r > = 0.35 for four variables in OIC. Lastly, Col1 was weakly correlated with OIC variables, O1 is not correlated with Col1 factor and OIC5 was the weakest variable in the OIC construct because there is no correlation with the collection factor and it only correlated with two variables and a value of r = 0.2 with Don2 and Don4.

To sum up, the KSP construct appears to have a moderate association with the OIC construct and its factors. Additionally, all of the variables of the OIC were significantly correlated with most of the factors and variables of the KSP construct at the 0.001 level.

Table 6-6: Correlations between the Knowledge-sharing processes and Organisational Innovation Capability Constructs

Construct	Pearson Correlation
	OIC
KSP	0.51**

** Correlation is significant at the 0.01 level. Statically, KSP is positively correlated with moderate effect to OIC.

Table 6-7: Correlations between KSP and OIC Variables

KSP/OIC	OIC8	OIC7	OIC6	OIC5	OIC4	OIC3	OIC1
Col1	0.21	0.22	0.21	-	0.22	0.21	-
Don5	0.30	0.31	0.29	-	0.30	0.29	0.26
Don4	0.34	0.36*	0.34	0.20	0.35*	0.33	0.30
Don2	0.35*	0.36*	0.35*	0.20	0.36*	0.34	0.31
Don1	0.30	0.31	0.30	-	0.31	0.29	0.26

* r > = 0.35
(KSP) Knowledge-sharing Processes:
(Don)- Knowledge-sharing Process (Donation):
K1D- I often share with my colleagues the new working skills that I learn.
K2D.- My colleagues often share with me the new working skills that they learn.
K4D- My colleagues often share with me the new information they acquire.
K5D- Sharing knowledge with my colleagues is regarded as something normal in my company.

(Col)- Knowledge-sharing Process (Collection):
K6C- My colleagues often share with me the working skills they know when I ask them.

.(OIC)- Organisational Innovation Capability:
OIC1- Our company frequently tries out new ideas.
OIC3- Our company is creative in its operating methods
OIC4- Our company is frequently the first to market new products and services
OIC5- Innovation is perceived as too risky in our company
OIC6- Our new product/service introduction has increased during the last five years.
OIC7- Our company often develops new products/services well accepted by the market.
OIC8- The new products or services developed by our company always arouse imitation from competitors.

6.4 Chapter Summary

This chapter detailed the analytical procedures and assessment results for the conceptual model developed in Chapter 3. The chapter began by providing an overview of SEM, the analytical technique that was utilised to assess and refine the theoretically developed model. The analytical procedures comprised of an assessment of two main SEM components: the measurement model and the structural model. From the results of the factor structures derived from the preceding chapter, the measurement model was partially disaggregated to reduce the analysis complexity. The assessment results indicated that the specified measurement model possessed acceptable levels of fit, convergent validity, discriminate validity and unidimensionality. The analysis then proceeded to a specification and assessment of the structural model, the second key component of SEM. This stage involved an assessment on the hypothesised relationships between the model constructs; a hierarchical analysis to produce the final model; and a test for any mediating effect. The results from the structural model assessment provided an answer to the first research question and the final model showed that the STF influenced the KSP, thus showing that the OIC was dependent upon both constructs. To answer the second research question, it was found that only the KSP

construct had a direct influence on the OIC construct. Furthermore, SEM was used to confirm that the KSP construct mediated the influence of the STF on OIC. The following chapter, Chapter 7, presents a discussion of these findings in greater detail.

7. Chapter 7
Model Validation

7.1 Introduction

In this chapter, the qualitative analysis of the research model validation is discussed. The qualitative analysis in this research involves two main steps: a within-case analysis and a cross-case analysis. A within-case analysis provides information and insight into how the model and its constructs were perceived within the Saudi context. The cross-case analysis can then validate the results from the multiple case studies by using a pattern matching technique that links the collected data to the theoretical propositions by comparing patterns of the actual values of variables to those predicted in the hypothesises to answers the research questions. In this study, the validation procedure involved interviewing nine people from six Saudi Arabian firms,

In Section 7.2, the aim and elements of the model validation procedure will be identified and related to the analysis' approaches. Section 7.3 will then illustrate the different analytical techniques employed for the analysis of within-case data and for cross-case patterns assessment. The results of within-case and cross-case analyses will be discussed in Sections 7.4. The pertinent findings from the analysis will be elaborated on in Section 7.5, which will then summarise the results discussed within the chapter.

7.2 Qualitative Validation of Research Model

The model validation phase was employed to decide whether the outcomes resulting from the quantitative assessment process illustrated in the previous chapters can be reconfirmed and to help to generalise the findings to the actual phenomena with consideration to the significance of people and the reality of the context under investigation. Model validation was attained through an analytical generalisation that utilised an explanatory case study research approach. This kind of approach naturally targets a causal model depicting a set of hypothetical relationships among variables. It should be noted that in this case the term 'explanatory' refers to the test of a presumed set of causal links stipulated by the model (Yin, 2011).

So that a scale could be put together for each of the model constructs in order to complete the case studies, it was necessary to identify the functioning of variables. As stated in Chapter 3, semi-structured interviews were used to probe certain variables denoting each of the model's constructs and factors. After this, a research model is then proposed by obtaining precise measures. The case studies were then utilised to validate the model that was developed after the quantitative analysis, with all measures stemmed based on the results found in Chapters 5 and 6. This process was undertaken to confirm that the data gathered from the case studies are compatible with those collected from the quantitative survey, resulting in more accurate validation of the model. The final evaluation scales collected from the factor analysis were employed to develop an interview protocol (see Appendix C).

7.3 Qualitative Data Analysis for Research Model Validation

Model validation engages two main analytical steps: within-case and cross-case analyses (see Chapter 3.13.2). The within-case analysis was concerned with the evaluation of gathered data and the reporting of findings from every case study. Those findings are shown in Tables 7-1 to 7-3. Then a comparison between results from the within case analysis and present cross-case findings was done, resulting in conclusive outcomes about whether the derived model can be reasonably clarified by the case studies. These steps are discussed in further detail in Sections 7.3.1 and 7.3.2.

7.3.1 Case Studies Profile

Six firms took part in this study in Saudi Arabia during 2012-2013. The six case study participants are submitted as Firms A, B, C, D, E and F. Table 7-2 summarises the firms' profiles. These are the organisation's industry, the number of employees at the company as well as the job titles of the interviewees, their years of experience within organisation, their education level and length of the interview. The interviewees were selected based on recommendations from each organisation's human resources department about who was the specialist in their field. The interviews were conducted was one-on-one in the offices of each firm in Saudi Arabia.

The firms composed a good sample mix in terms of the size of the firms, with the number of employees ranging between 100 and 1000. The different areas of expertise were IT services, government organisations, financial services and healthcare services.

Years of experience within firm for participants in the study ranged between one and 20 years. The author of the thesis conducted all interviews.

Table 7-1 shows all case studies profile.

Table 7-1: Case study profiles

Case	Organisation industry	No of Employees	Job Title	Years at Company	Education Level	Duration of Interview
Firm A	Financial	101-200	Senior manager	5	Master's Degree	40 minutes
			Supervisor	2	Bachelor's Degree	
Firm B	Aviation	500 -1000	Sales director	10	Master's Degree	55 minutes
			Sales manager	4	Master's Degree	
Firm C	IT	101-200	Assistant director	20	Master's Degree	50 minutes
Firm D	Defence	500 -1000	Project manager	5	Master's Degree	45 minutes
			Human resources manager	4	Bachelor's Degree	
Firm E	IT	500 -1000	Business development manager	9	Master's Degree	60 minutes
Firm F	Medical research Centre	500-1000	Research group leader	5	Bachelor's Degree	50 minutes

7.3.2 Within-case Analysis of Case Studies

The within-case analysis began by organising the collected evidence from the performed case studies, which included transcripts and different related documents. A reference number was assigned for every variable and contents were coded so that they could be categorised into appropriate factors. A set of codes was exploited for the coding aim based on the abbreviations of the model factor allocated to compatible phrase or paragraph of the documents. A descriptive coding was conducted in this study to categorise the large amount of information into relevant model factors, which refers to an attribution of a class of phenomena (i.e. model factors) to a segment of text (Miles and Huberman (2013). Analysis was carried out after the coding process, documenting all coded information in an evidentiary-based way, employing Miles and Huberman's (2013) tabular methodology. Their methodology involves generating a matrix of categories denoting the model factors and providing evidence within the generated categories. An obvious difference between evidence and interpretation was allocated by conducting a tabular approach, which means that tables only hold raw evidence (Yin, 2011). Every piece of coded information in the evidence table was tagged with a reference number connecting back to its mine to allow cross-referencing.

After organising all of the evidence into relevant model factors, the factors were assessed through an efficient process in which a classification of each factor based on its corresponding evidence took place, categorising it into one of the following value descriptors: high, medium or low. A series of appraisal rubrics – a broadly employed mean in the education field – was picked up to function as scaling standard to categorise the factors into the aforementioned three descriptors in order to guarantee the reliability and consistency of the rating (see Appendix F). The criteria were outlined according to the level of the key variables resulting from the factor analysis. For a factor to take on a particular value descriptor, the evidence provided for the factor had to demonstrate a close match to the details of such descriptor within the relevant criteria. The individual factors were then qualitatively summed after being scaled to stand for the total rating of their respective construct. This procedure was adapted from Zinatelli et al. (1996).

The within-case study results are summed up in Table 7-3. The qualitative rating for each construct and its associated factors for all case studies is the main aspect of the within-case results. A rating of the factors derived from the qualitative findings for each firm, which were gathered to represent the overall rating for all constructs.

Table 7-2: Within-case analysis results

Constructs/Factors	**Case Rating**					
	Firm A	**Firm B**	**Firm C**	**Firm D**	**Firm E**	**Firm F**
TMS	**Low**	**High**	**High**	**Low**	**High**	**Low**
Encouragement of knowledge-sharing	Low	High	High	Low	High	Low
Top managers and encouragement of knowledge-sharing	Med.	High	Low	Low	Medium	Low
Environment	High	High	High	Low	High	Low
Commitment	Low	High	High	Low	High	High
IS Infrastructure	**High**	**High**	**High**	**Low**	**High**	**High**
Technological system availability	High	High	High	Low	High	High
Usage of e-storages	High	Medium	High	Low	High	High
System effectiveness	Low	High	High	Low	High	High
Interpersonal Trust	**Medium**	**High**	**High**	**Medium**	**Medium**	**High**
Feelings/personal views/information	Medium	High	High	Low	High	High
Sharing personal information	High	Medium	Low	High	Medium	High
Policies and procedures of protection	Medium	High	High	Low	Medium	High
Trust level	Medium	High	High	High	Medium	High
Trustworthiness	Medium	High	High	Low	Low	High
Rewards System	**Low**	**High**	**High**	**Low**	**Medium**	**Low**
System existence	Low	High	High	Low	Medium	Low
System motivation	Low	High	High	Low	Medium	Low
KSP - donation	**Low**	**High**	**High**	**Low**	**Medium**	**High**
Learned working skills	Low	High	High	Low	High	High
	Low	High	High	Low	High	High
Learned new information	High	High	High	Low	Medium	High
	Medium	High	High	Low	Medium	High
Sharing knowledge as a norm	High	High	High	Low	Medium	High

KSP – collection	**High**	**High**	**High**	**High**	**Medium**	**High**
Shared knowledge on demand	Medium	High	High	High	Medium	High
	High	Medium	High	High	Medium	High
Information on demand	High	High	High	High	High	High
	High	High	High	Low	High	High
Habit of sharing knowledge	Low	Medium	High	Low	Medium	High
OIC	**Medium**	**High**	**High**	**Low**	**High**	**High**
Adoption of new ideas	High	High	High	Low	Medium	High
	Medium	High	High	Low	Medium	High
Market pioneering	Low	High	High	Low	High	High
	High	High	High	Low	High	High
Innovation as a risk	Medium	Low	Low	Low	High	High
Sales progress	Medium	High	High	Low	High	High
Market acceptance	Low	High	High	Low	High	High
Service/product edge	Medium	Medium	High	Low	Medium	High

7.3.3 Top Management Support Factor

The TMS rating had a mixed result, with Firms B, C, and E ranking as high while Firms A, D and F obtained a low rating. For the rest of the firms, a high level of TMS was displayed across most of the items (encouragement of knowledge-sharing, top managers and encouragement of knowledge-sharing, environment and commitment). Firms D and F showed a low rating for all aspects of TMS, except for the value commitment in Firm F, which obtained a high rating. Firm A showed high and medium ratings for environment and top managers and encouragement of knowledge-sharing respectively, which were outweighed by the low rating of the rest of the factors.

7.3.4 IS Infrastructure Factor

A slight but effective change in ratings happened for the second factor: IS infrastructure. This factor showed a high level in all firms, with only the exception of Firm D, which was the only one to show a low level across all items. Firms A, B, C, E and F showed a high level of technological system availability. The usage of e-storages was proven to be high in four firms, indicating that knowledge-sharing is facilitated. The two exceptions were Firm B, which showed a medium rating, and Firm D, which

had a low rating. Technological tools were proven to be highly attractive in encouraging staff to collaborate by sharing their knowledge in Firms B, C, E and F, while Firms A and D showed a low rating of attraction.

7.3.5 Interpersonal Trust Factor

There was a wide range of difference between the six firms in the interpersonal trust rating. Firms B, C and F showed a high level of interpersonal trust while Firms A and E were medium. Only Firm D showed a low rating. The staff from Firms B, C, E and F reported showing no hesitation sharing their feelings and points of view with their colleagues and therefore obtained a high rating, where some trust only existed on a medium level for Firm A and dropped to a low for Firm D, where staff hesitated to share their feelings and points of view. Sharing personal information rated medium to high for five firms. The exception was Firm C, which exhibited a low rating in that aspect. Regarding providing protection to those who share their knowledge against the harmful intentions of others, Firms B, C and F all received a high rating, A and E got a medium rating where only Firm D showed a low level of protection, meaning staff would not be open to the idea of sharing their knowledge as much. The trust level between co-workers was rated high for most firms, with the exclusion of Firms A and E, who were rated as medium. This shows a very good level of trust overall. Considering colleagues trustworthy was high for Firms B, C and F, medium for Firm A and low for Firms D and E.

7.3.6 Reward Systems Factor

Rewarding employees for sharing their knowledge with their colleagues and whether those rewards were considered effective in encouraging knowledge-sharing ranged between high for Firms B and C and low for Firms A, F and D.

7.3.7 Knowledge-sharing Process - Donation Factor

Donating knowledge-sharing gained a wide range of ratings: high for Firms B, C and F, medium for Firm E and low for Firms A and D. Learned new working skills rated high for B, C, E and F and low for A and D. Sharing new learned information was high for all firms except for D and E and sharing knowledge was considered normal for all firms except for Firms D and E.

7.3.8 Knowledge-sharing Process - Collection Factor

Collecting knowledge-sharing was high for all firms except Firm E. Sharing knowledge on demand was high for all firms except Firms A and E, which obtained a medium rating. Information on demand was rated high for all six firms. The habit of sharing knowledge ranged between high for Firms C and F, medium for B and E and low for A and D.

7.3.9 Organisational Innovation Capability

The OIC factor was rated high for Firms B, C, E and F. Firms A and D were rated as medium. Adopting new ideas was high in all firms except for Firm D, which was low, and E, which was medium. Market pioneering item rated high for all firms other than Firm B, which was low. Whether innovation was considered a risk was low in Firms B, C and D and high in A, E and F. Sales progress was high in all firms except for A, which was medium, and low in Firm D. Market acceptance achieved high level in most Firms except for A and D. Finally service product edge was medium in A, B and E, high in C and F and low in Firm D.

7.3.10 Cross-case Analysis of Case Studies

As stated in Chapter 3, confirming the conclusions obtained from multiple case studies by employing a pattern-matching technique was the main goal of the cross-case analysis, whereby a match between results from the study and the theoretical propositions was assessed. The technique includes contrasting a relationship pattern of actual variables against those foreseen by the model. Therefore, the fundamental aspect of the cross-case analysis was the development of a series of relationship patterns, anticipated by the experimental model derived from the previous quantitative evaluation.

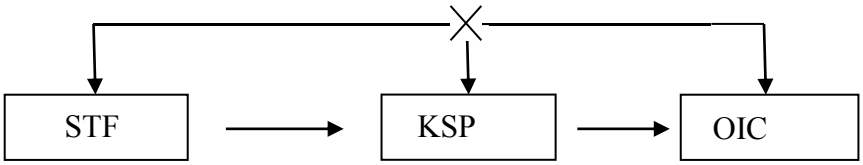
With the concluding experimental model (discussed in Chapter 6), predicted patterns were developed as high, medium and low value descriptors for the exogenous constructs OIC, knowledge-sharing process (donation and collection), socio-technical factors (TMS, IS infrastructure, interpersonal trust, reward system) and DOI (relative advantages, compatibility and complexity). The constructs were established through following the paths represented in the model and given their standardised coefficients. To be more specific, Cohen's (1988) effect size criteria was the categorising method for

standardised path coefficients in the model and they were classified into small (0.10 – 0.29); medium (0.30 – 0.49); and large (>0.50). A summary of that categorisation is listed in Table 7-1. That process resulted in developing three main predicted patterns, shown in Figure 7-1. Therefore, it is confirmed that the prediction was solely accomplished based on the key descriptors (i.e. high, medium and low), and crafty patterns were not nominated as the analysis targeted providing a cross match or mismatch between the case-based patterns and the model-predicted patterns. Thus, Cohen's criteria showed that the results of the final model of the relationship between constructs (as discussed in Chapter 6) could be classified and upgraded to a large effect since all the standardised path coefficients were above 0.5. This approach has been explained in Chapter 3.13.

Table 7-3: Classification of Effect Sizes for Relationships between Models' Constructs

Relationship	Standardised Path Coefficient of the Final Model	Classification of Effect Size based on Cohen's Criteria†
STF→KSP	0.58	Large effect
KSP→OIC	0.51	Large effect

†Cohen's effect size criteria: small (0.10 – 0.29); medium (0.30 – 0.49); and large (>0.50)



Predicted Pattern 1	High	High	High
Predicted Pattern 2	Medium	Medium	Medium
Predicted Pattern 3	Low	Low	Low

Figure 7-1: Predicted Patterns of Relationships between Model Constructs

For the cross-case analysis to be performed, an assessment of relationships between the rated items in each case against the predicted patterns was done (Figure7-1). The qualitative rating for the variables as well as a systematic assessment to determine whether the cases match the predicted patterns is shown in Table 8-4. The results are organised according to the matching-up of the case-based patterns against the predicted pattern (i.e. from a perfect match to a partial match).

Table7-4: Cross-caseAnalysisResults

Case	**STF**	**KCP**	**OIC**	**Matching result**
Firm B	High	High	High	Perfect match to *predicted pattern 1*
Firm C	High	High	High	Perfect match to *predicted pattern 1*
Firm A	Medium	Medium	Medium	Perfect match to *predicted pattern 2*
Firm F	Medium	High	High	Good match to *predicted pattern 1*
Firm E	High	Medium	High	Good match to *predicted pattern 1*
Firm D	Low	Medium	Low	Good match to *predicted pattern 1*

Table7-4 explains the correlation patterns of the rated constructs. Firms A, B and C exhibited a perfect match to *Predicted Pattern 1* (seeFigure7-1). In Firms B and C, the level of STF (high) suggests a powerful relationship with a high level of KSP and OIC, which perfectly matches *PredictedPattern1*. Firm A keeps a steady medium level for all constructs: STF, KSP and OIC resulting in a perfect match to *Predicted Pattern 2.* In Firm F's case, the high rating of constructs KSP and OIC was outweighed with the medium rating of the STF construct, resulting in showing a good match to *Predicted Pattern 1.* The same level of match was exhibited in the case of Firm E, where STF and OIC constructs were rated high and only the KSP construct showed a medium rating,

resulting in a good match to *Predicted Pattern 1*. Firm D almost showed a perfect match to *Predicted Pattern 3*, where the STF and OIC constructs were rated low. However, the KSP construct was rated medium, resulting in a perfect match to *Predicted Pattern 3* becoming a good match instead.

7.4 Discussion

The outcome of the analysis of the case studies of the six Saudi firms mentioned earlier have explored whether the model derived from the quantitative analysis can be qualitatively validated (i.e. can be explained) by the findings of the firms under actual work circumstances. Generally, the results indicated that the correlation between constructs illustrated in the model can be adequately explained by the results from the case studies. All case studies showed good to perfect matches with the predicted patterns. Two cases showed a perfect match (Firms B and C) and two others (Firms E and F) showed a good matchto*PredictedPattern1*. One case study (Firm A) showed a perfect match to *PredictedPattern2* and one case study (Firm D) showed a good match to *PredictedPattern3*. Sections 7.6.1 and7.6.2 will discuss in detail the relationship between different variables and different constructs.

7.4.1 Relationship between KSP and STF Constructs

Assessing the relationship between the KSP and STF constructs for Firms B and C, there is a strong correlation between the constructs that sustains the fact that TMS strongly affects the process of knowledge-sharing through donation and collection. The interviewed personnel confirmed the strong correlation between constructs, most of who were in management roles and were aware of most of the new initiatives in their organisation. These interviewees emphasised the encouragement of top managers of knowledge-sharing and for providing the required environment and resources to help staff to share knowledge and achieve quick progress in their work. Moreover, the interviewed managers stressed that they were committed to seeing their staff happy with levels of knowledge-sharing. In both Firms B and C, the firm was keen to provide their staff with a variety of tools and technologies to help knowledge-sharing, such as electronic bulletin boards that allow staff to chat, leave comments and share their experiences and knowledge. Most employees were happy to use e-storage in order to keep track of customers' details, history, transactions and communications that could be

accessed by other company members or for training purposes. Evaluating interpersonal trust in both of these firms showed a high level overall. However, despite the high level of interpersonal trust, Firm C employees generally hesitated to share their feelings and points of views with their colleagues unless they were asked for their opinions in a formal and documented meeting. A conservative attitude was practiced otherwise in the organisation and sharing personal information in conservative communities is not highly encouraged where it is work-irrelative data. Both firms maintained a high level of strong policies and procedures against any suspicious behaviour that could affect the company negatively. A high level of trust was sensed between co-workers and colleagues from other departments of both companies. A high level of trustworthiness between co-workers was noticed and most of the staff knew each other. Both Firms B and C had an established reward system to encourage knowledge-sharing that motivated staff to share their experiences, thus the firm obtained a high rating in both of the KSP (donating and collecting). For both firms, staff believed that sharing knowledge will constantly increase problem-solving capabilities and skills. The staff at both firms also believed that sharing knowledge will lift team-work spirit, which will directly result in a higher performance level. Employees of both firms showed a high level of reaction towards new information causing a disruption, which is believed to have a high impact on sharing that new information. Workers at Firms B and C believed that knowledge-sharing will help them do their jobs better and more effectively. Donating new information was rated high for both firms, which can be considered insignificant. The same rating was achieved for sharing new skills, resulting in considering sharing knowledge as a normal activity in the work environment. Both firms exhibited a high level of sharing knowledge and information when asked to provide an environment where knowledge-sharing becomes a habit.

Given that Firm D is in the defence industry, a totally different scope was exhibited when discussing knowledge-sharing. The secrecy required for such industry did not encourage knowledge-sharing, even if it was an acceptable habit for staff. However, there was a high level of trust between co-workers at Firm D. A low level of donating new information or skills among colleagues and co-workers was attained, yet staff could still obtain new information and skills by asking for it. The habit of sharing knowledge does not exist in this firm.

Firm A exhibited a medium level for the STF construct, which can be attributed to a low level of TMS for knowledge-sharing. Top managers did not consider encouraging knowledge-sharing as part of their job description, hence had a low level of commitment to knowledge-sharing, with managers not keen to witness knowledge-sharing in the work environment. Even though Firm A provided employees with a high level of tools and technologies to enable knowledge-sharing, those technologies were not attractive enough for co-workers to share their knowledge unless they were asked to by their superiors. Staff generally hesitated to share their points of views with their colleagues unless they were asked to and the majority of staff held a strong opinion against sharing personal information. Similarly to Firms B and C, Firm A maintained a strong policy against harmful intentions towards the firm, but had no specific policy about negative effects of knowledge-sharing unless it was documented. An acceptable level of trust was exchanged between Firm A's members and most of employees knew each other. As stated by a senior manager in Firm A, a reward system for sharing knowledge did not exist within company. The staff of the company believed that sharing knowledge will increase problem-solving skills, will improve teamwork and will help employees do a better job. In such a community, having knowledge equals power; however, donating new information or skills is not common in the type environment where you have to search for it. Staff members are happy to share their new skills or information when asked to, but the habit of knowledge-sharing does not exist in Firm A.

Firm E showed a high level of TMS for knowledge-sharing and management strongly encouraged KSP. A good environment for knowledge-sharing was provided for staff and most managers were committed and keen to see KSP flourishing throughout the firm. The firm provided staff with new technologies and variable tools that facilitated the sharing process; for example, staff members were keen to use e-storage systems, which helped knowledge-sharing. Implementing those systems was effective in encouraging staff and colleagues to share their knowledge and experiences. Employees of Firm E had a moderate level of interpersonal trust between them. An established reward system existed within Firm E that motivated staff to share their knowledge and experiences. Staff of Firm E emphasised the relative advantages that they gain from knowledge-sharing where they thought exchanging knowledge would help solving problems effectively, lift teamwork spirit and would help staff do their nominated jobs

effectively. Donating and collecting new information and skills were at a medium level for Firm E and knowledge-sharing was considered moderately normal.

7.4.2 Relationship between the KSP and OIC Constructs

In evaluating the relationship between the KSP and OIC constructs, a similarity could be viewed in the cases of Firms B, C and F, where all three firms showed a strong connection in that sharing knowledge through collection or donation highly affected the organisational innovation capacity. Specifically speaking, a high level of donating new information and new skills was scored in Firms B, C and F, which all treated knowledge-sharing as a normal activity within the company. The same rating was obtained by all three firms (B, C and F) in the process of collecting knowledge, where sharing knowledge or information was rated high. Both Firms C and F scored a high rating concerning having the habit of knowledge-sharing within the firm, with Firm B maintaining a medium acceptable level of the same variable. Both A and D shared a low level of donation activity, where donating new information or skills rated low, but within both firms, staff could still gain new skills or information on demanding them. The habit of sharing knowledge for both firms was considered acceptable but not highly available.

Firm E showed a medium level through the whole KSP construct, where a medium level of donating information was rated despite the high level obtained in donating new skills. That variable was outweighed by the medium level of donating new information or considering donating information as a normal habit within the company. The same medium level was scored by Firm E in the process of collecting new skills or information.

Most firms showed a high level of OIC. Firms B, C, E and F all showed a high level of adopting new ideas as the environment in those companies is open for any suggestions and new approaches and solutions. All four firms showed a high level of market pioneering and they were all firsts in the market to introduce new products or services. Innovation was felt to be a high risk and was chosen not to be taken by Firms B, C and E, as opposed to what the staff thought in Firm F, where all new ideas are considered and if they are accepted and validated by the committee or board, the firm will proceed with it. Firms B, C, E and F scored a high level of sales progress and their products and services sales increased in the five years prior to this study.

A high acceptance level of customers to the companies' new products and services was achieved by Firms B, C, E and F. Firms B and E's products and services are sometimes copied by competitors, whereas most of Firms C and F products get simulated, which gives both companies a great role in shaping the market. Firm D showed a low level through all of the OIC construct variables, as there is no field for competition locally for the company.

Firm A showed a great variety within the different variables ratings. A high rating was obtained in adopting new ideas as the firm frequently tries new concepts because the environment allows for new proposals. Firm A is in the finance industry, which means there is minimal room for introducing new methods or products, so consequently they achieved a medium rating. Innovation is not always considered a risky business within Firm A, but a bit of caution is always applied. The firm had improved the company's sales rate in the five years prior to the study, which is rated as a moderate progress. Due to the harsh competition within the local market, the firm's new products are not quickly accepted by customers. Competitors sometimes replicate Firm A's new products or services.

7.5 Chapter Summary

In this chapter, a confirmation study was carried out to evaluate whether the model that was derived from the quantitative analysis phase could be elucidated by the actual firms under study. This investigation utilised an explanatory case study research approach in this investigation. This approach tests hypotheses and propositions. Six Saudi firms were studied using face-to-face interviews with nine different professionals. Supporting documents were obtained as a secondary source of information. Analysing the gathered qualitative data involved two stages: within-case analysis and cross-case analysis. A rating level summary for factors and constructs and strength of the model factors explaining constructs were discussed in the within-case analysis. Patterns of relationships were then examined by using a pattern-matching technique where the cross-case analysis linked the rated factors, which later were evaluated by assessing them against the predicted patterns. The strength of the model factors has been validated by the results, which suggests that the model can be clarified by the actual occurrence within the studied six firms. A good to perfect match was shown across all cases under study.

8. Chapter 8
Discussion and Conclusion

8.1 Objectives and Structure of the Chapter

The objective of this chapter is to present the major results and findings of this research. Section 8.2 starts by revisiting the research aims, research hypotheses and the research questions. Section 8.3 discusses the study findings. Section 8.4 delineates the important contributions made by this research study to enrich and further contribute the existing body of knowledge along with a summary of the implications of the work. Section 8.5 identifies the limitations of the study and suggests a number of possible advices, guidelines and directions for further study. At the end, Section 8.6 concludes the thesis.

8.2 Revisiting the Research Aims, Research Model, Hypotheses and Questions

Revisiting the main research aims and research hypotheses and questions is a very important step to link the research questions and the answers of these questions prior to concluding the study's major findings. Chapter 2, the literature review, highlighted the findings and recommendations of the relevant research studies. Innovation as a part of national economic growth was examined with a focus on knowledge-management as a concept. Knowledge-sharing as a practice of donation and collection processes that is affected by certain factors, such as socio-technical factors and innovation characteristics, based on DOI theory towards innovation capability was also discussed. While several studies outlined theories about the factors that enabled knowledge-sharing success, few empirical studies had investigated which factors successfully affect the KSP in regards to increasing the innovation capability from an organisational perspective. Therefore, one of the main aims of this study was to provide empirical evidence for the theoretical arguments related to the question: to what extent do the enabled KSP influence staff willingness to donate and collect knowledge and positively influence the OIC? Following on from this aim, the research objective of the study sought to provide practical recommendations for practices for staff and their socio-technical orientation in their organisations to make their organisation more ready to

innovate and contribute to the national economic development. Such details would then be able to facilitate a more effective application of knowledge-sharing and innovation. Figure 8-1 reviews the study's research model.

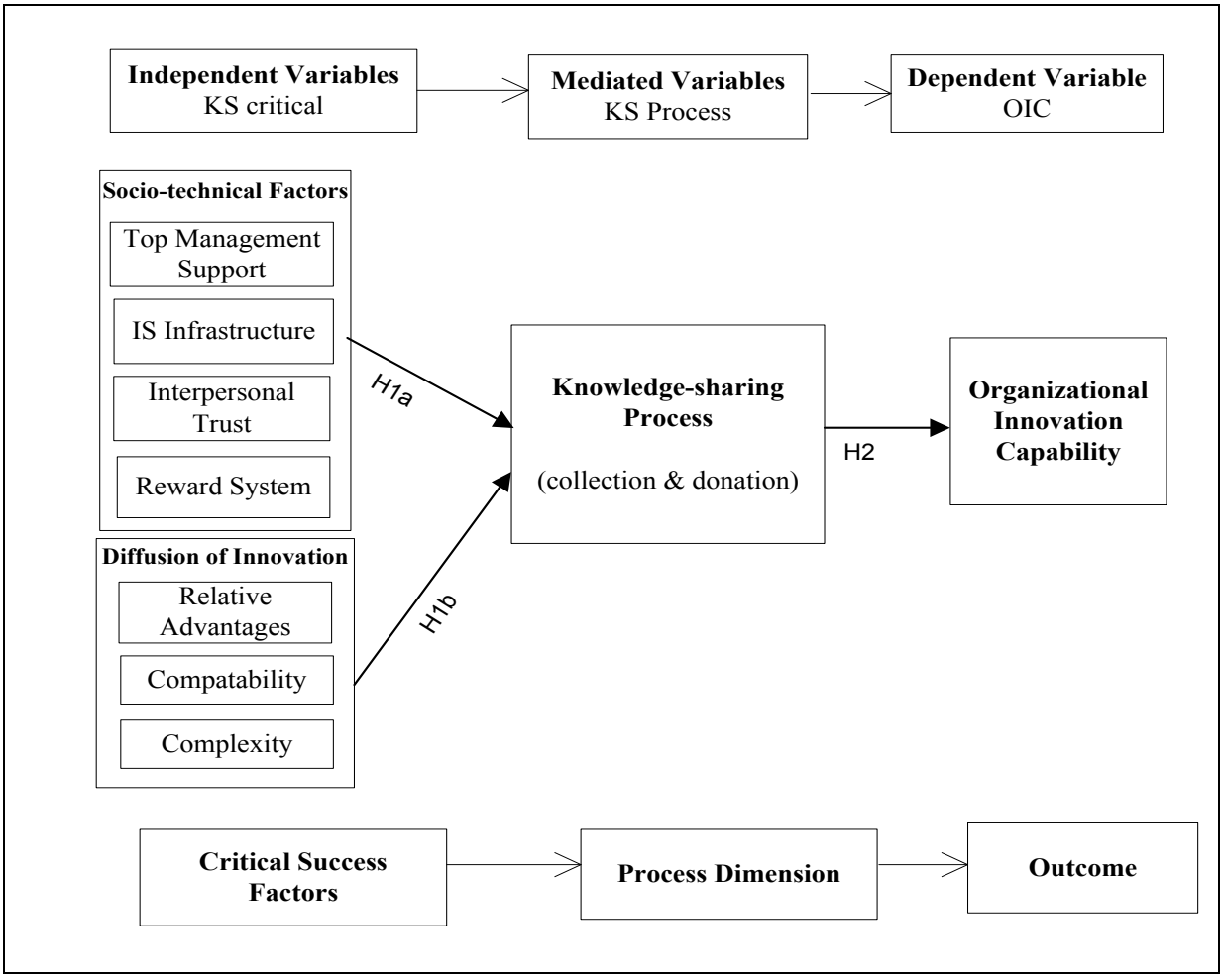


Figure 8-1: Research Model

To achieve this research aim the following research questions and hypotheses were developed:

RQ1: How do socio-technical-cultural factors influence knowledge-sharing in Saudi organisations?

a. To what extent do socio-technical cultural factors influence knowledge-sharing in Saudi Arabian organisations?

b. Do socio-technical factors influence support or limit organisational innovation capability in Saudi Arabian organisations?

H1: Knowledge-sharing factors or enablers positively influence knowledge-sharing processes (donation and collection).

a: Socio-technical factors positively influence knowledge-sharing processes (donation and collection).

b: Diffusion of innovation positively influences knowledge-sharing processes (donation and collection)

RQ2: In what way and to what extent do the affected knowledge-sharing processes influence Saudi Arabian organisational innovation capability?

H2: Employees' willingness to share knowledge (donation and collection) positively influences organisations' innovation capability and knowledge-sharing processes and acts as a mediator for the relationship between knowledge-sharing factors (Socio-technical factors and Diffusion of innovation) and organisational innovation capability.

8.3 Discussion of the Major Research Findings

The first relationship to be tested related to the influence of the STF and DOI knowledge-sharing factors on the knowledge-sharing practices (donation and collections) towards OIC. As discussed in Chapter 5, by using EFA and CFA, two factors were extracted from the KSF construct. These two factors were STF and DOI and these factors had 14 and 10 variables respectively.

To answer RQ1 and address its related hypothesis H1 and sub hypotheses H1A and H1B, relationship analysis through correlation and SEM found moderate association between the STF and KSP constructs, factors and variables. On the other hand, there was no association between DOI and KSP, meaning that KSF is partially moderately associated with KSP through only the STF construct and therefore shows positive moderate correlation. Specifically, the TMS was the most influential factor on KSP donation and collection. IS was the second factor that affected KSP donation; interpersonal trust with donations was the third and finally the reward systems with knowledge donations. These findings were based on the detailed correlation analysis in Chapter 6. Hypothesis H1A was tested by SEM. This study examined the effect of STF and DOI on KSP and found that STF was positively influential in KSP, therefore HIA was proven. However, H1B was not supported as the results show that DOI had no significant relationship with KSP based on structural analysis and its T value is very

low. It was also found that DOI factors do not show significant values and it was removed from the model, as discussed in Chapter 7.

8.3.1 Quantitative Assessment

The quantitative assessment had the following results.

8.3.2 Socio-technical Factors

The construct STF, which is a part of KSP and its factors (TMS, IS infrastructure, interpersonal trust and reward system) significantly positively influenced KSP.

In relation to TMS, this study finds that TMS was effective in encouraging employees to both donate and collect knowledge with other colleagues. The findings indicate perceptions of TMS and encouragement of knowledge-sharing and providing the best environment for this positively influenced employee willingness to share knowledge. Therefore, management should recognise this and implement more methods to promote knowledge-sharing activities and they should adopt and facilitate a social interaction culture in order to motivate their employees to share knowledge.

IS infrastructure shows positive significant relationship and correlation with knowledge donation but not significant with knowledge collection. Although the results of the analysis show that most respondents agreed that the use of various tools and technologies helps employees in sending knowledge, the results reveal no significant relationship between IS infrastructure and knowledge collection. This phenomenon maybe explained by the fact that organisations exhibit attractive systems to donate knowledge yet employees found it difficult to extract or recollect the experiences or the knowledge from these systems. The finding may also be caused by the fact that investing in the technology infrastructure is not enough to facilitate knowledge collection due to limitations and privilege regarding access limitations and possible sensitivity of the information and knowledge.

Interpersonal trust between co-workers shows positive significant correlation with knowledge donation from the perception that the trust relationship between staff is significant and therefore staff members readily donate knowledge they know and acquire. Therefore, it confirms that having a strong trust relationship between co-workers will usually increase knowledge donating but not always. However, this variable is not significant with knowledge collection. This implies that organisations

need to invest more time and effort in building the trust among staff to achieve strong results in knowledge-sharing. This effort will often lead to the best practice or business opportunities. However, fewer respondents agreed that staff should share personal information with their colleagues. This happens generally when a worker trusts the other workers inside the organisation and feels free to express feelings and perceptions, which can include knowledge and details that are not just work related.

The difference between the responses indicates that co-workers in organisations could be experiencing some form of conflict between freely expressing perceptions and being somewhat conservative". In addition, respondents' avoidance to share personal information should not negatively influence the KSP but was not strong enough to be significantly correlated to either knowledge donation or knowledge collection. This is because the work-related knowledge, which staff wants to be shared rather than individual knowledge.

The reward systems factor was weakly correlated with only the knowledge donation variable. Most of the respondents agreed their organisations usually reward those who share new learned knowledge, but the result was not strong enough to show a strong or moderate correlation. The low level of correlation can be a reason that most of the organisations either do not reward for sharing knowledge or do not have a clear policy or rule in their organisation concerning knowledge-sharing. Generally, staff in any organisation should recognise rewards as actions for desired behaviours and feel acknowledged by senior management. However, it is not sufficient to rely on the intention of staff to share knowledge without motivating such behaviours, because unrewarded behaviours or actions usually end up fading away due to lack of recognition and appreciation.

8.3.3 Organisation Innovation Capability

The impact of a firm's innovation capability was found to be strongly positively associated with employee enthusiasm to sharing knowledge (such as donation and collection of knowledge). The relationship analysis showed that KSP has a mediating role on the OIC construct via the STF construct; hence, H2 is strongly supported. This result indicates that OIC is significantly moderately correlated and suggests that innovation involves enabled knowledge-sharing by socio-technical factors which leads to generating new ideas, creative operating points, the advancement of new processes,

services and products and raising the level of the computation between organisations in certain industries or sectors. Therefore, changes introduced by organisations should involve a broad integration of the knowledge-sharing practices that attempt to encourage innovation, such as the allocation of a budget for providing adequate training for knowledge-sharing, the linking of staff to the generation of new ideas or the creation of teams systematically devoted to adopt smoothly new knowledge-based initiatives.

8.3.4 Qualitative Study Assessment

In order to generalise the results derived from the quantitative analysis, a sequential qualitative validation procedure was applied. This determined if the relationships in the empirical study can be sufficiently validated in the actual phenomena by management in the selected firms. This step was achieved by conducting a group of case studies with six Saudi firms from different industries. The case studies obtained two important results validating the empirical model. The within-case analysis results showed that:

- Almost all model factors representing the constructs were correlated somehow across all the sampled firms. This indicates that the factors were reliable in measuring the actual phenomena.
- An acceptable level of correlation of the overall finding from the cross-case analysis using the pattern-matching technique showed between the quantitative and qualitative results.
- Out of the six case studies, three were a perfect match and three unacceptable matches to the predicted patterns between constructs relationship in the model. The outcomes of this stage indicated that the empirical model can be explained by the results from the case studies.
- Thus, the validity of the empirical model was confirmed with good level of significance through comparing between the findings in the quantitative and qualitative studies, as the final validated research model has been shown to be representative of the actual situation over the sampled firms.

8.4 Study Contributions

Knowledge management, knowledge-sharing and innovation have been researched in many previous studies, except few existing studies that conduct empirical investigations into this area. New studies should advance the existing body of knowledge. The current

research study was conducted to provide a theoretical progression in the area of knowledge-sharing and innovations together, as well as to identify practical contributions for the management of knowledge within Saudi Arabia from organisational prospective. These contributions in existing body of knowledge and the implications for selected organisations towards adoption of knowledge-based initiatives in Saudi Arabia are as follows.

8.4.1 Contributions to the Existing Body of Knowledge

The current study has provided a number of insights into the influence of the knowledge-sharing factor dimensions on staff's attitudes towards KSP in Saudi Arabia in an organisational setting. Specific contributions to the current research body of knowledge are shown below:

- The study provides empirical evidence of the important relationships that exist between three key constructs (knowledge-sharing factors from socio-technical prospective, KSP and innovation capability from an organisational perspective) that represent KSP and the socio-technical factors that relate to OIC dimensions.
- Additional empirical evidence supported the argument that the socio-technical factors have an influence on staff preferences concerning KSP. Further, the STF (TMS, IS infrastructure, interpersonal trust and reward systems) that are statistically significant influence KSP (KSP) (donation and collection).
- The study empirically developed reliable and valid measurement scales for three theoretical constructs (socio-technical factors, KSP and OIC) that can be confidently conducted into knowledge-sharing and innovation practices, particularly in the Saudi organisational context.
- There is no existing research has investigated the influence of STF within the specific organisational country setting (such as Saudi Arabia) of the KSP that enrich innovation capability from organisational prospective. The current study fills that gap.
- The data analysis of the current study shows a demand for deeper research at the organisational level. Further investigations are needed to examine the differences between staff roles with respect to innovation initiative experience, such as policymakers, strategic managers and IT experts. The outcome would provide further understanding of this study's main concepts.

- Through extensive literature review and sighting relevant models or frameworks, the current study identified selected knowledge-sharing factors from a socio-technical dimension, a theoretical background theory called DOI, and a selected component from the innovation characteristics and examined the influence of these on the KSP that increase the capability of an organisation to innovate.
- This research was specifically looking at Saudi Arabia, a developing country that is adopting a KBE. Thus, very little academic research has dedicated to exploring these concepts together. This research will serve as a foundation for understanding more about knowledge sharing and innovations.
- The current study added knowledge on a substantial number of factors influencing innovation capability through knowledge sharing in a developing country like Saudi Arabia. This includes providing an initial understanding of the relationship between factors influencing specifically KSP and applying this understanding in the Saudi Arabian organisational context.
- The study aim was to fill the existing gap in the previous studies and its contribution to Saudi Arabia's knowledge economy adoption.

8.5 Study Implications

The influence of knowledge sharing towards organisational innovation is important to understand and assess the important factors, as innovation can be a key contributor to any country's welfare. To achieve this objective, the current study developed a measurement model that can understand the socio-technical factors that most effectively positively influence or enable knowledge-sharing towards OIC in Saudi Arabian firms. The following remarks summarise the research implications of the current research:

- Top management facilitation of knowledge sharing is important to enable a firm with the superior competence in knowledge-sharing that will allow them to succeed in innovation performance.
- Depending on technological dimensions only to knowledge sharing is insufficient for achieving interpersonal relationship and communications between staff that is necessary to motivate employee willingness to share knowledge. Therefore, all transitional elements, such as organisational culture, TMS, technology use and human resources, should always be considered

together when promoting knowledge-sharing initiatives towards innovation capability.

- It is also necessary to provide enough IS infrastructure to share knowledge to enable knowledge dissemination among different departments.
- It is also vital to reinforce trust between co-workers through arranging social networking and occasional gathering.
- Motivating the participation in decision-making will reduce the boundaries between organisational levels for information flow in Saudi organisation.
- Addressing all the recommended theories to foster knowledge sharing and support DOI.

8.6 Limitations of the Study and Recommendations for Future Research

The current research has used a number of research methods and analytical approaches. However, as with all studies, the findings should be understood in the knowledge of the limitations that were faced by the researcher and research. The limitations of this study and recommendations for directions of future research studies are listed below.

The study focused on knowledge-sharing practices and innovation capability in selected organisations in Saudi Arabia. It addressed the extent to which the knowledge based innovation with a socio-technical dimensions influence the preferences of staff. However, due to time and financial restrictions, no comparative study was undertaken for any other similar or different settings in other developing or developed country. Therefore, further research is recommended in this area.

From a research methodological point of view, the sample and context are always an issue for researchers. In the current study, using targeted organisations in Saudi Arabia for the study population contributed to the research generalisations and can be considered as a weakness. It is recommended that further research be undertaken using a bigger number of organisations from different sectors and industries. Such knowledge would be significantly contributed to understanding the link between knowledge-sharing factors and processes and OIC in Saudi Arabia. The results of this study could be easily applied to other Gulf countries, because they share the same Saudi Arabia culture, religion and traditions.

The findings of the current research were based and derived from the empirical analysis of collected data from questionnaire. The researcher attempted to ensure that all measurement items were instantly recognisable through the questionnaire, the pilot study and replication. However, the researcher had no control over the participants' interpretation of each item. This is a limitation faced by all researchers who employ a questionnaire survey method. Thus, this major limitation of this method is that it is based on respondents' perceptions and feedback, which may or may not reflect the actual situation. Therefore, it is recommended that for future research gather measurable variables from different data sources and use different approaches to minimise the effects of any response bias.

The survey questionnaire used in this study was developed by the researcher and was considered well developed and easily administered. It is recommended that the questionnaire be used for future research to provide the opportunity for in-depth country research studies. Other researchers can then ensure that it becomes a reliable and valid instrument.

Finally, while this research assessed the relationship between knowledge-sharing factors or enablers and staff preferences in donating and collecting knowledge in relation to enriching innovation capability, it did not attempt to develop a direct cause and effect model. Therefore, it is recommended that future research be undertaken into examining the direct cause and effect relationship between socio-technical factors and innovation capability or knowledge-sharing practices with innovation. The use of SEM is also recommended. Such a study will help in building a better understanding of the effect of each variable and its direct and indirect link with the other variables.

8.7 Conclusion

In this study, the staff at a number of Saudi Arabian organisations from different industries and sectors were surveyed for information that was used to evaluate the relationships between OIC and knowledge-sharing factors. The findings were significant toward coping with the initiative of adopting KBE in Saudi Arabia.

The thesis hypothesised that socio-technological factors (TMS, IS infrastructure, interpersonal trust and reward systems) and the DOI characteristics of knowledge-sharing (three factors capturing perceived relative advantages, compatibility and

complexity) influence the KSP (donation and collection of knowledge, mediating construct) towards positively influencing the innovation capability (single construct).

The study was conducted in response to the need to investigate the relationship among the above-stated phenomena. While some research related to these topics does exist, no research has examined these relationships practices in the different industries and sectors in Saudi Arabia. This current study, consequently, provides significant data and background information to fill this gap in the knowledge.

The study objectives of this research were also met. Therefore, practical recommendations for the research model components were provided that are in line with the preferences of staff and their organisations. The recommendations also assist in the more effective use of enabled KSP to facilitate innovation in Saudi Arabian organisations.

To directly achieve the objectives of this research, after conducting an extensive literature review and studying the most related models and frameworks, a conceptual model was proposed. The research model and hypotheses were assessed using different quantitative techniques, such as SEM including EFA, CFA and correlation analysis and. These techniques used the qualified data obtained from the survey of staff and managers in selected related sectors and industry in Saudi Arabia. Highlighted by the research results and findings, the current research adds additional academic understanding and experience to the body of knowledge-sharing and innovation research by providing empirical evidence with regard to the relationships among the three concepts: socio-technical factors, KSP and organisational innovation capacity. More specifically, the results indicate that select knowledge-sharing socio-technical factors or enablers are positively related to KSP towards innovation capability. These findings, hence, provide practical implications for senior staff or managers by offering recommendations that are in line with staff preferences and knowledge-sharing environments. Six explanatory case studies were conducted within Saudi Arabia from different industries to verify the empirical relationships and results. The results provided support to validate the empirical model derived from the quantitative study. The recommendations also facilitate more effective communications from different channels of knowledge-sharing so that organisations become capable for innovation. Finally, the thesis recommends future directions of research to extend the findings of this study.

References

Al-Alawi, A. I., Al-Marzooqi, N. Y., & Mohammed, Y. F. (2007). Organizational culture and knowledge sharing: critical success factors. *Journal of Knowledge Management*, *11*(2), 22-42.

Alavi, M., & Leidner, D. E. (2001). Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS quarterly*, 107-136.

Al Othman, F. A., & Busch, P. (2009,). Development of a critical factors model for the knowledge economy in Saudi Arabia. *Proceedings of the 7th Australian Information Security Management Conference*, 143-153.

Argote, L., Beckman, S. L. & Epple, D. (1990). The persistence and transfer of learning in industrial settings. *Management Science*, *36*(2), 140-154.

Aulawi, H., Sudirman, I., Suryadi, K., & Govindaraju, R. (2009). Knowledge sharing behavior, antecedent and their impact on the individual innovation capability. *Journal of Applied Sciences Research*, *5*(12), 2238-2245

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173-1182.

Bartol, K. M., & Srivastava, A. (2002). Encouraging knowledge sharing: the role of organizational reward systems. *Journal of Leadership & Organizational Studies*, *9*(1), 64-76.

Bates, R., & Khasawneh, S. (2005). Organizational learning culture, learning transfer climate and perceived innovation in Jordanian organizations. *International Journal of Training and Development*, *9*(2), 96-109.

Berenson, ML & Levine, DM 1996, *Basic business statistics: Concepts and applications*, London; Prentice-Hall.

Bock, G. W., Zmud, R. W., Kim, Y. G., & Lee, J. N. (2005). Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate. *MIS quarterly*, 87-111.

Boisot, M., & Griffiths, D. (1999). Possession is nine tenths of the law: managing a firm's knowledge base in a regime of weak appropriability. *International Journal of Technology Management*, *17*(6), 662-676.

Bollen, K. A. (1998). *Structural equation models*. John Wiley & Sons.

Brown, J. R., Fazzari, S. M., & Petersen, B. C. (2009). Financing innovation and growth: Cash flow, external equity, and the 1990s R&D boom. *The Journal of Finance*, *64*(1), 151-185.

Buganza, T., & Verganti, R. (2006). Life-cycle flexibility: How to measure and improve the innovative capability in turbulent environments. *Journal of Product Innovation Management*, *23*(5), 393-407.

Burns, A., & Bush, R. (2003). *Marketing research: Online research application*. Upper Saddle River, NJ; Prentice Hall

Byrne, B. M. (2001). Structural equation modeling with AMOS, EQS, and LISREL: Comparative approaches to testing for the factorial validity of a measuring instrument. *International Journal of Testing*, *1*(1), 55-86.

Calantone, R. J., Cavusgil, S. T., & Zhao, Y. (2002). Learning orientation, firm innovation capability, and firm performance. *Industrial Marketing Management*, *31*(6), 515-524.

Calderon, J. F., & Gonzales, E. C. (1993). *Methods of research and thesis writing*. Valenzuela, Metro Manila: National Bookstore.

Carrillo, P., & Chinowsky, P. (2006). Exploiting knowledge management: The engineering and construction perspective. *Journal of Management in Engineering*, *22*(1), 2-10.

Cavana, R. Y, Delahaye, B. L. & Sekaran, U. (2001). *Applied business research: Qualitative and quantitative methods*. Milton; John Wiley & Sons Australia.

Chan, R. (1999). 'Knowledge management for implementing ERP in SMES'. *Third Annual SAP Asia Pacific, Singapore, 21-39*.

Chen, L. (2007), 'Linking knowledge management to organisational business performance in construction'. PhD Thesis, Griffith University.

Choi, B. & Lee, H. (2002). Knowledge management strategy and its link to knowledge creation process. *Expert Systems with Applications*, *23*(3), 173-187.

Choi, B. & Lee, H. (2000). Knowledge management enablers, processes, and organizational performance: An integration and empirical examination. *APDSI*, *1*(1), 5-8.

Chow, C. W., Deng, F. J. & Ho, J. L. (2000). The openness of knowledge sharing within organizations: a comparative study of the United States and the People's Republic of China. *Journal of Management Accounting Research*, *12*(1), 65-95.

Churchill G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, *16*(1), 64-73.

Churchill, G. A., & Brown, T. J. (2004). *Basic marketing research*. Mason, OH, South-Western College Publisher.

Clarke, P., & Cooper, M. (2000). 'Knowledge management and collaboration'. In *Proceeds of the Third International Conference On Practical Aspects of Knowledge Management, Basel, Switzerland , 30 – 31 Oct. 2000*.

Coakes, S. J., Steed, L., Dzidic, P., & Version, S. P. S. S. (2006). 13.0 for Windows: Analysis without anguish.

Coase, R. H. (1937). The nature of the firm. *Economica*, *4*(16), 386-405.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. USA; Psychology Press.

Connelly, C. E., & Kelloway, E. K. (2003). Predictors of employees' perceptions of knowledge sharing cultures. *Leadership & Organization Development Journal*, *24*(5), 294-301.

Cozijnsen, A. J., Vrakking, W. J., & van IJzerloo, M. (2000). Success and failure of 50 innovation projects in Dutch companies. *European Journal of Innovation Management*, *3*(3), 150-159.

Daft, R. (2007). *The leadership experience*. USA; Cengage Learning.

Damanpour, F., & Gopalakrishnan, S. (1998). Theories of organizational structure and innovation adoption: the role of environmental change. *Journal of Engineering and Technology Management*, *15*(1), 1-24.

Darr, E. D., Argote, L., & Epple, D. (1995). The acquisition, transfer, and depreciation of knowledge in service organizations: Productivity in franchises. *Management Science*, *41*(11), 1750-1762.

Darroch, J., & McNaughton, R. (2002). Examining the link between knowledge management practices and types of innovation. *Journal of Intellectual Capital*, *3*(3), 210-222.

Dasgupta, M. & Gupta, R. (2009). Innovation in organizations: A review of the role of organizational learning and knowledge management. *Global Business Review*, *10*(2), 203-224.

Davenport, T. H., & Prusak, L. (2000). *Working knowledge: How organizations manage what they know*. Boston, MA; Harvard Business School Press.

Davenport, T. H., & Prusak, L. (1997). *Information ecology: Mastering the information and knowledge environment*. UK; Oxford University Press.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: Managing what your organization knows.* Boston, MA; Harvard Business School Press.

Davidson, C. (2013). *After the sheikhs*. Oxford, Oxford University Press.

Davies, A., & Brady, T. (2000). Organisational capabilities and learning in complex product systems: towards repeatable solutions. *Research Policy*, *29* (7), 931--953.

Dixon, N. M. (2000). *Common knowledge: How companies thrive by sharing what they know*. USA; Harvard Business Press.

Dotsika, F. (2009). Uniting formal and informal descriptive power: Reconciling ontologies with Folksonomies. *International Journal of Information Management, 29*(5), 407-415.

Eisenhardt, K. M. (1989). Making fast strategic decisions in high-velocity environments. *Academy of Management Journal*, *32*(3), 543-576.

El Harbi, S., Anderson, A. R. & Amamou, M. (2011). Knowledge sharing processes in Tunisian small ICT firms. *Library Review*, *60*(1), 24-36.

Ellin, E. (1981). Tracking innovation: The need for reliable measures of its presence and effects. *Technovation*, *1*(1), 69-80.

Ellis, K. (2001). Sharing best practices globally. *Training New York then Minneapolis, 38*(7), 32-39.

Essmann, H. E. (2009). 'Toward innovation capability maturity'. Doctoral dissertation, Stellenbosch: University of Stellenbosch.

Evangelista, R., Sandven, T., Sirilli, G., & Smith, K. (1998). Measuring innovation in European industry. *International Journal of the Economics of Business*, *5*(3), 311-333.

Field, A. (2009). *Discovering statistics using SPSS*. Sage publications.

Fillis, I. (2002). An Andalusian dog or a rising star? Creativity and the marketing/entrepreneurship interface. *Journal of Marketing Management*, *18*(3-4), 379-395.

Floyd, K. S., Yerby, J. & Santiago, J. (2011). Information systems faculty perceptions of ethical work climate and job satisfaction.

Franke, N., Von Hippel, E., & Schreier, M. (2006). Finding commercially attractive user innovations: A test of lead-user theory, *Journal of Product Innovation Management*, *23*(4), 301-315.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology*, *51*(1), 115-134.

Fruhling, A. L., & Siau, K. (2007). Assessing organizational innovation capability and its effect on e-commerce initiatives. *Journal of Computer Information Systems*, *47*(4), 91-95.

Fuenfschilling, L., & Truffer, B. (2014) The structuration of socio-technical regimes: Conceptual foundations from institutional theory. *Research Policy, 43*(4), 772–791.

Garson, D. (2006), 'PA765: Structural equation modeling'. Reviewed 18 February, 2014; from http://www2.chass.ncsu.edu/garson/pa765/structur.htm.

Gerbing, D. W., & Anderson, J. C. (1988). An updated paradigm for scale development incorporating unidimensionality and its assessment. *Journal of Marketing Research*, *25*(2), 186-192.

Goh, S. C. (2002). Managing effective knowledge transfer: An integrative framework and some practice implications. *Journal of Knowledge Management*, *6*(1), 23-30.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, *17*(2), 109-122.

Gupta, A. K., & Govindarajan, V. (2000). Knowledge management's social dimension: Lessons from Nucor Steel. *Sloan Management Review*, *42*(1), 71-80.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. & Tatham, R. L. (2006), *Multivariate data analysis* (6th ed.), Upper Saddle River, N.J; Pearson Prentice Hall..

Hansen, M. T. (1999). The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits. *Administrative Science Quarterly*, *44*(1), 82-111.

Hartmann, A., & Naaranoja, M. (2006). Improving the conditions for knowledge sharing within construction firms. In *Joint International Conference on Computing and Decision Making in Civil and Building Engineering* (pp. 3446-3455).

Hislop, D. (2003). Linking human resource management and knowledge management via commitment: A review and research agenda. *Employee Relations*, *25*(2), 182-202.

Hlupic, V. (Ed.). (2003). *Knowledge and business process management*. IGI Global.

Hopwood, C. J. (2007). Moderation and mediation in structural equation modeling: Applications for early intervention research. *Journal of Early Intervention*, *29*(3), 262-272.

Hoyle, R. H. (Ed.). (1995). *Structural equation modeling: Concepts, issues, and applications* (158-176). Thousand Oaks, California; Sage.

Hung, Y., Chen, Y. & Chou, S. T. On the Relationship between Knowledge Management Readiness and Intellectual Capital. In *ARPU Conference on Distance Learning and the Internet*.

Hurley, R. F., Hult, G. T. M., & Knight, G. A. (2005). Innovativeness and capacity to innovate in a complexity of firm-level relationships: A response to Woodside (2004). *Industrial Marketing Management*, *34*(3), 281-283.

Hurley, R. F., & Hult, G. T. M. (1998). Innovation, market orientation, and organizational learning: an integration and empirical examination. *The Journal of Marketing*, 62(3), 42-54.

Husted, K. & Michailova, S. (2003). Knowledge-sharing hostility in Russian firms. *California Management Review*, *45*(3), 59-77.

Huysman, M., & De Wit, D. (2004). Practices of managing knowledge sharing: Towards a second wave of knowledge management. *Knowledge and Process Management*, *11*(2), 81-92.

Jaccard, J., & Becker, M. A. (1997). *Statistics for the behavioral sciences*, Pacific Grove, CA.; Brooks.

Jasimuddin, S. M. & Zhang, Z. J. (2013). Knowledge management strategy and organizational culture. *Journal of the Operational Research Society, 65,*1490–1500

Kamara, J. M., Anumba, C. J., & Carrillo, P. M. (2002). A CLEVER approach to selecting a knowledge management strategy. *International Journal of Project Management*, *20*(3), 205-211.

Khorsheed, M. S. & Al-Fawzan, M. A. (2013). Fostering university-industry collaboration in Saudi Arabia through technology innovation centers. *Innovation: Management, Policy & Practice*, 3006-3036.

Kim, S., & Lee, H. 2006. The impact of organizational context and information technology on employee knowledge-sharing capabilities, *Public Administration Review*, *66*(3), 370-385.

Kline, R. B. (2011). *Principles and practice of structural equation modeling*. *New York, NY*; Guilford press.

Koufteros, X. A. (1999). Testing a model of pull production: A paradigm for manufacturing research using structural equation modeling. *Journal of Operations Management*, *17*(4), 467-488.

Kumar, N. & Rose, R. C. (2010). Examining the link between Islamic work ethic and innovation capability. *Journal Of Management Development*, *29*(1), 79-93.

Lakemeyer, G., & Levesque, H. J. (2000). *The logic of knowledge bases*. Cambridge, Mass.: MIT Press

Lee, H., & Choi, B. (2003). Knowledge management enablers, processes, and organizational performance: an integrative view and empirical examination. *Journal of Management Information Systems*, *20*(1), 179-228.

Liao, S. H., Fei, W. C., & Chen, C. C. (2007). Knowledge sharing, absorptive capacity, and innovation capability: an empirical study of Taiwan's knowledge-intensive industries. *Journal of Information Science*, *33*(3), 340-359.

Liebowitz, J. (2002). A look at NASA Goddard Space Flight Center's knowledge management initiatives. *IEEE software*, *19*(3), 40-42.

Lin, H. F. (2007). Knowledge sharing and firm innovation capability: An empirical study. *International Journal of Manpower*, *28*(3/4), 315-332.

Lin, H. F. (2006). Interorganizational and organizational determinants of planning effectiveness for internet-based interorganizational systems. *Information & Management*, *43*(4), 423-433.

Lin, H. F., & Lee, G. G. (2006). Effects of socio-technical factors on organizational intention to encourage knowledge sharing. *Management Decision*, *44*(1), 74-88.

Lin, W. B. (2008). The effect of knowledge sharing model. *Expert Systems with Applications*, *34*(2), 1508-1521.

Lu, C. S., Lai, K. H., & Cheng, T. E. (2007). Application of structural equation modeling to evaluate the intention of shippers to use Internet services in liner shipping. *European Journal of Operational Research*, *180*(2), 845-867.

Luna-Reyes, L. F., Cresswell, A. M., & Richardson, G. P. (2004). Knowledge and the development of interpersonal trust: A dynamic model. In *System Sciences, 2004.Proceedings of the 37th Annual Hawaii International Conference on System Sciences* (pp. 1-12).

MacNeil, C. M. (2004). Exploring the supervisor role as a facilitator of knowledge sharing in teams. *Journal of European Industrial Training*, *28*(1), 93-102.

Manley, K., & McFallan, S. (2005). The relationship between business strategies and successful innovation. In *The Australian Sociological Association Conference*, 5 – 8 December, 2005, Hobart, Australia.

Marouf, L. N. (2007). Social networks and knowledge sharing in organizations: A case study. *Journal of Knowledge Management*, *11*(6), 110-125.

Martiradonna, L. (2014). Changing attitudes in Saudi Arabia. *Nature Materials*, *13*(4), 321-322.

McDermott, R. (1999). Why information technology inspired but cannot deliver knowledge management. *California Management Review*, *41*(4), 21-35.

McQueen, R. (1998). Views of knowledge and knowledge management. In *Proceedings of the Fourth Americas Conference on Information Systems* (August) (pp. 609-611).

Metaxiotis, K., Ergazakis, K., & Psarras, J. (2005). Exploring the world of knowledge management: agreements and disagreements in the academic/practitioner community. *Journal of Knowledge Management*, *9*(2), 6-18.

Miles, M. B., & Huberman, A. M. (2013). *Qualitative data analysis: An expanded sourcebook* (3rd ed.). Los Angeles; Sage.

Mishra, J., & Morrissey, M. A. (1990). Trust in employee/employer relationships: A survey of West Michigan managers. *Public Personnel Management*.

Mitchell, R., & Bernauer, T. (1998). Empirical research on international environmental policy: designing qualitative case studies. *The Journal of Environment & Development*, *7*(1), 4-31.

Mohamed, S. (2003). Performance in international construction joint ventures: Modeling perspective. *Journal of Construction Engineering and Management*, *129*(6), 619-626.

Mohamed, S. F., & Anumba, C. J. (2006). Potential for improving site management practices through knowledge management. *Construction Innovation: Information, Process, Management*, *6*(4), 232-249.

Nadler, D., & Tushman, M. (1988). *Strategic organization design: Concepts, tools & processes*. Glenview, Ill: Scott, Foresman.

Niblock, T. (2013). 'The background to the change of government in 1985'. In P. Woodward (Ed.) *Sudan after Nimeiri* (pp. 34-44), USA; Routledge.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation, *Organization Science, 5*(1) 14-37.

Nonaka, I., & Konno, N. (1998). The concept of 'Ba': Building a foundation for knowledge creation. *California Management Review*, *40*(3), 40-54.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. USA; Oxford University Press.

Nystrom, P. C., Ramamurthy, K. & Wilson, A. L. (2002). Organizational context, climate and innovativeness: Adoption of imaging technology. *Journal Of Engineering And Technology Management*, *19*(3), 221-247.

Oldenkamp, J. H. (2001). Limitations of managing knowledge sharing. In *Proceedings of the Second European Conference on Knowledge Management, Bled, Slovenia* (pp. 411-418).

Organisation for Economic Co-operation and Development (2005). Oslo Manual: The measurement of scientific and technological activities (pp. 39-67). OECD. Reviewed 31 March, 2014; from: http:// www.oecdn.org /sti/inno/2367580.pdf.

Pallant, J. (2010). *SPSS survival manual: A step by step guide to data analysis using SPSS* (4th ed.). New York, NY; McGraw-Hill International.

Pan, S. L., & Leidner, D. E. (2003). Bridging communities of practice with information technology in pursuit of global knowledge sharing. *Journal of Strategic Information Systems*, *12*(1), 71-88.

Pathirage, C. P., Amaratunga, D. G., & Haigh, R. P. (2007). Tacit knowledge and organizational performance: Construction industry perspective. *Journal of Knowledge Management*, *11*(1), 115-126.

Pestel model in strategic management researchomatic. Retrieved 12 February, 2014; from http://www.researchomatic.com/Pestel-Model-In-Strategic-Management-55423.html

Pettigrew, A. M. (1987). Context and action in the transformation of the firm. *Journal of Management Studies*, *24*(6), 649-670.

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management*, *12*(4), 531-544.

Preece, A., Flett, A., Sleeman, D., Curry, D., Meany, N., & Perry, P. (2001). Better knowledge management through knowledge engineering. *Intelligent Systems, IEEE*, *16*(1), 36-43.

Preece, A., Hui, K., Gray, A., Marti, P., Bench-Capon, T., Cui, Z., & Jones, D. (2001). KRAFT: An agent architecture for knowledge fusion. *International Journal of Cooperative Information Systems*, *10*(1/2), 171-195.

Raven, A., & Prasser, S. G. (1996). Information technology support for the creation and transfer of tacit knowledge in organizations. In *Association for Information Systems 1996 Americas Conference*, *Phoenix*

Reich, B. H., Gemino, A., & Sauer, C. (2012). Knowledge management and project-based knowledge in it projects: A model and preliminary empirical results. *International Journal of Project Management 30*(6), 663–674.

Ribeiro, F. L., & Bettiol, C. (2006). Can shared knowledge bases support knowledge management systems in construction? In *Proceedings of Building on IT–Joint International Conference on Computing and Decision Making in Civil and Building Engineering, CIB W102,* Montreal; Oxford University Press.

Riege, A. (2005). Three-dozen knowledge-sharing barriers managers must consider. *Journal of Knowledge Management*, *9*(3), 18-35.

Rivkin, J. W. (2001). Reproducing knowledge: Replication without imitation at moderate complexity. *Organization Science*, *12*(3), 274-293.

Rogers, E. (2003), *Diffusion of innovations* (5th ed.). Mexico: The Department Of Communication & Journalism, University of New Mexico.

Rogers, E. M. (2010). *Diffusion of innovations*. Simon and Schuster.

Scantlebury S. & Lawton C. (2007), *Gaining a seat at the innovation table*. Boston: The Boston Consulting Group.

Schaffner Goldberg, G. (2009). *Poor women in rich countries*: *The feminization of poverty over the life course*. USA; Oxford University Press.

Schubert, P., Lincke, D., & Schmid, B. (1998). A global knowledge medium as a virtual community: The Net Academy concept. In *Proceedings of the 4th Conference of the Association for Information Systems* Baltimore, USA.

Sedera, D., Gable, G. G., & Chan, T. (2004). Knowledge management as an antecedent of enterprise system success. In *Americas Conference on Information Systems*, 6-8 August, New York, USA.

Sekaran, U. (2006). *Research methods for business: A skill building approach*. New York, NY; John Wiley & Sons.

Shah, R., & Goldstein, S. M. (2006). Use of structural equation modeling in operations management research: Looking back and forward. *Journal of Operations Management*, *24*(2), 148-169.

Sia, C. L., Teo, H. H., Tan, B. C., & Wei, K. K. (2004). Effects of environmental uncertainty on organizational intention to adopt distributed work arrangements. *Engineering Management, IEEE Transactions on*, *51*(3), 253-267.

Sie, B., Aho, A. M., & Uden, L. (2014). 'Communities of practice as an improvement tool for knowledge sharing in a multi-cultural learning community'. In *The 2nd International Workshop on Learning Technology for Education in Cloud* (pp. 109-114). Springer Netherlands.

Smith, R. G., & Farquhar, A. (2000). The road ahead for knowledge management: An AI perspective. *Ai Magazine*, *21*(4), 17.

Smith, H. A., & McKeen, J. D. (2003). Instilling a knowledge-sharing culture. *Queen's Centre for Knowledge-Based Enterprises*, *20*(1), 1-17.

Song, S. (2002). An internet knowledge sharing system. *Journal of Computer Information Systems*, *42*(3), 25-30.

Spelke, E. S. (1991). 'Physical knowledge in infancy: Reflections on Piaget's theory'. In S. Carey and R. Gelman (Eds) *The epigenesist of mind: Essays on biology and cognition* (pp. 133-169). New Jersey; Lawrence Erlbaum Associates.

Spender, J. C. (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal*, *17*(2), 45-62.

Sperber, A. D., Devellis, R. F., & Boehlecke, B. (1994). Cross-cultural translation methodology and validation. *Journal of Cross-Cultural Psychology*, *25*(4), 501-524.

Stoddart, L. (2001). Managing intranets to encourage knowledge sharing: Opportunities and constraints. *Online Information Review*, *25*(1), 19-29.

Syed-Ikhsan, S. O. S., & Rowland, F. (2004). Knowledge management in a public organization: A study on the relationship between organizational elements and the performance of knowledge transfer. *Journal of Knowledge Management*, *8*(2), 95-111.

Szulanski, G. (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal*, *17*(2), 27-43.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (pp. 243-310). Boston: Allyn & Bacon.

Tah, J. H. M., & Abanda, H. F. (2011) Sustainable building technology knowledge representation: Using Semantic Web Techniques. *Advanced Engineering Informatics 25*(3), 547-558.

Tan, H. H., & Zhao, B. (2003). Individual-and perceived contextual-level antecedents of individual technical information inquiry in organizations. *The Journal of Psychology*, *137*(6), 597-621.

Tanrıöver, Ö., & Bilgen, S. (2011) A framework for reviewing domain specific conceptual models. *Computer Standards & Interfaces, 33*(5), 448-464.

Tierney, P. (1999). Work relations as a precursor to a psychological climate for change: The role of work group supervisors and peers. *Journal of Organizational Change Management*, *12*(2), 120-134.

Tiwana, A. (2000). *The knowledge management toolkit: Practical techniques for building a knowledge management System*. Upper Saddle River, NJ; Prentice Hall.

Tohidinia, Z., & Mosakhani, M. (2010). Knowledge sharing behaviour and its predictors. *Industrial Management & Data Systems*, *110*(4), 611-631.

Toumi, I. (1999). *Corporate Knowledge, Theory and Practice of Intelligence Organization*. Helsinki: Metaxis.

Tsai, W. (2001). Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal*, *44*(5), 996-1004.

Uma, S. (2003). *Research methods for business*. New York, NY; Hermitage Publishing Service.

Van den Hooff, B., & de Leeuw van Weenen, F. (2004). Committed to share: Commitment and CMC use as antecedents of knowledge sharing. *Knowledge and Process Management*, *11*(1), 13-24.

Van den Hooff, B. & Van Weenen, F. D. L. (2004), Knowledge sharing in context: the influence of organizational commitment, communication climate and CMC use on knowledge sharing, *Journal of Knowledge Management, 8*(6), 117-30.

Verganti, R. (2006). Innovating through design. *Harvard Business Review*, *84*(12), 114.

Verganti, R. (2013). *Design driven innovation: changing the rules of competition by radically innovating what things mean*. USA; Harvard Business Press.

Verhoef, P. C., & Langerak, F. (2001). Possible determinants of consumers' adoption of electronic grocery shopping in the Netherlands. *Journal of Retailing and Consumer Services*, *8*(5), 275-285.

Wang, Z. & Wang, N. (2012). Knowledge sharing, innovation and firm performance. *Expert Systems with Applications*, *39*(10), pp. 8899--8908.

Weidenfeld, A., Williams, M., & Butler, R. (2010), Knowledge transfers and innovations amongst attractions. *Annals of Tourism Research, 37*(3), 604-626

Wu, C. R., Chang, C. W., & Lin, H. L. (2007). An organizational performance measurement model based on AHP sensitivity analysis. *International Journal of Business Performance Management*, *9*(1), 77-91.

Yeh, Y. J., Lai, S. Q., & Ho, C. T. (2006). Knowledge management enablers: A case study. *Industrial Management & Data Systems*, *106*(6), 793-810.

Yin, R. K. (2011). *Applications of case study research*. Thousand Oaks, California; Sage.

Yousef, D. A. (2000). Organizational commitment: a mediator of the relationships of leadership behavior with job satisfaction and performance in a non-western country. *Journal Of Managerial Psychology*, 15(1), 6--24.

Zack, M. H. (1999). Managing codified knowledge. *Sloan management review*, *40*(4), 45-58.

Zikmund, W., Babin, B., Carr, J., & Griffin, M. (2012). *Business research methods*. Canada; Cengage Learning.

Zinatelli, N., Cragg, P. B., & Cavaye, A. L. M. (1996). End user computing sophistication and success in small firms. *European Journal of Information Systems*, *5*(3), 172-181.

Appendix A

Survey Questionnaire

UNIVERSITY OF TECHNOLOGY SYDNEY
Faculty of Engineering and IT
School of Systems, Management and Leadership

Fahad Asaad AL-Othman
School of Systems, Management and Leadership,
Faculty of Engineering and IT, University of Technology Sydney

جامعة التقنية سيدني
كلية الهندسة وتقنية المعلومات
قسم الأنظمة والإدارة والقيادة

فهد أسعد العثمان
قسم الأنظمة والإدارة والقيادة ،
بكلية الهندسة وتقنية المعلومات ، بجامعة التقنية سيدني

Dear Prospective Participant,
I am Fahad A. Al-Othman, a PhD candidate at, UTS, working toward a doctorate degree in Computer Science. You are being invited to take part in an exciting research study focused on (knowledge based innovation) to participate, please read the following:

عزيزي المشارك،
يسعدني أن أعرفكم بنفسي. أنا فهد أسعد العثمان، مرشح لرسالة لدكتوراه من جامعة التقنية سيدني، حيث أنني أسعى للحصول على درجة الدكتوراه في علوم الحاسب الآلي. لذا ندعوكم للمشاركة في دراسة بحثية مثيرة ترتكز على (الابتكارات القائمة على المعرفة)، وللمشاركة في هذه الدراسة، يرجى الاطلاع على ما يلي:

TITLE: A survey of the influence of socio-technical-cultural factors on knowledge sharing towards innovation in Saudi Arabia: an organisational perspective

العنوان: دراسة مسحية تتناول تأثير العوامل الثقافية والفنية والاجتماعية على المعرفة التي تسهم في الابتكار والتطوير في المملكة العربية السعودية: **من منظور تنظيمي(مؤسساتي).**

PURPOSE: is to investigate the relationships between innovation and knowledge sharing in how the influence of socio-technical-cultural factors on knowledge sharing processes which wither can support or limit the organizational innovation capability.

الغرض: يتمثل الغرض في التحقيق في العلاقة بين الابتكار والمشاركة بالمعرفة والخبرات التي تسهم في كيفية تأثير العوامل الثقافية والفنية والاجتماعية على ألوان المعرفة التي تسهم في العمليات التي يمكنها دعم أو تحديد القابلية للابتكار التنظيمي.

PROCEDURE: your participation will involve completing the *(interview) and the enclosed questionnaire, which comprises some background questions and statements about your perception of organisational critical factors, as well as questions relating to your organization's culture. This study will take approximately 35-40 mins

الإجراءات: سوف تتضمن مشاركتكم إتمام الإجراءات الخاصة *(بالمقابلة الشخصية) والإجابة على الاستبانة المرفقة والتي تشمل بعض الأسئلة والبيانات عن مدى إدراككم واستيعابكم للعوامل التنظيمية الحرجة، بالإضافة إلى الأسئلة التي ترتبط بالثقافة المتبعة في مؤسستكم، حيث سوف تأخذ هذه الدراسة ما يقرب من 35 – 40 دقيقة.

1

CONFIDENTIALITY: confidentiality of the information you provide is assured. The questionnaire forms do not require personal details (however you may volunteer your name), and only collated data will be used in the research. The information collected will be only used for the purpose of this study. If you would like to receive feedback on this study please insert your email address below:

السرية: المعلومات التي تدلون بها تعتبر معلومات سرية، حيث لا تتطلب استمارات الاستبانة الإفصاح عن التفاصيل الشخصية (ومنها مثلا التطوع بتسجيل الاسم)، والبيانات التي يتم فحصها فقط هي التي سوف يتم استخدامها في البحث، وكذلك المعلومات التي يتم جمعها سوف تستخدم لأغراض هذه الدراسة فقط. وإذا كانت لديكم الرغبة في الحصول على ما توصلت إليه هذه الدراسة يمكنكم تسجيل عنوان البريد الإلكتروني الخاص بكم أدناه:

RIGHT TO REFUSE TO PARTICIPATE: your participation is completely **voluntary.**

الحق في عدم قبول المشاركة: تعتبر مشاركتكم هي مشاركة **تطوعية** محضة.

THE ETHICAL CONDUCT OF THIS RESEARCH:

السلوك الأخلاقي لهذا البحث:

This study has been approved by the University of Technology, Sydney Human Research Ethics Committee. If you have any complaints or reservations about any aspect of your participation in this research which you cannot resolve with the researcher, you may contact the Ethics Committee through the Research Ethics Officer (ph: +61 2 9514 9772 Research.Ethics@uts.edu.au) and quote the UTS HREC reference number. Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

تم اعتماد هذه الدراسة من جامعة التقنية، لجنة الأخلاق الإنسانية للبحث بولاية سيدني. وإذا كان لديكم أي شكاوى أو تحفظات عن أي جانب من جوانب مشاركتكم في هذا البحث والتي لا يمكنكم حلها مع الباحث، يمكنكم الاتصال باللجنة الأخلاقية من خلال مسئول أخلاقيات البحث على: (هاتف: 9772 9547 2 61+) أو عبر البريد الإلكتروني: (Research.Ethics@uts.edu.au) ويمكنكم الحصول على رقم مرجعي من لجنة أخلاق البحث بجامعة سيدني للتقنية. وسوف يتم التعامل مع أي شكوى ترد إلينا منكم ومعالجتها بثقة وسرية والتحقيق حولها بشكل كامل ثم يتم إبلاغكم بالنتائج.

Yours sincerely
Fahad Asaad AL-Othman

وتقبلوا تحياتي،
فهد أسعد العثمان

Section : Research Questionnaire

الجزء : استبيان بحثي

Using the following scale, ***please indicate to what extent you agree with each of the following statements:***

يمكنكم استخدام المعايير التالية: ***برجاء توضيح درجة موافقتكم على كل مما يلي:***

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة

Top Management Support

دعم ومساندة الإدارة العليا

1	**The top management level think that encouraging sharing knowledge with colleagues is very important** تعتقد الإدارة العليا أن تشجيع المشاركة المعرفية والخبرات مع الزملاء يعتبر أمرا مهما للغاية.	1	2	3	4	5
2	**Top managers always encourage and support staff to share their knowledge with other colleagues.** يقوم كبار المدراء دائما بتشجيع ودعم الموظفين لتبادل ما لديهم من معرفة وخبرات مع زملائهم.	1	2	3	4	5
3	**Top management level provides most of the necessary environment, help and resources to help the staff to share their knowledge with other staff.** تقوم الإدارة العليا بتوفير البيئة المناسبة وتقديم المساعدة والموارد اللازمة لمساعدة الموظفين على القيام بتبادل المعرفة والخبرات مع زملائهم.	1	2	3	4	5
4	**Top managers are keen to see the staffs are happy to share their knowledge with colleagues.** يحرص كبار المدراء على رؤية الموظفين سعداء أثر تبادلهم المعرفة والخبرات مع زملائهم.	1	2	3	4	5

IS Infrastructure

البنية التحتية لخدمات النظم والتقنية

1	**My company provides various tools and technologies to facilitate knowledge sharing and exchange experiences (e.g. email, intranet and groupware)** تقوم شركتنا بتقديم نظم وتقنيات متنوعة لتسهيل عملية تبادل المعرفة والخبرات (مثل استخدام البريد الإلكتروني، والإنترنت، والمجموعات الإلكترونية)	1	2	3	4	5
2	**Employees use expensively electronic storages to access data/ information/ Knowledge (such as online databases and knowledge bases).** يستخدام الموظفون وحدات تخزين الكترونية مرموقة للوصول إلى البيانات أو المعلومات أو المعرفة والخبرات السابقه (مثل قواعد البيانات وقواعد المعرفة على الإنترنت).	1	2	3	4	5
3	**The technological tools available attract the staff to collaborate by sharing their knowledge** أدوات التقنية المتوفرة تعمل على جذب الموظفين وحثهم على التبادل المعرفي والخبرات.	1	2	3	4	5

Interpersonal Trust

الثقة المتبادلة بين الأشخاص

1	**I don't hesitate to share my feelings and point of views with my colleagues** لا أتردد في تبادل ما بداخلي من أحاسيس ووجهات نظر مع زملائي	1	2	3	4	5
2	**I believe co-workers should not share personal information** أعتقد أنه ينبغي على الزملاء في العمل عدم القيام بتبادل معلوماتهم وأمورهم الشخصية	1	2	3	4	5
3	**Our company maintains certain rules and procedures to protect the employee sharing his/her knowledge against harmful intentions of others.** تتبنى شركتنا قواعد وإجراءات معينة لحماية الموظف الذي يقوم بالمشاركة بالمعرفة والخبرات التي لديه ضد المقاصد الفاسدة للآخرين.	1	2	3	4	5
4	**In our company a considerable level of trust exists between co-workers** في شركتنا هناك مستوى ملحوظ من الثقة بين زملاء العمل.	1	2	3	4	5
5	**Most of my colleagues are people whom I know and thus considered trustworthy** معظم زملائي في مؤسستي هم أشخاص أعرفهم ولذا فإنهم جديرين بالثقة بالنسبة لي.	1	2	3	4	5

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة

Rewards Systems

نظام المكافآت

1	**Our company rewards employees for sharing knowledge experience with their colleagues** تقوم مؤسستنا بمكافأة موظفيها على تبادل خبراتهم المعرفية مع زملائهم.	1 2 3 4 5
2	**The knowledge sharing rewards available are effective in motivating staff to spread their knowledge** تعتبر فكرة منح المكافأة على التبادل المعرفي أمرا فعالا في تحفيز الموظفين على نشر خبراتهم فيما بينهم.	1 2 3 4 5

Relative advantage:
In my organization, I believe sharing knowledge with colleagues will . . .

المزايا ذات العلاقة
في مؤسستي، أعتقد أن تبادل المعرفة والخبرات مع الزملاء سوف .....

1	**Increase solving-problem capability** يزيد من القدرة على حل المشكلات	1 2 3 4 5
2	**Improve team worker performance** تحسين أداء فريق العمل	1 2 3 4 5
3	**Quickly react to new information about the industry or market** التفاعل السريع مع المعلومات الجديدة عن قطاع الأعمال أو السوق	1 2 3 4 5
4	**Be effective in their jobs** يكون فعالا ومؤثرا في وظائفهم	1 2 3 4 5

Compatibility:
In my organization, I believe sharing knowledge with colleagues . . .

التوافق:
في مؤسستي، أعتقد أن تبادل المعرفة والخبرات مع الزملاء .....

1	**Compatible with the organizational situation** يكون متوافقا مع الموقف التنظيمي أو حالة المؤسسة	1 2 3 4 5
2	**Do not contradict the organizational policies** لا يتعارض مع السياسات التنظيمية للمؤسسة التي اعمل بها	1 2 3 4 5
3	**Fitted their work style** يتناسب مع أسلوب عملهم	1 2 3 4 5

Complexity
Application of knowledge sharing by my organization will lead difficulties in . . .

التعقيد
إن تطبيق عملية التبادل المعرفي والخبرات في مؤسستي سوف يقود إلى صعاب في .....

1	**Building employee commitment to the organization** إقامة حالة من ارتباط الموظف بالمؤسسة التي يعمل بها	1 2 3 4 5
2	**Controlling work quality** مراقبة جودة العمل داخل المنظومة	1 2 3 4 5
3	**Support learning processes** دعم عمليات التعلم داخل المؤسسة	1 2 3 4 5

Knowledge Sharing Process (Donation):

عملية التبادل المعرفي (المنح)

1	**I often share with my colleagues the new working skills that I learn.** أقوم غالبا بتبادل مهارات العمل الجديدة مع زملائي والتي تعلمتها في العمل.	1 2 3 4 5
2	**My colleagues often share with me the new working skills that they learn.** يقوم زملائي في العمل غالبا بتبادل مهارات العمل الجديدة معي والتي اكتسبوها في العمل.	1 2 3 4 5
3	**I often share with my colleagues the new information I acquire.** أقوم غالبا بتبادل المعلومات الجديدة مع زملائي والتي اكتسبتها في العمل.	1 2 3 4 5

4

4	My colleagues often share with me the new information they acquire. يقوم زملائي في العمل غالبا بتبادل المعلومات الجديدة معي والتي اكتسبوها في العمل.	1 2 3 4 5
5	Sharing knowledge with my colleagues is regarded as something normal in my company. تعتبر عملية التبادل المعرفي والخبرة مع زملائي أمرا طبيعيا في مؤسستي.	1 2 3 4 5

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
لا أوافق بشدة	لا أوافق	محايد	أوافق	أوافق بشدة

Knowledge Sharing Process (Collection):

عملية التبادل المعرفي (التحصيل)

1	My colleagues often share with me the working skills they know when I ask them. يقوم زملائي غالبا بتبادل المهارات العملية التي لديهم معي عندما أطلب منهم ذلك.	1 2 3 4 5
2	I often share with my colleagues the working skills I know when they ask me. أقوم في الغالب بتبادل مهاراتي العملية مع زملائي عندما يطلبون مني ذلك.	1 2 3 4 5
3	My colleagues often share with me the information they know when I ask them. يقوم زملائي غالبا بتبادل المعلومات التي لديهم معي عندما أطلب منهم ذلك.	1 2 3 4 5
4	I often share with my colleagues the information I know when they ask me. أقوم في الغالب بتبادل معلوماتي مع زملائي عندما يطلبون مني ذلك.	1 2 3 4 5
5	Our company staff often exchanges knowledge of working skills and information. يقوم موظفوا شركتنا في الغالب بتبادل المعرفة الخاصة بمهارات العمل والمعلومات.	1 2 3 4 5

Organizational Innovation Capability (OIC):

القدرة على الابتكار المؤسسي:

1	Our company frequently tries out new ideas تقوم مؤسستنا كثيرا بتجربة أفكار جديدة.	1 2 3 4 5
2	Our company seeks new ways of doing things تسعى مؤسستنا إلى وسائل جديدة للقيام بالأمور	1 2 3 4 5
3	Our company is creative in its operating methods تعتبر مؤسستنا من الشركات الرائدة في طرق التشغيل.	1 2 3 4 5
4	Our company is frequently the first to market new products and services تعتبر مؤسستنا دائما هي المسوق للمنتجات والخدمات الجديدة.	1 2 3 4 5
5	Innovation is perceived as too risky in our company and is resisted يفهم الابتكار على أنه محفوف بالمخاطر في مؤسستنا ويتم مقاومة هذه المخاطر.	1 2 3 4 5
6	Our new product/service introduction has increased during the last five years. زادت عملية تقديم المنتج أو الخدمة الجديدة خلال الخمس سنوات الأخيرة.	1 2 3 4 5
7	Our company often develops new products/services well accepted by the market. تقوم مؤسستنا في الغالب بتطوير منتجات أو خدمات جديدة والتي تكون مقبولة لدى السوق.	1 2 3 4 5
8	The new products or services developed by our company always arouse imitation from competitors. المنتجات أو الخدمات الجديدة التي تقوم مؤسستنا بتطويرها تحث المتنافسين دائما على المحاكاة.	1 2 3 4 5

Section : Organizational Background Information

الجزء : الخلفية المعلوماتية للمنظومة

Level of knowledge sharing inside organization:

- Excellent ☐
- Good ☐
- Poor ☐

مستوى المشاركة المعرفية والخبرات داخل المؤسسة:

- ممتاز ☐
- جيد ☐
- ضعيف ☐

Knowledge sharing techniques (You can choose more than one option):

- Teamwork and collaboration ☐
- Formal and informal meetings ☐
- Training (for new and existing staff) ☐
- Knowledge sharing tools (emails, intranet, knowledge base, social networking services) ☐
- Chatting during breaks ☐
- Workshops and seminars ☐
- Focused groups ☐
- Brainstorming ☐

تقنيات التبادل المعرفي (يمكنك اختيار أكثر من اختيار):

- العمل الجماعي والتعاون ☐
- الاجتماعات الرسمية وغير الرسمية ☐
- التدريب (للموظفين الجدد والحاليين) ☐
- أدوات التبادل المعرفي (البريد الإلكتروني، الإنترنت، القاعدة للبيانات المعرفية، وسائل الترابط الاجتماعي) ☐
- التحادث خلال فترات الراحة ☐
- ورش العمل والحلقات الدراسية ☐
- العمل كمجموعات ☐
- المحاورة العقلية(التفكير بصوت عالي) ☐

Innovative person characteristics (You can choose more than one option):

How do evaluate your contribution inside your organization?

- Self Motivated - A volunteer ☐
- Engaged in a chosen activity - Doing things ☐
- Willing to take a vague idea, or some hint of misunderstanding and work on it until it's understood. ☐
- Ideally also engaged with a diverse group of people in a self organizing community of practice. ☐

خصائص الشخص المبتكر (يمكنك استخدام أكثر من خيار واحد):

كيف يمكنك تقييم مساهمتك الشخصية داخل مؤسستك ؟

- الدافع الذاتي – مبادر ☐
- الارتباط في نشاط مختار – القيام بالأشياء ☐
- الرغبة في أخذ فكرة مبهمة، أو تلميح بعدم الفهم والعمل عليها حتى يتم فهمها ☐
- الارتباط مع مجموعات مختلفة من الأشخاص داخل المؤسسة بدافع ذاتي للعمل وانجاز المهام. ☐

Section : General Background Information

الجزء : الخلفية المعلوماتية العامة

1. Name of my organization (optional) _____

1- اسم مؤسستي (اختياري) : _____

2. My organization headquarter is located in Saudi Arabia ☐ Yes ☐ No

2- هل يقع المقر الرئيسي لمؤسستك في المملكة العربية السعودية؟ ☐ نعم ☐ لا

3. Type of organization is: ☐ Private sector ☐ Public sector ☐ Semi public ☐ Non- profit Organization ☐ Other _____

3- نوع المؤسسة : ☐ قطاع خاص ☐ قطاع عام ☐ مؤسسة شبه حكومية ☐ مؤسسة غير ربحية ☐ أخرى : _____

6

4. The number of people in my organization in Saudi Arabia is
☐ 20 and less ☐ 21-50 ☐51-100
☐ 101-200 ☐ 201-500 ☐ Over 500

5. Number of years worked in this organization is ☐ 1-5 years ☐ 6-10 years ☐11-20 years ☐ Over 20 years

6. Knowledge management experience is: ☐ 1-5 year ☐ 6-10 years ☐ 11-20 years ☐ Over 20 years

7. My job title is: ☐ CEO / General Manager ☐ Project / PMO Manager ☐ Division Head ☐ Supervisor ☐ Team Leader ☐ Coordinator ☐ Consultant ☐ Engineer ☐ Administrator ☐Instructor/Lecturer ☐ Staff ☐ Other _____

8. Nationality: ☐ Saudi ☐Non- Saudi. Country of Origin (Optional) _____

9. First Language : ☐ Arabic ☐English ☐ Other _____

10. Gender: ☐ Male ☐ Female

11. Organization Industry: ☐ Financial ☐ Insurance ☐ Healthcare ☐ Investments ☐ IT ☐ Consulting ☐ Construction ☐ Agriculture ☐ Petrochemical ☐ Manufacturing ☐ Education ☐ Retail ☐ Oil& Gas ☐ Merchandising ☐Transportation ☐ wholesale merchandising ☐ Information and communication technology ☐ other, _____

12- Education level is ☐ Doctoral degree ☐ Master's degree ☐ Bachelor's degree ☐ College degree ☐ other _____

4- عدد الأشخاص في مؤسستي في المملكة العربية السعودية : ☐ أقل من 20 ☐ من 21 إلى 50 ☐ من 51 إلى 100 ☐ من 101 إلى 200 ☐من 201 إلى 500 ☐ أكثر من 500

5- عدد سنوات العمل في هذه المؤسسة ☐ من 1 إلى 5 سنوات ☐ من 6 إلى 10 سنوات ☐ من 11 إلى 20 سنة ☐ أكثر من 20 سنة

6- خبرة التبادل المعرفي : ☐ من 1 إلى 5 سنوات ☐ من 6 إلى 10 سنوات ☐ من 11 إلى 20 سنة ☐ أكثر من 20 سنة

7- موقعي الوظيفي في المؤسسة هو: ☐ مدير تنفيذي / مدير عام ☐ مدير مشروع ☐ رئيس قسم ☐ مشرف ☐ قائد فريق ☐ منسق ☐ استشاري ☐ مهندس ☐ إداري ☐ موظف عام ☐ معلم / أستاذ(أكاديمي) ☐ أخرى _____

8- الجنسية: ☐ سعودي ☐ غير سعودي. اسم الدولة (اختياري)_____

9- اللغة الأساسيه: ☐العربية ☐الانجليزية ☐ أخرى _____

10- الجنس: ☐ ذكر ☐ انثى

11- قطاع الأعمال : ☐ مالية ☐ تأمين ☐ الرعاية الصحية ☐ الاستشارات ☐ تقنية المعلومات ☐الاستشارات ☐ الإنشاءات ☐ الزراعة ☐ البتروكيماويات ☐ التصنيع ☐ التعليم ☐ البيع بالتجزئة ☐ البترول والغاز الطبيعي ☐ التجارة ☐ تقنية المعلومات والاتصالات ☐ أخرى ، _____

9- مستوى التعليم ☐ درجة الدكتوراه ☐ درجة الماجستير ☐ درجة البكالوريوس ☐ دبلوم ☐ أخرى _____

➤ END OF QUESTIONNAIRE ➤

➤ نهاية الاستبيان ➤

Appendix B

INTERVIEWPROTOCOL GUIDE

INTERVIEWPROTOCOL GUIDE

TOPIC

The influence of socio-technical factors on knowledge sharing towards innovation in Saudi Arabia: **A Knowledge based Innovation Capability Perspective**

INTRODUCTION

Objectives:

To study the Knowledge based Innovation Capability in your firm by gathering the information about:
Your staff;
Your team;
Your superiors; and
Your firm's socio-technical aspects towards knowledge based innovation capability.

Outcomes:

Case study reports, journal and conference publications. Interview Conduct:
Permission to record the interview using digital note taking device.
Confidentiality–The interview record will not be released and will be erased after it has been transcribed. Your name will not be identified. Results of the study will be aggregated and presented as summaries only.
For any reason, if there is any question that you prefer not to answer please let me know.

STARTRECORDING

TOP MANAGEMENT SUPPORT QUESTIONS

General: What do you think about the top management support in your organizations towards sharing knowledge and innovation?

Specific:

Probe on "Encouragement of KSP"
Importance of encouragement sharing knowledge? Evaluate How?
Sharing knowledge with other staff or team members"

Probe on “Environment of KSP”
Providing necessary environment?
Providing resources to help the staff to share their knowledge with other staff? (Yes, No)?And to what extent?

Probe on “Commitment”
Top management keen to see the staffs are happy to share their knowledge with colleagues? How and to what extent?

IS INFRASTRUCTURE QUESTIONS

General: Please think about your IT SYSTEMS AND INFRASTRUCTRES
How do you evaluate or rank the IS infrastructure in your company in general? And to help you to share knowledge?

Specific:

Probe on “Technological systems presence”
My company provides various tools and technologies to facilitate knowledge sharing and exchange experiences (e.g. email, intranet and groupware)? Show evidence? To what extent?
Employees use expensively electronic storages to access data/ information/ Knowledge (such as online databases and knowledge bases)? Existed? To what extent?
Probe on “Technological systems attractiveness”

The technological tools available in our organization attract the staff to collaborate by sharing their knowledge? To what extent?

INTERPERSONAL TRUST QUESTIONS

General: Please think about your firm as a whole (Look at yourself and the others)

How do evaluate the level of trust between co-workers in your company?

Probe on “feelings and personal info”
Do you hesitate to share my feelings and point of views with my colleagues? What about the others?
Do you believe that co-workers should not share personal information? Opinion?

Probe on “Policy and procedures of trust”
Our company maintains certain rules and procedures to protect the employee sharing his/her knowledge against harmful intentions of others? How and to what extent?
Probe on “Trust and relationships”
In our company a considerable level of trust exists between co-workers? How and to what extent?
Most of my colleagues are people whom I know and thus considered trustworthy? How

and to what extent?

REWARD SYSTEMS QUESTIONS
General: Do you feel that you should be rewarded when you share knowledge with others?

Specific:
Probe on "Reward's system existence"
Our company reward employees for sharing knowledge or experience with their colleagues? How?
Probe on "Rewarding as a motivation driver"

The knowledge sharing rewards available are effective in motivating staff to spread their Knowledge? How?

KNOWLEDGE SHARING (DONATION) QUESTIONS
General: How do you evaluate knowledge sharing as a giving of knowledge process? Please think about your firm as a whole (Look at yourself and the others)

Specific:
Probe on "learned working skills"
I often share with my colleagues the new working skills that I learn? How and to extent?

My colleagues often share with me the new working skills that they learn? How and to extent?

Probe on "learned new information"
I often share with my colleagues the new information I acquire? How and to extent?

My colleagues often share with me the new information they acquire? How and to extent?

Probe on "SK as a norm"
Sharing knowledge with my colleagues is regarded as something normal in my company? To what extent?

KNOWLEDGE SHARING (COLLECTION) QUESTIONS
General: How do you evaluate knowledge sharing as a taking of knowledge process? Please think about your firm as a whole (Look at yourself and the others)

Specific:
Probe on "KS on demand"
My colleagues often share with me the working skills they know when I ask them? How and to extent?
I often share with my colleagues the working skills I know when they ask me? How and to extent?

Probe on “information on demand”
My colleagues often share with me the information they know when I ask them? How and to extent?

I often share with my colleagues the information I know when they ask me? How and to extent?

Probe on “KS as a hobbit”
Our company staff often exchanges knowledge of working skills and information? How and to extent?

INNOVATION CAPABILITY QUESTIONS

Probe on “Adoption of new ideas and processes”
Our company frequently tries out new ideas? Explain more?
Our company seeks new ways of doing things? Explain more
Probe on “Market Pioneering”
Our company is creative in its operating methods? How and to extent?
Our company is frequently the first to market new products and services? How and to extent?

Probe on “consideration of innovation”
Innovation is perceived as too risky in our company and is resisted? Is this true? Explain please?
Probe on “Innovation and ROI”
Our new product(s)/service(s) introduction has/have increased during the last five years? Happened? Explain how please?
Probe on “Development and market Acceptance”
Our company often develops new products/services well accepted by the market? Happened? Explain how and to extent please?
Probe on “Edge of competition”
The new products or services developed by our company always arouse imitation from competitors

ENDING QUESTIONS

Is there anything else that you want to comment about your firm?
STOPRECORDING

Appendix C

Descriptive Summary and
Example of Rating Results of
Case Study

Descriptive summery and rating results of Firm A

Constructs	Factors	Descriptive Summary	Rating
Top Management Support (TMS)	Encouragement of Sharing Knowledge	Over all, Top managers are this factor over colleges less important and the majority of managers don't consider it as a part of their management rules and procedures. A manager states that " I agree with you in this but the availability of this option is available theoretically but not shown in the application stage	(Med/Low)
	Encouragement of Sharing Knowledge	Top managers are generally accepting the concept of supporting to a certain extent. They accusingly encouraging their staff to share knowledge and learned lessons but without any enforcement	(Med)

Constructs	Factors	Descriptive Summary	Rating
Top Management Support (TMS) ***Overall Rating is (LOW)***	Environment of Sharing knowledge	Top Managers always provide the most needed environment and resources to help the staff to share knowledge and progress in their work faster	High
	Commitment	I n general, Top managers are not keen enough to see their staff happy in sharing knowledge. A manager has stated from the HR development unit they are treating this phenomena Theoretically in the KPI for their staff as a check box but in the realty they are not.	(Low)

Constructs	Factors	Descriptive Summary	Rating
IS Infrastructure	Tech Systems Availability	Firm Provide varies of tools and systems such as Electronic bulletin boards which contain procedures policies, multi user chat which allows you to add your comment and it has been cited as a user friendly one should attract the users of this system	(high)
	Usage of e-storages	People using extensively electronic bases to keep all the details of the customers and their history transactions polices communications with the client, orders, reminders and forecasting for the stocks market reports can be used in the future by anyone or for training purposes.	(high)

Constructs	Factors	Descriptive Summary	Rating
IS Infrastructure ***Overall Rating is (High)***	System attractiveness	Overall, the systems or tools are not attractive enough to share unless we receive orders from higher management to feed up the systems.	(/Med/Low)

Constructs	Factors	Descriptive Summary	Rating
Interpersonal Trust	Feelings/personal views /info	People generally sometime hesitate to share the feelings and point of views with their colleagues unless if they are in formal meeting and documented and one was asked to give his opinion or otherwise no one will do it as a common attitude inside the organization general conservative attitude. The majority of the people are against sharing personal information unless they are close friends in and out. One of the risk mangers stated that “personal is personal why do I share something irrelevant to work. One of supervisors the auditing team said “colleagues are colleagues, they are not friends”	(Med-Low) (High)

Constructs	Factors	Descriptive Summary	Rating
Interpersonal Trust	Polices and procedure of protection	The firm maintain a very strong policy and procedure in general for any suspicious action could affect the company negatively but there is no certain policy for sharing knowledge against harmful intentions unless it is documented. Then an action could be taken	(Med)
Overall Rating is (Med)	Level of trust	In the firm, there is an acceptable level of trust between co-workers and colleagues in the other department.	(Med)
	Trustworthiness	Most of the staff now each others and some times just the faces thus can be considered less trustworthy (to an extent). A manager stated "Professionally yes but personally no	(Med)

Constructs	Factors	Descriptive Summary	Rating
Reward Systems	R system existence	The firm never rewards employees for sharing knowledge and experiences with their colleagues. As stated by HR director it is not available.	(LOW)
	R System motivation	In the firm the staffs is not motivated to be rewarded if they share knowledge because there is no existence of the system.	(LOW)
Overall Rating is (Low)			

Constructs	Factors	Descriptive Summary	Rating
Knowledge sharing (Donation)	New working skills	Organization members rarely doing it because the skills a personal related matter varies among people. A senior manager said (I share knowledge and it is up to the other person how to implement it. Skills based on the way of thinking).	(Low)
		From the others prospective they are sharing the same concept. A supervisor said “Never happened to me”	(Low)
	New information	Yes True we often share the new information I acquire and leave the implementation to the person within certain policy	

Constructs	Factors	Descriptive Summary	Rating
Knowledge sharing (Donation) ***Overall Rating is (Low)***	New information	Rottenly happened As above last point	(High)
	Sharing knowledge as a norm	In the firm sharing knowledge is considered as a hard thing you have to fish for the information	(Low)

Constructs	Factors	Descriptive Summary	Rating
Knowledge sharing (Collection) ***Overall Rating is (High)***	Sharing knowledge on demand	The staff some times shares with me new skills when I ask them and some time they give not clear experience either because of not understanding or hiding the power of the skill. Personal attitude!!!.	(Med)
		True but with the condition if they should asked with it 100%.	(High)
	Information on demand	As above the supported if they ask	(High)
	Sharing knowledge as a habit	Yes if they ask	(High)
		The people in our organization rarely exchange working skills but they are open with information sharing especially if any one ask.	(Low)

Constructs	Factors	Descriptive Summary	Rating
Organizational innovation capability (OIC)	New Idea adoption	1. The Firm frequently tries out new ideas because the environment is very open for any suggestions and new approaches and solutions	(High)
		2. Our company considering the new ways of doing things is less active than other industries because we are providing financial services.	(Med)
	Market pioneering	1. No room for creativity in financial services.	(Low)
		2. Yes we are first in the Market with the new product and services	(High)
	Innovation as risk factor	If the new thing is valid and accepted by the committee or the board they will go ahead with it but through a process and policy.	(Med)

Constructs	Factors	Descriptive Summary	Rating
Organizational innovation capability (OIC)	Sales progress	The firm new product and services has increased last five year but not exponentially	(Med)
	Market Acceptance	Yes we develop new products and services but the acceptance rate is very high by the customers because of the harsh competition	(Low)
Overall Rating is (Med)	Service/Product Edge	The new product services we are providing sometimes been simulated by others	(Med)

Appendix D

Qualitative Assessment Rubrics

TableD-1 Top management support rubric

Sub-Factors	Rating		
	High	**Medium**	**Low**
Encouragement of KS.	• The encouragement sharing knowledge with colleagues is very important • Top managers always encourage and support staff to share their knowledge with other colleagues.	• The encouragement sharing knowledge with colleagues is less important • Top managers occasionally encourage and support staff to share their knowledge with other colleagues. • .	• The encouragement sharing knowledge with colleagues is less important. • Top managers rarely encourage and support staff to share their knowledge with other colleagues.
Environment of KS	• Top management level provides most of the necessary environment, help and resources to help the staff to share their knowledge with other staff.	• Top management level provides some of the necessary environment, help and resources to help the staff to share their knowledge with other staff.	• Top management level doesn't provide of the necessary environment, help and resources to help the staff to share their knowledge with other staff.
Commitment	• Top managers are very keen to see the staffs are happy to share their knowledge with colleagues.	• Top managers are less keen to see the staffs are happy to share their knowledge with colleagues.	• Top managers are not keen to see the staffs are happy to share their knowledge with colleagues.

TableD-2 IS Infrastructure Rubric

Sub-Factors	Rating		
	High	**Medium**	**Low**
Technological Systems presence	• My company provides various tools and technologies to facilitate knowledge sharing and exchange experiences (e.g. email, intranet and groupware) • Employees use expensively electronic storages to access data/ information/ Knowledge (such as online databases and knowledge bases)	• My company provides less number tools and technologies to facilitate knowledge sharing and exchange experiences (e.g. email, intranet and groupware) • Employees use adequately electronic storages to access data/ information/ Knowledge (such as online databases and knowledge bases)	• My company doesn't provide various tools and technologies to facilitate knowledge sharing and exchange experiences (e.g. email, intranet and groupware) • Employees use poor electronic storages to access data/ information/ Knowledge (such as online databases and knowledge bases)
Technological systems attractiveness	The technological tools available attract the staff to collaborate by sharing their knowledge	• The technological tools available attract less number of staff to collaborate by sharing their knowledge	The technological tools available doesn't attract staff to collaborate by sharing their knowledge

Table D-3 Interpersonal Trust Rubric

Factors	Rating		
	High	**Medium**	**Low**
feelings and personal info	• I don't hesitate to share my feelings and point of views with my **colleagues** • I believe co-workers should not share personal information	• I sometimes hesitate to share my feelings and point of views with my colleagues • I believe co-workers should share some personal information	• I hesitate to share my feelings and point of views with my colleague • I believe co-workers should share personal information
Policy and procedures of trust	• Our company maintains certain rules and procedures to protect the employee sharing his/her knowledge against harmful intentions of others	• Our company have minor certain rules and procedures to protect the employee sharing his/her knowledge against harmful intentions of others	• Our company lacks of certain rules and procedures to protect the employee sharing his/her knowledge against harmful intentions of others
Trust and relationships	• In our company a considerable level of trust exists between co-workers • Most of my colleagues are people whom I know and thus considered trustworthy	• In our company adequate level of trust exists between co-workers • Most of my colleagues are people whom I don't know very and thus considered less trustworthy	• In our company lack of existence of trust level between co-workers • Most of my colleagues are people whom I don't know them very well and thus considered not trustworthy .

TableD-4 Reward Systems Rubric

Factors	Rating		
	High	**Medium**	**Low**
Reward's system existence	• Our company always reward employees for sharing knowledge/ experience with their colleagues	• Our company sometimes reward employees for sharing knowledge/ experience with their colleagues	• Our company never reward employees for sharing knowledge/ experience with their colleagues
Rewarding as a motivation driver	• The knowledge sharing rewards practice available are very effective in motivating staff to spread their knowledge	• The knowledge sharing rewards practice available are less effective in motivating staff to spread their knowledge	• The knowledge sharing rewards practice (not) available are; or (not) effective in motivating staff to spread their knowledge .

TableD-5 KS(donation) Rubric

Sub-Factors	Rating		
	High	**Medium**	**Low**
Learned working skills	• I often share with my colleagues the new working skills that I learn. • My colleagues often share with me the new working skills that they learn.	• I sometimes share with my colleagues the new working skills that I learn. • My colleagues sometimes share with me the new working skills that they learn.	• I never share with my colleagues the new working skills that I learn. • My colleagues never share with me the new working skills that they learn.
Learned new information	• I often share with my colleagues the new information I acquire. • My colleagues often share with me the new information they acquire. •	• I sometimes share with my colleagues the new information I acquire • My colleagues sometimes share with me the new information they acquire.	• I never share with my colleagues the new information I acquire. • My colleagues never share with me the new information they acquire.
KS as a norm	• Sharing knowledge with my colleagues is fully regarded as something normal in my company.	• Sharing knowledge with my colleagues is sometimes regarded as something normal in my company	• Sharing knowledge with my colleagues is rarely or not regarded as something normal in my company.

TableD-6 KS (Collection) Rubric

Factors	Rating		
	High	**Medium**	**Low**
KS on demand	My colleagues often share with me the working skills they know when I ask them. • I often share with my colleagues the working skills I know when they ask me.	• My colleagues sometimes share with me the working skills they know when I ask them. • I sometimes share with my colleagues the working skills I know when they ask me	• My colleagues never share with me the working skills they know when I ask them. • • I never share with my colleagues the working skills I know when they ask me
Information on demand	• My colleagues often share with me the information they know • I often share with my colleagues the information I know when they ask me.	• My colleagues sometimes share with me the information they know when I ask them. • I sometimes share with my colleagues the information I know when they ask me.	• My colleagues never share with me the information they know when I ask them. • I never share with my colleagues the information I know when they ask me.
Hobbit of KS	• Our company staff often exchanges knowledge of working skills and information	• Our company staff sometimes exchange knowledge of working skills and information	• Our company staff rarely/never exchange knowledge of working skills and information

•

Table D-7 Organizational Innovation Capability Rubric

Factors	Rating		
	High	**Medium**	**Low**
Adoption of new ideas and processes	Our company frequently tries out new ideas. • Our company actively seeks new ways of doing things. •	• Our company is moderately flexible in trying new ideas. • Our company sometimes seeks new ways of doing things.	• Our company is not flexible in trying new ideas. • Our company never seeks new ways of doing things.
Market Pioneering	• Our company actively encourages creativity in operating methods • company is frequently the first to market new products and services	• Creativity is sometimes encouraged in our company. • Our company is trying to be the first to market new products and services	• Creativity is never encouraged. • Our company never become the first to market new products and services
Innovation and risk	• Our company has a very open atmosphere to innovate.	• Our company tries to take risks if possible.	• Our company never takes risks. It always follows the tried and true methods.
ROI/Returns progress	• Our new product(s)/service(s) introduction has/have steadily increased during the last five years	• Number of new products/services seems to have quite consistent increased over the past few years	• Our new product(s)/service(s) introduction has/have not increased during the last five years .
Market acceptance	Our company often develops new products/services well accepted by the market.	Our company sometimes develops new products/services well accepted by the market	• Our company never/rarely develop new products/services well accepted by the market
Edge of competition	• Our company is always ahead of its competitors in adopting new developments.	• Our company is at about the same level as its competitors in adopting new developments.	• Our company lags behind its competitors in adopting new developments