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Knowledge Sharing in Information Systems Development Projects:

A Comparative Study of Social Exchange and Social Cognitive Theories

A

Doctoral Thesis

Presented

By

Lean Mayana Makhubele
966631

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School of Economic and Business Sciences
Faculty of Commerce, Law and Management
UNIVERSITY OF THE WITWATERSRAND

Supervisor:
Professor Ray Kekwaletswe

September 2018

ATTESTATION OF AUTHORSHIP

I, Lean Mayana Makhubele, declare that the thesis titled, ***"Knowledge sharing in information systems development projects: A comparative study of social exchange and social cognitive theories***" is my original work, and neither the whole nor any part of this work has ever been submitted to an establishment of higher learning or research institute other than at the University of Witwatersrand. All sources used in this work have been acknowledged in the form of references.



28 September 2018

Signature **Date**

THESIS ABSTRACT

The knowledge-intensive nature of Information Systems Development (ISD) projects requires different types of knowledge and expertise from various Information Technology (IT) professionals. In this thesis, IT professionals are defined as individuals whose skills, trade and practice is in IT and or information systems. ISD projects are knowledge-intensive and they cannot be accomplished by a single individual; hence there is a need for the sharing of knowledge and expertise amongst ISD project IT professionals in order to successfully complete the project. IT professionals in ISD projects are often drawn from various functional teams within the organization and temporarily brought together for the duration of the project. Thus, knowledge sharing amongst IT professionals can be complex and challenging since individual backgrounds, contexts, and ISD expertise differ. Given the complexities, the relevance of this thesis is in explaining why individuals share knowledge during ISD projects.

The thesis argues that the decision to share experiences and what you know is influenced by social cognition and the need (or expectation) for social rewards, also known as social exchange. The research argument is that there is a need for a theoretical model that may be used to explain knowledge sharing amongst IT professionals which may assist in putting together an ISD project team. The theoretical model needs to be sensitive to the contextual factors which influence knowledge sharing amongst IT professionals. The study used Social Cognitive (SCT) and Social Exchange (SET) theories as lenses to conceptualize the model for knowledge sharing in ISD projects. A positivistic research philosophy was selected as being the most appropriate in understanding the challenges of knowledge sharing in ISD projects. A deductive quantitative approach using a survey research strategy was adopted as the research methodology. Non-probability, purposive sampling techniques were used to sample participants and a close-ended questionnaire was used for data collection. The research model was tested using Partial Least Square - Structural Equation Modelling (PLS - SEM) with quantitative data collected from 137 IT professionals and qualitative data collected from 70 IT professionals from various sectors in South Africa.

The squared multiple correlations (R^2), amongst independent variables explained and showed considerable amount of variance towards knowledge sharing as the dependent variable (R^2 = 0.32 %). Knowledge sharing explained 25 % of variance in individual performance (R^2 = 0.25 %). Knowledge sharing self-efficacy explained 25.3 % of the variance in outcome expectation (R^2 = 0.253%). The comparison between SET and SCT were done by contrasting the explanatory power to knowledge sharing using R^2 value. The explanatory power of SCT to knowledge sharing was weak at R^2 = 3.2 % and SET explanatory power to knowledge sharing was strong at R^2 = 14.6%. These results revealed that interpersonal trust, culture and knowledge sharing self-efficacy have a positive significant influence on knowledge sharing, that knowledge sharing self-efficacy has a positive influence on outcome expectation, and that knowledge sharing has a significant influence on individual performance. Insight from qualitative responses revealed that knowledge sharing shortens delivery times during ISD projects, as team members tend to rely on the assistance of their peers when they encounter problems in the project. The finding also reveal that monetary rewards do not entice project team members to share their knowledge, but they are motivated to share knowledge by their desire to help one another and to deliver a working product that meet or exceed customer expectations. Lastly, the results revealed that ISD project leadership should create an environment that is cognizant of different cultural beliefs in the project team, and they need to create an environment where individuals are appreciated for their contribution, and where their ideas are heard. They also need to encourage project team members to embrace the collectivist cultural values where project team members put the interest of the project first above their own.

Through a model, this thesis establishes why SET explains knowledge sharing better than SCT. The model for knowledge sharing was conceptualized as an outcome of interpretation of the empirical evidence against the existing body of knowledge. Through this model, this thesis contributes theoretically by explaining the factors which are pertinent to IT professionals sharing knowledge in an ISD project environment. Practically, the thesis may inform decision makers in ISD projects with ways to improve effective knowledge sharing amongst IT professionals. Methodologically, the contribution is in showing the positivistic philosophy and the survey research strategy as appropriate to offer alternative insights into what really influence knowledge sharing amongst IT professionals during ISD projects. The thesis also contributes to context by providing the insight that is distinctive and unique to South African IT professionals and ISD projects.

Keywords: ***Information Systems Development, knowledge sharing, knowledge, IT professionals, South Africa.***

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DEDICATION

This thesis is dedicated to my late sister Nestah Makhubele. Rest in peace my dear sister, you will forever be remembered.

To my late great grandmother, Ncekwasi Alice Mandlazi, and to my late grandmother Grace Mathilda Manyike, “na khensa swinene eka hinkwaswo leswi mi hi endleleke swona”.

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Lastly, to the black African child who has lost hope out there, just know that, “nothing just happens”. With dedication and resilience, you can achieve anything under the sun, remember, your family background does not determine your destiny.

“Mintirho ya vulavula” , “dyondzo a yi lumi”, “dyondzo i ndzalama”, dyondzo i xithlangu xo hlongola vusweti”

TABLE OF CONTENTS

ATTESTATION OF AUTHORSHIP ..... **i**
DEDICATION ..... **iv**
TABLE OF CONTENTS ..... **v**
TABLE OF FIGURES ..... **viii**
TABLE OF TABLES ..... **ix**
LIST OF ACRONYMS ..... **x**
CHAPTER 1 ..... **1**
INTRODUCTION AND BACKGROUND **1**
1.1 Introduction to the field of study 2
1.2 Relevance of this information systems research 7
1.3 Background to the research problem 9
1.4 Research problem 23
1.5 Summary of contribution 25
1.6 Research argument 25
1.7 Research purpose, aim, goal and objectives 26
1.8 Research questions 27
1.9 Delineation of the study 28
1.10 Summary of the chapter 28
1.11 Thesis outline 28
SURVEY OF SCHOLARSHIP AND THEORETICAL FOUNDATIONS **31**
2.1 Introduction 31
2.2 Knowledge 32
2.3 Information systems development projects and knowledge sharing 37
2.4 Organisational culture and knowledge sharing 47
2.5 Knowledge sharing and internet technology 51
2.6 Factors influencing interpersonal trust and knowledge sharing 52
2.7 Summary of the chapter 63
CHAPTER 3 ..... **64**
THEORETICAL FRAMEWORKS AND RESEARCH MODEL **64**
3.1 Introduction 64
3.2 Theoretical frameworks 64
3.3 Study hypotheses 85
3.4 Summary of the chapter 106

CHAPTER 4 107
RESEARCH METHODOLOGY 107
4.1 Introduction 107
4.2 Epistemology and ontology 107
4.3 Research Paradigm 108
4.4 Research methodology 114
4.5 Research strategy 118
4.6 Data collection techniques 119
4.7 Data collection procedures 122
4.8 The main survey 133
4.9 Data preparation 134
4.10 Data analysis 136
4.11 Evaluating measurement and structural model 138
4.12 Time horizon 142
4.13 Analysis of qualitative data 142
4.14 Limitation of methods 142
4.15 Summary of the chapter 143
CHAPTER 5 144
DATA ANALYSIS AND DISCUSSION OF FINDINGS 144
5.1 Introduction 144
5.2 Participants' demographics 144
5.3 Description statistics of constructs 150
5.4 Measurement model assessment 152
5.5 Structural model assessment 159
5.6 Mediation analysis 167
5.7 Summary of the chapter 169
CHAPTER 6 171
INTEPRETATION OF FINDINGS AND THE KNOWLEDGE SHARING MODEL 171
6.1 Introduction 171
6.2 Main findings of the study and the interpretation thereof 171
6.3 Chapter Summary 186
CHAPTER 7 187
ANALYSIS OF QUALITATIVE RESPONSES 187
7.1 Introduction 187
7.2 Participants' qualitative responses 187
7.3 Summary of the findings from the qualitative data 209
CHAPTER 8 213
EVALUATION OF THE RESEARCH 213
8.1 Introduction 213
8.2 Overview of the research 213

8.3 Relevance of the research 222
8.4 Contribution of the study 225
8.5 Limitations and suggestions for future research 232
8.6 Summary of the chapter 237
8.7 Conclusion of the research 238
REFERENCES 240
APPENDIX A: QUESTIONNARE 267
APPENDIX B: ETHICS APPROVAL 275

TABLE OF FIGURES

Figure 1-1: Contribution of ICT to the South African GDP (Stats SA, 2015) 21
Figure 2-1: SECI model (Nonaka, 2008) 34
Figure 2-2. Types of organisational culture (Shao et al., 2015) 50
Figure 3-1: Social Cognitive Theory (Bandura, 1986) 65
Figure 3-2: Social Exchange Theory (Cook, 1977) 70
Figure 3-3: Social exchange process (Andolšek, 2015) 71
Figure 3-4: research model for knowledge sharing behaviour in virtual communities (Hsu et al., 2007 76
Figure 3-5: Research model for knowledge contribution withholding in project teams (Lin & Huang, 2010) 78
Figure 3-6: Research model for knowledge sharing between IT professionals (Tsai & Cheng, 2012) 78
Figure 3-7: Research model for knowledge management systems usage antecedents (Lin & Huang, 2008) 79
Figure 3-8: Research model for knowledge sharing intension using knowledge management systems (Tsai et al., 2013) 80
Figure 3-9: research model for knowledge sharing in virtual communities (Chiu et al., 2006) 81
Figure 3-10: research model for knowledge sharing with-holding intension (Wang et al., 2014) 82
Figure 4-1: Paradigms and associated methodological choices (Holt & Goulding, 2014) 113
Figure 5-1: Results of the structural model 162
Figure 5-2: Social cognitive factors 165
Figure 5-3: Construct's associated with SET 166
Figure 5-4: Relationship between culture and knowledge sharing 168
Figure 5-5: Mediation analysis 168
Figure 6-1: Model for knowledge sharing amongst IT professionals in ISD projects 185

TABLE OF TABLES

Table 1-1: Challenges of knowledge sharing in ISD teams (Zahedi, Shahin & Babar, 2016) 13
Table 2-1: Types of trust (Ghaznavi et al., 2011) 54
Table 3-1: Previous studies that used social cognitive and social exchange theories. 81
Table 3-2: Hypotheses and their description 104
Table 4-1: Summary of research paradigms (Saunders et al., 2009) 112
Table 4-2: Measurement scale for individual performance 125
Table 4-3: Measurement scale for knowledge sharing 126
Table 4-4: Measurement scale for interpersonal trust 126
Table 4-5: Measurement scale for knowledge sharing self-efficacy 127
Table 4-6: Measurement scale for expected rewards 129
Table 4-7: Measurement scale for expected reciprocal relationship 129
Table 4-8: Measurement scale for culture 130
Table 4-9: Measurement items for outcome expectation 131
Table 4-10: Summary of measurement items 132
Table 5-1: Demographics of the participants (N = 137) 144
Table 5-2: Descriptive statistics of constructs 150
Table 5-5: Average Variance Extracted of constructs 153
Table 5-6: Cross loadings of constructs 154
Table 5-7: Correlation and AVE of constructs 156
Table 5-3: Reliability and descriptive statistics 157
Table 5-4: Reliability of constructs 159
Table 5-8: Results of structural model 160
Table 5-9: Summary of hypotheses testing 163

LIST OF ACRONYMS

AVE	Average Variance Extracted
IP	Individual Performance
C	Culture
KS	Knowledge Sharing
IT	Information Technology
IPT	Interpersonal Trust
OE	Outcome Expectations
KSSE	Knowledge Sharing Self-Efficacy
ERR	Expected Reciprocal Relationships
ER	Expected Rewards
EFA	Exploratory Factor Analysis
PLS – SEM	Partial Least Square - Structural Equation Modelling
CB-SEM	Covariance-based Structural Equation Modelling
RBV	Resource-Based View
SEM	Structural equation modelling
SPSS	Statistical Package for the Social Sciences
SET	Social Exchange Theory
SCT	Social Cognitive Theory
IS	Information Systems
ISD	Information Systems Development
VIF	Variance Inflation Factor
VC	Virtual Community

CHAPTER 1

INTRODUCTION AND BACKGROUND

Through the lenses of Social exchange theory and Social cognitive theory, this thesis explains and gives insight into what may influence IT professionals, as individuals, to share experiences and knowledge in an Information Systems Development (ISD) projects environment.

ISD projects are knowledge-intensive and thus are often staffed with individuals from various functional areas within the organisation. These individuals bring with them varied experience and know-how on ISD projects. For the purposes of this thesis, IT professionals are considered all individuals whose skills, trade and practice is in IT and or information systems. These typically include business analysts, project managers, software developers, systems analysts, project coordinators, change managers, system designers, and business architects. This thesis focuses on this wide range of IT professionals and how they jointly bring their wealth of experience to bear on an ISD project. Knowledge sharing amongst IT professionals can be challenging because each individual has a different background, context and expertise. This thesis gives insights into what really drives these IT professionals to share what they know and the implications for individual performance.

This study contributes to theory by drawing on both social exchange theory (SET), social cognitive theory (SCT) and the collectivism/individualism cultural values to explore the determinants of knowledge sharing in ISD projects and its influence on individual performance. The study also contributes to theory by comparing SET and SCT on how they fare on knowledge sharing. The practical implication of this study is that it showed that

interpersonal trust plays a significant role in knowledge sharing and that ISD project leaders need to make efforts to establish trustworthy relationships between project team members.

This introductory chapter is outlined as follows: Firstly, key concepts on knowledge sharing and ISD projects are introduced. This is followed by a discussion of the relevance of this study to information systems research. The background to the research problem and the challenges of knowledge sharing in ISD projects are discussed as well as the context of the study location. The problem statement, research goals, research aims, research objectives, and research questions are then outlined. Lastly, the delineation of the study is discussed, and the structure of the thesis is outlined with a brief summary of each chapter.

1.1 Introduction to the field of study

This introduction to the field of study gives an overview of key concepts that make up the research topic. It also outlines the relevance of this information systems research. The section starts with the discussion of ISD projects, followed by a discussion of the complexity of ISD projects and the need for agility in ISD projects. It ends by discussing knowledge sharing in ISD projects.

1.1.1 Information Systems Development (ISD) Projects

ISD projects are made up of knowledge-intense activities that are complex and therefore warrant various types of knowledge from ISD project members (Xia & Lee, 2004). Modern ISD projects are both technically and organisationally complex (Karlsen, Hagman & Pederson, 2011). Information Systems (IS) combine information, information technology, data, and people (Lu, Xiang, Wang &Wang, 2011). The key elements that make up information systems interact with one another to provide information used for decision making as well as operations within an organisation (Lu et al., 2011).

In this study, an ISD project is defined as the blueprint, investigation and execution of information technology such as hardware, software systems, and applications (Pee et al., 2010). Information Systems are developed or undertaken under a project structure (Li, Yang, Klein & Chen, 2011) and organisations arrange knowledge-intensive tasks around these projects (Mueller, 2014). ISD related tasks are allocated to various individuals based on their expertise as there is no single individual who can perform all the project tasks on their own. In addition, since projects are temporary and are intended to be completed in a short space of time under a tight budget (Almeida & Soares, 2014), knowledge sharing is key to achieving the goals of the ISD project (Mehta, Hall & Byrd, 2014). Organisations are able to respond more quickly to their needs when they are able to organise knowledge-intensive tasks through projects and these tasks are shared amongst the individuals in the projects based on the skills and expertise (Almeida & Soares, 2014).

ISD projects are usually staffed with IT professionals from different areas in the organisation who come together to accomplish the goals of the ISD project (Mehta et al., 2014). Each ISD project is a human-based process which happens in a shared space where there is a high level of uncertainty (Levy & Hazan, 2009), and its success depends on the expertise and knowledge of individual IT professionals (Aurum, Jeffery, Wohlin & Handzic, 2003). The ISD projects relies on the expertise of individual members to build a complete product (Ryan & O'Connor, 2013) with the project's tasks being shared amongst the various IT professionals. Consequently, as Ghobadi and D'Ambra (2013) note, knowledge sharing plays a huge part on the success of the project.

In a study done on the factors that affect the performance of open source software (OSS) projects, reciprocity and structural capital were found to influence expertise integration amongst OSS project team members (Chou & He, 2011). Past research has shown that the

shortage or limitation of knowledge resources contributes to project failure (Lin, Chen, Hsu & Fu, 2015).

1.1.2 The complex nature of ISD projects

Different ISD projects need to address a wide range of issues in our society and must solve many diverse problems. These complex ISD projects require knowledge from different domains such as project management and ISD (Sudhakar, 2012). ISD is being relied upon by organisations for operational and strategic purposes (Pee et al., 2010).

ISD projects are knowledge-intensive and require the expertise of all IT professionals involved (Pee, Kankanhalli & Pee, 2010). IT professionals in ISD projects learn and access the experiences of their fellow colleagues when they combine and share their tacit and explicit knowledge (Lee, Park & Lee, 2015). The complexity of ISD projects will determine the kind of IT professionals that should be part of the project based on their knowledge and expertise. ISD projects are complex because the projects are often ill-defined the process of problem solving needs more than just finding the correct answer.

The diverse skills and knowledge of the project team members (who are usually sourced from various functional teams in the organisation) means that each member has a different understanding of the customer needs and project goals which may lead to unavoidable conflict (Hsu, Li & Sun, 2017).

1.1.3 Knowledge sharing in ISD projects

Knowledge is processed information which has been mixed with reflection, experience, context and interpretation (Davenport & Prusak, 1998). Knowledge is considered an important resource which enables an organisation to compete and innovate, and it resides within individual employees and organisations (Kridan & Goulding, 2006).

Knowledge can either be explicit or tacit in nature. Tacit knowledge is knowledge that is embedded in the minds of individuals and it is obtained through experience and action. Tacit knowledge is very difficult to share or to take it away from its source, while explicit knowledge is the knowledge that has been codified or formalized and it is easily available to other individuals (Park & Gabbard, 2018).

Knowledge management is a set of practices designed to achieve the optimal use of knowledge by ensuring that important information is distributed and shared within the organisation in order to make better decisions (Colnar & Dimovski, 2017). In the context of ISD projects, there are three dimensions to knowledge management which are: knowledge practices, enabling environment and knowledge stock (Reich, Gemino & Sauer, 2014). Knowledge practices are procedures that are followed to plan and share knowledge amongst IT professionals. Knowledge stock is the technical and business domain knowledge held by IT professionals. Enabling environment is the integration of the social and technical aspects of the ISD projects which helps foster knowledge sharing (Reich et al., 2014).

The growing importance and challenges of knowledge sharing in organisations have gained attention both from practitioners and researchers in recent years. The fast-paced technological and market changes have led organisations to find better ways of responding to market pressures in order to stay relevant to the markets and customers they serve. Through knowledge sharing, IT professionals can apply their knowledge in their tasks which may result in innovation and organisational competitive advantage (Zhang & Jiang, 2015).

Knowledge sharing has been defined in many ways by various researchers. Essentially, knowledge sharing is when individuals make available their knowledge to others in the project or within the organisation (Wickramasinghe & Widyaratne, 2012). In this study, knowledge sharing is defined as the interchange of experiences, information and skills

between knowledge provider and knowledge seeker. Information in this regard refers to details about the ISD projects such as budgets, timelines, resources and project scope.

ISD experiences are normally obtained on the job through many years of work. Skills are task-related knowledge such as programming, process mapping, sourcing and compiling business requirements and technical designs documents, configuration of servers and applications etc. In ISD projects, knowledge sharing is an important activity because it inspires individual IT professionals to maintain social capital, by working together in pursuit of the desired project goals (Park & Lee, 2014).

Sharing knowledge in an ISD project alone is not enough; whether the knowledge being shared is of high quality and can be used to solve problems during the development of the information system being undertaken is of enormous importance (Ghobadi & D'Ambra, 2012). ISD demands collaboration and sharing of knowledge between technology and business and due to the difficulty of knowledge-based collaborations, ISD projects are more prone to failure (Lee et al., 2015). The failure of ISD projects can happen in many forms such as overspending, diverging from the originally-agreed scope and missing deadlines (Lee et al., 2015).

According to Kuo (2013), knowledge sharing has been observed as a vital factor for knowledge management, and its value is key to the success of an organisation. The tacit nature of the domain knowledge which is crucial during ISD projects makes it even more important that organisations embrace knowledge sharing, including:

- Sharing of expertise and knowledge between the ISD project team and the customer regarding the proposed information system;
- Eliciting business requirements from the customer;

- Establishing a secure repository to be used as a knowledge store of the proposed information systems from ISD project team and customers;
- Safeguarding knowledge from disappearing as experienced individuals resign from the organisation or project; and
- Prioritising the distribution of knowledge amongst team members in the quest to achieving project task assigned to team members (Chang, Yen, Chiang & Parolia, 2013).

The points raised above show that ISD projects are staffed with IT professionals from different functional teams in the organisation, and that these IT professionals have knowledge and experience that is critical to achieving the goals of the proposed information systems.

In ISD projects there is a need for mutual understanding where the IT professionals involved should realize that their tasks are interdependent and that they need to work together with their colleagues to complete all their respective tasks. They also need to realize that the sharing of knowledge should not be forced, but that individuals need to do it based on their own will.

This section introduced ISD projects and the role of knowledge sharing in ISD projects. The next section gives the relevance of this information systems research and the background to the research problem.

1.2 Relevance of this information systems research

A key IS issue facing organisations is how to put together an efficient and effective ISD project team. This is because ISD projects are multifaceted in that they consist of people, processes, tools and technology. The practical challenge is in putting together an ISD project team that will deliver a working Information Systems within the stipulated time frame with

fulfilled requirements. The success of such a team may be challenged by the fact that the background and expertise of the IT professionals in the project differ. This may impact the flow of knowledge between the team members.

The theoretical challenge is that the literature does not adequately address the behaviours which may drive IT professionals to share or not share knowledge in ISD projects. Existing literature minimally explains when and why IT professionals share knowledge during ISD projects. There is no adequate body of knowledge that addresses knowledge sharing amongst IT professionals, especially in the context of South Africa; therefore, there is a need to close the knowledge gap. A theoretical understanding the behaviours which influence IT professionals to share knowledge is likely to have a practical benefit for ISD projects.

Thus, the relevance of this study to IS research is:

1. Practically, the current key IS issue centres on how to put together teams of IT professionals that will deliver working Information Systems that satisfies customer requirements.
2. The current theoretical issues relate to understanding the factors that drive IT professionals to share or not to share knowledge.
3. The contextual challenge is understanding the factors that influence individuals to share knowledge in the context of South African IT professionals implementing ISD projects.
4. The methodological key issues centre on which research strategies can appropriately be used to better explain what influences knowledge sharing in ISD projects.

This section has discussed the problem context and outlined the relevance of this information systems research. The next section discusses the background to the research problem. Firstly, the concept of knowledge in organisations is discussed, followed by knowledge sharing

challenges. Prior studies in knowledge sharing from the South African context are also explored.

1.3 Background to the research problem

This section provides the background to the problem that the study aimed to address; it comprises of the explanation of knowledge and knowledge sharing in the context of ISD projects. It also highlights the research gaps identified from related literature. Firstly, the importance of knowledge in organisations is discussed, followed by knowledge sharing challenges in ISD projects.

1.3.1 Knowledge in organisations

In this study, knowledge is defined as processed information from which timely and high-quality decisions can be made.

Knowledge is recognized as an important intangible asset that is needed for organisational performance. Knowledge sharing plays a crucial role to the organisation's attractiveness and accomplishment (Moustaghfir & Schiuma, 2013; Mueller, 2014). In the knowledge economy, an organisation’s success often lies in its ability to acquire and share knowledge quickly within its domain to enable timely and effective decision-making (Downey, Galdbraith & Kates, 2002).

The knowledge held by individual employees needs to be viewed as a cherished intangible asset that should be managed well to realize good organisational success (Ipe, 2003). Knowledge held in the relationships between employees (called organisational or embedded knowledge) also needs to be respected as a lack of knowledge sharing between functional areas may trigger lack of performance of the ISD project (Nelson & Cooprider, 1996).

1.3.2 Knowledge sharing challenges in ISD projects

This subsection looks at challenges relating to knowledge sharing in ISD projects and how they impact on project success.

Challenges related to knowledge sharing

We know that knowledge sharing enables IT professionals to share and integrate individual's know-how and experiences with each other, and that the ISD project is at risk of failure when knowledge sharing challenges are not addressed.

ISD projects are faced with many risks that can results in the failure of a project, and factors relating to knowledge sharing are key. For example, turnover of IT professionals is a major risk which can result in the loss of valuable knowledge and experience (Pee, Kankanhalli, Tan, & Tham, 2014). Not only is old knowledge lost, new ISD project members are then also faced with the challenge of having to familiarise themselves with the frequent changes in organisational neccessities, technological landscape, as well as completing ISD projects within stipulated time, agreed scope and financials (Chang et al., 2013).

Another aspect involves the diversity and complexity of ISD projects. Organisations may embark on ISD projects to address different problems such as business opportunities, automation or enhancing a current or new business processes (Park & Lee, 2014). Since ISD projects are temporary, they often get staffed with IT professionals drawn from various areas of the organisation. In an ISD project environment, the diverse knowledge held by project IT professionals can assist the team with creative problem solving (Lee et al., 2015). While the diversity of expertise is essential for the success of the project, forming a new team poses a challenge to knowledge sharing as the team members' domain and technology expertise and way of work can differ enormously.

A key knowledge sharing obstacle encountered in ISD projects is how to comprehensively understand the underlying problem and design a new information system that addresses it. Developing a new information system that addresses the problem requires technical knowledge as well as knowledge in relation to the application domain (Tiwana & McLean, 2005). Much of the knowledge is scattered amongst a number of IT professionals (*Ibid, 2005*) or is held by the client. Even if the knowledge is held by IT professionals in the organisation, it may not be instantly available in a written form, such as business requirements, technical design specification and so forth (Tiwana & McLean, 2005). There is thus a need to understand how IT professionals such as business analyst, architects, project managers, programmers, systems analyst and others share knowledge which is needed in for the successful completion of the ISD project.

Factors influencing knowledge sharing

Knowledge sharing is acknowledged as having a significant influence on performance. However, the risks related to knowledge sharing are exacerbated by the fact that the manner in which knowledge sharing affects performance amongst IT professionals during ISD projects is not fully understood. It is thus very important to understand what influences IT professionals to share knowledge during ISD projects (Pee et al., 2010).

Employees in organisations often treat their professional knowledge as valuable personal assets that set them apart from their peers (Kuo, 2012). This is true in an ISD project setting where individuals recognise that the knowledge and skills they possess are valuable assets. This may dis-incentivise them from sharing their knowledge with fellow workers (Kuo, 2013). Instead, IT professionals may hoard knowledge or may share little or no knowledge at all with their peers as a result of the economic value they attach to their knowledge (Ghobadi & D'Ambra, 2013; Wang & Hou, 2015). In a cooperative setting similar to ISD projects, research has found that individuals compare the paybacks they will obtain as a consequence

of sharing their knowledge beforehand (Tsai, Chang, Cheng & Lien, 2013). Information systems studies emphasize the real-world effects of the knowledge being shared in accomplishing the ISD project objective (Ghobadi & D'Ambra, 2013). Therefore, it is imperative that the knowledge being shared should be able to be successfully applied to problem solving in the ISD project. How well an ISD project succeeds may depend on how well the sharing of knowledge amongst IT professionals occurs. When individuals working on an ISD project harmonize with one another and share their experience and understanding, it can lead to better outcomes (Park & Lee, 2014).

Impact of knowledge sharing on ISD project success

Notwithstanding the use of contemporary systems development processes, ISD projects are still frequently unsuccessful and in many occasions, projects are delivered late, fail altogether, or are abandoned as a result of outcomes which are contrary to the customer's expectations (Chow & Cao, 2008; Lu, et al., 2011), behind schedule or unappreciated by clients (Mathiassen & Pourkomeliyan, 2003). Team members' failure to share knowledge with one another is a key risk factor (Lu et al., 2011).ISD projects consist of complex activities and there is a need for IT professionals to capitalize on the expertise of one another to finish the responsibilities assigned to them. As ISD project tasks become more complex, the project not only experiences technological problems, but also faces human problems, such as behavioural issues (Lu et al., 2011). Knowledge sharing amongst IT professionals is a very important behavioural factor that leads to the success of the ISD project (Lu et al., 2011). ISD project tasks are interdependent and these requires individual resources to work together to share knowledge to complete the project (Chang et al., 2013). IT professionals in ISD projects should be willing to go the extra mile and invest more effort in knowledge sharing processes so that effective knowledge sharing can take place (Wang & Hou, 2015). Knowledge sharing is vital to ISD projects as it inspires members to uphold social capital to

achieve great performance and instil innovation in the team (Park & Lee, 2014). The presence of the social exchange of knowledge speeds up performance, reduces absenteeism and leads to a reduction in staff turnover (Tsai et al., 2013). Knowledge sharing also inspires IT professionals to partake in progressive behaviour. ISD projects happen in a context where social, organisational and management culture forms part of the organisational settings in which knowledge sharing in occurs. Table 1-1 shows a summary of knowledge sharing challenges in ISD projects which are categorized under management and social attributes.

Table 1-1: Challenges of knowledge sharing in ISD teams (Zahedi, Shahin & Babar, 2016)

Category	**Challenges**	**Descriptions**
Management	Turnover of employees	• The need to reconstruct social ties. • The need to transfer knowledge to newer employees. • Lack of motivation to share knowledge with newer employees. • Gaps in understanding and sharing knowledge amongst team members.
Social attributes	Low priority for knowledge sharing	• Knowledge sharing activities being sacrificed in order to meet project deadlines.
	Hierarchical structure	• Hierarchies that results in knowledge sharing bottlenecks.
	Technical knowledge and education gaps	• Technical knowledge imbalance which results in low quality of knowledge being shared. • Communication difficulties due to a lack of shared common technical jargon. • Inexperienced employees with limited understanding.
	Lack of trust	• No formal ties for team members to informally share knowledge.
		• No commitment trust to activities associated with knowledge sharing.
	Fear	• Lack of willingness to share knowledge due to job loss fear.
	Lack of openness	• Resistance to ask questions.

This section introduced the background to the research problem. It discussed knowledge in organisations as well as knowledge sharing challenges. Knowledge sharing happens in a social and organisational context and the next section discusses previous studies undertaking in knowledge management or knowledge sharing in projects in South Africa specifically.

1.3.3 Prior knowledge sharing studies within the South African context

This section reviews studies on knowledge sharing or knowledge sharing with the South African context. The review includes what was studied as well as the contribution made by the studies.

Khoza and Pretorius (2017) conducted a study into factors that negatively influence knowledge sharing in software development. The study was conducted on the software development industry in South Africa. Quantitative and qualitative data were collected from participants with software development knowledge from four software development organisations listed in the Johannesburg Stock Exchange (JSE). The study reveals that job security, motivation, time constraints, physiological factors, communication, resistance to change and rewards negatively influence knowledge sharing in software development organisations.

Prinsloo, van Waveren & Chan (2017) explored factors that impact knowledge dissemination in engineering projects. The contribution of the study is on the identification of factors that influence knowledge dissemination through a systematic literature review. The study also conducted interviews with expert groups with project management experience to evaluate the original list of factors obtained from conducting literature review. The study suggests that the critical factors identified as having a high impact on knowledge

dissemination in projects are mainly influenced by factors pertaining to individuals rather than factors which relate to knowledge, organisation or characteristics of the project.

Dube and Ngulube (2012) conducted a study on knowledge sharing in a multi-cultural environment. The study was exploratory in nature and followed the qualitative approach and data was collected through interviews as well as document analysis from seventeen academic staff from the University of South Africa's Information Science Department. The study revealed that knowledge sharing in the chosen case study was hampered by lack of institutional policies to guide knowledge sharing practice, limited strategies for knowledge sharing initiatives recognition or reward, institutional policies that did not encourage knowledge sharing as individuals (rather than group performance was rewarded or honoured).

Jewells and Ford (2006) focused on the factors which influence knowledge sharing in IT projects. The study was conducted as a case study across four different continents. It continents including Africa. The study collected data through three ways: survey, interviews and participant's observations. In South Africa, the study collected data from 11 individuals at ABSA Bank and SITA. However, the paper only reported the results based on quantitative data and not the qualitative data. The study revealed that team members were motivated to share knowledge and experiences when they believe it will contribute positively to the project team success.

Van den Berg & Snyman (2003) researched the use of IT enabled community of practice to manage the sharing of tacit knowledge. The study took the form of a case study and data was collected using interviews, documentation and semi-structured questionnaires with management during the planning of the community of practice, and with staff during the evaluation phase of the community of practice. The case study was carried out at a large

distribution organisation in South Africa. The study reveals that in the organisation, executive management as well as all other staff did not know what knowledge management is and what value it can bring to their company. After several workshops with all staff, a community of practice was implemented.

Averweg (2012) studied the use of intranet to augment knowledge sharing at the eThekwini Municipality. The study used secondary data from the municipality's employees via e-mail. The paper showed how the implementation of IT enabled Community of Practice (CoP's) can assist employees to convert their tacit knowledge into explicit knowledge where employees can share work related information with their fellow employees.

Van der Walt, van Brakel & Kok (2004) conducted a similar study on knowledge sharing using the organisation's intranet. This paper showed that there was no knowledge sharing culture in the organisation where the case study was carried out. This study contributed to knowledge management literature by showing that even though management consulting firms are regarded as knowledge producers who solve business problems of their various clients, they don't always have the best knowledge management frameworks in place to harness knowledge from their skilled employees or to capture lessons learnt from various projects they undertake with different clients. The paper showed that that IT- enabled knowledge sharing tools on their own are not enough to encourage employees to share knowledge and that senior management support is needed for any knowledge management initiatives to succeed.

Pretorius & Steyns (2005) explored knowledge management practices in project environment. The case study involved a South African bank which has been in operation for a decade and the case was carried out in three different project locations. The findings of the study reveal that project documentation (such as budgets, minutes of project meetings as well

as project schedules) and the culture of knowledge sharing differs in all three environments. This paper derives a knowledge management framework that can be used in project management.

Summary of contributions and short comings of prior South African studies

The preceding subsection reviewed knowledge sharing studies conducted in South Africa. This subsection summarizes the contribution and shortcomings of these studies with respect to the body of knowledge.

1. The study by Khoza & Pretorius (2017) contributed by identifying individual, organisational and technological factors that negatively influence knowledge sharing in software development. The study also ranked the factors that negatively influence knowledge sharing. The shortcoming of this study is that it was not underpinned by a sound information systems theory, and that data was collected only from software development companies. It was done from the negative perspective of knowledge sharing. This thesis collected data from IT professionals in various industries such as IT, financial services, oil and gas, government and many others. Social cognitive and social exchange theories were used as theoretical lenses. The thesis unpacks the influence of knowledge sharing on individual performance.
2. The study by Prinsloo, van Waveren & Chan (2017) contributed by systematically reviewing literature to show factors that influence knowledge dissemination. The shortcoming of the study is that it was focused on engineering projects and was not underpinned by an information systems theory. This thesis is about IT professionals from different industries, and not just from engineering.
3. The contribution of Pretorius & Steyns (2005) study is on deriving a knowledge management framework that can be used in project environment. The shortcoming of

this study is that it was not underpinned by an information systems theory. SCT and SET was used as theoretical underpinning to explore knowledge sharing amongst IT professionals during information systems projects in this thesis.

4. Van der Walt, van Brakel & Kok (2004) contributed by showing that management consulting firms do not always have the best knowledge management frameworks in place that will enable their employees to share knowledge, and that the lack of knowledge sharing culture inhibits knowledge sharing. The shortcoming of the study is that no explanation was given on how the questionnaire used to collect data was designed. The present study used questionnaires with items adapted from previous validated studies. The instrument was contextualised to fit the purpose of the study.
5. The contribution of Averweg (2012) study is in showing the role played by IT enabled community of practice in aiding employees to convert their tacit knowledge into explicit knowledge. This thesis study used primary data sourced from IT professionals from various industries. The thesis did recognised the importance played by IT enabled virtual communities in knowledge sharing, but it was not the core focus of our study.
6. Van den Berg & Snyman (2003) study contribute by showing the role played by senior management for the success of any knowledge management initiative. The contribution of this study is in showing the importance of aligning the knowledge management processes such as creation, codification, dissemination and utilization with explicit and tacit knowledge. They also contributed by deriving a knowledge management framework that can be used in project environments. The shortcoming of the study is that it was not underpinned by an information systems theory, and that since the organisation implemented a new IT enabled knowledge sharing tools, the adoption of the new technology by employees was not considered as it may play a role on whether employees uses the new technology to share knowledge or not. This

thesis did not look at the IT enabled sharing tools as a mechanism that IT professional uses to share knowledge.

7. Jewells and Ford (2006) study contributed by showing that individual in project teams were not driven by personal extrinsic motivational factors such as financial rewards and personal status to share knowledge with other individuals. The shortcoming of the study is that data was collected from eleven individuals in the financial and IT sector in South Africa. This thesis collected data from IT professionals in various sectors This thesis also investigated the role of collectivism /individualism cultural orientation on knowledge sharing and how knowledge sharing influences individual performance.

   The study contributed to knowledge sharing literature by showing that personal extrinsic motivational factors such as financial rewards and personal status in the project team were not the driving force towards persuading individuals to share their knowledge with others in the project. The study found that individuals were motivated by the desire to see the team succeed. Lastly, the results also revealed that individuals will share knowledge if they believe it is expected of them to do so, in this case, expectations of sharing knowledge play a significant role in persuading individuals to share their knowledge in IT projects.

8. The contribution of Dube and Ngulube (2012) study is on identifying factors that prevent individuals from sharing their knowledge. The shortcoming of the study is that the case study was limited to a specific department at a certain University. This thesis looked the culture from the collectivist / individualistic orientations to understand how an individual's cultural orientation's preference inhibit or enable knowledge sharing. This thesis also looked at how trust as an environmental factor influences knowledge sharing.

Generally, the shortcomings of the preceding studies are :

1. They were not underpinned by an information systems theory
2. They have not looked at the influence of environmental factors such as trust to understand how trust enable or prevents one from sharing knowledge.
3. They have not looked at the individualism /collectivism cultural orientation and its influence on knowledge sharing
4. They have not looked at how an individual's self-efficacy influences them to share knowledge or not.
5. They have not looked at how knowledge sharing influence individual performance

To this point, this thesis' contribution is additionally in bridging and addressing the knowledge gaps left by the prior South African based studies. For example, the thesis addresses the theoretical grounding gap by using Social Exchange Theory (SET) and Social Cognitive Theory (SCT) as theoretical lenses. The two theories were also comparatively analysed to see which theory better explains the knowledge sharing phenomenon in the perspective of IT professionals. This is discussed further in Chapter 3.

1.3.4 Study location and context

This section discusses the study location and context. This study was carried out in South Africa. That is, the thesis explains the factors which influence IT professionals' knowledge sharing within the South African economic, social and political context. Compared to other countries in Africa and the Middle East, South Africa is perceived as a significant player in the Information and Communication Technologies (ICTs) sector. The State Information Technology Agency (SITA) has been entrusted with the custodianship of ICTs services, predominantly in national departments and other government entities' in South Africa. The South African IT services market were forecast to touch R75.64 billion by 2013 and South

Africa has a 33.3 % slice of the ICT marketplace in Africa and the Middle East region (Hahn et al., 2010). South Africa ranks number 49 on the world global competiveness report out of 140 countries (World Economic Forum, 2015). Particularly, it ranks number 50 with regard to technological readiness and 38 in terms of innovation. The 2015 report shows an uptake of ICT and increase in innovation; South Africa moved from the 56th place in the previous report to 49th in the 2015 – 2016 global competiveness report.

The ICT sector contributes a significant amount to the South African Gross Domestic Product (GDP). Figure 1.1 shows the contribution of ICT to the South African GDP. In support of this, Kyobe (2011) indicates that ICTs adoption and diffusion contributes significantly to the development of a country's economy.

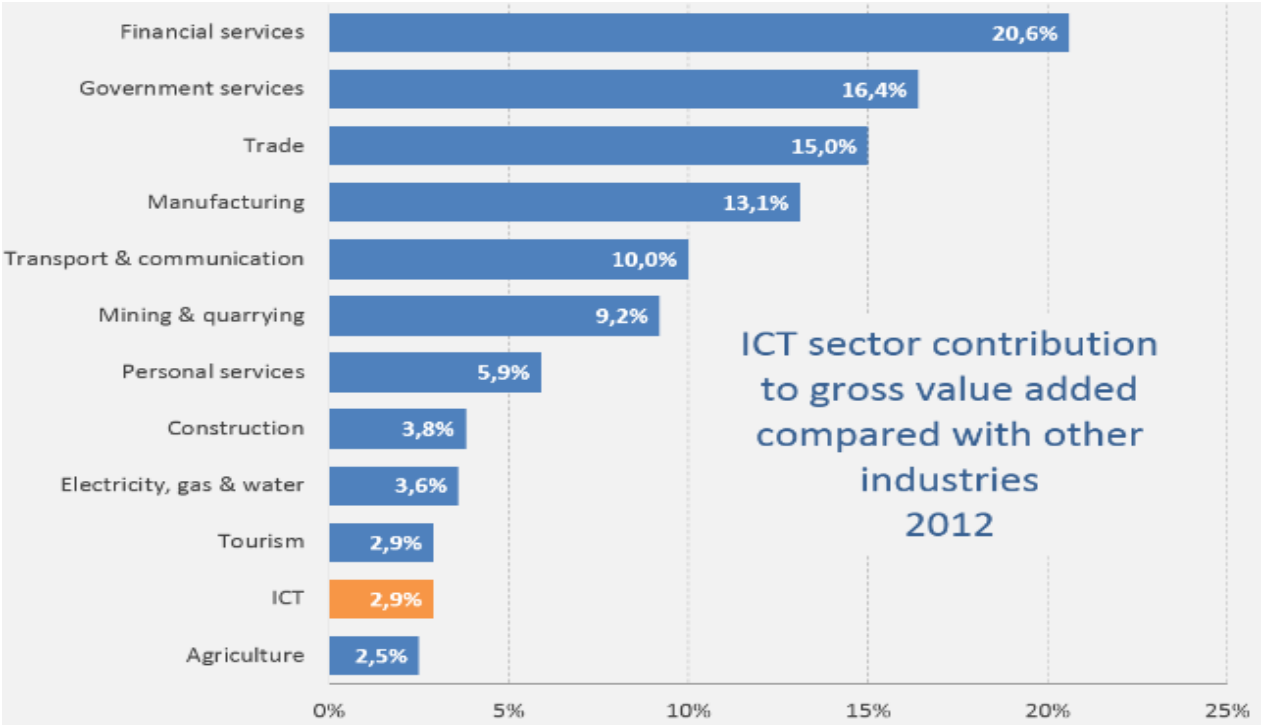

Figure 1-1: Contribution of ICT to the South African GDP (Stats SA, 2015)

In 2012, ICT directly contributed R94.7 billion in to the country Gross Domestic Product (GDP), which accounted for 2.9 % to the total GDP. ICT contributed more to GDP than the agricultural sector (Statistics South Africa, 2015).

There is a high demand for IT skills in South Africa. Service providers are in fact being negatively impacted as they cannot keep skilled IT employees for important IT projects because of the lack of skilled IT talent (Hahn, Anavitar, Liu, Cramosysan, McNee, Atwal, O'Connell, Munglani, Jones, Matson, Velosa & Bova, 2009). To add to this, skilled IT staff often accept higher paying jobs in other countries and this puts a strain on the South African local IT market. It appears that skilled IT resources in South Africa do not spend much time in one job or with the same employer, and that they will not hesitate to move to other organisations that will pay them better. This observation is supported by Jacobs, Otter, Hestermann, Chandler and Stevens (2008) who note that the implementation of modern applications is being threatened by the lack of IT talent. When organisations lose IT talent, they carry the exorbitant cost because they also lose tacit knowledge (Borges, 2013).

Individual differences between members of an ISD project team can exacerbate knowledge sharing challenges so it is very important to note that the South African population is racially, economically and culturally diverse. South Africa's complex political history has created divides between the black, white, coloured and Indian groups within the country. While black South Africans make up the vast majority of the total population (approximately 80%), this population is further made up of different sub-groups with their own indigenous languages. English is used as the language of business communication, but it is spoken as a home language by less than 10% of the entire population.

This section introduced the location of the study and the context in which it was undertaken. It discussed the South African ICT landscape and the challenges faced by the industry with regard to IT talent. Knowledge sharing studies completed in the South African context were also discussed.

The following section introduces the research problem and discusses the multidimensional context of the study from three viewpoints. Firstly, the context in terms of the IT industry in South Africa, the second context in terms of the IT profession in South Africa, for example, the shortage of IT skills and how organisations are fighting the war of IT talent in order to get staff who are in high demand and in short supply to assist in ISD projects. Lastly, the context of the IT professionals who participate in ISD projects in terms of cultural background. The context is very important in relation to the research problem identified in section 1.4 for which this study seeks to address. The next section discusses the research problem.

1.4 Research problem

The preceding sections have outlined the importance of knowledge sharing for the success of ISD projects and have highlighted some of the specific challenges to knowledge sharing in the ISD context in South Africa.

To recap: Knowledge sharing amongst IT professionals can be complex and challenging since individual backgrounds, contexts, and ISD expertise differ.

- IT professionals are part of a shared community that obtains, processes and shares knowledge with fellow colleagues.
- ISD projects are reliant on the sharing of knowledge between IT professionals.
- Different IT professionals bring with them a wealth of knowledge and expertise gained through experience in various ISD domains.
- Knowledge sharing is often challenged by the fact that IT professionals are often brought together from various functional areas of the organisation, may be working together for the first time, and that there may be a gap in the level of knowledge and expertise. Thus, knowledge sharing amongst IT professionals can be complex and challenging since individual backgrounds, contexts and ISD expertise differ.

However, what persuades and inspires individual IT professionals to share knowledge and individual experiences, "the know what" and "know how" is often not clear. The current body of literature relating to the South African context inadequately explains this. The studies that have sought to study knowledge sharing in ISD projects in the South African context have the following shortcomings:

- Most were not grounded in theory (Khoza & Pretorius, 2017; Prinsloo et al., 2017; Dube and Ngulube; 2012; van den Berg & Snyman, 2003; van der Walt et al., 2004).
- Some study designs lacked constructs and external validity (Khoza & Pretorius, 2017).
- Some studies made conclusions based on descriptive statistics (Khoza & Pretorius, 2017).
- Some used secondary data to make conclusions (Averweg, 2012).
- Some lacked proper research methodology or used methodologies inappropriately (Van der Walt et al., 2004).
- Findings are not generalizable as the majority of the studies were not done across a range of ISD projects (Prinsloo et al., 2017; Dube & Ngulube, 2012).

These identified challenges call for the development of theoretical frameworks that will serve as guidelines for knowledge sharing during ISD projects.

The problem that this thesis addresses is thus that, while it is well-understood that ISD project success is dependent on knowledge sharing between IT professionals who have varied knowledge, skills and experience and come from diverse backgrounds, there is insufficient understanding of the factors that influence knowledge sharing in the ISD project context, particularly in South Africa.

To address the identified research gaps and to answer the research questions, this study followed an explanatory research where the focus of the study is on studying the research problem and to explain the relationship between variables following the positivism research

paradigm. The study used a survey research strategy, using deductive quantitative approach where data was collected quantitively using questionnaire from IT professionals identified through non-probability purposive sampling. Qualitative data was also collected to gain some insight on selected quantitative data. Quantitative data were analysed using smart partial least square 3.2 and qualitative data were analysed using thematic analysis. The research model was tested using partial least square – structural equational modelling (PLS-SEM). The research design has been explained in detail in chapter 4.

1.5 Summary of contribution

In addressing the research gaps identified in section 1.3.3 and 1.4, the contribution of this thesis is in terms of understanding how social cognitive, social exchange theories and cultural values clarify knowledge sharing amongst IT professionals during ISD projects. The thesis contributions are detailed fully in chapter 8.

By investigating the impact of various categories of exchange, cognitive and espoused cultural values, the outcome of this study can assist information system practitioners involved in ISD projects to devise better ways of improving knowledge sharing in ISD projects by enabling them to persuade and manage the diverse dimensions of exchange, cognitive and espoused cultural values in ISD projects.

1.6 Research argument

The research argument driving this thesis is that there is a need for a theoretical model that may be used to explain knowledge sharing amongst team members. This model may be used to leverage the theoretical and practical challenges of putting together an ISD project team. The thesis conceptualizes such a model.

1.7 Research purpose, aim, goal and objectives

The research purpose, aims, goals and objectives of the study are as follows:

1.7.1 Purpose

The purpose of this study was to explore and explain the factors that influence knowledge sharing amongst IT professionals during ISD projects.

1.7.2 Aim

The aim of this study was to analyse which of the two theories (Social Cognitive Theory and Social Exchange Theory) best explains knowledge sharing amongst individual IT professionals during ISD projects.

1.7.3 Goal

The goal of this study was to conceptualise a model for knowledge sharing amongst South African IT professionals, during ISD projects.

In order to achieve the goal, the following objectives were tackled:

1. To explore and identify social cognitive and social exchange factors that influence IT professionals sharing of knowledge during ISD projects
2. To explore and explain the extent to which various factors influence knowledge sharing and individual performance. The factors are namely:
    a. social exchange factors (trust, expected rewards, expected reciprocal relationship)
    b. social cognitive factors (knowledge sharing self-efficacy, outcome expectation) and
    c. culture.

3. To explore and explain the extent to which knowledge sharing self-efficacy mediates culture and knowledge sharing.
4. To compare the two underpinning theories to best explain individual knowledge sharing.
5. To explore the influence of knowledge sharing on individual performance.

1.8 Research questions

In order to achieve the objectives of this study, the study considered the following research questions.

1.8.1 Primary research question

Why do individual IT professionals share knowledge during Information Systems Development projects?

1.8.2 Secondary research questions

The primary research question was broken down into sub-questions:

1. What social cognitive and social exchange factors influence IT professionals to share knowledge during ISD projects?
2. To what extent do social cognitive factors (trust, expected rewards, expected reciprocal relationship), social cognitive factors (knowledge sharing self-efficacy, outcome expectation) and culture influence knowledge sharing and individual performance?
3. To what extent does culture and knowledge sharing self-efficacy mediate knowledge sharing and culture?
4. Which theory best explains individual knowledge sharing during ISD projects?
5. What is the influence of knowledge sharing in individual performance?

1.9 Delineation of the study

This study was limited to social cognitive and social exchange factors influencing knowledge sharing during ISD projects amongst IT professional in South Africa. Data was only gathered from IT professionals who have working experience and knowledge in ISD projects. This study did not look at the factors that result in the overall success of the project nor the information systems development methodology followed in the ISD projects. The study was only interested on those factors that persuade IT professionals to share knowledge during ISD projects that may enable them to perform very well and which may result in the overall success of the ISD project under consideration.

1.10 Summary of the chapter

This chapter introduced the field of study by delving into knowledge in information system development projects. It includes the background to the research problem, and the argument of the thesis. It also presented the aim, goal and purpose for which this study was undertaken. Research objectives and research questions were also discussed. The chapter concludes with an outline of the entire thesis.

1.11 Thesis outline

The rest of the thesis is outlined as follows:

Chapter two starts with the survey of scholarship on knowledge, knowledge sharing and ISD projects. It looks at what other authors have previously argued in relation to knowledge sharing and ISD projects. The chapter ends with a summary.

Chapter three presents the research hypotheses and the operationalization of constructs. It clearly defines the constructs and how they have been used in this thesis. The association

amongst the study constructs is hypothesised based on the literature. The chapter also discusses in detail the two theories used as theoretical lenses in this study. The chapter ends by proposing the research model.

Chapter four outlines the research methodology and design adopted. It includes the discussion of research philosophies and data collection techniques. It also includes the process followed during data preparation and discusses the research scope as well as ethics that were taken into consideration for this thesis.

Chapter five presents the outcomes from statistical analysis as well as hypothesis testing through the use of Partial Least Square (PLS) - Structural Equation Modelling (SEM). Construct validity, hypothesis testing and the assessment of the research model are explained in detail. The chapter also presents the comparative analysis of the social exchange and social exchange theories in order to determine which of the two theories better explains knowledge sharing amongst IT professionals during ISD projects. The chapter closes with a summary of outcomes from the hypotheses testing and presentation of the final research model.

Chapter six outlines the discussion of the results of the study based on empirical evidence. It presents the outcomes of the thesis and the implication thereof.

Chapter seven provides the analysis of the participant's qualitative responses. It reports how the responses were organised into themes and how the qualitative findings were analysed against the quantitative responses.

Chapter eight presents the evaluation of the research. It reflects on the research journey. It shows how the intention of the study was achieved, how the research questions that drove the study were tackled and how the research objectives were achieved. It also contains the

limitations of the study and suggestions for future research. The chapter also discusses the contribution of the study as well as an overall conclusion.

CHAPTER 2

SURVEY OF SCHOLARSHIP AND THEORETICAL FOUNDATIONS

2.1 Introduction

The previous chapter introduced readers to the field of study as well as the research problem and the objective of the study. The intention of this chapter is to unpack the concepts of knowledge sharing within the context of ISD projects in order to give a foundation to the present study. The literature related to knowledge sharing and ISD projects is thus reviewed.

The chapter is structured as follows:

- A high-level overview of knowledge, knowledge types and knowledge sharing is provided, followed by a discussion of tacit and explicit knowledge.
- A discussion of information systems development projects includes the differences between agile and traditional systems development methodologies, complexity in ISD projects, project team members' interdependence, context awareness and social presence.
- Organisational culture and knowledge sharing are then discussed, including typologies of organisational culture.
- The next section focuses on knowledge sharing and internet technology.
- Then interpersonal trust and knowledge sharing are discussed, including types of trust.
- The subsequent section discusses rewards, reciprocity and outcome expectation.

- Lastly, the summary of the chapter is given.

2.2 Knowledge

In the current competitive world of business, knowledge is recognized as the utmost source from which organisations can create significant value for their shareholders. The management of knowledge is understood to be crucial for organisational competitiveness (Moustaghfir & Schiuma, 2013). As explained in the resource-based view of a firm (RBV), organisations that want to sustain an advantage over their competitors need to be able to create and manage assets that cannot be imitated by others (Jain, Sandhu & Goh, 2015). Gone are the days when organisations used to solely compete based on tangible and visible resources. In this day and age, forward-looking organisations are competing through intangible resources such as intellectual capital and knowledge-based assets which are held in the brains of individuals as tacit knowledge (Jain et al., 2015). Knowledge is attached to the person who possesses it and it becomes a personal asset which symbolizes the proficiencies of pooled resources in networks and alliances (Smith, 2001). In support of this, Davenport and Prusak (1998) say that, due to its intangibility, knowledge assets are very hard to duplicate and they are more significant than resources that can be touched and felt.

There is a great need to distinguish between knowledge, data and information which are often (wrongly) used interchangeably. Data is a set of raw facts that may be useful or not useful for a specific task. Information is data which has been processed and appropriate for a specific task (Karlsen et al., 2011). Knowledge is processed information which has been mixed with reflection, experience, context as well as interpretation (Davenport & Prusak, 1998). An organisation can sustain and increase its competitive advantage if it encourages its workers to effectively share useful knowledge with their fellow workers (Hau, Kim, Lee & Kim, 2013). Quigley et al., (2007) note that there is increasing evidence which suggests that organisations

that successfully build an atmosphere that is favourable to knowledge sharing and where shared knowledge is put into use are more productive.

In an organisational setting, knowledge resides with individual employees and such knowledge should be effectively managed in order to achieve organisational performance (Wickramasinghe & Widyaratne, 2012). There is a need for workers with precise understanding and competencies to share knowledge with their fellow employees collaboratively so that the organisation can perform successfully (Park, Lee & Lee, 2015). The organisation's ability to identify, create, share and apply knowledge in its daily tasks has an impact on its competitive advantage (Choi, Lee & Yoo, 2010).

2.2.1 Tacit and explicit knowledge sharing

Tacit knowledge is knowledge which is entrenched in an individual team member's brain and it is very difficult to remove from its source. Tacit knowledge represents knowledge which is based on an individual experience acquired over many years (Koskinen & Vanharata, 2002). It is not easy to acquire or to share as it resides in social relations amongst individuals (Koskinen & Vanharata, 2002).

Explicit knowledge, on the other hand, is knowledge that is easily expressed in written format and can be found in organisational reports and or on the internet (Hau et al., 2013).

Both explicit and tacit knowledge are very important to the organisation and there are various means by which the knowledge gets shared amongst employees. Organisations need both types of knowledge to function properly and to compete successfully in a tough business environment.

There are two dominant perspectives which exist regarding the relationship between tacit and explicit knowledge (Jasimuddin, Klein & Connell, 2005):

a) **Knowledge as a category:** This approach suggests that tacit and explicit knowledge represent different branches of knowledge with different characteristics. This approach posits that tacit knowledge cannot be separated from the individual who possesses such knowledge, while on the other hand, it is very easy to codify, document and to transmit explicit knowledge to the wider audience;

b) **Knowledge as a continuum:** This approach doesn't separate tacit from explicit knowledge, but sees knowledge as having both tacit and explicit characteristics.

In essence, an organisation needs both explicit and tacit knowledge to function optimally. One of the earliest and most established works by Nonaka and Takeuchi (1995) is the Socialization, Externalization, Combination and Internalization (SECI) model which describes four quadrants for knowledge creation and sharing in terms of tacit and explicit knowledge and the model is shown in figure 2-1.

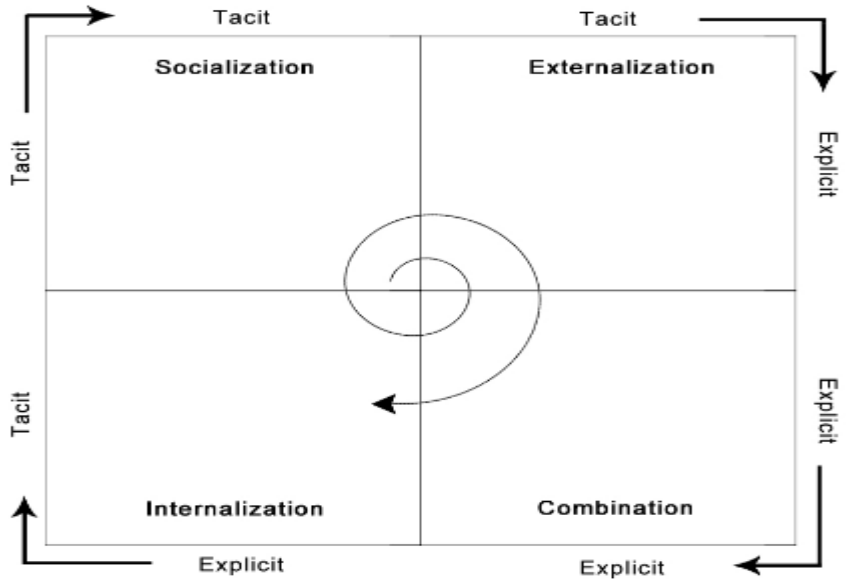

Figure 2-1: SECI model (Nonaka, 2008)

The SECI Model illustrates four modes of knowledge sharing as proposed by Nonaka (2008), it shows the four quadrants of socialization, externalization, combination and internalization

in which both explicit and tacit knowledge are generated and shared amongst individual employees in an organisational setting. As noted by Lee and Kelkar (2013), the SECI model as proposed by Nonaka (2008) is a potential model to help understand how knowledge is created and or shared amongst IT professionals in an organisational setting.

The SECI model can be understood as follows:

a) **Socialization** is where tacit knowledge is transferred from one person to another. This can happen when individual employees interact with their peers in formal or informal settings. During this process, new knowledge is developed through shared personal experiences. This is one of the best ways in which individual employees can share their knowledge which they can apply in their work when needed.

b) **Externalization** is when tacit knowledge is transformed into explicit knowledge. This can occur, for example, by writing down or describing the processes one uses at work. A relevant collaborative example of this is using online discussions databases for like-minded individuals to share problems and solutions.

c) **Combination** is whereby explicit knowledge is shared and expanded. In this process, localised and tested explicit knowledge is made available to a wider audience in the organisation. The key aspect of this process is the ability of the organisation to keep their explicit knowledge current and relevant and make certain that workers can use it in their work to carry out their tasks.

d) **Internalization** is when explicit knowledge is converted into tacit knowledge. In this process, employees identify relevant codified explicit knowledge and apply it in their work routines and it becomes part of their daily norm. In this process, the employee learns by doing.

Tacit knowledge can be technical or cognitive and is made up of beliefs, values, mental models, assumptions, insight and perceptions (Smith, 2001). Technical tacit knowledge is shown when an individual team member masters a particular skill or skills, while cognitive tacit knowledge includes implicit mental models and perceptions so deeply rooted in the team member's daily life, that they are often subconscious (Smith, 2001).

Unlike tacit knowledge, explicit knowledge is technical and needs some form of educational knowledge or experience gained through designed learning (Smith, 2001). Both tacit and explicit knowledge are very important to an organisation as one cannot be used in the absence of the other. This means that it is very important that both explicit and tacit knowledge be shared amongst the IT professionals working on an ISD project so that the project can be completed within the stipulated conditions. This is supported by Allameh, Pool, Jaberi and Soveini (2014) who note that knowledge is a very important indicator for organisational success; hence it needs to be managed carefully.

There are two types of knowledge sharing; personal advice usage and electronic document usage (Hass & Hansen, 2007). Personal advice usage is where knowledge is shared through direct contacts between IT professionals, such as when one team member advises another on how to complete a specific task. This facilitates the transmission of tacit knowledge. Electronic document usage, on the other hand, is when knowledge is shared through written documents and this encourages explicit knowledge sharing *(*Hass & Hansen, 2007).

Understanding the various forms of knowledge discussed here and the means by which knowledge can be shared and transformed is an important foundation for better understanding how knowledge can be shared in the ISD context and what motivates IT professionals to share their explicit and tacit knowledge.

2.3 Information systems development projects and knowledge sharing

ISD has changed in line with the transition of the global economy from an industrial to a knowledge-based economy (Ryan & O'Connor, 2013). The ISD field is highly knowledge-driven and depends on the expertise of individual employees in order to create a working product (Ryan & O'Connor, 2013). Many researchers have acknowledged that knowledge is now one of the most important, intangible and critical resources from which organisations can create value. Both tacit and explicit knowledge are key towards enabling the organisation to achieve its strategic objectives.

The Resource-Based View (RBV) theory of a firm explains that intangible resources, such as knowledge, enhance the performance of the organisation if they are combined (Barney, 1991). Regardless of sector, IT plays a crucial function in the competitive strategy of organisations these days. For example, software products command a sizeable market and generate annual revenue of more than $300 billion in the United States of America alone and it also contributes significantly to that country's economic growth (Ozer & Vogel, 2015). The management of IT professionals, IT projects as well as IT systems and all the tacit and explicit knowledge associated with them should be a key concern for the organisation (Koriat & Gerbard, 2014).

This is particularly true since ISD projects are characterised by a high failure rate and are often assessed as incomplete, full of challenges, late or over budget (Ozer & Vogel, 2015). Lu et al., (2011) report that the Standish group conducted a survey of 8400 Information Systems projects from 1994 to 2004 which revealed that the success rate of ISD projects during that period under review was less than 30%.

In the present, highly-competitive and dynamic business environment, organisations need to be agile so that they are in a position to respond quickly to unpredictable changes in economic conditions. One of the ways in which organisations are able to respond faster to the forever changing business landscape is through the use of IT. IT systems can streamline business processes or solve business problems (Park & Lee, 2014). These complex systems can help organisations make informed decisions and satisfy the needs of their clients. They are also used to run the organisation's operations and transactions in order to increase productivity, improve quality, and increase service quality as well as to enhance their competitive advantage (Lu, Xiang, Wang, & Wang, 2011). However, developing and implementing these systems is a knowledge-intensive and complex process. The explicit and tacit knowledge of the organisation and all team members are essential strategic resources needed to enhance the quality of the systems (Bharadwaj & Saxena, 2005).

ISD projects consist of complex tasks that cannot be achieved by any single individual, hence they are undertaken by a team with diverse skills. The various IT professionals on the team need to be able to communicate with each other, share information and learn whatever is necessary to get the project completed (Bharadwaj & Saxena, 2005). Walz, Elam and Curtis (1993) who note that in complex ISD projects, knowledge from multiple technical and functional domains is a necessity. In ISD projects, the sources of information and knowledge are not from an individual, but from relevant documentation, trial and error, and formal training sessions, as well as from other IT professionals (Waltz et al., 1993).

ISD project teams are usually formed temporarily to accomplish a specific project and are staffed with individuals who may not have worked together before. It is thus important for the IT professionals to build strong relationships very quickly (Pee et al., 2010).

Developing a shared understanding of the project needs, and building a shared knowledge base is key for the project team's ability to perform. Lu et al., (2011) who note that knowledge sharing is a very essential behavioural mechanism in the success of an ISD project. Knowledge sharing and collaboration, which are purely based on exchange relationships between IT professionals in an ISD project, are crucial in achieving the goal of the information systems implementation (Xu & Ma, 2008). Knowledge shared by each IT professional needs to be absorbed by the others into their own existing knowledge base. Individual team members then need to apply such knowledge in problem solving in the project (Ozer & Vogel, 2015).

It is clear from this discussion of the economic context and the literature that in the knowledge-economy IT projects are key to organisational success. It is also clear that knowledge sharing between IT professionals is key to IT project success. However, there are many factors which can impede the transfer of knowledge.

2.3.1 Model of knowledge sharing impediments in organisations

Szulanski (1996) outlines various factors that may prevent the flow of knowledge within organisations. The author says that unless those factors are dealt with decisively, the flow of knowledge between those who seek knowledge and those who provide knowledge may be challenged. The factors identified relate to the following characteristics (Szulanski, 1996):

Characteristics of knowledge transferred

It is not easy to convince a knowledge receiver of the value of the knowledge you are about to transfer if knowledge transferred in the past has not proven to be useful.

Characteristics of the source of knowledge

The knowledge provider may not want to share their knowledge because they think that the knowledge they possess is their personal property and they may be afraid of losing the ownership of such knowledge. This is also referred to as the "knowledge is power" mentality. Another factor relating to the source of knowledge which can prevent the sharing of knowledge is if the knowledge receiver perceives the knowledge source to be unreliable.

Characteristics of the knowledge receiver

If the knowledge receiver isn't motivated, the knowledge received may not be used for its intended purpose. This may be as a result of the knowledge receiver not trusting the knowledge from the knowledge provider. An unmotivated knowledge receiver may not use or receive the knowledge at all. They may also not be forthcoming in using the new knowledge they have received.

Characteristics of the context

The context through which the knowledge is shared within the organisation can also play a role in limiting the flow of knowledge. The context within which the knowledge transfer takes place need to be conducive so that the knowledge receiver can receive and use the knowledge. An organisational context that hinders or prevents the use of received knowledge is problematic.

Understanding the factors that can impede knowledge flow in the organisation is important to understand when and why IT professionals engage in knowledge transfer and can provide practical guidelines for how to improve knowledge sharing. For example, in order to enable the flow of knowledge in ISD projects, it is important for the organisation to put mechanisms in place to enable knowledge sharing. Increasingly, software development approaches explicitly include these kinds of mechanisms.

2.3.2 Difference between agile and traditional systems development

The biggest wish for an ISD project is to create a functional information system that is within budget, scope and timeframes. The system also needs to be of a quality that enables the ISD project team to respond to any modifications that may come from customers at any stage of the ISD project. Knowledge relating to the business need, the system design etc. is produced and disseminated in order to construct complete information systems that are of high quality and which can be developed in a shorter time, with lower development cost (Ryan & O'Connor, 2013).

There are many different approaches to developing systems, each of which places emphasis on different aspects of the delivery and which adopt different processes. Two general schools of thought that are prevalent currently are the traditional systems development approach and the agile approach.

A key difference between traditional and agile systems development methodologies is the involvement of the customer in the ISD process (Cockburn & Highsmith, 2001). In order to produce a complete IS which satisfies and adheres to stakeholder's requirements, it is vital for knowledge to be created and disseminated and the ISD project teams are faced with the challenges of identifying and taking care of the knowledge they possess (Rus & Lindvall, 2002). Traditional and agile teams identify, store and use this knowledge in different ways.

In traditional systems development methodology, customers get more involved during the business requirements gathering phase. Thereafter the IT team will develop the information system based on the written specifications provided. Traditional systems development is thus reliant on explicit knowledge.

On the other hand, in agile development methodology, customers are involved in all stages of the ISD development process, and that customers and programmers have a vital role to play throughout an ISD project. Agile systems development emphasises the social interactions between the client and the project team (Ryan & O'Connor, 2013; Nerur & Balijepally, 2007). Thus additional emphasis is placed on tacit knowledge.

Knowledge sharing in ISD projects has been acknowledged as an obligatory need for the triumphant conclusion of ISD project (Park & Lee, 2014). How the necessary knowledge is obtained, used, shared and stored will depend to a large degree on the development methodology selected.

2.3.3 Complexity in ISD projects

The actual and perceived difficulty or complexity of the project is an important factor when considering knowledge sharing within an ISD project team. The bigger the project, the more difficult it becomes (Murray, 2000). ISD projects are also inherently difficult because they deal with matters from both an organisational and technological perspective (Xia & Lee, 2014). One reason that ISD projects do not succeed is that the project is more difficult than the project team imagined it to be (Murray, 2000). In this thesis, complexity or difficultly in ISD projects is viewed as the difficulty experienced in both technological and organisational levels.

ISD projects tasks are unpredictable and are becoming increasingly complex. Developing an information system requires the collaboration of numerous people with diverse skills and knowledge (Lu et al., 2011). This requires the integration of various expertise which lies with various individuals in the project (Almeida & Soares, 2014). ISD projects are thus staffed with members with complementary skills and expertise. Sharing these skills and expertise is vital to the success of the project (Blankenship & Ruona, 2009).

Nelson & Cooprider (1996) note that project team members should have common objective in order for the project to be successful. The authors note that the lack of collective objectives between the team members may results in the failure of the ISD project.

The team also need to be able to handle change and shifting goal posts. With the rapid change of IT as well as the business environment, it is very difficult to manage and estimate business requirements and technical specifications (Xia & Lee, 2014). The complexity and doubt in ISD projects can be reduced when team members have the required expertise and this expertise is integrated and shared amongst the individuals in the project (Liberatore & Wenhong, 2010).

Organisational factors can also increase the difficulty of the project. The inability to keep up with changing technology, absence of own experts and staff turnover are factors affecting the successful implementation of ISD projects which are deemed to be complex or difficult (Ko, Kirsch and King, 2005).

2.3.4 Project team member's interdependence during ISD

ISD Project members can assist one another to achieve the goals of the system being developed, or they can select to fight each other which will have undesirable penalties on the project (Johnson & Johnson, 1998). A group of individuals striving to achieve their own objectives will clearly be less likely to deliver on a complex system, than a collaborative team working well together. So what makes an IT project team work?

Teams where members need to rely on each to other to some extent to complete their tasks, tend to be stronger teams. The term used to describe this is "mutual dependence". This is a familiar aspect of ISD projects (Parolia et al., 2011). What is more, mutual dependence amongst ISD project team members turn out to be critical in a difficult environment (Nelson

& Cooprider, 1996). Dependence between individuals in ISD projects is very important in motivating all affected parties to engage and build relationships (Park et al., 2014).

When team members are mutually dependent on each other, their collective objectives become aligned. The collective objectives are the bonds that keep people involved in ISD projects together and allow them to share their knowledge with others (Chow & Chan, 2008). Mutual dependence in ISD projects can be attained when the team works together, and when the team members share their knowledge with each other (Wagner, 1995).

Earlier studies from the co-operation viewpoint recognize mutual dependence between ISD project individuals as a vital sign for the sharing of know-how (Parolia et al., 2011). The sharing of knowledge assets is the greatest significant form of communication in ISD projects amongst individuals (Pee et al., 2010) and can lead to important outcomes. For example, effective knowledge sharing by individuals in ISD projects has been found to significantly reduce the time spent trying to resolve a particular problem (Park et al., 2014).

The Social Interdependence Theory presents an excellent clarification for cooperative and competitive behaviour in an ISD project setting (Ghobadi & D'Ambra, 2012). Social Interdependence Theory posits that when members or subunits of a group have tasks, rewards and goals that are interdependent on each other, it may promote interaction (Pee, Kankanhalli & Kim (2010). ISD projects depend on the diverse expertise of the individuals who are put together in the project (Pee et al., 2010). Specifically, ISD projects require both business and IT knowledge: the business knowledge relates to business processes, business requirements, and the IT knowledge touches on the technical possibilities of the new IS.

It is very important for IT professionals in ISD projects to have knowledge of information systems (IS) and application domains as they are critical in solving IS problems (Khatri & Vessey, 2016). In this study, IS domain means an area of information systems where IT

professionals in ISD projects have specialized knowledge, for example software development, integration, process modelling. Applications knowledge domain means an area within business in which an ISD project is undertaken to address, for example marketing, finance, sales, human resources, production (Khathri & Vessey, 2016).

The absence of knowledge resources (such as the lack of expertise) amongst project team members has been recognized as one of the risk factors that negatively influence the performance of IT projects (Reich, Gemino & Sauer, 2008). Based on the problem which a particular IS is trying to address, the solution may involve sophisticated business problems and/or include the use of complex technologies. It is therefore imperative for the project team members to work together to develop a shared insight into the business and understanding of the technological aspects.

However, some individuals in project teams may be willing to share their expertise with others while some may not be interested. According to Lin and Huang (2010), there is a high chance of individuals withholding their knowledge while engaged in group activities such as in ISD project. Team members who readily share their knowledge could be discouraged when they discover that others are withholding knowledge.

An aspect of IS project development that requires intensive interaction, communication and knowledge sharing relates to the allocation and completion of project tasks. ISD projects task have attributes such as description of the tasks, by when the tasks should be performed and by whom, as well as the tasks dependencies. Task allocation is essentially the distribution of individual expertise.

Past studies have found that the breakdown in project team's tasks coordination, challenges in knowledge sharing as well as the challenges in integration the expertise from various individuals in the project team prevent project's success. That is why is very important for

ISD project teams to effectively manage and coordinate the expertise of all the individuals working on a given project (Faraj & Sproull, 2000).

In ISD projects however, it is impossible to predict the outcome of some tasks, especially non-routine ones. Project team members need to be able to identify problems quickly and need to use the relevant expertise to address such problems quickly (Lin et al., 2015, Faraj & Sproull, 2000). This adaptability and flexibility requires a good deal of co-ordination and assumes that the team members are at least aware of each other's expertise.

This highlights the mutual dependence or interdependence of individuals working on ISD projects and shows that there is a need to coordinate tasks between team members, where interdependent tasks are shared amongst the team members based on their skills and expertise. Furthermore, this complex web of tasks completion and knowledge sharing takes place in a specific social context.

2.3.5 Context awareness and social presence

Knowledge sharing happens in a shared environment. It cannot take place in the absence of social interactions between ISD project team members. There are two components to this: context awareness and social presence.

Context awareness refers to the fact that team members understand each other's knowledge domains. When members of an ISD project team are aware of who has specific knowledge, it allows them to speedily consult with the correct, well-informed individual to address the problem at hand (Chang et al., 2013). However, if team members are not aware of their fellow team member's expertise, it may delay resolving a particular problem that requires immediate attention.

Being aware of each team member's knowledge is not sufficient, however, team members also need to share social presence. Hwang (2007) explains social presence as the emotional state of oneness between individuals with specific reference to closeness or tangibility. When one team member shares a social presence with another through common language or culture, they improve their knowledge sharing ability. Social presence has been regarded as a predictor of knowledge sharing and the performance of an individual team member which is produced via social communications (Kim, 2011).

Both context awareness and social presence are important in ISD projects. Team members need to be able to locate and know who the experts are so that they can be contacted when needed. This helps eliminates the waste of valuable time when individuals encounter problems or issues they cannot resolve by making sure they can escalate the issue appropriately and seek assistance.

2.4 Organisational culture and knowledge sharing

Numerous studies have been undertaken at by various researchers into organisational culture. Authors have found that organisational culture may have a very critical influence on the success of an organisation over a long term (Wiewiora, Trigunarsyah, Murphy & Coffey, 2013).

Culture in general is "the shared psychological training of the human mind which differentiated the individuals of one human group from another" by Hofstede (2001). It is the degree to which an individual embraces their national cultural values (Zhang & Maruping, 2008). Cultural beliefs can push people to behave in different ways even when addressing the same task or problem (Zhang & Maruping, 2008). Culture does not only exist at a national level; individuals will embrace different cultural values irrespective of their nationality (Hwang, 2008).

Organisational culture is the shared beliefs and values which govern how people behave within an organisation (Alavi & Leidner, 2001). New members who join the organisation need to adapt to such rules in order to have a sense of belonging in the organisation. Many organisations find it difficult to change the behaviour of their members and this affects their desire to increase the members' knowledge sharing behaviour (Bock et al., 2005).

Organisational culture plays an important part in shaping the attainment of knowledge sharing efforts in organisations (Alavi, Kayworth & Leidner, 2005). Taylor (2013) posits that the values, belief systems and interaction with the external environment are all crucial elements that need to be looked at in the context of organisational culture. Each organisation has a culture which is unique to itself; it blossoms over time to show the organisation's identity in two ways: the invisible and visible (Al-Alawi, Marzooqi & Mohammed, 2007). Al-Alawi et al note that the visible dimension of culture in the organisation is revealed in the not spoken set of beliefs perception and actions of employees that are guided by adopted values, mission and philosophies. Meanwhile the invisible dimension of the culture is reflected by the unspoken values which guide the employee's perception and conduct (Al-Alawi et al., 2007). Tseng (2010) notes that just as each individual is unique with their own characteristics, so each organisation has a unique culture that influences how the operations are run.

Organisational culture is recognized as an important factor in fostering knowledge sharing (Shao, Feng & Liu, 2012). Practices, rules and values shape the environment in which individuals collaborate and exchange knowledge (De Long & Fahey, 2000). This means that the culture which is practised in a particular organisation has an influence on how knowledge is shared. Empirical evidence from various studies has shown that specific cultural values in organisational settings have the potential to influence employees' knowledge sharing behaviours. Organisational culture not only plays a role in shaping team members'

knowledge sharing behaviour, it also influences how members learn from each other (De Long & Fahey, 2000). For example, according to Peralta and Saldanha (2014), in an organisational setting some employees may hoard knowledge because of fear of being criticized by others in the team and they may feel their knowledge is not accurate, irrelevant or not adding value to their fellow team members.

A recent study conducted from the perspective of small and medium enterprises, found that a culture in which innovativeness, entrepreneurship and creativeness are promoted, as well as a clan culture which puts emphasis on team work and participation and cohesion, has a positive effect on the sharing of tacit knowledge (Wiewiora, Murphy, & Trigunarsyah, 2014).

Individual cultural values and organisational culture will both affect the ISD project team. Wiewora et al., (2013) note that in a project setting, team members with various expertise and backgrounds, who usually have their own culture and their own way of working, are brought together to form a project team. The authors argue that this may cause conflict as these different types of cultures may not be in sync with the culture of the entire project

Issa and Haddad (2008) classified ways in which organisational culture influences employee's behaviours which are relevant to knowledge sharing, creation and use. They put forward that organisational culture:

- shapes the assumptions which are held by employees;
- defines the relationship that exists between organisations and individual knowledge;
- creates an environment for social interactions amongst the employees and also defines how knowledge will be utilized in various scenarios; and
- moulds the methods through which new knowledge will be created, institutionalised and distributed within the organisation.

Team members' interactions and knowledge sharing is strong influenced by organisational culture. Wiewiora et al., (2013) note that culture establishes an organisational context from the basis of which social interactions amongst the employees take place and culture also creates norms in regard to what is wrong and right.

2.4.1 Typologies of organisational culture

It's useful to consider organisational culture in terms of a flexibility – stability and internal focus – external focus axis (Shao, Wang and Feng (2015). In this way, one can identify four types of organisational culture as shown in the figure 2-2. The four categories are Group, Developmental, Hierarchical and Relational cultures.

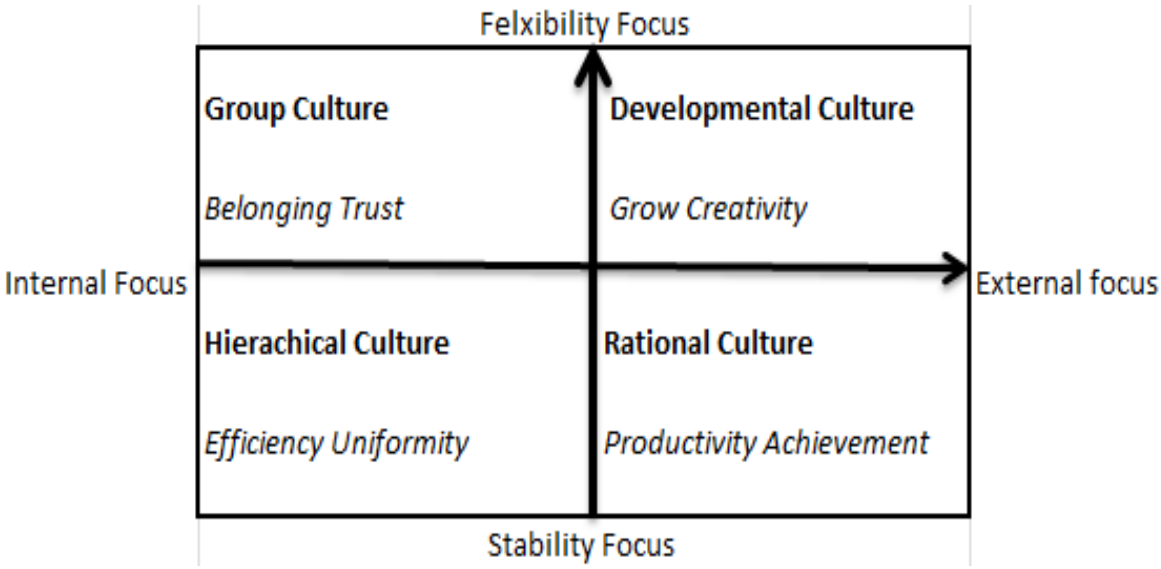

Figure 2-2. Types of organisational culture (Shao et al., 2015)

A developmental culture centres on the external environment and values flexibility and includes growth resource, acquisition and creativity (Shao et al., 2015). Group culture focuses on the internal environment and values flexibility and it has trust, participation and sense of belonging as its core values. A hierarchical culture puts an emphasis on the internal environment and promotes stability and it has efficiency and uniformity as its core values. A

rational culture focuses on the external environment and promotes stability with its core values being productivity and achievement. The four typologies of cultures can co-exist within the same organisation and all of them can have the same influence (Shao et al., 2015).

2.5 Knowledge sharing and internet technology

There are various ways in which team members can share their tacit and explicit knowledge. A valuable and important contemporary communication and knowledge sharing channel is through the use of internet technology, especially since ISD project teams can be scattered across the organisation's offices and they need to be able to collaborate with each other in order to complete the assignment at hand.

Virtual Communities (VCs) that connect individual through the use of internet technology have become important channels for professional knowledge sharing (Gang & Ravichandran, 2015). Similarly, organisations are experiencing productivity increases as a result of their investment in collaboration technology (Maruping & Magni, 2014).

A VC is a group of individuals with a common awareness who come together and exchange knowledge through the use of internet technology (Rheingold, 2000). Knowledge sharing is voluntary and an individual cannot be forced to share what they know. Various types of VCs such as chat rooms, virtual worlds, message boards and social networks all encourage their users to interact with each other (Liao et al., 2013). VCs are used for both professional and non-professional purposes and they provide their users with a means to communicate and also allows them to exchange their knowledge.

VCs whose members do not supply productive and quality productive knowledge do not satisfy their members (Wasko & Faraj, 2000). More people use VCs to acquire knowledge which they can use to solve business problems. As more and more organisations adopt VCs

to bridge the collaboration gap between geographically dispersed employees, the challenge that remains is to inspire participants to distribute their knowledge to other individuals (Hsu et al., 2007).

The ability to communicate and share knowledge is only part of the equation however. As mentioned previously, team members also need to want to share their knowledge.

2.6 Factors influencing interpersonal trust and knowledge sharing

Many studies have been undertaken to understand the various factors which motivate or prevent individual team members from sharing knowledge in ISD projects (Jewels & Ford, 2006; Shao et al., 2012; Wiewiora et al., 2014; Park & Lee, 2014; Pee et al., 2005).

Social Exchange Theory (SET) (which is discussed in greater detail in Chapter 3) views individual team members in an ISD project as being interdependent on each other. Individual team members will share their knowledge on the basis that the other party will do something good for them in return. SET Theory places an emphasis on reciprocal relationships. When reciprocal acts take place in a social relationship setting, the team members may begin to trust each other, and this will increase the likelihood of them sharing knowledge and personal feelings (Chen, Fan & Tsai, 2014). Understanding trust in a team context is thus essential in order to understand how knowledge is shared between team members.

According on Social Exchange Theory (SET), individuals participate in an exchange behaviour when the rewards of engaging in such behaviour are more than the cost (Liao, 2008). Social exchange deals with intangible social costs such as respect, love and knowledge (Liao, 2008). If the exchange of knowledge between individual team members is driven by friendship and that, as suggested by SET, team members tend to share knowledge with people

they have a close relationship with (Wang et al., 2014). The Social Exchange Theory, unlike the Economic Theory occurs reciprocally, meaning that there are no binding contracts between the actors (Huang, Davison & Gu, 2008). Reciprocity occurs as a response to the previous action or in expecting a future gain from present action (Liao et al., 2012). Since trust and dependence on each other by individual team members in an ISD project development has been regarded as the critical motivating factor for the individual to partake in knowledge sharing exchange relationships (Park & Lee, 2014), SET is a useful way to approach IT teams.

There are costs and benefits associated with knowledge sharing for individual members. According to SET, an individual compares the benefits and the cost before engaging in knowledge sharing behaviour. In ISD projects, team members participate in knowledge sharing behaviour if they think that their rewards are interdependent on their fellow team members accomplishing their tasks. On the other hand, the costs associated with knowledge sharing include time, energy and the risk of loss of power and ownership (Chennamaneni, Teng & Raja, 2012).

2.6.1 Interpersonal trust

Researchers define trust in different ways. This study adopts an explanation of interpersonal trust as an individual team's expectation that other team members in the project will perform future actions based on honesty and cooperative behaviour (Van Acker, Vermuelen, Kreijns & Lutgerink & van Buuren, 2014).

There are various ways to unpack the concept of interpersonal trust. For example, Casimir et al (2012) break interpersonal trust down into two components:

- Cognition-based trust, which is based on competence and available knowledge, as well as individual responsibility
- Affect-based trust, which is based on the associations that exist between individuals which consist of care and concerns of fellow team members and which include the intrinsic value, such as reciprocal relationships.

Abrams, Cross, Lesser & Levin (2003) looked at trust in a similar way. They have identified two dimensions of interpersonal trust: benevolence and competence. In benevolence trust, team members care about the well-being and goals of each other. In terms of competence-based trust, team members believe that other team members have the relevant expertise in their specialised field and that other team members can depend on their expertise when they need assistance.

Ghaznavi et al. (2011) have identified four categories of trust and it is useful to highlight the dissimilarities between them. Figure 2-1 shows different types of trust.

Table 2-1: Types of trust (Ghaznavi et al., 2011)

Type of trust	**Meaning of trust**	**Study context in which trust was applied**
Interpersonal	The willingness of one party to be defenceless to the actions of the other. (Mayer et al, 1998)	Trust in interpersonal relations.
Cognition	Trust that is built on impressions instead of that which is built on interactions between people. (McKnight, Cummings & Chervany, 1998)	Establishment of trust at the start of the relationship.
Competence	Trust that allows the knowledge recipient to show confidence about the expertise and knowledge possessed by the knowledge provider (McKnight, Cummings & Chervany, 1998)	Building trust in interpersonal networks.

Institution-based	Belief that organisational structure exists to shield team members from bad results (Aradichvill, 2008)	Trust on how sharing of knowledge is manifested in virtual group of people who have the same concern.
Benevolence	Showing an interest in the well-being of other people (Abrams, Cross, Lesser, Levin, 2003)	Trust in knowledge sharing networks.

Table 2-1 above gives an overview of different types of trust. Since ISD projects are knowledge-intensive activities that needs the diverse skills and expertise of various individual team members, this study focused on interpersonal trust. This places the emphasis on interpersonal relationships between individuals during ISD projects and how those interpersonal relationships influence them to share (or not share) knowledge with one another. The study draws on the distinction between benevolence and competency-based forms of interpersonal trust.

Trust plays a very important role in interpersonal relationships. In the context of ISD projects, the individual team members need to trust one another in order to share knowledge with each other (Hsu et al., 2007). It takes time to build trust and it can easily be destroyed, hence it is very critical that attention is paid to the continuous development and nurturing of trust (Siau & Shen, 2003).

Interpersonal trust is required in order for knowledge sharing and collaboration to take place in the project team (Chen et al., 2014). Interpersonal trust has been recognised as a key feature which influences knowledge sharing in society such as ISD projects (Parameswaran & Whinston, 2007). Chai, Das and Rao (2011) also note that interpersonal trust commands a very significant role in creating an atmosphere which is supportive to knowledge sharing. In support of this, Kuo (2013) posits that people in an organisation are likely to part ways with

their knowledge in an environment where they have a soaring altitude of trust towards their peers and to the organisation.

Interpersonal trust plays a more important role in social transactions than it does in transactions of economic value, and it can enable knowledge sharing and the enable a person to voluntarily distribute their shared understanding and experience with others (Casimir, Lee & Loon, 2012).

In previous studies conducted on the effect of interpersonal trust in knowledge sharing in projects, Inkpen and Tsang (2005) noted that the atmosphere of interpersonal trust has an important effect on the exchange of knowledge, as team members do not feel they have to protect themselves from social loafers. In support of this, Foos, Husted and Michailova (2010), as well as Holste and Fields (2010) found that in an environment where there is trust, there is a positive association between successful sharing knowledge and the use of tacit knowledge.

Interpersonal trust is also a strong determinant of a person's drive to become part of group of individuals with similar goals (Swift & Hwang, 2013). The individual should be confident that his/her interests will not be jeopardized in the process of knowledge sharing, as they may not participate in any knowledge sharing activities if they perceive their own interest to be in jeopardy. Learning within an organisation is centralised on the eagerness of individual workers to partake in and share knowledge, and without trust and knowledge sharing, that learning cannot take place (Swift & Hwang, 2013).

In an ISD project setting, the belief that users have about the trustworthiness as well as the validity of the knowledge they receive from their peers will definitely drive them to share knowledge. Mutual trust between individuals needs to be established before they can engage in knowledge sharing relationships, and without trust there will not be any sharing of

knowledge (Zhou et al., 2014). Interpersonal trust has been recognized as a key factor in reducing the fear that an individual may have of losing their identity and it subsequently enhances their knowledge sharing behaviour (Kuo, 2013).

Interpersonal trust plays an important role in fostering knowledge, with different types of trust having affecting knowledge sharing in different ways.

2.6.2 Intrinsic and extrinsic motivation

Previous studies on individual motivation in knowledge sharing have identified two types of motivations as being important, namely intrinsic and extrinsic motivations (Hau et al., 2013). A person who is intrinsically motivated is one who will engage in a behaviour because it is enjoyable. They are stimulated by the desire and fun of helping others. On the other hand, extrinsically motivated people are those who are driven by a particular goal such as monetary rewards or some form of tangible benefits (Hung, Durcikova, Lai & Lin, 2011).

In terms of knowledge sharing, the motivational drivers that drive people to share knowledge can be classified in three categories that explain social action; economics, social psychology and sociology (Bock, Zmud, Kim & Lee, 2005).

Economic motivation relates to anticipated extrinsic rewards. The authors found that many organisations they interviewed implemented monetary rewards and points towards promotion for knowledge sharing.

Social and psychological motivations relate to relationships and a feeling of self-pride, Bock et al., (2005) found that anticipated reciprocal relationships influenced employees to uphold good associations with other workers with regard to knowledge sharing. The authors also found that a sense of self-worth also played a major part in the employee's decision to

partake in knowledge-sharing behaviour as they see themselves as providing value to their organisation.

It is important to note that sociological, fairness, innovativeness and affiliation institutional structures play a huge role on how employees share knowledge. A climate which consists of trust, innovativeness as well as one that which promotes affiliation were seen to play a huge role on how employees share their knowledge (Bock, Zmud, Kim & Lee, 2005).

Extrinsic rewards

While some individuals are intrisically motivated, others are more inclinde to adapt their behaviour based on external factors. Organisational rewards such as monetary incentives (including increased remuneration and gratuities) and non-monetary incentives (such as promotion and job security) have been recognized as having a positive influence in motivating individual employees to engage in the desired behaviour, such as knowledge sharing (Wickramasinghe & Widyaratne, 2012). Some individual employees may also be motivated to share knowledge when they think that the benefits they will receive will be greater than the cost or risk (Bock et al., 2005).

This leads to the conclusion that organisations should spend less time trying to encourage users to share knowledge, and focus more on fostering the inspirations that persuade people to share with the knowledge they possess and pass it on to others (Bock & Kim, 2002).

Organisations need to reward their employees with financial incentives such as bonuses, salary increases and job security for continuously engaging in knowledge sharing behaviours (Ba, Stallaert & Winston, 2001). Pee et al., (2010) note that rewards systems that are carefully implemented can facilitate knowledge sharing, promote team togetherness and also augment the keenness of the individuals to add to the success of the team. While other

research found positive association between rewards and knowledge sharing, Bock et al., (2005) did not discover any significant association amongst knowledge sharing and rewards.

Reciprocity

Some employees will engage in knowledge sharing not because they expect any monetary rewards, but because they feel their knowledge sharing will result in a reciprocal relationship or returns in the near future, and reciprocity has been found to be a self-motivator for individuals to partake in knowledge sharing behaviour based on their own will (Chennamaneni et al., 2012).

Individuals who are intrinsically motivated may help others to solve problems because they enjoy helping others, they care about the welfare of others or they want to exhibit their own mastery of the topic area. This satisfies their internal psychological needs and allows them to feel proud of themselves in having such knowledge (Zhao, Detlor & Connelly, 2016). On the other hand, extrinsically-motivated individuals will partake in knowledge sharing solely for the purpose of rewards, job security, increased salary or bonuses (Zhao et al., 2016; Ko et al., 2005).

Unlike organisational rewards, reciprocity is based on exchange relationships between individual team members, those who are providers and receivers of knowledge (Hau et al., 2013). In a research undertaken by Fong and Chu (2006) in the built environment in Hong Kong and the UK, employees shared knowledge not because they wanted monetary returns, but for the enjoyment of helping others within their team and the organisation at large. Furthermore, researchers have found that employees' enjoyment in helping their co-workers positively affects their attitude with regard to knowledge sharing (Liao, To and Hsu, 2013). In a study conducted by Tholath and Thattil (2016) on motivational factors affecting knowledge sharing in the Indian banking sector, the authors found that operational autonomy

(being given the freedom to be creative), job satisfaction, learning and growth were the key motivational factors for employees to participate in knowledge sharing, whereas, money was not found to be an important motivational factor.

Individual team members devote time to sharing their mutual problems and concerns when they build close relationships (Huang, 2009). Past research studies have revealed a positive association between anticipated reciprocal relationship and co-operation behaviour (Tohidinia & Mosakhani, 2010). In a knowledge sharing study done on online virtual conferencing (VC), Wasko and Faraj (2005) found that people who share their knowledge via online VCs expect other people to do the same. Similarly, people who trust in a reciprocal relationship tend to share knowledge with those whom they think will be able to share the knowledge with them (Liao et al., 2013). If individual employees have self-confidence that they can expand their association with fellow employees through the sharing of knowledge, there are high chances that they will engage in knowledge sharing behaviour for that purpose (Tsai et al., 2013).

2.6.3 Outcome expectation and knowledge sharing

Outcome expectation is also a vital factor in the decision of whether an individual team member will share knowledge or not (Tsai et al., 2013). Outcome expectation refers to the anticipated results of one's own behaviour. In the case of knowledge sharing, it means the results that one individual would expect when sharing their knowledge (Bandura, 1997). Hsu et al., (2007) say that outcome expectations consists of three forms namely: physical effects (such as pain, pleasure and distress), social effects (such as monetary rewards, applause, social recognition, as well as power) and self-evaluation effects (such as self-satisfaction).

In a study done by Zhou, Zuo, Yu and Chai (2014) on knowledge sharing in VCs, the authors found that there are many potential external and internal benefits that users may receive by

engaging in knowledge sharing. The internal benefits include enhanced social relationships, reputation and self-expert, while external benefits include future career advancement and skills improvement. Further, if employees believe they will receive both internal and external benefits, they will develop an added optimistic mind-set towards knowledge sharing (Tsai et al., 2013). In an ISD context, a team member needs to be able to assess the likelihood of any of these potential outcomes being realised through knowledge sharing.

Outcome expectation serves as an incentive that pushes an individual team member to partake in knowledge sharing behaviour (Zhou, et al., 2014). In addition to an individual team member gaining more friends in an ISD projects by engaging in the knowledge sharing behaviour, the outcome expectation may include self-image development, improving their own reputation in the project and it may also result in career progression in the near future (Zhou et al., 2014). The expectation that an individual has on the impact of their action can promote or impeded knowledge sharing.

2.6.4 Self-efficacy and knowledge sharing

Self-efficacy refers to a person's belief in their own abilities. It is the confidence a person has that they can control their own behaviour, motivation and environment. This study defines knowledge sharing self-efficacy as an individual's self-confidence in their own ability to carry out a certain behaviour (Wang & Hou, 2015).

Relating to knowledge sharing, self-efficacy is a form of self-motivation in the sense that individual team members who have a high belief in their capability to supply useful ISD knowledge will be more motivated and enthusiastic to share this knowledge (Liao et al., 2013). However, self-efficacy goes beyond the desire of one individual to share knowledge, on top of their desire; the individual should have the capability of sharing knowledge that will be useful to other individuals in the team (Hsu et al., 2007).

A study done on electronic knowledge repositories established that knowledge self-efficacy was definitely related to electronic knowledge self-efficacy where individuals believed that their sharing of knowledge in electronic databases will improve work efficiency, solve job-related problems and make a difference at their work place (Chen, Chen & Kinshuk, 2009). This means that individuals in that particular electronic knowledge repository believed in their capabilities of being able to use the repository.

Individuals who are highly confident in themselves regarding their ability to assist their fellow team members with high quality knowledge are likely to share their knowledge with colleagues as they deem that sharing their knowledge with others will result in improved performance of their colleagues as well as solving work-related problems (Wasko & Faraj, 2000; Bock & Kim, 2002).

In the context of ISD projects, individual team members who believe that capabilities in any of the ISD domains can contribute positively to the project, they have high chances of sharing their knowledge (Tsai et al., 2013).

Self-efficacy plays a very important role when individual team members attempt to complete tasks, targets and or challenges and that an individual team member's self-efficacy is dynamically developed from external experiences gained, perception about oneself as well as persuasion from other team members (Zhou et al., 2014). It is very difficult for individuals who have a low self confidence in themselves to engage in cognitive challenging tasks such as those found in ISD projects (Wu et al., 2012).

More importantly – for the purposes of this study – self-efficacy held by an individual has been found to promote knowledge sharing (Wu, Lee& Tsai, 2012). This means that when an individual has a high level of confidence in themselves, they are more likely engage in knowledge sharing behaviour.

Individuals with increased levels of confidence in themselves tend to be persistent when faced with challenging tasks and they are also more active in knowledge sharing as well as in knowledge acquisition (Shao, Wang & Feng, 2015). In line with Social Cognitive Theory, previous studies have also found that outcome expectancy and self-efficacy extensively affect the employee's knowledge sharing behavioural intention (Cheng & Chu, 2014). Self-efficacy isn't sufficient however; Zhao et al., (2016) note that even if the individual has high levels of self-reliance in their aptitude to share knowledge, they may not do so if they perceive that the other individuals are less knowledgeable than them and that they may not reciprocate the favour.

2.7 Summary of the chapter

This chapter discussed a range of concepts relevant to knowledge sharing and information system development projects, based on a review of the literature. It looked at the importance of ISD in organisations and how knowledge sharing plays a key role in ensuring that individual team members share their expertise. The concepts of tacit and explicit knowledge were explored as they relate to information systems development projects, with focus on agile and traditional information systems development methodologies. Organisational culture, interpersonal trust, rewards, reciprocity, outcome expectation and self-efficacy were also covered.

The next chapter introduces the theories that underpin the study, outlines the overall hypotheses, and presents the research model.

CHAPTER 3

THEORETICAL FRAMEWORKS AND RESEARCH MODEL

3.1 Introduction

The previous chapter reviewed literature on knowledge sharing and ISD projects in order to provide a foundation for this study. The intention of this chapter is to discuss the theoretical frameworks that underpin the study and to develop a research model to explain individuals' knowledge sharing practices in ISD projects in the South African context.

Firstly, the theoretical frameworks, namely Social Exchange Theory (SET) and Social Cognitive Theory (SCT), are discussed in depth. Secondly, the research constructs that form part of the research model and the relationships between them are discussed. This is then followed by the hypotheses of the study. Lastly, the conceptual research model for the study is presented.

3.2 Theoretical frameworks

The two theoretical frameworks that underpin the study have both previously been used extensively to study human behaviour similar to knowledge sharing. Social Cognitive Theory is discussed first, followed by the discussion on Social Exchange Theory.

3.2.1 Social Cognitive Theory (SCT)

SCT argues that the manner in which an individual behaves is partially influenced by the environment in which they find themselves, as well as their own cognition, for example their beliefs and expectations (Bandura, 1997). The theory posits that an individual is influenced

by their own self- efficacy or the belief they have on their own capabilities to perform certain actions, as well as the outcome they expect from performing such actions (Hsu et al., 2007).

SCT was developed by Bandura (1977) and it posits that human deeds are created and manipulated by the influence of the social network within which the person finds themselves, as well as the intellect of that person (Chiu, Hsu & Wang, 2006; Lin & Huang, 2010). This is represented in figure 3-1 below.

Key Concepts of SCT

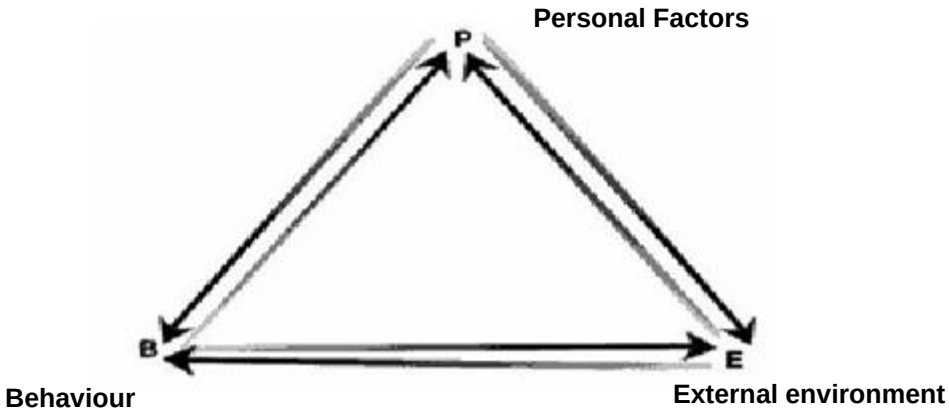

Figure 3-1: Social Cognitive Theory (Bandura, 1986)

In Figure 3-1, B represents behaviour, E represents external environment and P represents personal factors (Bandura, 1986). All three factors interact with and influence one another bi-directionally (Tsai & Cheng, 2010). In SCT, personal cognition and social influence plays a huge role in persuading an individual to share knowledge (Hsu et al., 2007). The two basic determinants of personal cognition are self-efficacy and outcome expectation (Hsu et al., 2007). In SCT, trust is an environmental factor that affects both the knowledge sharing behaviour and individual characteristics (Tsai & Cheng, 2012).

- **Personal Factors: Self-Efficacy and Outcomes Expectation**

In terms of SCT, outcome expectation and self-efficacy play an important role in guiding an individual's behaviour (Chiu et al., 2006). An individual's self-confidence in their own ability to engage in a certain behaviour (their self-efficacy), and the outcome they expect from their action (outcome expectation) are considered important personal factors.

SCT maintains that an individual employee relies on their own self-confidence before deciding to partake in a certain behaviour (Bandura, 1964). When people are not confident in their own ability to carry out specific behaviour, they are not likely to carry out such behaviour (Chiu et al., 2006). They need to have confidence in their own ability to successfully complete the tasks at hand (Lin & Huang, 2010). An individual perceived self-efficacy would encourage the individual to share knowledge (Lin & Huang, 2008).

In the context of knowledge sharing, if individuals do not have confidence in their own knowledge and their ability to share that knowledge, they are unlikely to participate in knowledge sharing behaviour. This is emphasized when knowledge sharing action is voluntary (Chiu, Hsu & Wang, 2006). In past studies, self-efficacy has been found to influence an individual's intention to share knowledge (Papadopoulos et al., 2013) and self-efficacy has been found to be a mediator between creativity and knowledge sharing amongst athletes (Wu, Lee & Tsai, 2012). In this study, self-efficacy has been explored from the individual 'self-confidence point of view.

Outcome expectations are the expected results of an individual's behaviour (Hsu et al., 2007) and an individual's motivation to participate in knowledge sharing will be influenced by the outcomes that they expect to flow from that. Outcome expectations include social effects, physical effects and self-evaluation (Hsu et al., 2017). As previously discussed, in the context of ISD projects, outcome expectation could include external rewards, such as a bonus, or

could include internal rewards, such as strengthened relationships or pride. On the other hand, outcome expectation may be meaningless if an individual does not have self-confidence in their own confidence.

- **External environment**

SCT also recognises the affect that the social context (like the organisational culture) or the environmental setting (like beliefs such as trust) have an effect on features and behaviour. The theory helps explain the influence that social settings have on a person's behaviour (Chang et al., 2013). SCT considers the association amongst people, the environment in which they find themselves, as well as the influence of the surroundings (Chang et al., 2013). This study explores how environment affects knowledge sharing behaviour through trust.

- **Behaviour**

The behaviour that is of interest in this study, is whether individual team members will share project-related knowledge with their fellow peers in the project in order to finish ISD project. In this instance, the individual team member will rely on the expertise of his or her fellow team members when he encounters challenges in relation to the project tasks allocated to him or her. The individual will also want to be seen by fellow team members as someone who is knowledgeable in a specific area and who has the interest of the project at heart.

Selection of SCT for this study

SCT has been used several times as a framework to confirm human behaviour (Compeau & Higgins, 1995). For example, it has been used in previous studies to explain personal motivations in knowledge sharing, usage of knowledge management systems, collective learning, as well in electronic commerce (Lin & Huang, 2010). Research using SCT to study knowledge sharing behaviour has looked at sharing knowledge in open educational resources

by teachers in classrooms and over the internet (Van Acker et al., 2014), virtual communities (Chiu, Hsu & Wang, 2006; Hsu, Ju, Yen & Chang, 2007; Tamjidyamcholo, Baba, Tamjid & Gholipour, 2013), knowledge management systems (Huang & Lin, 2008), weblogs (Papadopoulos, Stamati, & Nopparuch, 2013) as well as knowledge sharing in enterprise resource planning systems (Shao et al, 2014) and the impact of how users process information based on web personalization (Tam & Ho, 2006). A summary of these studies is included in Table 3-1 below.

The current study seeks to explore the applicability of SCT in knowledge sharing in ISD projects in the South African setting. The study adopts the two constructs of SCT (self-efficacy and outcome expectation) that have previously been found to play a positive influence in knowledge sharing behaviour. SCT has been chosen for this study as it takes cognisance of the environmental influence on individual behaviour and it also involves the investigation of how individuals build their own social reality, which in turn is as a result of their own cognitive outcome (Tam & Ho, 2006). In the context of an ISD project, SCT recognizes the influence of the ISD project environment on the individual knowledge sharing behaviour and the expectations they have upon sharing their knowledge. In SCT, the social influence is based on trust. In this study, trust is modelled as representing the environment, self-efficacy and outcome expectation as representing personal cognition (Hsu et al., 2007). Similarly, ISD project environment is influenced by many interrelated organisational and technological factors which are constantly changing over time (Wang, Huang & Yang, 2012).

3.2.2 Social Exchange Theory (SET)

In this study, the social exchange theory is adopted as a theoretical lens to examine IT professional's knowledge sharing within ISD projects. SET has its roots in sociology, psychology and economics. The theory suggests that human associations are the outcome of

an exchange process where people only participate in relationships to maximize benefits and minimize cost (Wang et al., 2014). SET enhances the feeling of trust where an individual will partake in knowledge sharing if they trust the other parties with whom they need to share knowledge with (Tsai & Cheng, 2012).

SET was developed by Blau (1964) and it posits that human associations are based on a particular cost and benefit analysis. Benefits are those things that hold value to an individual such as acceptance, friendship, companionship and social support, while costs are those things that an individual perceives as costly or negative such as financial expense, effort and time which are spent during the course of maintaining a relationship (Wang et al., 2014). SET states that individuals will participate in an exchange behaviour, such as knowledge sharing, because they assume that their reward will be more than the cost (Liao, 2008).

There is no altruism in SET (with altruism defined here as the ability of an individual to perform an action to benefit others without considering their own interest) (Krok, 2013). This means that in the social exchange context, an individual's desire to perform a certain action will be motivated by the returns they will attain after performing such an action (Blau, 1964).

The difference between social exchange and economic exchange in relation to an individual's behaviour is that social exchange puts more emphasis on intangible returns and reciprocity (such as association) (Blau, 1964). Blau notes that economic exchange puts more emphasis on tangible returns as well as rational self-interest, such as money. Unlike economic exchange which puts emphasis on transactions, social exchange deals with intangible cost and benefits at a social level such as knowledge, respect and love (Liao, 2008). In SCT and SET, the trust construct is regarded as an important environmental factors through which the knowledge seeker and knowledge provider connects to each other (Tsai & Cheng, 2012; Hsu

et al., 2007). According to Bock et al., (2005), when individuals trust each other, they are more willing to share knowledge.

Key concepts of SET

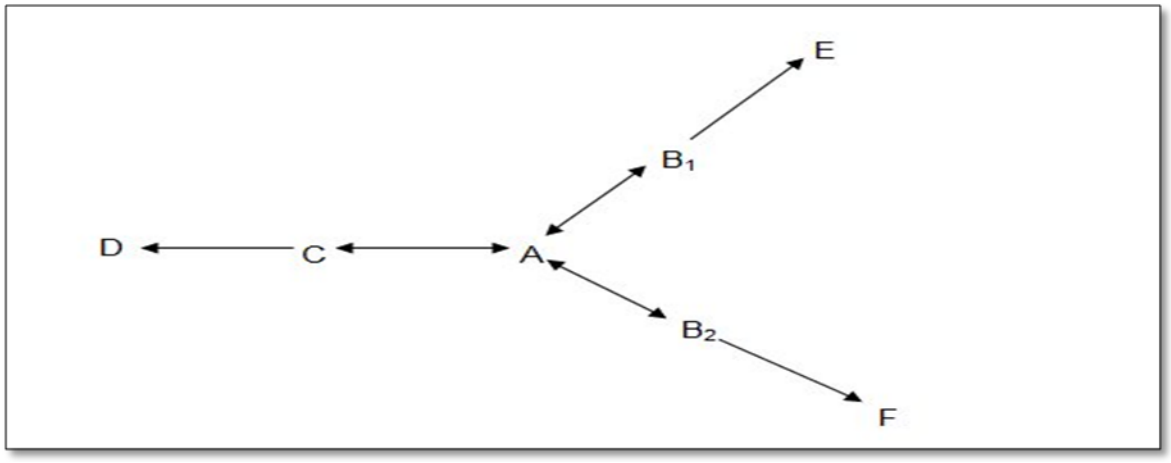

Figure 3-2: Social Exchange Theory (Cook, 1977)

Figure 3.2 depicts the actors in a social exchange environment, represented by the letters (e.g. A, B,C, D, E and F). The movement of resources is represented by the arrows. The arrow head points to the recipient of resources and the end of the arrow points to the provider of resources. In the figure 3-2, B1 and B2 denotes the same actor, B, can give or receive varying amount of resources. Figure 3-3 shows the process of social exchange.

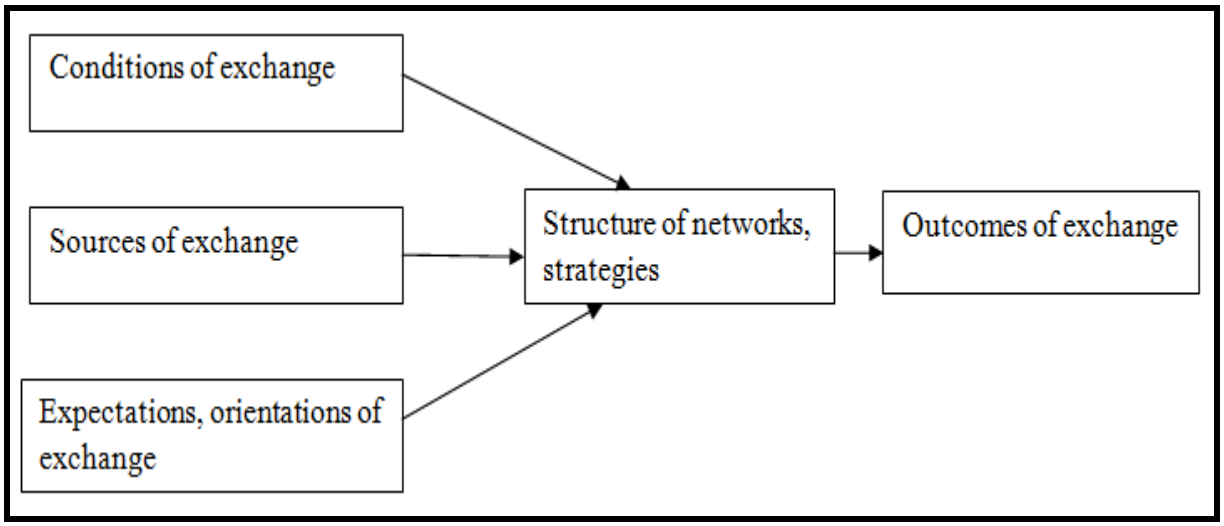

Figure 3-3: Social exchange process (Andolšek, 2015)

Figure 3-3 above shows the process of social exchange. In social exchange, the exchange of resources happens in organisational settings where there is competition of resources between individual employees, and yet the same individuals need to work with one another in order to achieve common objectives (Andolšek, 2015).

- **Sources of exchange**

Knowledge is a vital resource and knowledge sharing is an important component of the exchange process (Andolšek, 2015).

- **Conditions of exchange**

Individuals are prepared to enter into an exchange process when:

i. One party has something the others need but do not have; and
ii. Everyone in the exchange relationship wants to obtain more from the relationship than they give.

Without these conditions an exchange of resources will not occur (Homans, 1961, as cited in Andolšek, 2015).

- **Outcomes of exchange**

Interactions in the relationships generate the gratitude, obligation and trust that motivate behaviour (Gang & Ravichandran, 2015). An individual adds the benefits and subtracts the cost in order to establish how much a particular relationship is worth (Monge & Contractor, 2003). The decision of whether individuals continue or terminate a relationship will depend on the outcome of their assessment.

Previous studies have suggested that non-monetary rewards such as building trust amongst members in teams, experiencing reciprocity as well as improving job performance is a positive stimulus for engaging in knowledge sharing behaviours (Gang & Ravichandran, 2015). Similarly, social exchange produces individual feelings of trust, obligation as well as gratitude (Tsai & Cheng, 2012). That is why, trust, expected rewards, as well as expected reciprocal relationships were chosen as key constructs to test in this research model.

- **Expectations of exchange**

In order for knowledge sharing to be rewarding, the following three scenarios need to be considered (Krok, 2013):

- We share knowledge with others in the manner we want them to share knowledge with us. An individual cannot share less knowledge and expect more knowledge from the recipient. Also, a person may not feel good if they share more knowledge and receive less knowledge;

- When we share our knowledge with someone, we get some sort of self-satisfaction; and

- When we share our knowledge with others, it can yield recognition in the form of monetary or non-monetary rewards, such as others thinking positively about ourselves or getting a promotion or a salary raise.

In view of lack of instructions that govern the social interaction between individuals, social exchange does not guarantee any reciprocal outcome from such interaction (Liao, 2008). In this study, an individual team member will share project-related knowledge with fellow team members if the perceived benefits outweigh the cost. The benefits they are expecting from performing the knowledge sharing behaviour can be in various forms such as monetary and non-monetary.

The personal characteristics such as culture, interpersonal trust as well as expected association play a pivotal role in this space in determining whether an individual team member will share knowledge, with whom and for what reasons.

Selection of SET for this study

Several theories, which include social cognitive, social exchange, theory of reasoned actions and theory of planned behaviour, social capital and expectancy theories, have been used in the past to study knowledge sharing behaviour, but SET has been found to be the most popular for studying human behaviour in organisations (Tsai, Chang, Cheng & Lien, 2013).

SET is so popular because it has been conceptualized from the human resource management viewpoint specifically to help understand workplace behaviour (Serenko & Bontis, 2016). Since ISD projects happen in workplace settings, SET is appropriate for studying behaviour in this context, including study knowledge sharing behaviour.

SET has been used in various studies focused on knowledge sharing including ones that have sought to understand:

- IT professionals' knowledge intention through knowledge management systems (Tsai et al., 2013 ; Kankanhalli, Tan & Wei, 2005),
- knowledge sharing amongst product developers in research and development (Liao, 2008), social network (Moghavvemi et al., 2017),
- online health communities (Yan, Wang, Chen & Zhang, 2016),
- virtual communities (Gang & Ravichandran, 2015; Alsharo & Ramirez, 2017, Liao et al., 2012) and
- intra-organisational knowledge sharing amongst employees (Wu & Lee, 2017; Reyjav & Weisberg, 2009).

This study has thus adopted SET as an additional theoretical lens to examine IT professional's knowledge sharing within ISD projects. The study views knowledge sharing behaviour as a type of social exchange, where individuals share their skills and knowledge with one another, expecting to receive knowledge from the same individuals they shared knowledge with in return (Moghavvemi, Sharabati, Paramanathan & Rahin, 2017).

The current study adopted three constructs of SET, interpersonal trust, expected reciprocal relationship and expected rewards, as these factors have been identified as playing a major role in influencing an individual's knowledge sharing behaviour (Gang & Ravichandran, 2015).

Research models of previous studies

The following section shows research model of previous related studies.

Figure 3-4 shows a research model on knowledge sharing in behaviour by Hsu et al., (2007). The study used social cognitive theory to understand the knowledge sharing behaviour of members in virtual communities. In this trust, the environmental factors of social cognitive theory were represented by trust, the personal cognition was represented by knowledge

sharing efficacy, personal outcome expectations and community related outcome expectations. Knowledge sharing represents the behaviour under investigation.

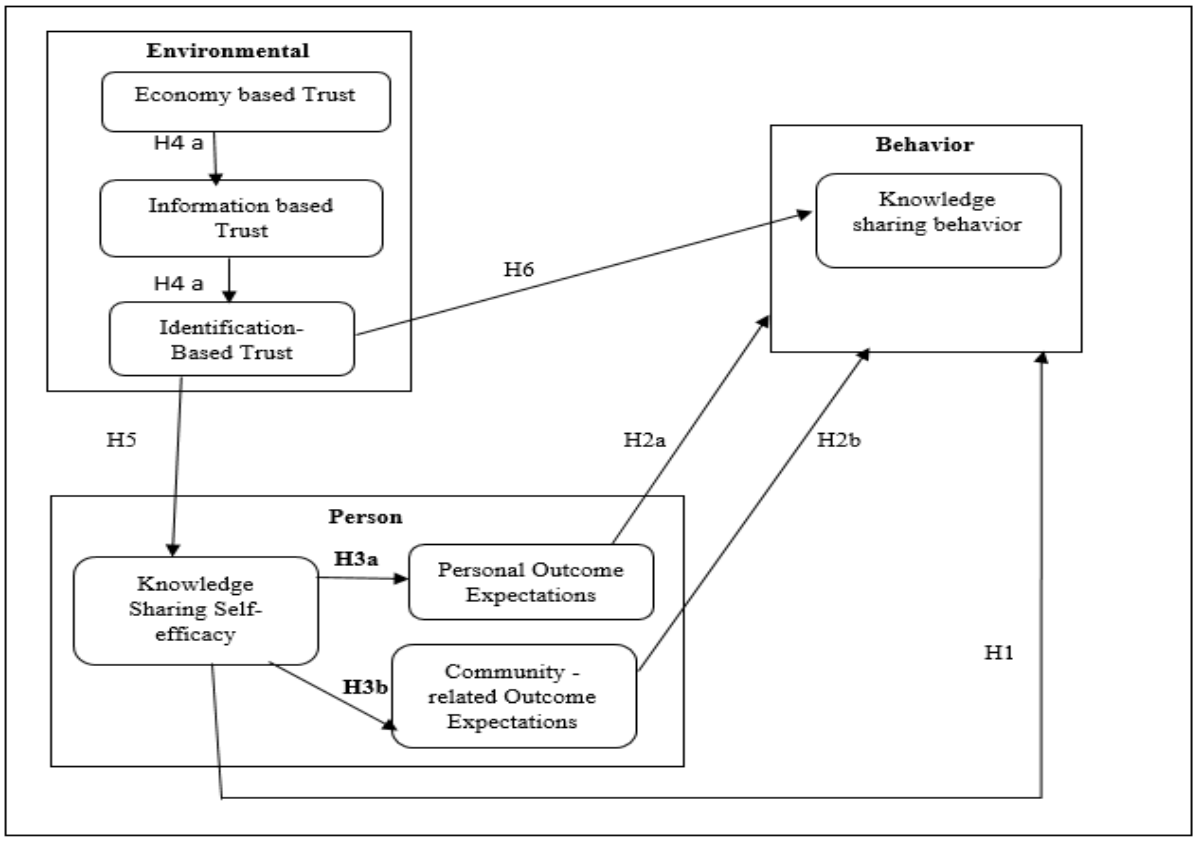

Figure 3-4: research model for knowledge sharing behaviour in virtual communities (Hsu et al., 2007)

The findings of the study suggest that there is a positive relationship between the virtual communities' knowledge sharing self-efficacy and knowledge sharing behaviour. In this study, knowledge self-efficacy is a strong determent of knowledge sharing behaviour. The finding also revealed that personal outcome expectation is positively related to knowledge sharing behaviour. There was no positive relationship found between team community-related outcome expectations and knowledge sharing behaviour. Finally, identification-based trust has a positive relationship with knowledge behaviour.

Figure 3-5 shows a research model for knowledge contribution withholding effort in project teams by Lin & Huang (2010). The study used social cognitive and social exchange to

understand factors which contribute to knowledge withholding in project teams. The environmental dimensions are represented by trust, task visibility, group size, procedural justice and distributive justice. Team outcome expectations, knowledge contribution self-efficacy and personal outcome expectation represented personal cognition.

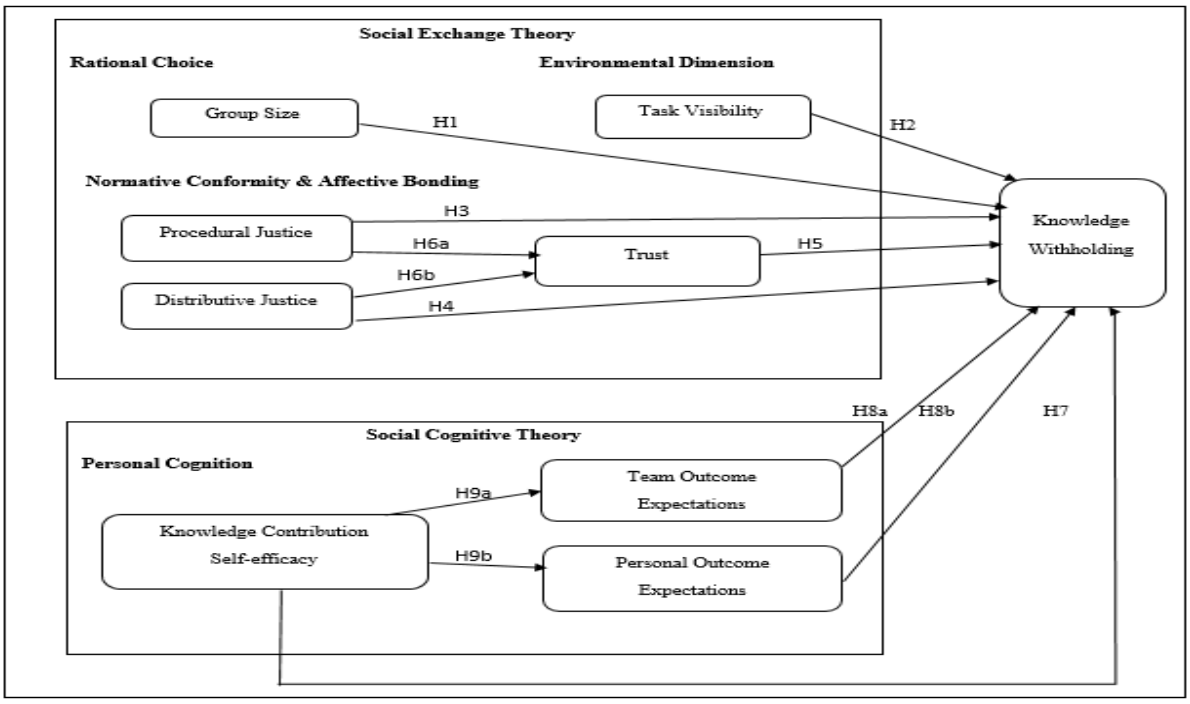

Figure 3-5: Research model for knowledge contribution withholding in project teams (Lin & Huang, 2010)

The results of the study found that trust, team outcome expectations and distribute justice have a significant influence on knowledge with holding. Knowledge contribution self-efficacy, group size, procedural justice, task visibility.

Figure 3-6 shows the research model of integration of social for knowledge sharing between IT professionals. The study used an integration of social exchange and social exchange theories to explore the relationships among trust, organisational justice, organisational commitment and the mediating effect of trust and organisational commitment.

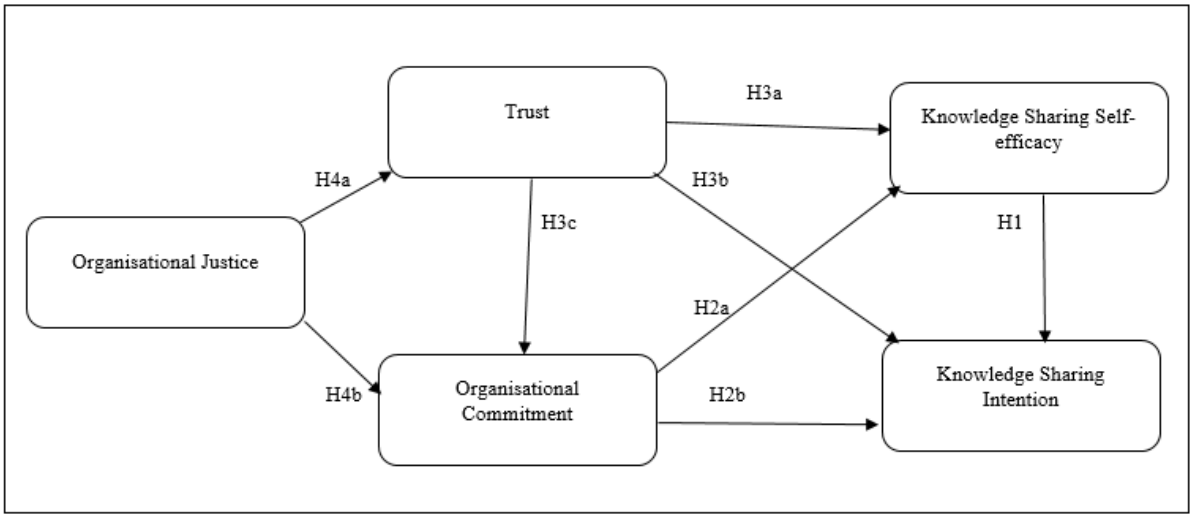

Figure 3-6: Research model for knowledge sharing between IT professionals (Tsai & Cheng, 2012)

The findings of the study reveal that knowledge sharing self-efficacy has a positive influence on knowledge sharing intention. Organisational commitment is positively related to knowledge sharing self-efficacy. The findings also show that trust is not positively related to knowledge sharing intention and knowledge sharing self-efficacy.

Figure 3-7 shows a research model which explored the factors that influence KMS usage using task technology fit and social cognitive factors.

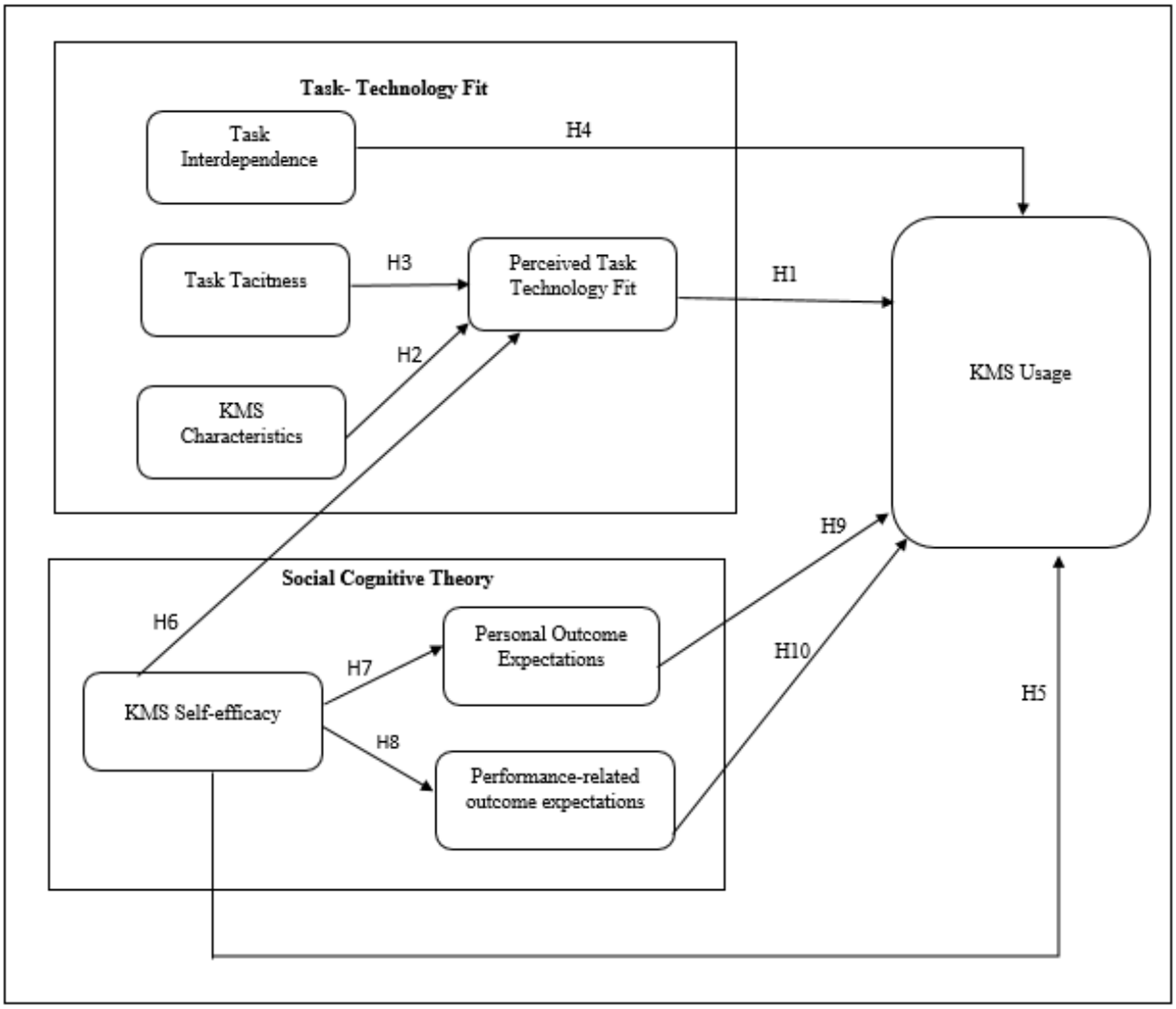

Figure 3-7: Research model for knowledge management systems usage antecedents (Lin & Huang, 2008)

The findings of the study show that task interdependence, perceived task technology fit, KMS self-efficacy and personal outcome expectation have positive relationship with KMS usage. Performance related outcome expectation does not have any positive relationship with KMS usage.

Figure 3-8 show a research model of IT professionals' knowledge sharing intention through KMS. The study used social exchange factors constructs such as perceived organisational support, organisational trust and reciprocal relationship expectancy and its influence on the attitude towards KMs and knowledge sharing intention. The study also investigated the influence of perceived self-efficacy on knowledge sharing

intension.

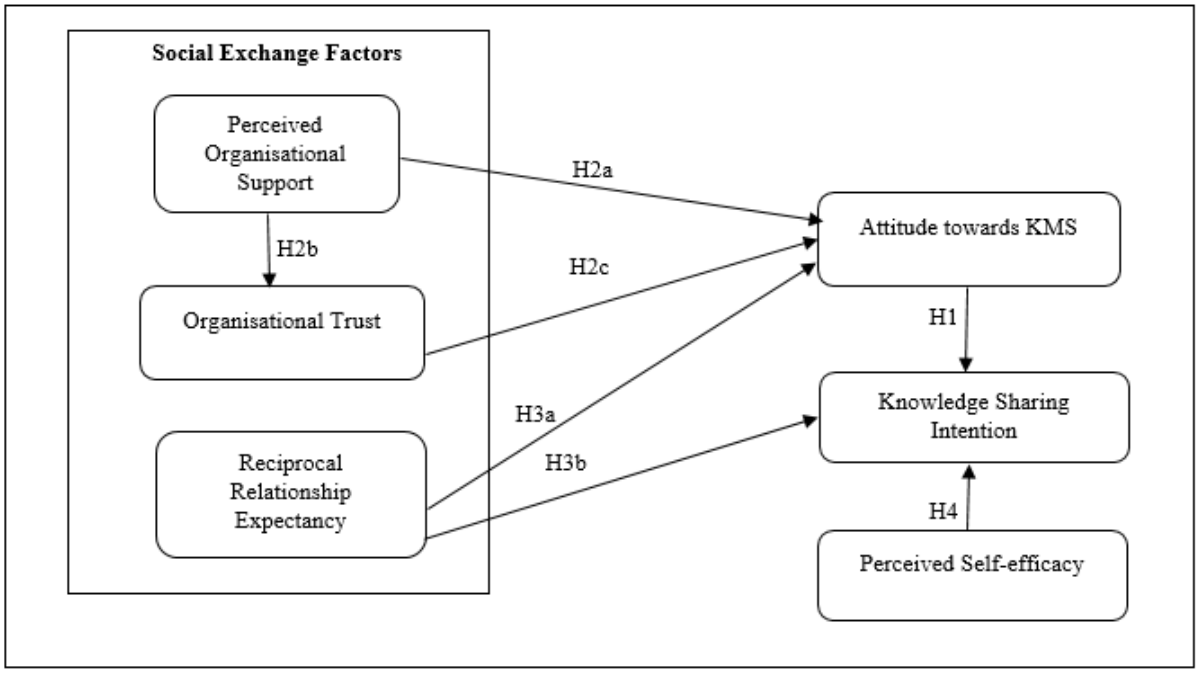

Figure 3-8: Research model for knowledge sharing intension using knowledge management systems (Tsai et al., 2013)

The results of the study reveal that attitude towards KMS is positively related to knowledge sharing intention. The results also show that organisational trust is positively related to knowledge sharing intension and reciprocal relationship expectance is positively related to knowledge sharing intension and attitude towards KMS.

Figure 3-9 show a research model for knowledge sharing in virtual communities using social cognitive and social capital theories. The study used community related outcome expectations and personal outcome expectations constructs from social cognitive theory and shared language, shared vision, trust, reciprocity, identification, and social interaction ties from social capital theory.

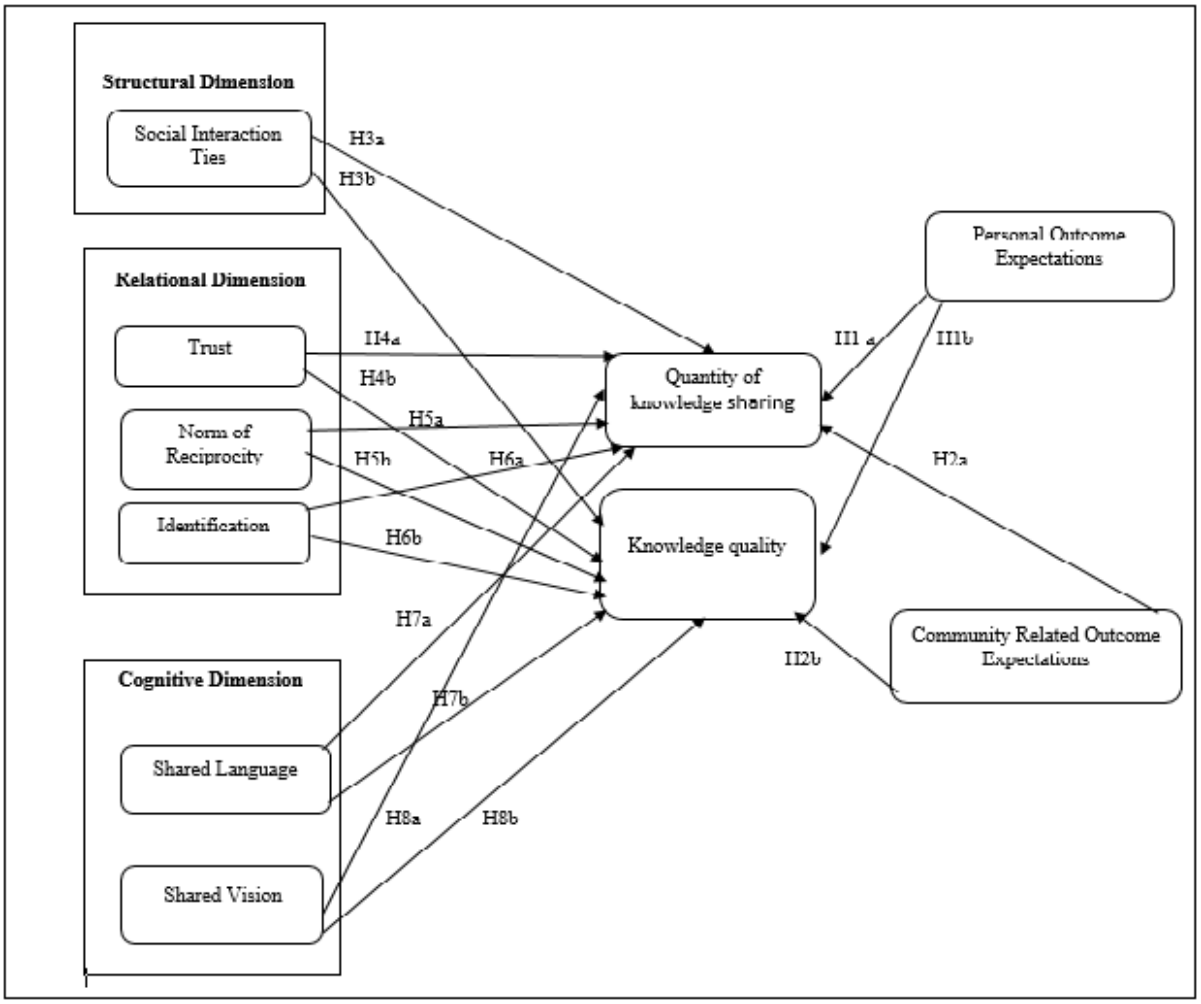

Figure 3-9: research model for knowledge sharing in virtual communities (Chiu et al., 2006)

The results of the study reveal that personal outcome expectations has a positive influence on the quantity and quality of knowledge sharing and personal outcome expectations has a negative relationship with quantity of knowledge sharing. The results also show that social interaction ties, reciprocity and identification have a positive influence on quantity of knowledge sharing and a negative influence on quality of knowledge sharing.

Figure 3-10 shows a research model of knowledge-withholding intention amongst students in management education using social exchange theories. The study explored how perceived social identity, expected rewards and expected association influences knowledge-withholding intention.

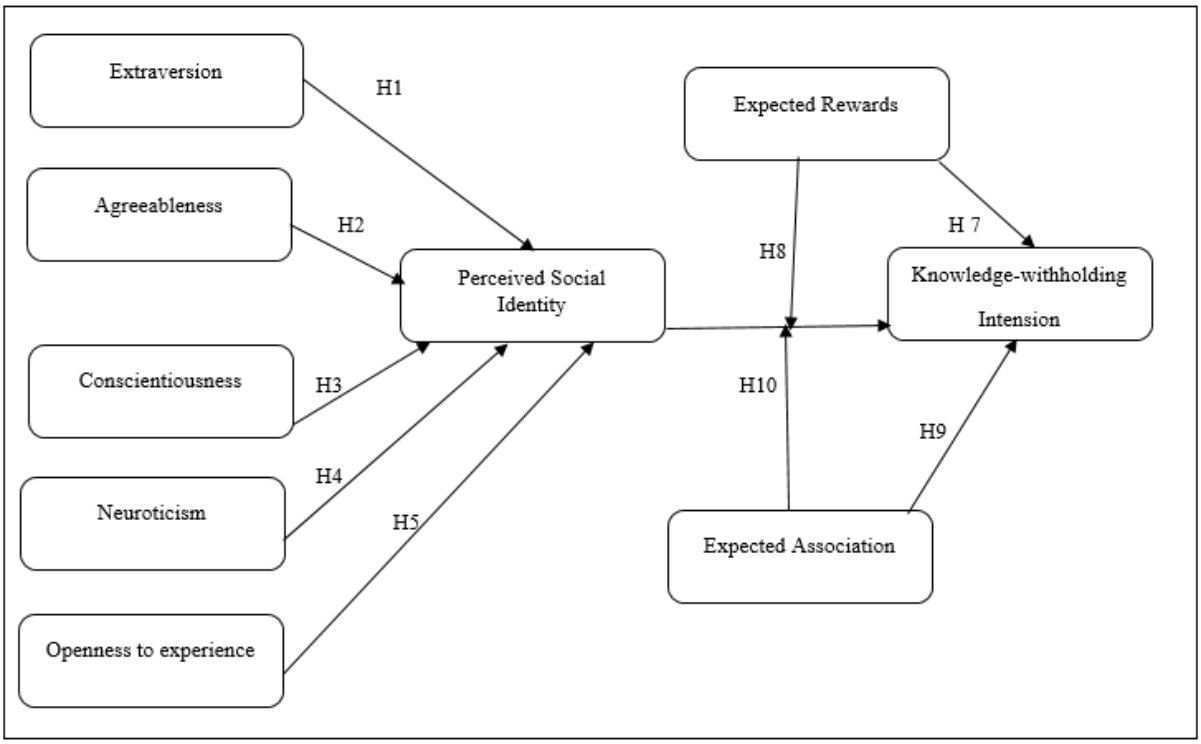

Figure 3-10: research model for knowledge sharing with-holding intension (Wang et al., 2014)

The results of the study reveal that perceived social identity has a negative influence on knowledge sharing withholding intention. Expected rewards was found to have a negative influence on knowledge sharing withholding efforts, and expected rewards was positively related to knowledge with holding intention.

Table 3-1 shows a summary of previous related studies.

Table 3-1: Previous studies that used social cognitive and social exchange theories.

Researchers	**Context**	**Outcome**	**Limitation of the study (knowledge gap)**	**How the present study addresses the limitation or extend knowledge**
Lin and Huang (2010)	The research combines SCT and SCT to build a framework for features. persuading	Knowledge withholding is influenced by distributive justice and trust.	No mention of the cultural factors that influence team members to share knowledge. .	This study included the espoused cultural values to understand how it influences

Researchers	Context	Outcome	Limitation of the study (knowledge gap)	How the present study addresses the limitation or extend knowledge
	suppression knowledge by teams on project.			individual to share knowledge during ISD projects.
Chiu, Hsu and Wang (2006)	The paper uses SCT and Social Capital Theory to build a framework to inspect motivational features that sway people's knowledge sharing in VC's.	Outcome expectations effect individual sharing of knowledge in VC's.	The study measured knowledge sharing based on the quality and quantity of knowledge shared.	Knowledge sharing was measured based on tacit and explicit knowledge.
Tsai and Cheng (2010)	The paper inspects the software engineer's knowledge sharing behaviour	Social cognition was discovered to have positive impact on software engineer's knowledge sharing behaviour and their intent to share knowledge.	The study did not consider the influence of trust as part of the environmental factors which may influence the programmers to share or not to share knowledge.	The study added trust (both competency and benevolence). In addition to this, the influence of knowledge sharing on individual performance was investigated.
Ghobadi and D'Ambra (2013)	The study integrates coopetitive model of knowledge sharing and the social interdependence theory to clarify knowledge sharing in cross functional software development teams.	Both optimistic and undesirable interdependencies provide upsurge to supportive and competitive behaviours between teams from various areas.	The study only paid much attention to high quality knowledge sharing and not on quantity.	The theoretical background focusses on the determinant of knowledge sharing. This study incorporates both tacit and explicit knowledge to understand how it influence the performance of an individual during ISD projects.
Tsai et al.	The study examines the	The study found that trust, associated	The study did not consider the	This study used both constructs

Researchers	Context	Outcome	Limitation of the study (knowledge gap)	How the present study addresses the limitation or extend knowledge
(2013)	intent of IT professionals to share knowledge through Knowledge Management Systems (KMS) systems from the view of Social Exchange Theory.	expectancy as well as self-efficacy have an encouraging significance on knowledge sharing through KMS.	outcome expectation from SCT nor expected rewards and their influence on knowledge sharing intention.	from SCT and SET to investigate its influence on the actual knowledge sharing behaviour.
Wang, Lin,Li & Lin (2014)	The study used social exchange and social identity theories to understand what drives knowledge withholding amongst students in management education.	The study found that expected rewards and perceived social identity as well as expected association negatively affect knowledge withholding.	The study did not consider the influence of cultural orientation determine the influence collectivism and individualism cultural orientation on knowledge with holding.	The present study was focused on knowledge sharing instead of knowledge withholding. The influence of individualism and collectivism cultural orientations were investigated from the positive perspective of knowledge sharing.
Hsu et al., (2007)	The study used SCT to identify factors that hinder or enable knowledge sharing behaviours from the perspective of personal cognition and social environment.	The study found that personal outcome expectation and knowledge sharing self-efficacy have positive influence with knowledge sharing behaviour.	The study only focused on the influence of identification-based trust on knowledge self-self-efficacy and knowledge sharing behaviour. It did not take into consideration the competency of the individuals. The study did not consider rewards and expected reciprocal	Since ISD projects is made of skilled individuals, this study looked at both competency and benevolences-based type of trust to determine how these two types of trust influences individuals in ISD projects whether to share or not share knowledge. Expected rewards and expected

Researchers	Context	Outcome	Limitation of the study (knowledge gap)	How the present study addresses the limitation or extend knowledge
			relationships.	reciprocal relationship was considered for this study.
Tsai & Cheng (2012)	The study used an integrated theory of SCT and SET to explore relationship among trust, organisational justice, commitment, and knowledge sharing self-efficacy.	The study found that knowledge sharing self-efficacy positively influences intention to share knowledge, and that organisational commitment positively influences knowledge sharing self-efficacy.	The study focused on organisational, colleague and supervisor-based view of trust. It did not take into consideration the complex knowledge held by IT professionals and how their competency prohibits or enable knowledge sharing. The study did not include outcome expectation.	The environmental factors in this study was tackled from the benevolence and competency perspective. In addition to this, the cultural orientation of the individuals was taken into consideration. The study also focused on the actual knowledge sharing behaviour rather than intention. The influence of outcome expectation on knowledge sharing was investigated.
Lin & Huang (2008)	The study used task technology fit and SCT to investigate the determinant of KMS usage.	The study found that there is no positive relationship between performance-related outcome expectations and knowledge sharing and that KMS self-efficacy has a positive relationship with KMS usage.	The study focused on knowledge withholding rather than on knowledge sharing.	This study investigated knowledge sharing from the positive perspective and not on negative perspective.

Context and Cultural Values

Knowledge sharing is influenced by both personal factors and contextual forces, and organisational culture could serve as a contextual force (Lia, To, & Hsu, 2013). This is also supported by Pee et al., (2010) who say that in addition to the knowledge giver, receiver and the channel used in the knowledge sharing behaviour, knowledge sharing itself is also disturbed by the environment in which the sharing of knowledge occurs.

Yu, Lu, and Liu (2010) and Shao et al., (2015) hold that organisational culture is crucial in nurturing knowledge sharing. For this purpose, organisational culture is defined as the contextual situation, as well as the feelings, beliefs and the behaviours of members in an organisation (Bock et al., 2005).

Since ISD projects happen in organisational settings, cultural values have been added as a construct to the research model, in addition to the constructs adopted from SCT and SET.

Together these constructs have been used in this study to understand how individual team members reach decisions about whether to share or not share knowledge during ISD projects.

3.3 Study hypotheses

Based on the constructs identified in theory and past research, nine hypotheses have been developed for this study. These include individual performance, interpersonal trust, expected rewards, expected reciprocal relationships, outcome expectations, knowledge sharing self-efficacy and espoused national cultural values. These are discussed here in view of the existing literature are followed by the study hypotheses. A research model of the study is presented at the end of the chapter.

3.3.1 Knowledge sharing

This study investigates the determinants of knowledge sharing and its implication on individual performance during ISD projects.

In these volatile and uncertain economic times, competition for market share and survival amongst various organisations is a reality and knowledge plays a very important part in an organisation's growth prospects. Knowledge forms a key component of this. Liao (2008) argues that the organisation's competitive advantage lies in the knowledge that resides within their employees and that knowledge is the backbone of organisation's value (Shao et al., 2012). In their quest to survive and grow, many organisations have seen the need to make their tactical, operational and strategic processes more effective and efficient through the use of IT (Shao, et al., 2012).

In this study, knowledge sharing is defined as the interchange of experiences, information and skills amongst individual team members in order to accomplish ISD tasks (Chen, Li, Clark & Dietrich, 2013). Information is regarded details about the ISD project such as budgets, timelines, resources, project scope and other factors. Experiences are seen as the experience-based knowledge that an individual has acquired through many years of work experience in ISD projects. Skills are the tasks related to knowledge such as programming, process mapping, sourcing and compiling business requirements and configuration of servers.

In ISD projects, the management of knowledge and sharing knowledge with the correct person at the correct time is imperative (Robillard, 1999). For example, the project team needs to fully understand the problem the new system is trying to address. In an ISD project setting, where various individuals work together to accomplish a common goal, the issue of knowledge sharing is critical as the flows of knowledge should enable improve quality of deliverables and flow of innovative ideas (Nesheim & Hunskaar, 2015).

The knowledge-intensive nature of ISD projects requires different expertise from IT professionals involved (Pee et al., 2010). The application of problem domain and technical knowledge are the two types of knowledge needed in order to develop an information system that will solve the underlying problem, and such knowledge is held in the minds of various experts (Tiwana & MacLean, 2005; Pee et al., 2010). When organisations do not enable the sharing of knowledge used by ISD project team in their daily tasks, the organisation could lose the knowledge when a key project team member resigns or when the project ends (Wickramasinghe & Widyaratne, 2012).

The returns that await organisations with regard to competitive advantage as a result of effective management of knowledge have been discussed in the literature (Nonaka & Takeauchi, 1995). It is important that both tacit and explicit knowledge to be shared amongst individuals in ISD projects. Knowledge sharing involves the sharing of both tacit and explicit knowledge (Oliviera, Curado, Macada & Nodari, 2015). Tacit knowledge which is very hard to articulate is created through social interactions while explicit knowledge is easily found in documents (Oliviera et al., 2015; Ryan & O'connor, 2013). The interactions between team members are key because without interactions, there will not be any sharing of knowledge (Liao, 2008).

3.3.2 Individual performance and knowledge sharing

The literature on information systems posits that knowledge sharing will have a major influence on the performance of individuals in ISD projects (Park & Lee, 2014). If knowledge is key to performance, then increased knowledge (achieved through knowledge sharing) should increase performance. It is thus imperative to study how knowledge sharing impacts the performance of individual team members in software development projects (Ozer & Vogel, 2015).

In this study, individual performance is defined as the quality of the deliverables that an individual team member generates.

In ISD projects, individual team members rely on the voluntary sharing of knowledge from their peers to solve complex problems they come across in the project (Lee, Park & Lee, 2015). According to social capital theory, social capital exist in the relationships between project team members and the successful execution of the project depends on building effective and efficient exchange relationship between team members that will allow them to share important knowledge (Lee et al., 2015). Social capital theory posits that relationships between project team members in an ISD project setting are a valuable resource and that value can be found in the existence of the network ties as well as in the assets which can be generated based on the strength of the ties (Lefebvre, Sorenson, Henchion & Gellynck, 2016). In support of this, the greater the network ties and the availability of knowledge in ISD projects, there is highly likelihood of individual performance (Henttonen, Kianto & Ritala, 2016). In an ISD project environment, knowledge sharing enables the project team members to maintain social capital (Park & Lee, 2014). In a study done on the role of knowledge sharing in employee's performance in knowledge-intensive firms, the findings reveal that that knowledge sharing has a positive effect on employee's individual performance where employees develop their own learning ability and personal development because of their knowledge sharing (Iqbal, Toulson & Tweed, 2013).

During ISD projects, individuals are seen to accumulate, seek and share knowledge in order to perform better in the tasks assigned to them. ISD projects are associated with complex tasks and consist of many subtasks that are dependent on each other and individual team members need to help each other to realize their potential and complete the tasks assigned to them (Navimipour & Charband, 2016).

Knowledge sharing provides individuals in the context of ISD project with a good understanding of how things get done and helps them access the abundance of skills and expertise of their fellow team members. By relying on the available skills and expertise of their colleagues, team members can undertake and complete any tasks no matter how difficult it may seem to be (Ghobadi & D'Ambra, 2012).

Various studies have shown that knowledge sharing impacts on individual performance. Pee et al (2010) found that knowledge sharing is a way to boost the performance of individual in ISD projects. Hansen (2002) found that knowledge sharing has a great role in improving individual performance which may lead to innovative solutions to the organisation's problems (Hansen, 2002). Chen et al (2013) report that past studies have found that the integration and coordination of individual team member's expertise have a positive association on the performance of the software development team output (Chen et al., 2013).

In a study done on the role of knowledge sharing and organisational culture on Enterprise Resource Planning (ERP) success, knowledge sharing was found to have an optimistic impression on the accomplishment of the ERP projects (Shoe et al., 2012). Similarly, in a study done on the association amongst performance and knowledge sharing of software developers in a software development project, researchers found an increase in the performance of the software developers who received knowledge from peers and who had the liberty of incorporating the knowledge received in their assigned software development tasks (Ozer & Vogel, 2015).

Research has found that knowledge sharing leads to improved individual performance as a consequence of improved choice making and synchronization. Individuals also take less time to make decisions as a result of the varied knowledge and skills in the project team (Choi, Lee &Yoo, 2010). Knowledge sharing enables the individual team members to improve their

individual performance in relation to their assigned tasks during ISD projects (Wang and Ko, 2012).

Many studies also have investigated knowledge sharing in terms of the usefulness of the shared knowledge, and amount of knowledge being shared (Chiu et al., 2006). Yang (2006) found that unless the knowledge held by an individual is made available to the fellow team members who requires it, its usefulness will not be noticed within the organisation. Various studies have also found that project team members need to participate in the knowledge sharing process and also to ensure that the quantity of knowledge being shared is of high quantity (Cox, 2007; Liu, Chang & Hu, 2010). According to D'Ambra & Ghobadi (2013), when ISD project member's works together, high quality knowledge is shared and this has a good impact on the performance of individual team members in the project. Ghobadi & D'Ambra (2013) highlight the importance of reputation and the superiority of the knowledge being shared.

The following is thus hypothesized:

H1: Knowledge sharing positively influences IT professional's performance during an ISD project.

3.3.3 Interpersonal trust and knowledge sharing

Individuals are more likely to disclose accurate information with people they trust (Acker, Vermuelen, Kreijns, Lutgerink & van Buuren, 2014). Interpersonal trust is thus crucial in voluntary actions such as knowledge sharing and it has also been considered to be a vital factor in social exchanges relationships (Hsu & Chang, 2014). Past studies have reviewed trust in many different forms and with different relationship, and even though the different types of trust may vary with one another, they are related to one another (Mayer et al., 2005).

The concept of trust in the context of knowledge sharing has been researched several times. For example, Davenport and Prusak (1998) found that trust is important in knowledge sharing. Park et al., (2014) also concluded in a study done on knowledge sharing in virtual communities that trust was an important factor which influences knowledge sharing. In a similar study conducted on knowledge sharing amongst members in an online community, Liu, Lin, Chang and Chao (2014) found that trust plays a crucial role in the promotion of knowledge sharing. Further, Maurer (2010) found in a project environment that interpersonal trust drives the acquisition of knowledge as it motivates individual team members to share ideas and knowledge. Swift and Hwang (2013) also found that trust is a very central factor in the facilitation of knowledge sharing and that it promotes learning in organisations.

Various other studies have found that trust is one of the many important factors that support knowledge sharing along with previous experiences in knowledge sharing, external rewards, social process, as well as organisational culture (McNeish & Mann, 2010). When trust exists in teams or organisations, people are more eager to part with their knowledge. Knowledge sharing can thus be influenced directly or indirectly through trust (McNeish & Mann, 2010).

Interpersonal trust takes time to build and only takes seconds to destroy, which is why it is very important for ISD individual team members to pay attention to the development of continuous trust (Hsu et al., 2007). The authors further say that interpersonal trust involves unspecified obligation, in other words, there is no binding contract between the knowledge provider and knowledge receiver.

Trust amongst members of the ISD project can motivate them to share private and valuable knowledge (Maurer, 2010). In the context of ISD projects, individuals from various teams or functional areas come together to perform their assigned project tasks. Maurer (2010) reports

that interpersonal trust can assist in strengthening and in improving the relationship between individual team members during ISD projects.

In support of this, Cabrera and Cabrera (2005) note that the willingness to share knowledge amongst individual team member's increases when team members trust each other. They conclude that interpersonal trust is an essential element for knowledge sharing. Similarly, in a study conducted on team work and knowledge sharing, Wickramasinghe and Widyaratne (2012) note that interpersonal trust is absolutely connected with knowledge sharing. They further found that interpersonal trust removes dishonesty, cheating and the practice of individuals blaming each other for failures within the project.

Researchers have found that both the provider of the knowledge and the recipient need to trust each other. On the one hand, an individual team member seeking knowledge allows themselves to be vulnerable by acknowledging that they lack certain knowledge that will enable them to complete the tasks assigned to them in the project. On the other hand, the person providing the knowledge trusts that the other individual will utilize the knowledge they are providing productively. IT professionals regard the tacit knowledge they have gained throughout their careers as being precious and they will only share it with those they trust and who have a track record of solid performance (Werner, Blaas-Franken & Martin, 2016). On the other hand, it is in human nature to share knowledge that people perceive as being valuable (Liao, 2008).

The research into trust and knowledge sharing ties into both theories that have been chosen to underpin this study. Social Exchange Theory posits there is a positive association between interpersonal trust and knowledge sharing, and that knowledge sharing heavily depends on trust (Staples & Weber, 2008). With reference to Social Cognitive Theory, previous research has found that individuals who have great self-efficacy are more keen to share knowledge

with peers as they trust that their sharing of knowledge will aid others to resolve difficulties and improve their work performance (Wasko & Faraj, 2000; Tsai & Cheng, 2012; Bock & Kim, 2002).

Trust is a multidimensional construct that has been researched from various disciplines (Maurer, 2010; Hsu et al., 2007). Various researchers have come with different definitions of trust and have noted that trust is a difficult concept to define (McNeish & Mann, 2010). Ghaznavi, Perry, Logan & Toulson (2011) says that trust is when an individual expects that the behaviour of another individual will follow certain principles, norms and values. Gang and Ravichandran (2015) defined trust as the keenness of an individual to be exposed to the activities of others. The authors claim that trust is a vital precursor in the development of knowledge exchange relationships between knowledge workers.

This study adopts the definition of interpersonal trust as an individual team's expectation that other team members in the project will perform future actions based on honesty and cooperative behaviour (Van Acker et al., 2014).

Based on past studies in to interpersonal trust development, this study applied two interpersonal trust factors, competency-based trust and benevolence-based trust.

- **Competence-based trust** is defined as the individual team member's belief that their fellow team members with whom they share knowledge are knowledgeable about ISD projects.
- **Benevolence-based** trust is the belief that individual team members have that their fellow team members will not hurt them intentionally (Acker et al., 2014).

The following is hypothesised:

Hypothesis 2: Interpersonal trust between Individual IT professionals positively influences an individual IT professional's knowledge sharing.

3.3.4 Expected rewards and knowledge sharing

SET states that an individual considers the benefits versus the cost when considering engaging in an action. In this study, expected rewards mean the individual member's expectation that there are benefits linked with their knowledge sharing act. So for example, one could assume that knowledge sharing entails the exchange of knowledge and personal experience in exchange for social and economic benefits (Zhang, de Pablos & Zhou, 2013). Economic exchange includes organisational rewards such as improved work conditions, better pay and other associated benefits deemed to be necessary by those particular organisations (Zhang et al., 2013).

There are two types of motivation that can drive an individual to share knowledge (Hung et al., 2011). The first one is intrinsic motivation where an individual will share knowledge because they find it enjoyable and interesting. The second is extrinsic motivation, where the individual is driven by a particular goal they need to attain.

Various research has been conducted to understand the impact of expected rewards on knowledge sharing, some of the studies yielded positive results while some yielded negative results.

In the context of ISD projects, expected rewards implies that when individual team members believe there is something in it for them such as extrinsic rewards (monetary, promotion, learning opportunities) when they engage in positive knowledge sharing behaviour, their attitude will be positive toward the knowledge sharing act (Tsai et al., 2013).

Wasko and Faraj (2000; 2005) have found that in voluntary settings, individuals resist or feel unable to share knowledge with others. Expected rewards are thus key to stimulating individual team members to share their understanding and experience (Menkhoff, Yueh, Evers and Loh, 2007). Kankanhalli, Tan and Wei (2005) found that when individual team members trust that they will obtain intrinsic rewards (social recognition, self-gratification, authority etc.), they enjoy participating in knowledge sharing behaviour.

Bartol and Srivastava (2002) found that tangible rewards such as money inspire an individual to share knowledge through contribution to knowledge databases, formal and informal collaborations between and within teams, and through different work teams in the organisation. Hall (2001) found that in the knowledge sharing context, tangible rewards such as pay rises, bonuses such as share incentives are one of the key drivers to persuade individuals to share knowledge in an organisation. Past research has also identified organisational rewards as being the driver in encouraging individuals to carry out desired action or behaviours such as knowledge sharing (Wickramasinghe & Widyaratne, 2012).

In a study done by Voelpel and Han (2005), Siemens in China implemented a knowledge management system called sharenet. In an attempt to stimulate their employees to share their knowledge using sharenet, Siemens introduced incentives where employees were awarded shares for every positive knowledge contribution they made. The authors found that the introduction of shares to incentivise employees resulted in an increase of employees who used sharenet to share knowledge. During the economic downturn of 2001, demands for Siemens services fell and this resulted in the company suspending the issuing of shares to employees in relation to Sharenet (Voelpel & Han, 2005). This also resulted in the decrease in the number of employees who used Sharenet to share their knowledge. This finding is in line with SET which states that individuals maximize benefits and minimise cost before

committing to a certain behaviour and that individuals will undertake a behaviour if there are rewards associated with such a behaviour.

However, not all the research supports the assumption that knowledge sharing behaviour is linked to expected rewards. Lin (2007) and Bock et al., (2005) found no positive association amongst expected rewards and employee's intention to share knowledge. Other studies found that expected reciprocal relationships, rather than expected rewards, have a positive impact on the intention and attitude of employees to share knowledge (Bock et al., 2005; Lin, 2007).

Based on SET and previous research, this study hypothesizes that individuals will share knowledge only after conducting a cost and analysis benefit, and they will participate in knowledge sharing only if the rewards are greater than the cost. Similarly, the study assumes that individuals will always maximize the benefits and minimise the cost and that they are motivated to share what they know if they expect that future benefits will exceed their efforts (Beck, Pahlke & Seebach, 2014).

In this study, expected rewards are defined as the team member's expectation that there are benefits (intrinsic or external) associated with their knowledge sharing.

The following hypothesis is thus put forward:

Hypothesis 3: Expected rewards positively influence an individual IT professional's knowledge sharing.

3.3.5 Expected reciprocal relationships and knowledge sharing

Knowledge sharing is a voluntary action and knowledge is a scarce resource which individuals are not willing to share with others unless there is something in it for them. Social Exchange Theory suggests people will share knowledge and more effort with people with whom they have close interactions (Wang et al., 2014).

In the context of SET, individuals are motivated to help if they believe that others will also discharge or return the same favour fairly in the near future. If the other parties do not violate this, there will be a social interaction which will increase the reciprocal relationship between the individuals involved (Beck et al., 2014).

Previous studies have revealed that reciprocity plays an important part in knowledge sharing. Wang et al. (2014) found that the sharing of knowledge amongst individuals is driven by friendship and interpersonal relationships are a good foundation for knowledge sharing. In a knowledge sharing study, Gang & Ravichandran (2015) found that the user expectation of reciprocal relationships in a video conference setting, makes them share knowledge.

Studies have also shown that reputation and group status are important factors. During an ISD project, an individual will share knowledge especially if it will boost their reputation amongst the project team members (Beck et al., 2014). This is further supported by Hung et al., (2011), who found that when individuals feel that they will increase their reputation by sharing knowledge, they are more likely to do so. The authors further say that when the individual sees that their status in the group has increased as a consequence of sharing their knowledge, the quality of their performance also increases.

In this study, expected reciprocal relationship means the individual members' expectation that there are benefits associated with their knowledge sharing (Wang & Hou, 2015).

The following is hypothesized:

Hypothesis 4: An individual IT professional's expected reciprocal relationship positively influence knowledge sharing.

3.3.6 Outcome expectation

Outcome expectation is defined as the team member's beliefs that finishing an assigned task or tasks will result in favourable outcomes (Hsu et al., 2007). SCT states that if an individual expects a positive outcome when they share their knowledge in relation to the project with others, then they will participate in knowledge sharing behaviour (Bandura, 1997; Compeau & Higgins, 1995, as referenced by Hsu et al., 2007).

There are two kinds of outcome expectation; team outcome expectations and personal outcome expectations. Lin and Huang (2010) explain that an outcome can be both personal (such as pleasure) and team related (such as performance on the project). Lin and Huang (2010) also noted that those individuals who have high personal and team outcomes will take on their fair share of the burden when they are exposed to tasks that challenges their thinking.

In a study conducted by Wasko and Faraj (2000) in VCs, the authors found that VC members were motivated by the VC's interest rather than their own personal interest.

Previous studies conducted on the relationship between the outcomes of an ISD project and knowledge sharing, have reported that knowledge sharing has a significant role in improving the outcomes of the ISD project (Lin & Huang, 2010). In the perspective of ISD projects, the outcomes that individuals expect are crucial to knowledge sharing. Individuals who expect positive outcome, either for themselves or for the project as a whole, will engage in positive knowledge sharing so that they can achieve their expected outcomes. This is especially true if they believe that their actions will have a good outcome for both the project and for themselves as individuals.

In this study, outcome expectation is the individual's own assessment of whether their sharing knowledge or participating in knowledge sharing activities will yield a positive result

for the Information Systems currently under consideration (Lin & Huang, 2010). This study adopts personal outcome as the level of analysis of this is on individuals.

Therefore, the following is hypothesized:

Hypothesis 5: An individual IT professional's outcome expectation positively influences knowledge sharing.

3.3.7 Knowledge sharing self- efficacy

Self-efficacy is understood as a type of self-evaluation and it is defined as the individual's judgment of their ability to execute a specific behaviour (Chen, Chuang & Chen, 2012). Self-efficacy is not the expertise that an individual possesses but rather their confidence in their ability.

As per SCT, an individual can use self-efficacy to evaluate themselves to see whether they are able to perform certain actions based on their own capabilities (Liao et al., 2013). In knowledge sharing, self-efficacy is viewed as a vital condition through which a person can affect the required change in behaviour (Tsai et al., 2013).

Previous research in ISD projects has found that self-efficacy is vital since the individual's expectation of an optimistic result will be futile if they don't believe in their capability to perform their duties effectively (Hsu, Ju, Yen & Chang, 2007). The authors as well contended that obstacles and difficulty to the giving out of available know how between ISD individuals possibly be understood as an absence in their self-efficacy.

This study defines knowledge sharing self-efficacy as an individual's self-confidence in their own ability to participate in knowledge sharing (Wang & Hou, 2015). It is the individual's confidence in their own skills and knowledge and the level of self-confidence that a project team member has in his or her ability to share project knowledge with others.

Therefore, the following is hypothesized:

Hypothesis 6: An individual IT professional's knowledge sharing self-efficacy positively influences outcome expectation.

Hypothesis 7: An individual IT professional's knowledge sharing self-efficacy positively influences knowledge sharing.

3.3.8 Collectivism and individualism cultural orientation and knowledge sharing

Previous studies reported that culture influences the way people participate in knowledge sharing (Chen & Lin, 2013). Accordingly, this study proposes that culture is being crucial to knowledge sharing (Alavi & Leidner, 2001). Since in ISD projects, individuals will have different cultural orientations regardless of their nationalities (Hwang, 2012), culture could have a major impact on knowledge sharing behaviour.

Hofstede (2001) puts forward five work-related cultural dimensions which may differ for every country, including:

- collectivism versus individualism,
- uncertainty avoidance,
- power distance,
- indulgence versus restraint,
- masculinity versus femininity (Hofstede, 2001).

Collectivism refers to the degree to which individuals are integrated as a group (Arpaci & Baloglu, 2016). Individualism refers to the degree to which an individual act alone rather than as a member of a group (Arpaci, Baloglu & Kesici, 2018). Collectivist cultural orientations

put emphasis on group identity as compared to individual cultural orientation which put emphasis on individual identity (Hwang, 2012).

Cultural values are central to motivators in life and every individual may possess both aspects of individualist and collectivist cultural orientations (Saad, Cleveland & Ho, 2015).

Employees with an individualist orientation place value on personal privacy and personal opinions (Arpaci et al., 2018). Individuals with an individualist cultural orientation put their own interest first before the needs of the group. They are also not afraid to speak their minds with regards to how to solve a particular problem (Ndletyana, 2003). IT professional with high degree of individualism prefer to solve problems on their own rather than seek to solve problems as a group (Zhang et al., 2014).

On the other hand, employees who subscribe to a collectivist cultural orientation will consider the interests of the project team. This will include their approach to knowledge sharing. Collectivists depend on one another and they are motivated by the common organisational needs (Yu, 2014). Collectivists see themselves as part of the group and they are driven by the desire of the entire group, where they see themselves as interdependent on their own members rather than on their own (Tang, Werner & Karwowski, 2016).

In terms of performance, an individualist will perform better when motivated by personal goals while a collectivist will perform better when motivated by group goals (Ndletyana 2003; Yu, 2014).

While there has been some research into the impact of culture on technology adoption, acceptance and use, there is little research into the effect of culture on knowledge sharing.

Some of the studies undertaken to understand how culture influence technology adoption, acceptance and use include studies seeking to understand:

- How individuals adopt household technology in the United States of America (Zhang & Maruping, 2008);
- The effect of knowledge sharing in a multi-national virtual classes of students in Beijing, Hong Kong, and Netherlands (Zhang et al., 2014);
- Technology acceptance amongst students from 30 nationalities at a University in the United States of America (Srite & Karahana, 2006);
- The mobile shopping behaviour of consumers in United States of America and China (Lu, Yu, Liu & Wei, 2017),
- The role of espoused values on e-service adoption between users in Nigeria and United States of America (Udo, Bagchi & Kirs, 2012)

While there have been few empirical studies undertaken to understand the impact of cultural orientations in knowledge sharing (Zhang et al., 2014), some insights can be drawn from studies such as those conducted to understand:

- Challenges and opportunities of knowledge sharing in a multicultural environment in a South African University (Dube & Ngulube, 2012);
- The moderating effects of collectivist cultural orientation on knowledge sharing attitude by e-mail (Hwang, 2012);
- The impact of national cultural values on team learning in the South African context (Ndletyana, 2003).

Findings from research into organisational culture and knowledge sharing show that organisational culture can enable or block the formation and sharing of knowledge within organisations (Zhang et al., 2014). Kathiravelu, Mansor, Ramayah and Idris (2013) note that some features of organisational culture also contribute to the hindrance of knowledge sharing. The authors found that cultural features such as emotional intelligence, fear, gender

differences, and lack of social network can play a major role in hindering effective knowledge sharing (Kathiravelu et al., 2013). Similarly, Peralta and Saldanha (2014) conclude that organisational knowledge centred culture (KCC) or knowledge friendly culture is at the centre of employee's knowledge sharing and plays a major role in the day-to-day knowledge needs as far as actions and decisions are concerned.

Since ISD projects consist of individuals that are brought together from different teams and cultural backgrounds, the teams are likely to be diverse. Zhang, de Pablos and Xu (2014) have found that the more culturally diverse the ISD project team is, the less likely the individual will be to participate in knowledge sharing. The authors further say that in a multi-cultural virtual classes, the cultural diversity of students may result in different perceptions on knowledge sharing. The present study examines how cultural orientation at an individual level may influence individual IT professionals to share knowledge during ISD projects in the South African context. It fills a gap in the literature by examining the influence of collectivist and individualistic cultural orientations on knowledge sharing and knowledge sharing self-efficacy. In the study, the definition of culture from Hofstede (2001) who defines culture as ''the collective mental programming of the human mind based on values" is adopted. The present study is concerned with culture at an individual level and focuses on the collectivism/individualism dimension of Hofstede cultural dimensions. Accordingly, the study tests the following hypotheses:

Hypothesis 8: A collectivist cultural orientation positively influences an IT professional's knowledge sharing self-efficacy.

Hypothesis 9: A collectivist cultural orientation positively influences an IT professional's knowledge sharing.

Table 3-2: Hypotheses and their description

Hypotheses	Descriptions
Hypothesis 1	Knowledge sharing positively influences an IT professional's performance during ISD project.
Hypothesis 2	Interpersonal trust between Individual IT professionals positively influences an individual IT professional's knowledge sharing.
Hypothesis 3	Expected rewards positively influences an individual IT professional's knowledge sharing.
Hypothesis 4	An individual IT professional's expected reciprocal relationship positively influences knowledge sharing.
Hypothesis 5	An individual IT professional's outcome expectation positively influences knowledge sharing.
Hypothesis 6	An individual IT professional's knowledge sharing self-efficacy positively influences outcome expectation.
Hypothesis 7	An individual IT professional's knowledge sharing self-efficacy positively influences knowledge sharing.
Hypothesis 8	A collectivist cultural orientation positively influences an IT professional's knowledge sharing self-efficacy.
Hypothesis 9	A collectivist cultural orientation positively influences an IT professional's knowledge sharing.

Table 3.2 summarizes the hypotheses of the study. The study consists of nine hypotheses that were tested using structural equation modelling in chapter 5.

These hypotheses inform the research model outlined below which is based on the integration of SET and SCT theories, as well as espoused cultural values. This study seeks to understand how these factors enable IT professionals to participate in knowledge sharing.

3.3.9 Research Model

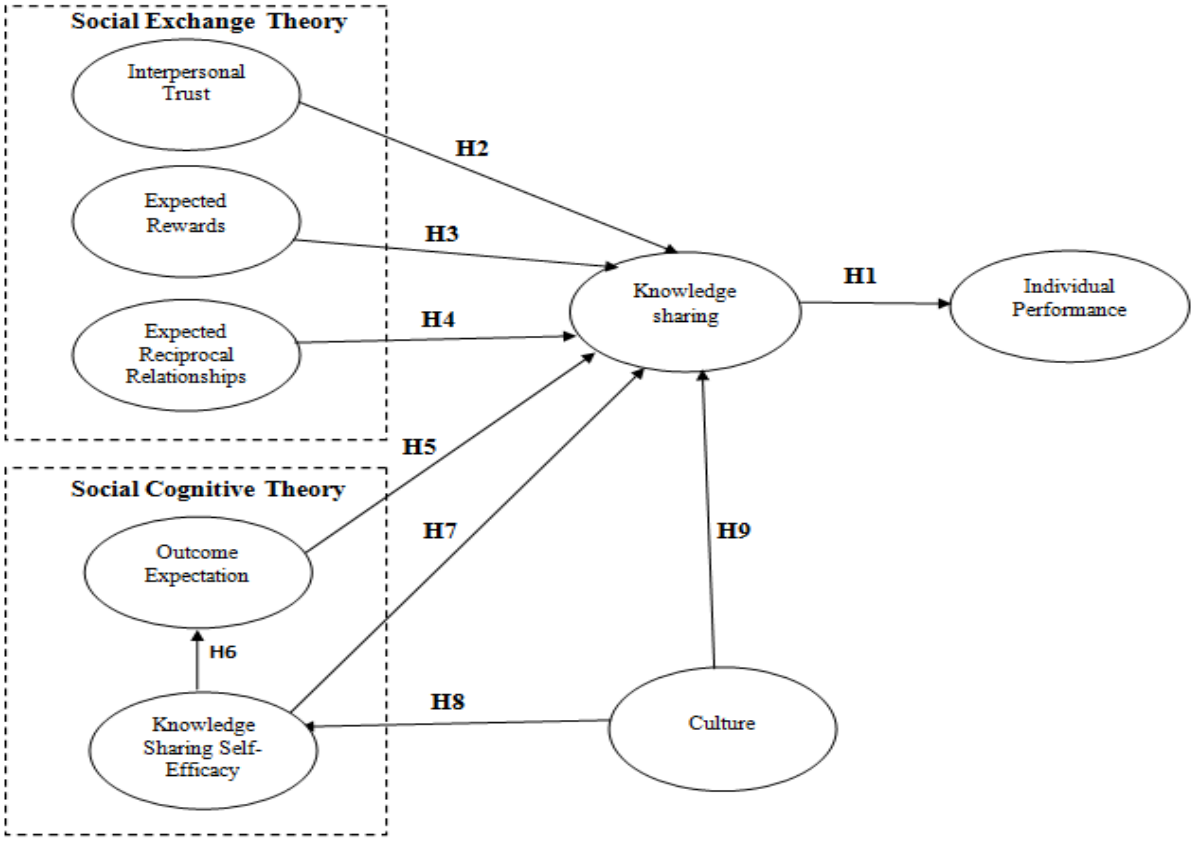

Figure 3-11: Research model

Figure 3-11 above shows the research model of the study. The model consists of constructs from Social Exchange Theory and Social Cognitive Theory and includes culture as an additional dimension. The research model also shows the hypotheses proposed in this study and the relationships between the constructs. The model includes knowledge sharing as a mediator between the SET and SEC variables, in terms of impact on individual performance.

The model suggests that when an individual team member in an ISD project performs well in an ISD project as a result of the knowledge they share or receive, they may be able to accomplish ISD project within the expected time, cost and scope. Similarly, the effective realization of ISD objectives lies on the combination and sharing of expertise and an

understanding that permits individuals in the project to learn from the knowledge and skills of other team members (Lee et al., 2015).

3.4 Summary of the chapter

This chapter discussed in detail the two theories that underpin this study. The hypotheses of this study were also discussed based on the reviewed literature. The research model was also presented and discussed.

The next chapter discusses the research procedures used in this study.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

The previous chapter discussed the social exchange and social cognitive theories which were used as theoretical lenses to develop a research model for this study. It also presented the conceptual research model and discussed the hypotheses and relationships between the variables.

The intention of this chapter is to discuss the research methodology utilized in this study. It introduced the research paradigms, strategies, approaches, choices and time horizon. It also discussed the sampling techniques used, unit of analysis chosen, data collection techniques used, as well as data analysis methods employed. The operationalization of constructs and their measures is also discussed. The chapter concludes by discussing the ethical guidelines which were taken into consideration in this study.

4.2 Epistemology and ontology

When dealing with research paradigms, it is very important to clear the confusion between ontology and epistemology. Ontology deals with the nature of reality and the form of such reality (Maree, 2007). Ontology is defined differently by different authors as well as in different research methodologies and approaches (Maree, 2007). The key ontological question that should be asked by researchers is "What it is that can be known by the nature of reality?" (Guba & Lincoln, 1994; Mohammed, 2017). There are two parts of ontology which are subjectivism and objectivism (Saunders et al., 2009). The objectivist view holds that

social entities exist and their existence is independent of societal players who are worried with their presence. The subjectivist aspect of ontology states that social realities are created as a result of perception as well as actions that are held by the social actors who are concerned with their existence (Saunders et al., 2009).

Epistemology is concerned with what is known to be an adequate knowledge in a specific area of study (Saunders et al., 2009). Epistemology focuses on how things can be known or discovered (Maree, 2007). The epistemological question that needs to be asked by researchers is "What is the association between the would-be knower and what is it that can be known?" (Guba & Lincoln, 1994).

4.3 Research Paradigm

A research paradigm is a set of collective statements or a method of thinking concerning certain aspects of the world (Oates, 2008). The research paradigm guides the researcher undertaking the study into understanding which research methods are most appropriate or suitable for their study (Guba & Lincoln, 1994). The researcher should explain the research paradigm that has informed their study beyond simply describing the research methods. This is because qualitative and quantitative research methods could be used with any research paradigm (Saunders, Lewis & Thornhill, 2009). There are two main research paradigms, positivism and post-positivism (Bhattacherjee, 2012).

4.3.1 Positivism

Positivism is a research paradigm with its roots in natural science and it assumes that the social world is viewed objectively (Blumberg et al., 2008). In a positivist research paradigm, the researcher carrying out the research should be neutral and take on the role of an impartial expert who is not biased towards the outcome of the research based on their value systems

(Blumberg et al., 2008; Guba & Lincoln, 1994). A positivist research paradigm searches for empirical truths based on facts (Malina, Nørreklit & Selto, 2011).

The major goal of scientific approaches and positivism paradigm is to discover global rules, patterns and regularities (Oates, 2008). Positivism assumes that knowledge creation is based on facts that can be observed and measured and relies solely on testable theories (Bhattacherjee, 2012). A positivistic research paradigm is associated with the natural sciences as the researcher is working with observable social reality. This paradigm posits that the researcher is self-governing and neither influences nor is influenced by the phenomenon being studied (Saunders et al., 2009).

Positivist research in the natural and social science typically has the following in common (Johannessen & Olaisen, 2005):

- The research tests deductive hypothetical statements which are based on statistical or universal laws.
- There is methodological unity.
- The research is statistically or mathematically oriented.
- There are linear causal explanations for the results.

A positivist research paradigm is aligned to quantitative data analysis and testing of hypotheses (Oates, 2008; Creswell, 2009). Researchers that embark on positivist research are likely to use an organised methodology in order to enable the duplication of the research outcomes (Gill & Johnson, 2002).

4.3.2 Interpretivism

Interpretivist studies look at how the world is viewed by people, both as individuals or in groups (Oates, 2008). Interpretivism inspires the researcher to understand the research

participants and their characteristics as social actors (Saunders et al., 2009). Researchers in interpretive studies are typically dynamic and look for socially-constructed meaning. They are flexible and consider multiple subjective realities where there is no single version of the truth. They often involve the study of human beings in their normal settings. They are typically associated with qualitative data analysis as well as multiple interpretations (Oates, 2008).

An interpretivist research paradigm makes the following assumptions (Maree, 2007):

- human life can only be understood from within;
- social life is a uniquely human product,
- the human mind is the purpose source or origin of meaning;
- knowledge of the social world affects human behaviour; and
- human knowledge and the social world do not exist independently of each other.

The interpretivist research paradigm focuses on how people create their social life through the way in which they relate and intermingle with each other. There is an opportunity to understand the perceptions people have of their own actions if one places them in the social context they are accustomed to (Hussey & Hussey, 1997).

4.3.3 Critical research

Investigators in the critical research paradigm hold that social reality is constructed by human beings (Oates, 2008). Critical research views it as imperative to understand thoroughly the lived experiences of human beings (Oates, 2008). The investigator's critical theory goes above the idea of clarifying and understanding a thing, by empowering human beings (Maree, 2007; Oates, 2008). Researchers undertaking critical theory do not take things at face value, but probe and confront what they are being told (Maree, 2007; Oates, 2008).

4.3.4 Realism and pragmatism

A pragmatic approach holds that the research question will guide one regarding which ontology, axiology or epistemology to adopt. It is also important for researchers to think of the research paradigms they select as a continuum instead of the dichotomies (for example it is possible to use quantitative and qualitative methods in one study).

The realism research paradigm is similar to positivism and states that knowledge can be developed through a scientific approach. This paradigm can be direct or critical (Saunders et al., 2009). Direct realism views the world as accurately depicted by what we experience through our senses, while critical realism posits the view that the world is based on what we experience through our senses, sensations and description (Saunders et al., 2009).

Research philosophies command a vital role in a scholarly study as a simple comprehension of research philosophies aids the scholar to explain which research design to utilize (Blumberg, Cooper & Schindler, 2008).

In order to clarify the confusion that exists amongst researchers, Guba and Lincoln (1994) suggested four fundamental research philosophies which are positivism, critical theory, post-positivism and constructivism.

Table 4.1 below shows the summary of four research paradigms, namely positivism, realism, interpretivism and pragmatism.

Table 4-1: Summary of research paradigms (Saunders et al., 2009)

	Positivism	**Realism**	**Interpretive**	**Pragmatism**
Ontology: The researcher's view of the nature of reality or being	Reality is external, objective and independent of social actors.	Reality is objective. It exists independently of human thoughts and beliefs or knowledge of their existence (realist), but is interpreted through social conditioning (critical realist).	Reality is socially constructed and subjective, and may change. There may be multiple realities.	Reality is external and there may be multiple. Adopt the view best able to answer the research question.
Epistemology: Views of the researcher on what constitutes acceptable knowledge	Only observable phenomena can provide credible data and facts. Focus is on causality and laws, like generalizations. Seeks to reduce phenomena to their simplest elements.	Observable phenomena provide credible data and facts. Insufficient data means inaccuracies in sensations (direct realism). Alternatively, phenomena create sensations which are open to misinterpretation (Critical realism). Focus on explaining within a context or contexts	Subjective meanings and social phenomena prove acceptable knowledge. The focus is on the details of situation, a reality behind these details. Look for the subjective meanings motivating actions.	Either or both observable phenomena and subjective meanings can provide acceptable knowledge. Dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data.
Axiology: Views of the researcher on the role of values in research.	Research is undertaken in a value-free way. The researcher is independent of the data and maintains an objective stance.	Research is value-laden. The researcher is biased by world views, cultural experiences and upbringing. These will impact on the research.	Research is value-bound. The researcher is part of what is being researched, and cannot be separated from it. So the research will be subjective.	Values play a large role in interpreting results. The researcher can adopt both objective and subjective points of view.
Data collection: Collection techniques	Highly structured, large samples, measurement,	Methods chosen must fit the subject matter,	Small samples, in-depth investigations,	Mixed or multiple method designs, quantitative and

associated with the research paradigm	quantitative, but can use qualitative	quantitative or qualitative	qualitative	qualitative

The research paradigm that a researcher selects to use in a study has an effect on the methods that can be used to produce credible evidence to answer the research questions (Mohammed, 2017). Figure 4.1 illustrates the positive – interpretivist paradigm continuum and research methods that are associated with different paradigms.

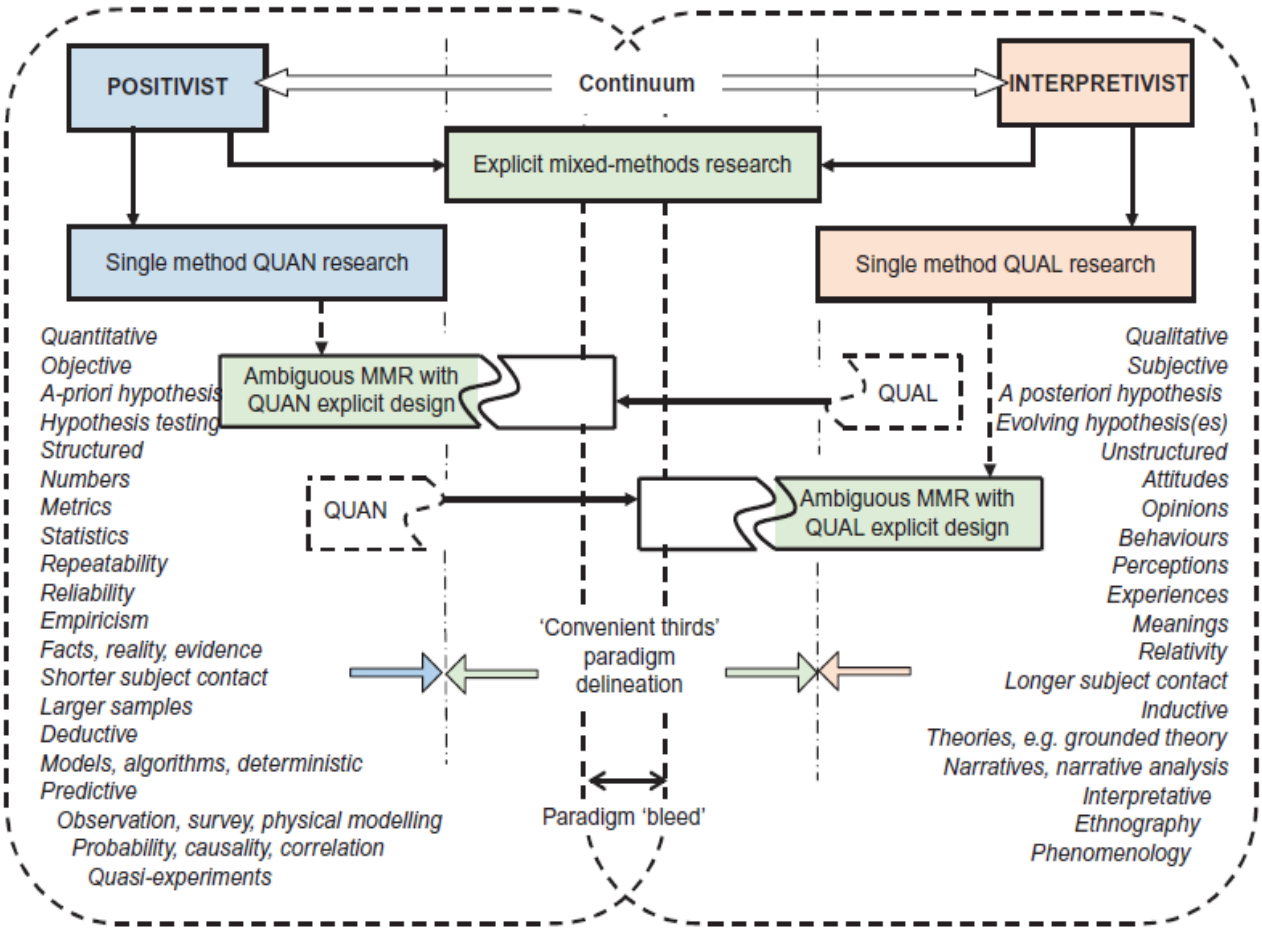

Figure 4-1: Paradigms and associated methodological choices (Holt & Goulding, 2014)

As illustrated in Figure 4.1 the positivist research paradigm is normally associated with quantitative research methods while interpretivism is associated with qualitative research. It is very imperative for the researcher to describe in detail the research paradigm which

informed their study. Based on the summary in Table 4.1, the research paradigm identified as appropriate for this study is the positivist paradigm as the study uses established theories to develop and test hypotheses in order to predict knowledge sharing phenomenon between IT professionals in ISD projects. This study adopts an objective ontological stance with a view that knowledge sharing phenomenon is independent, objective and external to IT professionals.

4.4 Research methodology

Research is an organised investigation which aims to offer the evidence required to solve a research problem (Oates, 2008). The research methodology is the structure that shows the process involved in research (Remenyi & Williams, 1998). The research methodology is focused on the complete methods and viewpoints of the entire research process and it answers questions such as why one gathers specific data, what data were gathered, where data was gathered from, how data was gathered and how the data was analysed (Collis & Hussey, 2003; Mohammed, 2017).

A deductive research approach consists of the development of a theory which then need to be rigorously tested. In deductive research, theory plays a major role in determining the type of research questions that participants need to answer (Rowley, 2014).

A deductive research approach was used in this study. Propositions and theories were established, and the strategy of the study was established to be suitable to evaluate the propositions and theory.

This study followed the five steps listed below:

- Presuming a proposition;
- Articulating the proposition in operational terms;

- Analysing the hypothesis;
- Probing the precise result of the inquiry; and
- Amending the theory in light of the conclusions.

4.4.1 Quantitative research

In quantitative studies, the investigator uses arithmetic data to evaluate associations between study constructs (Charles & Mertler, 2002). The purpose of quantitative data is to check for similarities in the data gathered and to arrive at conclusions. The researcher utilizes quantitative methods to analyse theories to test their truth and check for casual effects amongst study constructs (Maree, 2007).

Post-positivism (which is also known as methodological pluralism) believes in using more than one method for scientific inquiry (Morris, McNaughton, Mullins & Osmond, 2009). Post-positivism is a paradigm which puts emphasis on the subjective nature of reality rather than adopting the objective lens of the positivism paradigm (Ryan, 2006). Post-positivism which method is utilized by the researcher to improve knowledge, and that the researcher depends on the method of post-positivist to produce knowledge (Tashakkori & Teddlie, 1998). Researchers in post-positivist believes not all knowledge is completely known and that the researcher assumes a learning role rather than a testing role, where they see conducting research with other people, and learning with them along the way (Ryan, 2006).

The main aim of the quantitative research method is to clarify the associations between the study constructs (Maree, 2007). There are two types of quantitative data, namely continuous and discrete data (Salkind, 2009). Discrete data is data where values can be placed in categories with definite boundaries, and continuous data is data with an infinite number of possible values (Salkind, 2009). There are also four different types measurement scales used in quantitative research, namely nominal, ordinal, interval and ratio scales (Gravetter &

Forzano, 2012). Nominal scales describe variables which are categorical in nature, ordinal scales describe variables that can be arranged in a continuum and consist of a series of ranks, interval scales describe variables that have equal intervals (these allow the researcher to determine the distance between points which are equal across the scale) and ratio scales describe the variables with the same interval in between them and with a possible value of 0 (Gravetter & Forzano, 2012; Salking, 2009).

4.4.2 Qualitative research

Qualitative studies establish complex reports, examine words and undertake research study in non-laboratory setting (Creswell, 2007). The objective of a qualitative study is to uncover and understand the subject being explored in the study (Creswell, 2005).

Even though positivist research is associated with quantitative research, the use of mixed methods research is desirable in order to generate unique insight that one cannot get from using quantitative or qualitative research methods alone (Bhattacherjee, 2012).

4.4.3 Mixed methods

Mixed methods research is the use of both quantitative and qualitative for data collection, analysis and inference in order to gain insights into a particular phenomenon (Kwok, 2012). According to Howe (2012), both quantitative and qualitative methods may be used together in between and within studies provided their roles remain distinct. The purpose of mixed methods research is not to surpress either quantitative or qualititative methods, but to minimize the weakness and rely on the strengths of both research methods in a single research study or across various studies (Johnson & Onwuegbuzie, 2004). The use of mixed methods research allows researchers to choose design elemnts that offer the better chance of answering the research questions under investigations (Johnson & Onwuegbuzie, 2004).

Mixed methods research can be classified into four categories, namely embedded, explanatory, triangulation and exploratory design (Creswell & Clark, 2007). The benefits of using triangulation of quantitative and qualitative methods is that the comparison of results from both quantitative and qualitative data may bring new insight into existing research findings and can also enrich the understanding of a particular phenomenon by bringing the depth and power of a given research study (Howe, 2012).

The use of both qualitative and quantitative data helps the researcher to expand their understanding of the phenomenon being studied (Bless,Higson-Smith & Sithole, 2013). In mixed method research, the researcher should consider the research paradigm to decide where to place their emphasis, for example whether to give both qualitative and quantitiatve research the same status, or place more emphasis on one or the other (Morgan, 1998). A positivist researcher can use mixed method and still maintain their posivistic view since the use of mix methods will assist to expand the understanding of the phenomenon under investigation (Johnson & Onwuegbuzie, 2004).

When to carry out the qualitative or quantitative data collection in mixed methods research is an important decision (Johnson & Onwuegbuzie, 2004). There are three approaches, namely: sequential, concurrent and tranformative mixed methods (Creswell, 2009). In sequential mixed methods, the researcher expands the findings of one method by conducting subsequent research using another method. In concurrent mixed method research, the reseacher conducts both quantitative and qualitative research concurrently, collecting data at the same time. In transformative mixed methods research the researcher uses a theoretical lens in a research design that includes both quantitative and qualitative data (Creswell, 2009).

This study used both quantitative and qualitative data collection approaches. The triangulation of data collection methods was chosen in order to understand the knowledge sharing phenomenon using both qualitative and quantitative data.

The data was collected from research participants through the use of a survey questionnaire which included qualitative open-ended questions where research participants were requested to provide written responses. The quantitative aspect was selected to predict the causal effect amongst the constructs of the research model. The qualitative approach seeks to gain a deeper understanding or insight into the participant's knowledge sharing behaviour in ISD projects which may not have been captured through the quantitative responses. The qualitative data should complement the quantitative data by providing contextualized insights from participants and should help explain the quantitative responses. Both the quantitative and qualitative responses were collected at the same time, they both appeared in the research instrument used to collect data from participants.

4.5 Research strategy

A research strategy is a plan that a researcher uses to gather and examine the data (Blumberg et al., 2008). There are various ways in which a study investigator can gather data from research participants, such as using case studies, experiments, grounded theory, surveys, ethnography, action research, as well as archival research (Saunders et al., 2009).

4.5.1 Survey research strategy

A survey research approach goes hand in hand with deductive research (Saunders et al., 2009). This approach is commonly used in management and business research and is mostly used to gather data about questions such as where, what, who, how many and how much. The benefit of using a survey tool is that the person carrying out the research will collect similar

data from an enomous collection of research participants in an organised and standardised way (Oates, 2008). The survey research approach allows the researcher to gather quantitative data that can then be examined using descriptive and inferential statistics. The researcher can also propose probable associations amongst constructs of the study (Saunders et al., 2009).

For this study, a survey research strategy was selected, and data was gathered through a close-ended questionnaire. Rowley (2014) notes that it is easier to collect data from a larger sample using a questionnaire and highlights that the findings may be generalized to the larger population.

4.6 Data collection techniques

4.6.1 Unit of analysis

The unit of analysis for this study was individuals and the analysis were carried at individual level.

4.6.2 Population

The population studied in this research is IT professionals with working knowledge of ISD projects, for example software developers, IT architects, IT project managers, IT programme managers, business and systems analyst, software testers, solutions architects, technical specialists and many others, based in South Africa.

The IT professionals were selected because of their comprehensive experience and knowledge in ISD projects. Their work typically consists of cognitively-intense activities, such as design of complex systems which necessitate collaborative problem solving amongst team members (Tsai et al., 2013).

4.6.3 Sampling

Sampling in a research study is the process of selecting a portion of the population with the sole reasons of observing and making statistical assumption. The purpose is to select the participants that form a representative subset of the population being studied, with the aim of generalizing the findings (Sekaran, 2003).

There are various ways to select a sample from the overall population. Probability and non-probability are a few sampling procedures that can be utilized by researchers (Maree, 2007). Within these categories there are different methods for choosing the sample, such as quota, expert or snowball sampling.

According to Saunders et al., (2009), in probability sampling, the chances that each case in the target population can be selected is known and equal for all the cases, while in non-probability sampling, the chances of each case in the target population to be selected is not known. Bhattacherjee (2012) notes that non-probability sampling consists of convenience sampling where the sample of the population is chosen based on their ease of availability.

In quota sampling, the target population is categorized into subgroups and a set of non-random participants are chosen from each subgroup based on the defined quota. Expert sampling involves the selection of the target population based on their expertise relevant to the research phenomenon under investigation. Lastly, snowball sampling involves identifying a few participants that meet the requirements and then asking them to suggest other participants whom they think will meet the same criteria.

For this study, only IT professionals with working experience of ISD projects were selected to participate.

Non-probability expert sampling techniques were used to identify IT professionals with working knowledge of ISD projects based on their work experience (Bhattacherjee, 2012). This sampling technique was chosen because the researcher believed that the chosen sample would have in-depth knowledge and experience of ISD projects. The limitation of expert sampling techniques is that the chosen sample relies to a large extent on the researcher's subjective deliberation rather than the use of objective criteria (Bless et al., 2013). In addition to this, the sampling error is not known, and the researcher cannot certainly say that the results obtained from the sample are representative of the entire population. There is also a large risk of non-sampling errors (Lavrakas, 2008).

In this study, popular professional social networking sites, such as LinkedIn, were used to look for potential participants. The search strings such as "software developers", "IT project managers", "business analyst" and others was used to search for individuals with job titles associated with roles relevant to ISD projects.

4.6.4 Ethical consideration

This section addresses the ethical considerations related to this study including informed consent, right to privacy and protection from harm (both emotional and physical).

Ethics refers to the truthful choices a researcher makes in relations to their behaviour, as well as in their interactions and relationships with fellow human beings (Cooper & Schindler, 2003).

In this thesis, ethical clearance was received from the University of Witwatersrand Human Research Ethics Committee (Non-medical), protocol number **H15/05/21** before the survey was conducted. The ethical clearance was approved unconditionally on the **22 May 2015.**

The ethical guidelines as outlined in the approval protocol by the Ethics Committee were followed throughout the data collection process.

Prospective participants in the study were informed that their participation was voluntary and not mandatory. They were informed that they had the right not to participate and the right to withdraw from the study at any time should they so wish. They were also informed that their participation was valued and important. In terms of privacy, participants were guaranteed that the information collected from them in relation to the questionnaire would not be shared with any person for any reason and that their information would remain confidential and would solely be used for the analysis of the study. Participants were also informed that there were no rewards (monetary or non-monetary) associated with their participation in this study.

In this thesis, research participants were informed about the purpose and scope of the study so that they could make an informed judgment regarding their participation. They were assured that they would not experience any form of harm (emotional or physical) as a result of their participation, as their participation would be anonymous and none of the data collected would be linked to their identity. All questions were generic, and the questionnaire did not contain any sensitive questions except for demographics data which would not be used to identify any person by name as their participation was anonymous. The demographic questions were generic and did not ask for names or include any questions regarding a person's personal information.

4.7 Data collection procedures

In this study, a secure web-based survey was utilized to collect data. A web-based survey has the psychometric qualities similar to those of collecting data physically (Gang & Ravichandran, 2015). However, a web-based survey has benefits over a survey written on physical paper:

- The cost of conducting a web survey is less as compared to that of a physical paper,
- The researcher can get faster responses from the respondents as the respondents can complete the survey at the comfort of their own time,
- It saves times as the researcher is not required to go out and follow up with participants, the researcher can simply contact the respondent or send reminders to the electronically
- Survey enables the collection of para data,
- The researcher is able to reach a wider audience irrespective of their geographic locations, and the survey can achieve a higher response rate (Hsu et al., 2007; Höhne & Schlosser, 2017).

On the other hand, a web-based survey also has some disadvantages. For example, a web-based survey tends to have response time outliers, where there is disparity in the response time of the survey from participants (Höhne & Schlosser, 2017). Höhne and Schlosser (2017) advise that response times which fall below or above the threshold should be discarded. Another disadvantage is that a web-based survey is necessarily self-administered and this may distort the quality of the information received as some participants may hide or provide false information or they simple may not have the knowledge to properly respond to some of the questions in the survey (Gravetter & Forzano, 2012). A web-based survey also has the probability of none and late response bias (Mueller, 2014). Further, a researcher cannot speculate that the participants who did not respond to the web survey would have responded in the same way as the participants who did respond (Mueller, 2014).

These considerations regarding web-based surveys need to be added to the limitations of surveys in general. According to Babbie (2016), surveys have the following limitations:

- Standardized questionnaires are unable to accurately capture what is most important for some respondents when assessing their experiences, attitude, orientations and circumstances.
- Surveys fails to deal with social life as the researcher conducting the research does not develop an understanding of the current situation in which the participants find themselves.
- Surveys are inflexible and it is difficult to modify the survey tool during the study, even if the researcher becomes aware of new or importance constructs or associations.

4.7.1 Constructs operationalisation and their measures

A close-ended questionnaire was selected as a research instrument for the study because it is good for gathering data which is exploratory in nature and it is much easier to analyse data as compared to data obtained from open-ended questions (Maree, 2007). A seven-point Likert scale, ranging from (1) Strongly disagree (2) Disagree (3) Slightly disagree (4) Neutral (5) Slightly agree (6) Agree to (7) strongly agree was used. The seven-point Likert scale was used because it provides the participants with many choices to choose from and it also allows the participants to select a neutral point if they wish to and this avoid a situation where participants are forced to choose a particular answer (Alwin, 1997).

Data was collected through a secure web survey and only the study investigator has access to the survey.

All variables in this study were operationalised based on previous validated scales as summarised in Table 4-10 below. Items were modified from previous validated items in order to fit the context of this study. It is advisable to use research items from previous validated scales in deductive studies where theory plays a major role in questionnaire designs (Rowley, 2014).

Individual performance was evaluated in terms of the quality of output an individual member produces as a result of knowledge sharing and the items were adapted from Ozer and Vogel (2015). Table 4-2 shows the scales used to measure individual performance.

Table 4-2: Measurement scale for individual performance

Constructs	**Code**	**Items**	**Definition**	**Reference**
Individual Performance	IP1	When knowledge is shared, I adequately complete assigned duties.	The quality of the output that an individual produces as a result of their knowledge.	Ozer and Vogel (2015)
	IP2	When knowledge is shared, I meet formal performance requirements of the job.		
	1P3	When knowledge is shared, I engage in activities that will directly affect my performance evaluation.		
	IP4	When knowledge is shared, I fulfil responsibilities specified in the job description.		
	IP5	When knowledge is shared, I perform tasks that are expected of me.		
	IP6	When knowledge is not shared, I fail to perform essential duties.		

Scales for knowledge sharing were based on the degree to which individual members in the project team shared their explicit and tacit knowledge in the project team. The first two items deal with explicit knowledge and the other two deals with tacit knowledge. The scales were adapted to fit the knowledge sharing context of this study and cover tacit and explicit knowledge. The scales were adapted from Oliveira, Curado, Macada and Nodari (2015). Table 4-3 shows the scale for measuring knowledge sharing.

Table 4-3: Measurement scale for knowledge sharing

Constructs	Code	Items	Definition	Reference
Knowledge sharing	KS1	I often share reports and official documents with my project team members.	Individual members in the project team share their explicit and tacit knowledge with the project team.	Oliveira, Curado, Macada and Nodari (2015)
	KS2	I always share my manuals, methodologies and models with my project team members.		
	KS3	I often share my experiences or know-how with my project team members.		
	KS4	I always share my know-where and know-whom when prompted by my project team members.		

Table 4-4 below shows the scale for interpersonal trust including competency and benevolence trust. The scale measures the individual member's belief that the team members they are sharing knowledge with are knowledgeable about ISD and also their belief that other team members will not harm them intentionally. The first three items focus on benevolence trust and the last four items focus on competency-based trust. The scales were adapted from Van Acker, Vermilion, Kreijns, Lutgerink and van Buuren (2014). This study adopts the unidimensional nature of the constructs from McKnight, Choudhury & Kacmar (2002) where trust was studied from the benevolence and competency-based trust.

Table 4-4: Measurement scale for interpersonal trust

Constructs	Code	Items	Definition	Reference
	IPT1	I believe that the project team members I share knowledge with would act in my	The individual member's	

Interpersonal trust		best interest.	expectation that other team members in an ISD project will perform future actions based on honesty and cooperative behaviour.	Van Acker et al., (2014)
	IPT2	I believe that the project team members I share knowledge with would do their best to help me if I required help.		
	IPT3	I believe that the project team members I share knowledge with are interested in my well-being, not just their own.		
	IPT4	I believe that the project team members I share knowledge with are competent and effective source of expertise		
	IPT5	I believe that the project team members I share knowledge with perform their role of sharing ISD project knowledge very well.		
	IPT6	I believe that the project team members I share knowledge with are capable and are a proficient source of expertise and knowledge.		
	IPT7	I believe that the project team members I share knowledge with are very knowledgeable in ISD project-related knowledge.		

Knowledge sharing self-efficacy was measured based on the individual's self-confidence in their own ability to carry out a certain behaviour. The scale was adapted from Lin and Huang (2010). The scale for knowledge sharing self-efficacy are shown below in Table 4-5.

Table 4-5: Measurement scale for knowledge sharing self-efficacy

Constructs	**Code**	**Items**	**Definition**	**Reference**
Knowledge sharing self-efficacy		I have confidence in my ability to:	Individual's self-confidence in their own ability to carry out a	Lin & Huang (2010)
	KSS1	Provide knowledge that		

		people I work with consider valuable.	certain behaviour.	
	KSS2	Provide knowledge that people I work with consider informative.		
	KSS3	Provide knowledge that people I work with consider helpful.		
	KSS4	Be informed to provide valuable knowledge.		
	KSS5	Have the expertise, experiences and insights needed to provide valuable knowledge.		

This study takes note that different individuals are motivated by different things in relation to their knowledge sharing behaviour. According to Wang & Hou (2015), soft or intrinsic rewards are the implicit rewards an individual expects to receive as a result of their knowledge sharing behaviour (e.g. relationship with others, personal reputation), while hard or extrinsic rewards are the explicit rewards an individual expects to receive as a result of their knowledge sharing behaviour (e.g. financial rewards or benefits, promotion and other benefits in the workplace).

This study adopted the scale for expected rewards based on the perspective of hard or explicit rewards. The soft or intrinsic reward aspect is covered by scales relating to expected reciprocal relationships and hence are not included here.Scales for expected rewards are based on individual member's belief that there are explicit benefits associated with their knowledge sharing and items were adapted from Wang and Hou (2015). Table 4-6 shows the scales for expected rewards.

Table 4-6: Measurement scale for expected rewards

Constructs	Code	Items	Definition	Reference
Expected Rewards	ER1	I expect to be rewarded with a higher salary in return for sharing knowledge with my project team members.	The individual member's expectation that there are benefits associated with their knowledge sharing.	Wang and Hou (2015)
	ER2	I expect to receive monetary rewards (i.e. additional bonus) in return for sharing knowledge with my project team members.		
	ER3	I expect to receive opportunities to learn from others in return for sharing knowledge with my project team members.		
	ER4	I expect to be rewarded with increased job security in return for sharing knowledge with my colleagues.		

Expected reciprocal relationships were measured based on the individual member's belief that they need to share knowledge with their peers if they want to receive knowledge. The scale items were adapted from Gang and Ravichandran (2015). Table 4-7 shows the scales for expected reciprocal relationships.

Table 4-7: Measurement scale for expected reciprocal relationship

Constructs	Code	Items	definition	Reference
Expected reciprocal relationships	ERR1	My knowledge sharing will strengthen the ties between me and my	Individual member's belief that they need to	Gang and Ravichandran

		project team members.	share knowledge with their peers if they want to receive knowledge.	(2015).
	ERR2	My knowledge sharing will acquaint me with new project team members		
	ERR3	My knowledge sharing will expand the scope of my association with other project team members		
	ERR4	My knowledge sharing will result in cooperation with outstanding project team members.		
	ERR5	My knowledge sharing will create strong relationships with project team members who have common interests.		

Table 4-8 below shows the scales for culture which were based on the collectivism / individualism cultural orientations which an individual member in project team subscribes to. The scales were adapted from Srite and Karahanna (2006); Udo, Bagchi and Kris (2012).

Table 4-8: Measurement scale for culture

Constructs	**Code**	**Items**	**definition**	**Reference**
Culture	C1	Being accepted as a member of the project team is more important than being independent.	Espoused values to which an individual member in project team subscribes.	Srite and Karahanna (2006); Udo, Bagchi and Kris (2012).
	C2	Being loyal to the project team is more important than individual gain.		
	C3	Project team success is more important than individual success.		
	C4	Individual rewards are not as important as project team welfare.		

	C5	Being accepted as a member of the project team is more important than having autonomy and independence.		

Scales for outcome expectations were measured based on the individual member's judgment that their sharing of knowledge in the project will have positive outcomes. The items were adapted from Lin and Huang (2010). Table 4.9 shows the scales for outcome expectation.

Table 4-9: Measurement items for outcome expectation

Constructs	**Code**	**Items**	**definition**	**Reference**
Outcome Expectation	OE1	My knowledge sharing will strengthen the ties between me and my project team members.	An individual member's judgment that their sharing of knowledge in the project will have positive outcomes.	Lin and Huang (2010).
	OE2	My knowledge sharing will acquaint me with new project team members.		
	OE3	My knowledge sharing will expand the scope of my association with other project team members.		
	OE4	My knowledge sharing will result in cooperation with outstanding project team members.		
	OE5	My knowledge sharing will create strong relationships with project team members with whom I have common interests.		

Table 4-10 below summarizes the variables and their measures.

Table 4-10: Summary of measurement items

Constructs	**Definition**	**Number of items**	**Source of scales**
Knowledge sharing	The degree to which individual members in the project team share their explicit and tacit knowledge in the project team.	4	Oliveira, Curado, Macada and Nodari (2015)
Individual performance	The quality of output an individual member produces as a result of knowledge sharing.	6	Ozer and Vogel (2015)
Expected rewards	The individual member's expectation that there are benefits associated with their knowledge sharing.	4	Wang and Hou (2015)
Expected reciprocal relationships	An individual member's belief that they need to share knowledge with their peers if they want to receive knowledge.	5	Gang and Ravichandran (2015).
Knowledge sharing self-efficacy	An individual's self-confidence in their own ability to carry out a certain behaviour.	5	Wang and Hou (2015)
Outcome expectations	An individual member's judgment that their sharing of knowledge in the project will have positive outcomes.	5	Lin and Huang (2010).
Culture	Espoused values to which an individual member in the project team subscribes.	5	Srite and Karahanna (2006); Udo, Bagchi and Kris (2012).
Interpersonal trust	The individual member's expectation that other team members in an ISD project will perform future actions based on honesty and cooperative behaviour.	7	Van Acker et al., (2014)

4.7.2 Pre-test

In order to ensure content validity, the questionnaire was reviewed by two academics from an Information Systems (IS) background with experience in questionnaire design in order to assess the ease of understanding and to ensure clarity and accuracy. Modifications were made to the questionnaire based on the comments from these academics.

In order to pre-test the survey tool, the questionnaire was distributed to 30 IT professionals with working experience in ISD projects. Pre-testing of the questionnaire is important as it assists the researcher to:

- find where respondents are facing trouble in responding to some items;
- see whether respondents find any questions unclear;
- determine whether respondents are able to respond to various types of questions;
- assess whether the pre-defined answers cater for all the desired responses; and
- see how much time it takes the respondents to goes through all the questions and finish the entire questions. (Oates, 2008)

The research instrument was amended based on the feedback received from the pre-test before the actual data collection was undertaken.

4.8 The main survey

The survey was designed and posted on the Survey Monkey web survey platform from 05 October 2017 to 20 November 2017. The URL to the survey was shared with participants via LinkedIn and e-mail. The survey was shared with 300 participants, and 137 participants completed the survey. This represents a response rate of 45%.

The survey contained an introductory section that clarified the purpose of the thesis and explained to the respondents about the confidentiality of their data during and after their participation. Participants were thoroughly informed about their rights to confidentiality, privacy and protection from any harm. They were advised that there were no rewards linked to their participation in the study.

Participants were mainly from the information technology sector working in various industries of the South African economy ranging from information technology, oil and gas, financial services, government, telecommunications and others.

On average, participants took between 15 and 20 minutes to complete the survey.

4.9 Data preparation

In this study, the preparation of data involved finding any missing data from the web survey, filtering data, as well as downloading the data from the web survey and uploading it to statistical analysis software for further analysis.

None of the 137 completed surveys had any data missing. Once participants started the survey, they either had a choice of stopping the survey, or answering all mandatory questions before completing the survey. There was no missing data from the completed surveys.

4.9.1 Common method bias and multi-collinearity

Common method bias is when a single factor in a study appears to account for a large percentage of the variance of all factors combined. Common method bias results in high correlations between the variables being studied (Hsu et al., 2007).

In this study, steps were taken in the research design to avoid common method bias. Once data was collected, the data was also investigated for any potential common method bias (CMV).

To reduce common method, bias the two-stage approach proposed by Hsu & Chang (2014) was adopted: firstly, participants were guaranteed of their confidentiality, and secondly, the questionnaire item was refined through a pre-test. The study also avoided common bias by ensuring that the survey did not contain sensitive questions that may prevent participants from answering.

Once data was collected, the researcher examined the data common method bias. Common method bias was also assessed using Harman's one-factor test (Chou & He, 2011). The presence of common method is detected when one factor accounts for more than 50% majority of the variance. The process entails entering all constructs in unrotated factor analysis. The results of this study show that no factor contain more than 50 % of the unrotated variance. The unrotated values are shown in table 5-6 in chapter 5. The unrotated variance shows that: culture (5.40 %), expected rewards (15.3%), expected reciprocal relationship (15.5%), individual performance (5.2%), interpersonal trust (4.30%), knowledge sharing (7.20%), knowledge sharing self-efficacy (10.25%) and outcome expectation accounting for 6.3% of the variance. The results show that no factor accounted for more than 50% of the variance. This means that common method bias was not an issue for this study.

Multi-collinearity is a phenomenon in a regression model where by the independent variable correlates highly with other independent variables than it does with dependant variables (Hsu & Chang, 2014). This may occur as a result of high correlations among constructs. Multi-collinearity occurs when the variance inflation factor (VIF) exceeds 3.3 (Pee et al., 2010). For this study, the results of the VIF ranged from 1.64 for culture, 1.11 for individual

performance, 1.25 for interpersonal trust, 1.41 for knowledge sharing, 1.27 for knowledge sharing self-efficacy, 1.38 for outcome expectation, 1.23 for expected rewards and 1.33 for expected reciprocal relationship. The results showed that the VIF values were well below the cut-off value of 3.3 and this means that multi-collinearity was not a problem in this study.

4.10 Data analysis

Smart Partial Least Square (PLS) version 3.2 was used to analyse data (Ringle, Wende & Will , 2005).

4.10.1 Introduction to Structural Equation Modelling (SEM)

Structural Equation Modelling (SEM) is a very effective tool that allows the researcher to test and estimate the causal relationships between the constructs and its measures (Gupta et al., 2017). It is used to assess the measurement model and to inspect the associations of the dependent and independent constructs (Ghobadi & D'Ambra, 2013). It defines the inter-associations amongst the factors and confirms the structural model (Gupta, Kapur & Kumar, 2017).

The main objective of SEM is to ascertain whether the propositions suggested by the researcher corresponds with the empirical data which was gathered (Lei & Peu, 2007). Using various statistical methods, SEM allows a researcher to estimate the cause and effect relationship based on the theoretical model (Vinzi, Trinchera, Squillacciotti & Tenenhaus, 2008). It can thus be used to assess whether the constructs in the study are usable through practical data (Lei & Peu, 2007). SEM employs multivariate analysis can be used to demonstrate the causal effect between the study constructs (Lei & Peu, 2007).

The key advantage of SEM is that is able to estimate and test complex cause and effect relationships between variables even if the relationships between the variables are not directly observed (Astrachan, et al, 2014). It is also capable of testing the structural model and

assessing overall fit of the model at the same time (Gefen, Straub & Boudreau, 2000). SEM also allows for each latent variable to be measured by multiple observable variables (Wang & Sun, 2017).

There has been a dramatic increase in the use of SEM in various disciplines such as psychology, management and marketing (Reinartz, Haenlein & Henseler, 2009; Astrachan, Patel & Wanzenried, 2014).

There are two approaches to SEM namely:

- a co-variance-based (CB-SEM), maximum likelihood estimation of SEM (e.g. LISREL), and
- a component-based, partial least square (PLS) approach to SEM (e.g. PLS-SEM). (Vinzi et al., 2008 ; Astrachan et al., 2014)

The focus of co-variance based SEM is on the estimation of the model parameters using maximum likelihood (ML) in order to ensure that the theoretical co-variance matrix is closer to the empirical co-variance matrix as predicted by the theoretical model (Reinartz et al., 2009). CB-SEM requires the researcher to specify the full theoretical model before starting data analysis and the parameters can only be estimated once the model is correctly specified (Astranchan et al., 2014).

CB-SEM and PLS-SEM use different approaches when assessing the structural model quality (Astrachan et al., 2014). CB-SEM is more appropriate when the aim is to test and confirm an established theory and it requires a large amount of data which may not be available at the early stages of theory development (Astrachan et al., 2014).

In IS research, component-based SEM, such as PLS, is widely used as an alternative to covariance-based SEM and it enables the researcher to observe the structural and measurement model at the same time (Petter, Straub & Rai, 2007).

4.10.2 Partial Least Square (PLS) Structural Equation Modelling

PLS is a structural equation modelling tool which uses a component-based approach for the estimation of the structural model (Hwang, 2012). PLS path modelling mixes psychometric modelling as well as econometric prediction of those latent variables indirectly observed through multiple variables (Becker & Ishmael, 2016).

PLS-SEM is an appropriate choice when the objective is to develop and test a theory as it allows the examination of variables and their relationships in a structural model which is complex (Hair et al, 2014, Ringle et al., 2013). In such circumstances, PLS-SEM becomes the obvious choice because the purpose of theory development is to observe relationships, their directions, their strength and their observable measures (Astrachan et al., 2014).

One disadvantage of PLS-SEM is that the measurement error is more biased than in Covariance Based -SEM, and no restriction is imposed on the data and the test of model fit is not available (Alashwal & Abdul-Rahman, 2014). In SEM, latent variables can be modelled as reflective indicators and PLS can handle reflective constructs (Tamjidyamcholo et al., 2013). Reflective constructs are indicated by a single-headed arrow pointing out from the latent constructs outward into the indicators (Hair et al., 2011). All constructs in this study were modelled as reflective.

4.11 Evaluating measurement and structural model

In this study, data analysis was done in two stages: the initial method is the measurement model, and the second method is the structural model (McDonald & Ho, 2002). The initial

method involves the analysis of the measurement model. The second method comprises of the testing of the structural associations between the variables (Ghobadi & D'Ambra, 2013).

Factor analysis is a modelling approach used for exploring the hypotheses of observed indicators or variables (Jomnonkwao & Ratanavaraha, 2016). Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA) are the two basic types of factors analysis.

In SEM, CFA deals with the relationship between indicators and observed measures within a measurement model and it is theory and hypothesis driven (Brown, 2006). Similarly, CFA is used for the exploration of relationship among latent constructs (Diana, 2014). CFA has been widely acknowledged as being superior to EFA. The advantage of CFA is its ability to estimate parameters such as factor loading as well as its ability to investigate correlations between factors as opposed to the scales without the worry of measurement error (Leak, 2011).

EFA is used to determine the correct number of common factors which are required to clarify the relationships of observed variables (Jomnonkwao & Ratanavaraha, 2016). CFA is aligned with PLS-SEM. The centroid estimating scheme of Smart PLS is appropriate for conducting CFA as it takes note of the signs of association between adjacent latent and latent variables (Alashwal & Abdul-Rahman, 2014).

4.11.1 The measurement model

For this thesis, PLS-SEM was selected to assess the measurement model and to inspect the associations of the dependent and independent constructs. (Ghobadi & D'Ambra, 2013). The measurement model assessment includes convergent validity, indicator reliability, internal consistency and discriminant validity (Hair, Anderson, Tatham & Black, 1995; Pee et al, 2010; Hsu & Chang, 2014).

In research, reliability and validity is of great importance and is key in the use of self-reported measures (Zongo, Guénette, Moisan, Guillaumie, Lauzier & Grégoire, 2016). While Validity is concerned with whether an empirical measure used in research correctly mirrors the meaning of the concepts being measured (Barbie, 2016). Reliability is concerned with whether the same technique can produce the same results when applied to the same object repeatedly. Failure to achieve validity and reliability can be problematic for research methods that seek to support theory and generalize their findings (Pailian & Halberda, 2015).

Internal consistency checks how unified the different items of the same construct within a specific measure are (Salkind, 2009). It is achieved when the measures used are able to produce identical estimates consistently over a period of time (Pailian & Halberda, 2015; Fornell & Larcker, 1981). Even though there will be variation on the scores of the various items of a particular construct in a measure, the variation should point in the same direction. When there is higher correlation amongst the items' score, there is higher internal consistency (Salkind, 2008; Bless et al., 2013). In PLS-SEM, composite reliability is seen as the most appropriate means for establishing internal consistency as opposed to using Cronbach's alpha (Hair, Sarstedt, Pieper & Ringle, 2012). Internal consistency is assessed using the value of composite reliability and a valid internal consistency score should be 0.7 or higher (Hsu & Cheng, 2014; Hair et al., 2012).

Convergent validity can be described as the relationship between the scales used to measure a construct as well as other scales which are anticipated to measure similar constructs (Bless et al., 2013). In convergent validity, two different methods which measure the same construct are created, and the objective is to show that the two different methods converge on similar construct, and there is strong relationship between their measures (Gravetter & Forzano, 2012). In order to assess convergent validity, the Average Variance Extracted (AVE) needs to

be examined. The AVE value needs to be 0.5 or higher to demonstrate a high degree of convergent validity (Hair, Ringle & Sarstedt, 2011).

Indicator reliability can be measured using Cronbach's alpha, which should have a value of 0.70 or higher in order for the constructs to have an acceptable reliability (Hair et al., 2005).

According to Aburub (2015), discriminant validity shows the degree to which each latent variable is unique and different from one another (e.g. latent variable A is different from latent variables B, C, D, E etc.). It also shows whether the latent variables are accountable for more variance of observed variables to which they are related (Aburub, 2015). In PLS–SEM, discriminant validity can be measured using two measures: the Fornell-Lacker criterion (Fornel & Lacker, 1981) and cross loading (Hair et al., 2011). The Fornell-Lacker criterion requires that a latent variable share more variance with its own assigned indicators than it does with any other latent variable and each latent variable construct AVE should be greater than the latent variable highest squared correlation with other latent variables (Hair et al, 2011). For the cross loading measure, the loading of an indicator with its related latent variables should be higher than the loadings for all the remaining variables (Hair et al., 2011). In this study, discriminant validity was demonstrated by comparing the correlation between constructs with the square root value of AVE for each construct (Tamjidyamcholo et al., 2013).

4.11.2 The structural model

The assessment of the structural model includes estimating both the coefficient and R^2 value (Hsu & Chang, 2014). The assessment of the structural model can also assist the researcher to check whether the proposed hypotheses are supported by the data collected for participants (Urbach & Ahlemann, 2010). In order to test hypotheses, the statistical significance of the equivalent coefficient needs to be assessed (Pee at al., 2010). The hypotheses, latent

constructs, as well as the paths between the items are assessed with the structural model (Hsu et al., 2007).

4.12 Time horizon

Owing to financial and time constraints, this thesis was a cross sectional study. Cross sectional studies look at an issue under investigation at a specific point in time (Saunders et al., 2009). A cross sectional study frequently utilizes a survey research approach.

4.13 Analysis of qualitative data

In order to gain insight into some of the quantitative data, qualitative data were collected from participants. The qualitative data were analysed using thematic analysis where themes were established from qualitative responses.

4.14 Limitation of methods

The methods used in this study have some limitation. The use of cross sectional survey study may limit the ability to fully understands the research phenomenon under investigation. Behavioural studies in a complex subject such as in information systems development projects may be better understood through a longitudinal study, where the same phenomenon is studied over time using the same participants in order to determine the evolution of the phenomenon over a longer period. One other limitation from the study is the collection of quantitative and qualitative data at the same time which may not give a full picture of the quantitative data collected. The use of interviews may have been better at capturing the participants qualitative data that may give a better explanation of the quantitative data. More explanation on research methods have been explained in chapter 8.

4.15 Summary of the chapter

This chapter explained the epistemology and ontology. This was followed by the research paradigms followed in this thesis. The research methodology, research strategies, data collections techniques and ethical considerations were discussed in details. Data collection procedures and data analysis approached followed in this thesis were discussed. Lastly, the measurement and structural models were discussed. The chapter ends with a summary.

The next chapter analyses the data collected from participants.

CHAPTER 5

DATA ANALYSIS AND DISCUSSION OF FINDINGS

5.1 Introduction

The previous chapter discussed the research methodology used to collect data from participants. This chapter discusses the empirical results of this research. The examination of data was conducted using the statistical techniques discussed in Chapter four. Chapter five is outlined as followed: first, a descriptive analysis of demographics is discussed; then the validity and the reliability of the measurement model is assessed; this is followed by the validation of the structural model. The chapter ends with a summary.

5.2 Participants' demographics

The demographics of the participants are shown in Table 5-1. The demographics of the participants include gender, age, education, experience, current position, industry, company size, size of the ISD project team, duration of the ISD project, budget for the ISD project, and the phase of the ISD project at the time of the study. The survey responses were downloaded from the Survey Monkey and uploaded into SPSS version 18 which was used to generate the demographics presented in Table 5-1.

Table 5-1: Demographics of the participants (N = 137)

Demographics	**Frequency (N = 137)**	**Percentage**
Gender		
Male	77	56.20
Female	60	43.79

Demographics	Frequency (N = 137)	Percentage
Age		
20 - 25	11	8.0
26 - 35	71	51.8
36 - 46	47	34.3
46 - 55	8	5.8
Over 55	0	0
Education		
Matric	2	1.5
Certificate	2	1.5
Diploma	16	11.7
Bachelor	59	43.1
Honours	25	18.2
Masters	31	22.6
PhD	2	1.5
Others	0	0
Work Experience		
1 - 2	7	5.1
3 - 4	20	14.6
5 - 8	34	24.8
9 years or more	76	55.5
Industry		
Information Technology	48	35.0
Financial services	35	25.5
Government	14	10.2
Consulting	8	5.8

Demographics	Frequency (N = 137)	Percentage
Logistics	1	.7
Retail	4	2.9
Oil and Gas	15	10.9
Manufacturing	3	2.2
Healthcare	3	2.2
Transportation and Aviation	1	.7
Telecommunication	5	3.6
Others	0	0
Current Position at Work		
Business Analyst	18	13.3
Project Manager	10	7.29
IT Manager	5	0.05
Software Developer	40	29.19
Systems Analyst	8	5.83
Solution Architect	5	0.05
Applications Specialist	8	5.83
Consultant	15	10.94
Business Intelligence Specialist	5	0.05
Data Analyst	7	5.10
Process Engineer	10	7.29
Technical Specialist	6	4.37
Company Size		
1 – 50	7	5.1
51 – 100	7	5.1
101 – 500	21	15.3

Demographics	Frequency (N = 137)	Percentage
Over 500	102	75.4
ISD Project size		
1 – 20	71	1 – 20
21 – 30	36	21 – 30
31 – 50	14	31 – 50
Over 50	16	Over 50
Project Duration		
0 – 6	27	19.7
7 – 12	62	45.3
13 – 18	20	14.6
Over 18 months	28	20.4
Project budget		
Less than R100 000	18	13.1
R101 000 – R1 million	51	37.2
R1 million – R5million	43	31.4
Over R5 million	25	18.2
Project Phase		
Initiation	18	13.1
Planning	39	28.5
Execution	67	48.9
Closeout	13	9.5

With regards to gender, 55.56% were males and 43.79% were female.

This is not surprising as the IT profession in South Africa is male dominated (Khoza & Pretorius, 2017; Zhao et al., 2016). The analysis shows that 8.0% of the participants were

between the ages of 20 - 25, more than half of the participants were between the ages of 26 - 35 (51.8%), 34.3% of the participants were between the age of 36 - 46, and 5.8% of the participants were between the ages of 46 - 55.

Participants with an educational qualification of matric and certificates accounted for 1.5% each respectively. Participants with diplomas accounted for 11.7%. The majority of the participants (43.1%) have Bachelor degrees, followed by those with Honours degrees (18.2%). Those with Masters Degrees accounted for 22.6% and 2.2% indicated having PhDs.

Participants with working experience of between 1 and 2 years accounted for 5.1%. Those with 2 - 4 years' experience accounted for 14.6%. Those with work experience of 5 - 8 years accounted for 24.8%. The majority of the participants (55.5%) indicated that they have more than 9 years of working experience.

Since the study only collected data from IT professionals, participants were requested to provide their job titles. The participants listed their titles as follows: 13.3% are business analyst, 7.29% are project managers, 0.05% are IT managers, the majority (29.19%) are software developers, 5.83% are systems analyst, 0.05% are solution architects, 5.83% are applications specialists, 10.94% are consultants, 0.05% are business intelligence specialists, 5.10% are data analysts, 7.29% are process engineers, and 4.37% are technical specialists.

With regard to the industry, participants were asked which industry they work in. The majority of participants (35.0%) work in the Information Technology sector, followed by financial services at 25.5%, oil and gas at 10.9%, government at 10.2%, consulting at 5.8%, telecommunication at 3.6%, manufacturing at 2%, retail at 2.9%, healthcare at 2%, and transportation and aviation at 0.7%.

Participants were also asked about the size of the organisations they work for. Those working for organisations with 1 - 50 and 51 - 100 employees accounted for 5.1% each. Those working for organisations with 101 - 500 employees accounted for 15.3%. The majority of participants (74.5%) worked for organisations with more than 500 employees.

Participants were also asked about the size of the ISD project team they are part of. The majority (51.8%) indicated their project team size to be between 1 - 20 members, followed by 26.3% as part of teams with 21- 30 members, 10.2% with teams between 31 - 50 members, and 11.7% as part of teams with over 50 members.

With regard to project duration, 19.7% of projects lasted for 0 - 6 months, 45.3% for 7 - 12 months, 14.6% for 13 - 18 months, and 20.4% exceeded 18 months.

In addition, participants were asked about the budget of their ISD projects. 13.1% had a budget below R100 000, the majority (37.2%) had a budget between R101 000 - R1 million, 31.4% had a budget of between R1 million - R5 million, and 18.2% had a budget of over R5 million.

For this study, an independent t-test was carried out in order to determine any difference between participants who responded and those who did not respond with regard to age, work experience and gender. The results of the t-test did not show any statistically significance difference. There was also no significance difference between participants who respondents early with those who responded late. This means than non-response bias was not an issue for this study.

Lastly, participants were asked about the phases of their ISD projects, 13.1% were engaged in the initiating phase, 28.5% were in the planning phase, the majority of the participants (48.9%) were engaged in execution, and lastly, 9.5% were engaged in the close-out phase.

5.3 Description statistics of constructs

Table 5-2 shows the descriptive statistics of the constructs, mean and standard deviation.

Table 5-2: Descriptive statistics of constructs

Constructs	Indicator	N	Mean	Standard Deviation
Knowledge sharing	KS1	137	6.234	1.048
	KS2	137	6.044	0.950
	KS3	137	6.153	1.107
	KS4	137	5.920	1.250
Individual Performance	IP1	137	6.277	0.762
	IP2	137	6.277	0.742
	IP3	137	6.131	0.973
	IP4	137	6.212	0.931
	IP5	137	6.365	0.782
	IP6	137	5.686	1.079
Culture	C1	137	5.854	1.386
	C2	137	6.007	1.193
	C3	137	5.912	1.276
	C4	137	5.277	1.775
	C5	137	5.526	1.460
Interpersonal Trust	IPT1	137	5.584	1.354
	IPT2	137	5.854	1.022
	IPT3	137	5.000	1.509
	IPT4	137	5.511	1.134
	IPT5	137	5.401	1.199
	IPT6	137	5.686	1.079
	IPT7	137	5.474	1.435

Expected Rewards	ER1	137	3.905	2.068
	ER2	137	3.672	1.960
	ER3	137	5.891	1.242
	ER4	137	4.562	1.966
Expected Reciprocal Relationship	ERR1	137	6.153	1.152
	ERR2	137	6.000	1.018
	ERR3	137	6.117	0.960
	ERR4	137	5.956	1.093
	ERR5	137	6.219	0.902
Outcome Expectation	OE1	137	5.540	1.571
	OE2	137	5.912	1.270
	OE3	137	6.117	1.004
	OE4	137	6.212	0.970
	OE5	137	5.993	0.985
Knowledge Sharing Self – efficacy	KSSE1	137	6.328	0.756
	KSSE2	137	6.292	0.794
	KSSE3	137	6.292	0.873
	KSSE4	137	6.328	0.775
	KSSE5	137	6.307	0.788

Data normality

In this study, data normality was tested using two statistical analysis such as shapiro-wilk test and skewness and kurtosis. The results of shapiro-wilk test show that the constructs have the values of 0.00 which is less than 0.5 %. Based on the results, it shows that data from the test is not normal. The second test of skewness and kurtosis reveal that about 68% of the data is

not normal distributed as it falls outside the recommended threshold of - 3 and +3 (George & Mallery, 2010; Obrenovic, Obrenovic, & Hudaykulov (2014). This means that data in this study was not normally distributed and hence necessitated the need to use PLS-SEM.

5.4 Measurement model assessment

As discussed in Chapter 4, PLS is a structural equation modelling technique which is capable of testing the psychometric characteristics of all the measurement scales (e.g. measurement model) and also analyses the direction and strength among the study variables (e.g. structural model) (Pee et al., 2010).

PLS was selected because it put little emphasis on sample size as well as residual distribution (Hsu & Chang, 2014) as well as its ability to account for both reflective measures in the structural model (Pee et al., 2010). Partial Least Square (PLS) Smart graph 3.2.1 was used to assess the research model. In this study, the validity and reliability of the measurement model was evaluated by using the following analyses: construct validity, internal consistency reliability, indicator reliability, convergent and discriminant validity.

5.4.1 Construct validity

Construct validity is concerned with ensuring that the measurement items are measured and interpreted correctly (Mohammed, 2017). In this study, construct validity was verified by making sure that measurement items correctly measured the theoretical constructs they ought to measure (Gupta et al., 2017). This was achieved by making use of previously tested which were modified to fit the context of this study. For face validity, the survey instrument was pilot tested, and the final instrument was modified based on the input received from pilot-testing.

5.4.2 Indicator reliability

In this study, item loading was used to measure the indicator reliability of the measurement model. An item needs to have a loading of at least 0.7 in order to have satisfactory indicator reliability (Pee et al, 2010). Items with less than the 0.7 were eliminated and those with a satisfactory loading are shown on Table 5-3 and these items were fit to be used for further analysis in this the study. All items are significant at $p < 0.005$. Variables such as C4, IPT1, ER1, ER2, OE1 and KSSE were dropped as they fell below the cut off value.

5.4.3 Convergent validity

Convergent validity can be described as the relationship between the scales used to measure a construct as well as other scales which are expected to measure similar constructs (Bless et al., 2013). In this study, the convergent validity of the measurement model was assessed by checking the Average Variance Extracted (AVE). Table 5-3 shows the AVE of the constructs. All AVE values are greater than the acceptable cut-off value of 0.5, and this means that the convergent validity of the measures has been confirmed (Hsu et al., 2012).

Table 5-3: Average Variance Extracted of constructs

Constructs	**Average Variance Extracted (AVE)**
Culture	0.606
Expected Rewards	0.604
Expected Reciprocal Relationships	0.591
Individual Performance	0.604
Interpersonal Trust	0.591
Knowledge Sharing	0.631
Knowledge Sharing Self-Efficacy	0.785
Outcome Expectation	0.654

In addition, the convergent validity of the measurement model was also assessed by looking at the factors loading of all items. The cross loading was done on Smart PLS and the results are shown in Table 5-4. All factor loading should be higher than 0.6 for a valid convergent validity (Ghobadi & D'Ambra, 2012).

Table 5-4: Cross loadings of constructs

	C	ER	ERR	IP	IPT	KS	KSSE	OE	AVE
C_1	0.776	0.199	0.241	0.163	0.164	0.309	-0.082	0.204	0.606
C_2	0.833	0.249	0.23	0.15	0.132	0.302	0.066	0.314	
C_3	0.658	0.312	0.233	0.192	0.227	0.23	0.115	0.264	
C_5	0.832	0.364	0.331	0.149	0.204	0.322	0.046	0.327	
ERR_1	0.329	0.545	0.71	0.198	0.139	0.308	0.076	0.213	0.591
ERR_2	0.177	0.405	0.671	-0.002	0.24	0.133	0.204	0.341	
ERR_3	0.113	0.336	0.669	0.04	0.307	0.087	0.215	0.337	
ERR_4	0.144	0.239	0.666	0.049	0.081	0.108	0.317	0.337	
ERR_5	0.248	0.342	0.78	0.202	-0.017	0.3	0.295	0.348	
ER_3	0.28	0.861	0.354	0.166	0.165	0.287	0.248	0.258	0.604
ER_4	0.288	0.683	0.576	0.198	0.277	0.2	0.104	0.249	
IPT_2	0.165	0.168	0.139	0.226	0.687	0.198	0.298	0.011	0.591
IPT_3	0.138	0.15	0.194	0.074	0.656	0.14	0.125	0.11	
IPT_4	0.177	0.191	0.079	0.189	0.866	0.237	0.326	0.159	
IPT_5	0.284	0.204	0.067	0.173	0.853	0.286	0.281	0.25	
IPT_6	0.194	0.283	0.2	0.262	0.782	0.203	0.084	0.108	
IPT_7	0.061	0.242	0.106	0.077	0.747	0.204	0.27	0.108	
IP_1	0.198	0.23	0.22	0.768	0.183	0.306	0.072	0.1	0.604

IP_2	0.13	0.174	0.167	0.841	0.236	0.31	0.178	0.137	
IP_3	0.107	0.074	0.104	0.706	0.212	0.223	0.202	0.017	
IP_4	0.203	0.138	0.098	0.739	0.194	0.221	0.089	0.089	
IP_5	0.168	0.227	0.143	0.822	0.074	0.361	0.139	0.043	
KSSE_2	-0.023	0.202	0.229	0.153	0.204	0.132	0.843	0.306	0.785
KSSE_3	0.027	0.228	0.294	0.106	0.273	0.141	0.909	0.333	
KSSE_4	0.087	0.187	0.253	0.144	0.268	0.152	0.923	0.321	
KSSE_5	0.051	0.233	0.234	0.208	0.348	0.279	0.867	0.253	
KS_1	0.363	0.239	0.256	0.365	0.14	0.820	0.037	0.094	0.631
KS_2	0.312	0.297	0.321	0.329	0.256	0.828	0.037	0.017	
KS_3	0.291	0.287	0.207	0.282	0.335	0.824	0.283	0.13	
KS_4	0.223	0.177	0.272	0.21	0.149	0.699	0.3	0.138	
OE_2	0.333	0.265	0.29	0.087	0.091	0.135	0.202	0.76	0.654
OE_3	0.28	0.308	0.373	0.089	0.112	0.094	0.14	0.811	
OE_4	0.291	0.222	0.349	0.118	0.057	0.158	0.295	0.85	
OE_5	0.269	0.277	0.346	0.046	0.247	0.018	0.359	0.811	
Eigenvalue	2.70	2.11	1.79	3.81	3.12	6.38	1.23	1.73	
Variance Extracted	8.20	6.40	5.44	11.56	9.48	19.35	3.74	5.2	
Cumulative Variance%	2.70	55.01	60.46	30.91	40.40	19.35	69.45	65.71	
Unrotated Variance	5.40	15.30	15.50	5.20	4.30	7.20	10.25	6.3	

The cross-loading results in Table 5-4 show that all the loadings of the measurement items were higher against their own variables to the other variables. This means that the loading in each block is higher as compared to another block in the columns and rows. The results show that the convergent validity of the measurement model is adequate.

5.4.4 Discriminant validity

The square root of the AVE is an indication of how much variance is shared between a construct and its items, while the inter-construct correlation is an indication of how much variance is shared between constructs. Discriminant validity in this study was assessed by comparing the values of the AVE as well as the correlation between constructs in order to ascertain whether the correlation between pairs of constructs is below the recommended value of 0.9, and also to check whether the square root of the AVE is larger than that of the correlation's coefficients (Ghobadi & D'Ambra, 2012). Table 5.5 shows the results of the correlation matrix and AVE.

Table 5-5: Correlation and AVE of constructs

	AVE	**C**	**ER**	**ERR**	**IP**	**IPT**	**KS**	**KSSE**	**OE**
C	0.606	0.778							
ER	0.604	0.360	0.777						
ERR	0.591	0.334	0.565	0.700					
IP	0.604	0.207	0.228	0.194	0.777				
IPT	0.591	0.230	0.268	0.157	0.221	0.769			
KS	0.631	0.376	0.319	0.330	0.376	0.283	0.795		
KSSE	0.785	0.042	0.240	0.286	0.172	0.310	0.200	0.886	
OE	0.654	0.357	0.323	0.418	0.101	0.173	0.116	0.342	0.809
Diagonal elements represented in bold is the square root of the AVE. Off diagonal elements are the inter-construct correlations									

Table 5-5 shows the AVE, the square root of AVE and the correlation between constructs. The results indicate that the AVE values in the off-diagonal cells are lower than the AVE values in the diagonal cells thereby showing discriminant validity (Tiwana & McLean, 2005;

Chiyangwa & Mnkandla, 2017). This shows that the measures of constructs correlate more highly with their own items and not with the items of other constructs (Pee et al., 2010).

5.4.5 Internal consistency reliability

In order for the measurement model to have a satisfactory internal consistency reliability, the composite reliability of each variable needs to be equal to 0.70 or higher (Hsu & Chang, 2014). In this study, the composite reliability for each construct is shown in Table 5-6 and was higher than 0.70 in each case which shows an acceptable reliability.

Table 5-6: Reliability and descriptive statistics

Constructs	**Indicator**	**N**	**Mean**	**Standard deviation**	**Composite reliability**
Knowledge sharing	KS1	137	6.234	1.048	0.872
	KS2	137	6.044	0.950	
	KS3	137	6.153	1.107	
	KS4	137	5.920	1.250	
Individual Performance	IP1	137	6.277	0.762	0.884
	IP2	137	6.277	0.742	
	IP3	137	6.131	0.973	
	IP4	137	6.212	0.931	
	IP5	137	6.365	0.782	
Culture	C1	137	5.854	1.386	0.859
	C2	137	6.007	1.193	
	C3	137	5.912	1.276	
	C5	137	5.526	1.460	
Interpersonal Trust	IPT2	137	5.854	1.022	
	IPT3	137	5.000	1.509	

Constructs	Indicator	N	Mean	Standard deviation	Composite reliability
	IPT4	137	5.511	1.134	0.896
	IPT5	137	5.401	1.199	
	IPT6	137	5.686	1.079	
	IPT7	137	5.474	1.435	
Expected Rewards	ER3	137	5.891	1.242	0.751
	ER4	137	4.562	1.966	
Expected Reciprocal Relationship	ERR1	137	6.153	1.152	0.827
	ERR2	137	6.000	1.018	
	ERR3	137	6.117	0.960	
	ERR4	137	5.956	1.093	
	ERR5	137	6.219	0.902	
Outcome Expectations	OE2	137	5.912	1.270	0.883
	OE3	137	6.117	1.004	
	OE4	137	6.212	0.970	
	OE5	137	5.993	0.985	
Knowledge sharing Self-efficacy	KSSE2	137	6.292	0.794	0.936
	KSSE3	137	6.292	0.873	
	KSSE4	137	6.328	0.775	
	KSSE5	137	6.307	0.788	

Table 5-3 shows the reliability and descriptive statistics of the study constructs as well as the composite reliability. In exploratory research such as this one, a composite reliability of 0.60 to 0.70 shows a reliable composite reliability (Afthanorhan, 2013).

5.4.6 Reliability of constructs

In this study, reliability of constructs was also measured using the Cronbach's alpha coefficients.

Table 5-7: Reliability of constructs

Constructs	Cronbach's alpha
Culture	0.743
Expected Rewards	0.716
Expected Reciprocal Relationships	0.768
Individual Performance	0.758
Interpersonal Trust	0.857
Knowledge Sharing	0.796
Knowledge Sharing Self-Efficacy	0.884
Outcome Expectation	0.812

The results of constructs reliability in Table 5-7 show that all constructs were above the recommended value of 0.7 (Hair et al., 2005).

5.5 Structural model assessment

In PLS, the structural model signifies the associations between latent variables (Tiwana & McLean, 2005), and the assessment of the structural model includes estimating the R^2 value and the path coefficients (Park & Lee, 2014). The value of R^2 shows the predictive power of the model for dependent variables, while path coefficients describe the strength of the associations between dependent and independent variables (Park & Lee, 2014).

In this study, a bootstrapping technique with 500 samples from 137 cases was used in order to estimate the paths in the structural model (Tiwana & McLean, 2005; Hsu & Chang, 2014).

It is important to ensure that the significance test have statistical power as they have no use otherwise because you cannot differentiate between Hypotheses 0 and alternative Hypothesis 1 (Faul et al., 2007).

In order to ensure that sample size of the study was adequate, statistical power analysis using the G* power (version 3.1.9.2) software was run with a statistical power = 0.95, $\alpha = 0.05$, effective size $f^2 = 0.15$ (Faul, Erdfelder, Lang & Buchner, 2007; Ghobadi &D'Ambra, 2012). The sample of 137 exceeds the minimum required sample of 74. Table 5-8 shows the results of the structural model.

Another way to estimate the sample size is to use the ten times rule, meaning that you need to collect 10 responses for every path in your research model (Hair, Sarstedt, Pieper & Ringle, 2012). Using this method, the minimum sample size is 90 so 137 is still an acceptable sample size for this study. Table 5-8 below shows the results of the structural model.

Table 5-8: Results of structural model

Path	**Path Coefficient**	**T Statistics**	**P Values**	**Hypotheses**	**Hypothesis testing results**
Interpersonal Trust -> Knowledge Sharing	0.206	2.379	0.018	H2	Supported
Knowledge Sharing -> Individual Performance	0.500	4.275	0.000	H1	Supported
Expected Reciprocal Relationship -> Knowledge Sharing	0.031	0.162	0.888	H4	Not supported
Expected Rewards -> Knowledge Sharing	0.062	0.178	0.842	H3	Not supported
Knowledge Sharing Self Efficacy -> Knowledge Sharing	0.202	2.168	0.016	H7	Supported
Knowledge Sharing Self-efficacy -> Outcome Expectations	0.503	4.589	0.000	H6	Supported

Outcome Expectations -> Knowledge Sharing	0.061	1.369	0.172	H5	Not supported
Culture -> Knowledge Sharing	0.518	3.309	0.001	H9	Supported
Culture -> Knowledge Sharing Self-efficacy	0.011	0.124	0.902	H8	Not supported

As shown in Table 5-8, the path between knowledge sharing and individual performance is significant ($\beta = 0.500$, $p < 0.05$) supporting hypothesis 1. As expected in the study, interpersonal trust is significantly associated with knowledge sharing ($\beta = 0.206$, $p < 0.05$) thereby supporting hypotheses 2. The relationship between expected rewards is not significant ($\beta = 0.062$, $p > 0.05$), therefore, hypothesis H3 is not supported. There is no positive relationship between expected reciprocal relationship and knowledge sharing ($\beta = 0.031$, $p > 0.05$), therefore, hypothesis 4 is not supported. The path between outcome expectation and knowledge sharing is not significant ($\beta = 0.061$, $p > 0.05$) and hypothesis 5 is not supported. Knowledge sharing self-efficacy positively influences outcome expectation ($\beta = 0.0503$, $p < 0.05$) supporting hypothesis 6. The path between knowledge sharing self-efficacy and knowledge sharing is significant ($\beta = 0.202$, $p < 0.05$) therefore hypothesis 7 is supported. The influence of culture on knowledge sharing self-efficacy is not significant ($\beta = 0.011$, $p > 0.05$) and hypothesis 8 is not supported. The influence of culture on knowledge sharing is significant ($\beta = 0.518$, $p < 0.05$), therefore hypothesis H9 is supported.

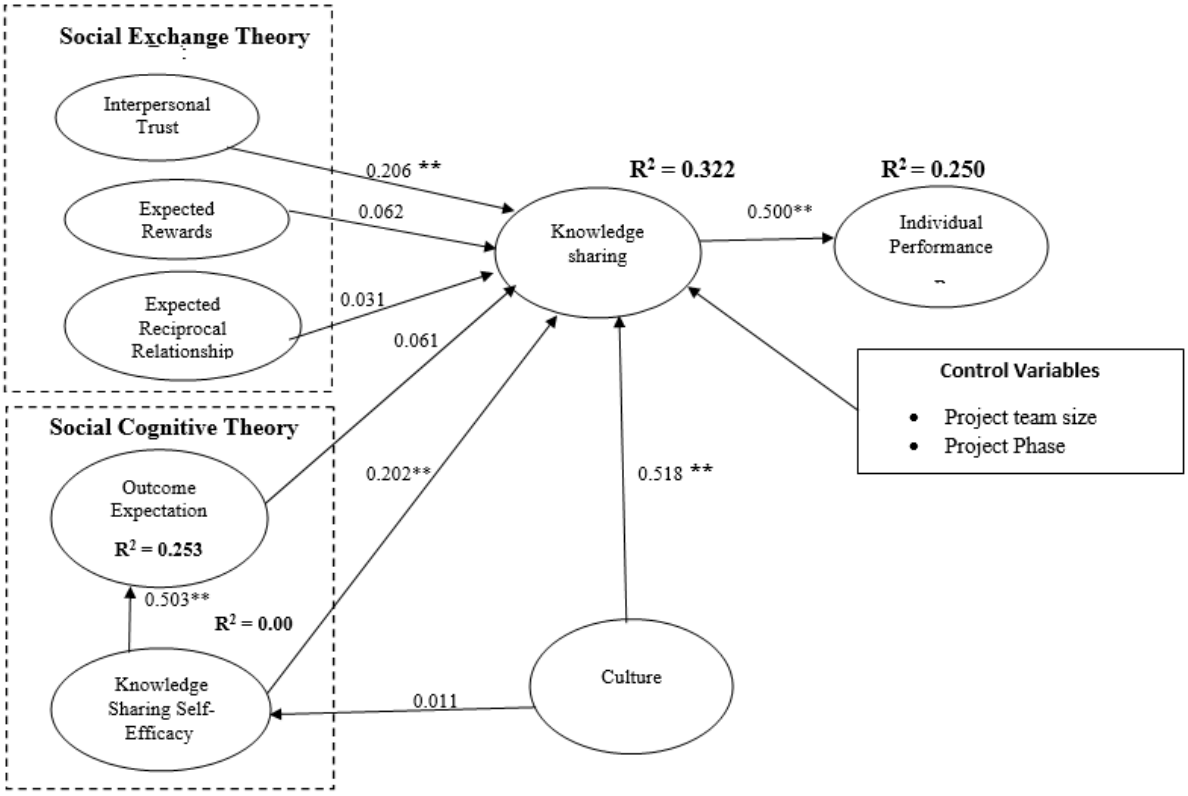

Figure 5-1: Results of the structural model

Figure 5-1 shows the results of the structural model with coefficients. It also shows the R^2 values which explain 25.0% of the variance in individual performance, 32.0% of the variance in knowledge sharing, and 25,3% of the variance in outcome expectations. The R^2 value of knowledge sharing self-efficacy was insignificant at 0%.

Control variables

Project team size and project phase were used as control variables to see their influence on knowledge sharing. Project team size was measured by the number of team members as indicated by the participants. It was used for as a control variable because it has been associated with affective and cognitive processes of teams (Rico, Alcover, Manzanares, Gil, 2009). According to Pee et al., 2010), large project teams may be faced with challenges as a result of increased conflict that may arise from the team. Project phase were measured based on the phase in which a project was at a given point in time. As the ISD project progress

through various phases of the development process, different types of knowledge may be required for each phase (Pee et al., 2010). Regression analysis test was carried out in PLS. The results show that there is not significance influence on knowledge when project and team size are added ($p > 0.05$) . There were no causal relationships between project team size and project phases on knowledge sharing.

5.5.1 Summary of hypotheses testing

The path coefficient between two latent variables needs to be assessed in order to validate the proposed hypotheses and the structural model. The value of the path coefficient needs to be at least 0.1 to account for an impact in the in the structural model (Hair et al., 2011). The results of the hypotheses testing are shown in table 5-9.

Table 5-9: Summary of hypotheses testing

Hypotheses	**Descriptions**	**Results**
H 1	Knowledge sharing positively influences an IT professional's performance during an ISD project.	Supported
H2	Interpersonal trust amongst individual IT professionals positively influences knowledge sharing.	Supported
H3	Expected rewards positively influences an individual IT professional's knowledge sharing.	Not supported
H 4	An individual IT professional's expected reciprocal relationship positively influences knowledge sharing.	Not supported
H5	An individual IT professional's outcome expectation positively influences knowledge sharing.	Not supported
H6	An individual IT professional's knowledge sharing self-efficacy positively influences outcome expectation.	Supported
H7	An individual IT professional's knowledge sharing self-efficacy positively influences knowledge sharing.	Supported
H8	Collectivist cultural orientation positively influences an IT professional's knowledge sharing self-efficacy.	Not supported

H9	Collectivist cultural orientation positively influences an IT professional's knowledge sharing.	Supported

The analysis in Table 5-9 shows that interpersonal trust directly influences knowledge sharing ($\beta = 0.206$, $t = 2.379$, $p < 0.05$) and knowledge sharing positively influences individual performance ($\beta = 0.500$, $t = 4.275$, $p < 0.05$). Therefore, hypotheses H1 and hypothesis H2 are supported. There is no positive relationship between expected rewards and knowledge ($\beta = 0.062$, $t = 0.178$, $p > 0.05$), therefore hypothesis H3 is not supported. The relationship between expected reciprocal relationship and knowledge sharing was not significant ($\beta = 0.031$, $t = 0.162$, $p > 0.05$), therefore hypothesis H4 is not supported.

There is no positive relationship between outcome expectation and knowledge sharing ($\beta = 0.061$, $t = 1.369$, $p > 0.05$) therefore hypotheses 5 is not supported. There is a positive relationship between knowledge sharing self-efficacy and outcome expectation ($\beta = 0.503$, $t = 4.589$, $p < 0.05$) and hypothesis H6 is supported. Based on the analysis, there is no positive relationship between knowledge sharing self-efficacy ($\beta = 0.202$, $t = 2.168$, $p < 0.05$) and therefore hypothesis H7 is supported. There is no positive relationship between culture and knowledge sharing self-efficacy ($\beta = 0.011$, $t = 0.124$, $p > 0.05$), therefore hypothesis H8 is not supported. Lastly, there is a positive relationship between culture and knowledge sharing ($\beta = 0.5.18$, $t = 3.309$, $p < 0.05$), therefore hypothesis H9 is supported.

5.5.2 Comparing Social Exchange Theory with Social Cognitive Theory

This section looks at how SEC and SET theories fared as far as their contribution to knowledge sharing is concerned. The two theories were used as theoretical lenses for this study and as such, the proposed research model in Chapter 3 is made up of constructs drawn from SET and SEC theories. SET is represented by interpersonal trust, expected rewards and

expected reciprocal relationships. SCT is represented by knowledge sharing self-efficacy, and outcome expectation.

This section compares the research results for the constructs linked to SET and SCT in order to see which one of the two theories better explains knowledge sharing.

Social Cognitive theory

Figure 5-2 shows the constructs associated with SCT. The constructs are knowledge sharing self-efficacy and outcome expectation.

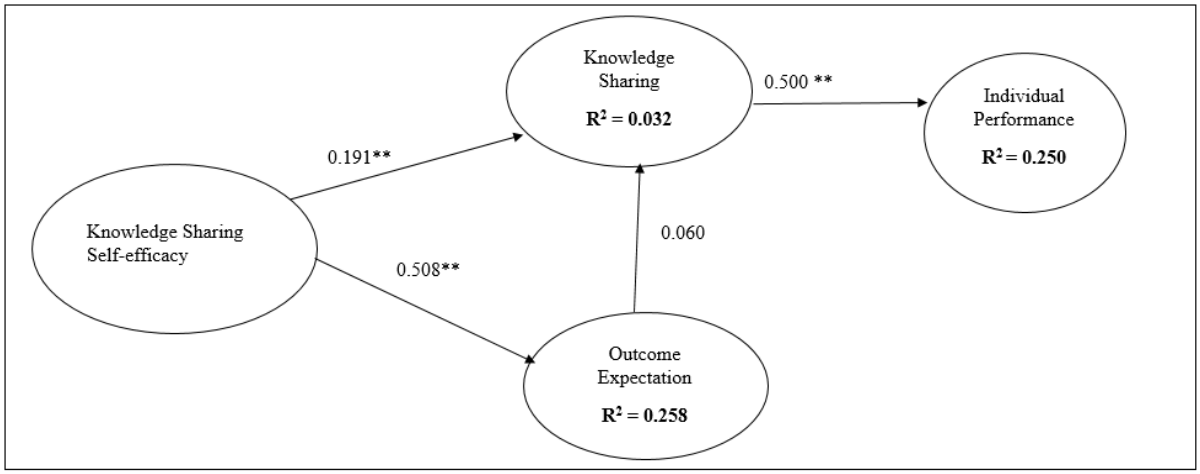

Figure 5-2: Social cognitive factors

As shows in Figure 5-2, the path between knowledge sharing self-efficacy and knowledge sharing is significant ($\beta = 0.191$, $p < 0.05$) and hypothesis H7 is supported. This means that there is a positive relationship between knowledge sharing self-efficacy and knowledge sharing. The relationship between knowledge sharing self-efficacy and outcome expectation is also significant ($\beta = 0.508$, $p < 0.05$). However, the relationship between outcome expectation and knowledge sharing is insignificant ($\beta = 0.060$, $p > 0.05$). There is a positive relation between knowledge sharing and individual performance ($\beta = 0.500$, $p < 0.05$).

The model in Figure 5-2 also shows the explanatory power. The explanatory power of the research model is shown by the statistical measure R^2 values (Tamjidyamcholo et al., 2013). According to Hsu and Chang (2014), the values of R^2 should exceed 10% in order to show an acceptable explanatory power. The SCT model in Figure 5-2 explains 25.0% variance in individual performance, 3.2% of variance in knowledge sharing and 25.8% of the variance in outcome expectation.

Social Exchange Theory

Figure 5-3 shows the SET model with its constructs. The constructs consist of expected rewards, interpersonal trust and expected reciprocal relationships.

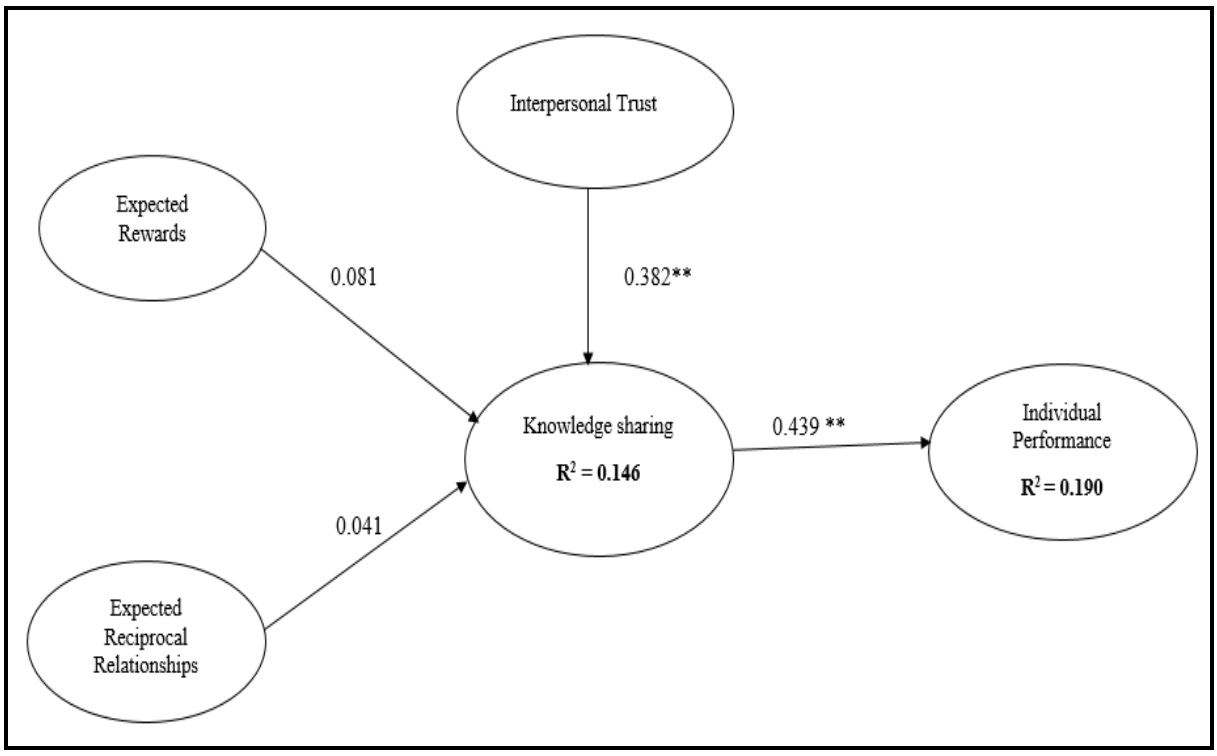

Figure 5-3: Construct's associated with SET

The relationship between interpersonal trust and knowledge sharing is significant ($\beta = 0.382$, $P < 0.05$) and therefore, hypotheses H2 is supported. There is a significance relationship between knowledge sharing and individual performance ($\beta = 0.439$, $p < 0.05$). However, the relationship between expected rewards and knowledge sharing ($\beta = 0.081$, $p > 0.05$) and the

relationship between expected reciprocal relationships and knowledge sharing ($\beta = 0.041$, $p > 0.05$) are not significant, therefore hypotheses H3 and H4 were not supported.

The explanatory power of the model explains 19.0% of the variance in individual performance and 14.6% of the variance in knowledge sharing.

The explanatory power of the model as shown in Figure 5-3 for SCT explains 3.2% of the variance in knowledge sharing. The explanatory power of the model shown in figure 5.3 for SET explains 14.6% of the variance in knowledge sharing. The R^2 value of knowledge sharing in figure 5.3 for SET is greater than 10, which means that the statistical power of the variance explained in knowledge sharing is acceptable. On the other hand, the R^2 values of knowledge sharing in figure 5.3 for SCT is 3.2% which is less than the recommended level of 10. Therefore, in this study, the explanatory power of the SCT model with regard to knowledge sharing is very weak. In this study, SET better explains knowledge sharing than SCT.

5.6 Mediation analysis

In this study, post-hoc analysis was done in order to check the mediating effect of knowledge sharing-efficacy on knowledge sharing. According to Kuo (2013), a construct acts as a mediator when the following conditions are met:

- When the independent constructs positively influence the mediating constructs (e.g. path a).
- When the mediating construct positively influences the dependent construct (e.g. path b).
- When the paths (a and b) are controlled, the previous positive relationships between the dependent construct and independent construct is no longer significant.

The influence of culture on knowledge sharing was examined as shown in Figure 5-4.

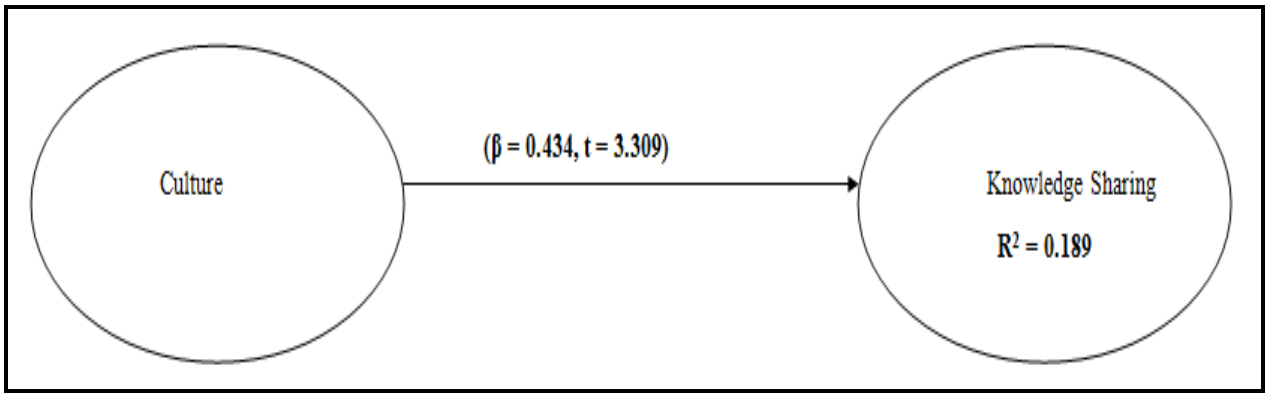

Figure 5-4: Relationship between culture and knowledge sharing

Based on the analysis in Figure 5-4, culture has a positive influence on knowledge sharing (β = 0.434, t = 3.309). A test was also conducted to examine the mediating effect of knowledge sharing self-efficacy on culture and knowledge sharing as shown in Figure 5-5.

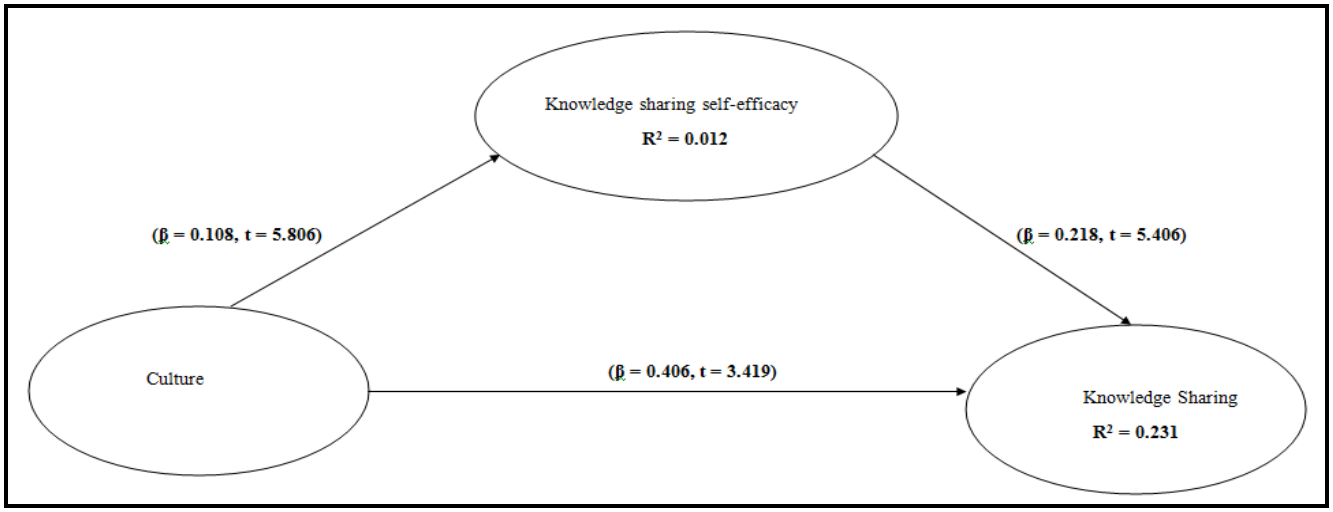

Figure 5-5: Mediation analysis

The results in Figure 5-5 show that knowledge sharing self-efficacy has a positive influence on knowledge sharing (β = 0.218, t = 5.406) and that culture positively influences knowledge sharing (β = 0.406, t = 3.419). The introduction of knowledge sharing self-efficacy as a mediating construct between culture and knowledge sharing resulted in the reduction of the

co-efficient between culture and knowledge sharing from 0.434, t = 3.309 to β = 0.406. In addition to this, the R^2 values were increased from 0.189 or 18.9% to 0.231 or 23.1%. This means that knowledge sharing self-efficacy partially mediates the relationship between knowledge sharing and culture.

5.7 Summary of the chapter

This chapter discussed the findings of the research. It included a breakdown of the participant's demographics. Most of the participants in the study were software developers and business analyst. Business analyst are the ones who source requirements from the customers, who then translate the requirements into technical requirements which software developers can understand in order to develop the required information systems. One important findings from the demographics is that most of the participants worked in the knowledge-intensive sectors industries such as IT and financial services where knowledge sharing plays an important role in their competitive advantage. These industries are in the fore front of technological innovations in order to retain and lure customers in the face of threats from current and future players in the space. The various tests undertaken to assess the measurement model were discussed, including construct validity, internal consistency, construct reliability, indicator reliability, convergent validity and discriminant validity. The assessment of the structural model and hypotheses testing was detailed showing that five of the hypotheses were supported by the data.

The comparative analysis between SET and SCT were also discussed. Regarding the determinants of knowledge sharing, the findings of the study shows that Interpersonal trust, knowledge sharing self-efficacy and the collectivist cultural orientated culture is important to knowledge sharing. Knowledge sharing has also been found to influence individual performance. Lastly, the mediation analysis was discussed which found that knowledge

sharing self-efficacy partially mediates the relationship between knowledge sharing and culture.

The next chapter provides the interpretation and discussion of findings and the knowledge sharing model.

CHAPTER 6

INTEPRETATION OF FINDINGS AND THE KNOWLEDGE SHARING MODEL

6.1 Introduction

The previous chapter presented the quantitative component of the data analysis for the study. This chapter interprets these empirical findings based on the literature. The chapter also presents the empirically derived model for knowledge sharing in ISD projects amongst IT professionals.

While the focus of this chapter is the interpretation of quantitative data, it does draw on some of the qualitative data to enrich the discussions and provide additional insights. The main qualitative findings are presented in the subsequent chapter.

This chapter presents the findings as follows: first the findings on knowledge sharing and individual performance, followed by findings on interpersonal trust and knowledge sharing, and then expected rewards and knowledge sharing, then expected reciprocal relationship and knowledge sharing, followed by knowledge sharing self-efficacy and outcome expectations and finally the findings on culture and knowledge sharing, culture and knowledge self-efficacy.

6.2 Main findings of the study and the interpretation thereof

There are various factors which may influence an individual IT professional's knowledge sharing during ISD projects. The purpose of this study was to explore and explain these factors.

6.2.1 Knowledge sharing and individual performance

As expected, the results show that knowledge sharing plays a crucial role in the performance of individual IT professionals during ISD projects ($\beta = 0.500$; $t = 4.275$, $p < 0.05$).

In this study, there is a significant relationship between knowledge sharing and individual performance. This supports the findings of previous studies (Ozer & Vogel, 2015; Park & Lee, 2014) who found that knowledge sharing during ISD projects influences the performance of the individual team members. In this study, it means that both tacit and explicit knowledge plays a very important role in an individual's performance.

Knowledge being shared and received in ISD projects should be effectively applied to solving a specific problem. An ISD project team with higher problem-solving capability can use the knowledge and skills of their fellow team members to achieve a favourable outcome (Lin, Chen, Hsu & Fu, 2015). Ozer and Vogel (2015) found that the relationship was stronger between knowledge sharing and individual performance when individual team members had the freedom to incorporate the knowledge they received from their fellow team members into their allocated project tasks.

One participant in this study, a senior IT auditor, phrased this relationship as follows:

> *"I think knowledge sharing can enhance individual and team performance during the project. Team members will know exactly what to do and what is expected from them. Individual performance may increase the chances of the project to be successful and eliminate the project implementation to be delayed."*

ISD projects tasks are complex and people are expected to put in extra effort to perform well in complex situation. Individual project team members may not want to be seen as non-

performers as their non-performance may have a negative influence on the overall success of the projects or on other tasks that are highly dependent on theirs.

A business analyst participating in this study noted:

> *"Knowledge sharing plays a huge role in improving individual performance, as one cannot be independent, but they need the expertise of other team members in order to complete their tasks. It impacts the success of the project simply because if an individual does not meet the certain skills or having limited skills will always influence the success of the project".*

Similarly, horizontal coordination – where IT professional engage one another to solve problem they encounter – is positively related to knowledge transfer which leads to the improved performance of the IS project (Parolia, Goodman, Li & Jiang, 2007). An IT consultant commented:

> *"Individuals are very key to the success of ISD projects. The collective expertise of all the individuals involved in IT projects needs to be utilized effectively for the benefits of the projects. Even today, most IT projects still fail because of many reasons; working together towards a common goal can alleviate some of the causes of such failures."*

Hypothesis H1 proposed that knowledge sharing positively influences IT professional's performance during an ISD project. The research findings confirm that hypothesis H1 is supported.

6.2.2 Interpersonal trust and knowledge sharing

As expected, the results in this study indicate that there is a positive relationship between interpersonal trust and knowledge sharing.

Based on social exchange theory, trust has been recognized as a significant ingredient governing many social exchanges relationships and trust is very important in enhancing knowledge sharing (Tsai et al., 2012). The exchange relationships are characterized by dependence, vulnerability, and uncertainty. Interpersonal trust reduces the perceived uncertainty to knowledge sharing for the knowledge contributor (Hsu & Chang, 2014). In an ISD project environment setting, interpersonal trust can be established between two individuals as far as knowledge sharing is concerned, as long as there is existence of benevolence and competency-based trust (Kuo, 2012).

The results in this study show that benevolence-based and competence-based trust amongst individual team members during an ISD project plays a major role in knowledge sharing ($\beta = 0.206$; $t = 2.379$, $p < 0.05$). This finding supports the outcomes of past studies where interpersonal trust has been found key to persuading individuals to share their knowledge (Hsu & Chang, 2014; Swift & Hwang, 2013; Wickramasinghe & Widyaratne, 2012; Van Acker, et al., 2014; Park & Lee, 2014).

McKnight, Choudhury & Kacmar (1998) also found that trusting beliefs (e.g. competency-based and benevolence-based trust beliefs) are positively related to trusting intension where individuals are prepared to engage in a trust-related behaviour with a web vendor.

This also supports the findings of Kuo (2010) who found that trust in the workplace positively influence the knowledge sharing behaviour. Individuals are very selective about

whom they trust, and trust is very fragile in that it takes time to be formed and it may be destroyed in a matter of seconds (Hsu et al., 2007).

In ISD projects, time is a precious resource and it is imperative that individual project team members learn to trust one another in the small amount of time available so that they may be able to share their expertise and know-how with their fellow team members. Lack of trust may impede the flow of needed knowledge which is critical to problem-solving in the project.

Hypothesis 2 proposed that interpersonal trust between Individual IT professionals positively influences individual IT professional's knowledge sharing. The results have demonstrated that this is true and so Hypothesis H2 is supported.

6.2.3 Expected rewards and knowledge sharing

Different types of rewards may play a role in the knowledge sharing in organisations (Kuo, 2012). When rewards are carefully implemented, they can facilitate knowledge sharing, increase an individual's willingness to contribute to the success of the team and nurture team spirit (Pee at el., 2010). According to SET, social relationship between individuals can be established when the benefits derived from the relationship are greater than the cost (Gang & Ravichandran, 2015). For an individual to engage in a knowledge sharing behaviour they should be motivated by a favourable outcome, otherwise, they may not engage in the knowledge behaviour (Wang & Hou, 2015).

The results of this study show that there is no significant relationship between expected rewards and knowledge sharing. These results support the outcomes of some previous studies which found that expected rewards do not have any significance on knowledge sharing (McDermott & O'Dell, 2001; Jewels & Ford, 2006 and Bock et al., 2005).

However, the results from this study contradict the findings of other studies which found that when individuals expect to receive rewards as a result of their knowledge sharing, they will indeed engage in the knowledge sharing behaviour as long as the rewards remain in force (Voelpel & Han, 2005; Wickramasinghe & Widyaratne, 2012; Pee et al., 2010). Previous research has linked expectations of internal and external rewards to knowledge sharing. For example, Wang & Hou (2005), found that hard/extrinsic rewards (e.g. financial rewards, promotion, or reciprocity) and soft/intrinsic rewards (e.g. relationship with others, or personal reputation) have a positive relationship with knowledge sharing.

Hypothesis H3 suggested that expected rewards positively influence an individual IT professional's knowledge sharing ($\beta = 0.062$, $p > 0.05$). The results show that hypothesis H3 is not supported.

The qualitative inputs to the survey highlight some of the reasons why the findings of the study revealed a non-significant association between expected rewards and knowledge sharing. For example, a software developer stated:

> *"Individuals are supposed to share knowledge in projects even if not given any rewards. The company pays them for the work they do and that should be enough to motivate them."*

The same sentiments were echoed by a systems analyst who commented:

> *"I don't think rewards influence the sharing of knowledge, but success and common understanding and relationships builds team morale and unity".*

Some individuals believe that giving rewards to project participants is not a good idea as it will promote knowledge hoarding, where individuals who have certain expertise would not want to share that expertise with their fellow team members because they want a bigger

chunk of the rewards for themselves or may not share knowledge at all for the fear of losing power and the value associated with the knowledge they possess (Hsu & Chang, 2014). Instead of focusing on giving rewards to project individuals, the focus should be on motivating the entire team, as project work is only beneficial when different individuals integrate their expertise to create the complete product. One software developer noted:

> *"Expected rewards shouldn't trigger knowledge sharing; instead, knowledge sharing should be part of the project mandate".*

This suggests that when individuals in an ISD project team put their differences aside and work towards a common goal, they can indeed achieve a greater success which is beyond what a single individual can achieve on their own.

Intangible rewards are seen as the best rewards that an organisation can give to ISD project team in order to entice them to share knowledge. Recognition or public feedback should not be undervalued as a reward as it can stimulate individuals to share more of what they know with other individuals in the project. As one of the systems analysts put it:

> *"Monetary rewards are actually a negative motivator in teams and projects. Status and recognition is of much higher value and should rather be used. Sharing knowledge for the purpose of getting a reward is not sincere and might affect negatively the project. Individuals should only expect personal growth as a reward from knowledge sharing in a team. Mutual relationships are strengthened when knowledge is shared, supported by a positive knowledge sharing culture."*

6.2.4 Expected reciprocal relationship and knowledge sharing

According to to SET, knowledge sharing is considered a mandatory prerequisite to getting intrinsic rewards such as expected reciprocal relationship (Bock & Kim, 2002). Reciprocity can only be continuous when each individual discharges their knowledge sharing obligations (Gang & Ravinchandran,2015).

Contrary to what was expected in this study (that there might be a positive association between expected reciprocal relationship and knowledge sharing), the results show that there is no significant relationship between expected reciprocal relationship and knowledge sharing. The findings of the study are contrary to the positive findings of the existence of a positive relationship between expected reciprocal relationship and knowledge sharing in previous studies (Liao et al., 2013; Wang et al., 2014).

Hypothesis H4 put forward that an individual IT professional's expected reciprocal relationship positively influences knowledge sharing ($\beta = 0.031$, $p > 0.05$). However, the results in this study were insignificant, therefore hypothesis H4 is not supported. The findings of this study also support previous findings by Serenko and Bontis (2016), who found no positive relationship between reciprocity and attitude to share knowledge.

One reason for there not being a link between expected reciprocal relationships and knowledge sharing may be that some individuals in the project do not expect anything in return for sharing their knowledge, over and above their normal pay at the end of the month. One of the business analysts responding to the survey commented:

"It is better not to have expectations, but to share knowledge as a habit to help others understand what you bring to the table; it may also create interest in your field of expertise from which relationships can be fostered and grown."

On the other hand, some participants expressed a belief that expected reciprocal relationships do have a positive influence on knowledge sharing during ISD projects. An application specialist mentioned:

"Expected reciprocal relationships do have a positive influence on knowledge sharing: if I share knowledge with a team member, I expect that team member to do the same thing, if not, I will not share my knowledge with them. On the other hand, reciprocal relationships increase knowledge sharing and I would not connect it with rewards".

6.2.5 Outcome expectation and knowledge sharing

In SCT, an individual is more likely to engage in a knowledge sharing behaviour when they expect that the results of their knowledge sharing behaviour will yield favourable outcome (Chiu et al., 2006). Contrary to our expectation, the results of this study show that there is no significant relationship between outcome expectation and knowledge sharing. The findings of this study is consistent with findings of a previous study by Chiu et al., (2006) who found that personal outcome expectations do not have any positive relationship with knowledge sharing. The absence of any positive relationship between knowledge sharing and outcome expectation may suggest that individuals in ISD project teams do not share knowledge, although they expect that their desires will be fulfilled when knowledge sharing takes place.

The findings of this study are contrary to that of Hsu et al. (2007), who found a positive relationship between personal outcome expectation and knowledge sharing behaviour in

virtual communities, where individuals believe that sharing their knowledge will result in positive outcome which are personal to them.

Hypothesis H5 posited that an individual IT professional's outcome expectation positively influences knowledge sharing ($\beta = 0.077$; $p < 0.05$) but the research results did not back this up. Therefore, hypothesis H5 was not supported.

This may be caused by the fact that in ISD projects, IT professionals know that even if they don't fully commit to the project at hand, the project may still succeed through the efforts of other hard-working IT professionals.

6.2.6 Knowledge sharing self-efficacy and outcome expectation

According to SCT, an individual with high self-efficacy is highly likely to participate in a certain behaviour (Hsu et al., 2007). This means that in an ISD project environment, individual who has high self-confidence in their own ability to perform some specific IS tasks, they will likely perform those tasks. Such an individual will be likely to share their knowledge. On the other hand, it will be pointless of an individual to anticipate positive outcomes if they are not confident in their own ability to execute the required actions (Lin & Huang, 2010).

As expected in this study, the results revealed that there is a positive association between knowledge sharing self-efficacy and outcome expectation. These findings are similar to those from previous studies on project teams (Lin & Huang, 2010; Lin & Huang, 2008; Hsu et al., 2007) which found that a person with high-confidence in their ability to partake in a particular behaviour, such as knowledge sharing, will participate in such behaviour because they expect their behaviour to contribute to the success of the project. The types of

individuals with this mentality are those who have bought into and are aligned to the overall objectives of the ISD project, and they believe they can make a significant difference towards attaining the project objectives.

Hypothesis H6 suggested that an individual IT professional's knowledge self-efficacy positively influences outcome expectation ($\beta = 0.503$; $p < 0.05$). The data shows that this is true and Hypothesis H6 is supported.

This means that when individuals have high self-confidence in their ability to share ISD project related knowledge, they won't hesitate to share such knowledge with other individuals in the project team because their knowledge sharing may result in positive personal outcome. These results confirm the position taken in SCT that self-efficacy has a positive influence on one's expected positive outcome and such expected outcome will not be useful if the person does not have self-confidence in their own ability to share ISD related knowledge. The finding of this study is also consistent with other studies in information system such as that of Compeau and Higgins (1995a,1995b) who found that computer self-efficacy wields a significance influence on personal outcome expectations, and that computer self-efficacy has a positive influence on performance which in turn has a positive influence on outcome expectation (Marakas, 2000).

6.2.7 Knowledge sharing self-efficacy and knowledge sharing

According to SCT, an individual will participate in an action with personal cognition, and self-efficacy, is the determinant of such personal cognition, and self-efficacy is a vital factor influencing the individual choice of sharing knowledge (Hsu et al., 2007). An individual with high self-efficacy in their own abilities of sharing knowledge is highly likely to share knowledge (Lin & Chang, 2018). Individuals with low self-efficacy are not likely to share their knowledge with others (Tsai et al., 2013).

On the hypothesized relationship between knowledge sharing self-efficacy and knowledge sharing, the results show that there is positive relationship (β =0.202, t = 2.168, $p < 0.05$). The findings of this study supports the findings from previous studies such as Tsai and Cheng (2012) who found that there a positive relationship between knowledge sharing self-efficacy and knowledge sharing, and that perceived self-efficacy is positively related to knowledge sharing's intention amongst IT professional through knowledge management systems (Tsai et al., 2013). It also supports the findings of Lin & Huang (2010) that self-efficacy was positively related to knowledge management systems usage and Van Acker et al., (2014) who found that knowledge sharing self-efficacy plays a major role in influencing teachers to share open educational resources. The finding of this study contradicts findings of a study done by Tamjidyamcholo et al., (2013), where they found that self-efficacy does not have any significant relationship with knowledge sharing attitude.

Hypothesis H7 proposed that an individual IT professional's knowledge sharing self-efficacy positively influences knowledge sharing. The results from this study show that there is a significant relationship between knowledge sharing self-efficacy and knowledge sharing, therefore Hypothesis H7 is supported. This means that when a person has a self-confidence in themselves, they are more likely to share knowledge with others (Hsu et al., 2007).

6.2.8 Culture and knowledge sharing self-efficacy

This study takes cognisance that ISD project happens in a social environment happens within an organisational boundary, where organizational culture may influence how the individuals within that organisation behaves. Cultural orientations such as individualism / collectivism play a significant role in motivating individuals to share knowledge (Zhang, de Pablo's & Xu, 2014). The results of this shows that there is no positive relationship between culture and knowledge sharing self – efficacy. The results of this study are contrary to the results of past

studies of Zhang et al., (2014) who found a positive relationship between knowledge sharing self-efficacy and culture. This means that the cultural orientations (collectivism or individualism) embraced by an individual do not have an effect on one's confidence on their ability to engage to share knowledge. This may mean that though collectivist-oriented individuals are highly likely to share knowledge, they may not have the confidence of doing so.

Hypothesis H8 states that an individual IT professional's culture positively influences knowledge sharing self-efficacy ($\beta = 0.011$; $p > 0.05$). However, the result of the study does not support hypothesis H8.

6.2.9 Culture and knowledge sharing

Collectivist cultural oriented individuals put the interest of the group first before theirs, and this means that they are likely to share knowledge than individuals who value individualistic cultural orientations (Arpaci & Baloglu, 2015). According to SET, there are two critical assumptions that may lead an individual to share knowledge, long term relationship and the expectations that come with one sharing their knowledge (Zhang et al., 2014). Noted that individuals in collectivistic cultural orientation put a lot of emphasis on relationships (Yu, 2014).

In terms of the association between culture and knowledge sharing, the results show that there is indeed a positive link ($\beta = 0.518$, $p < 0.05$). This means that collectivist cultural oriented individuals are highly likely share knowledge with others in ISD project as they have the interest of the group instead of their own (Hofstede, 1991).

The findings of this research support the findings of previous studies which found that collectivist cultural orientation has a positive effect on knowledge sharing (Arpaci & Baloglu,

2015; Yu, 2014, Zhang et al., 2014; Peralta & Saldanha, 2014). This also supports the findings of Yu (2014) who found that individual who are embraces collectivism orientation has positive influence on knowledge sharing intention. This mean that individuals who are collectivist oriented are more likely to share knowledge. Hypotheses 9 posits that an individual IT professional's culture positively influences knowledge sharing. The results of the study support hypothesis H9. The findings of this study suggest that when people have a more collectivist orientation, they are more likely to share,

A solution architect working in the telecommunication industry said:

> *"Culture equally is key - if it is toxic, there is limitation in as far as knowledge sharing is concerned and if it is conducive, professional and healthy, sharing will be in abundance".*

The same sentiments were shared by a business analyst who said

> *"Culture is very important, some culture prevents sharing of knowledge among team members, some promote sharing, but in projects, team members should enjoy sharing knowledge in order to accomplish the project goals. In some cultures, it is acceptable to 'brag' about what you know and this creates awareness around your skills. Some people in the team may not be as open to talking about their knowledge and achievements relating to the project. This can lead to the team member not being given the opportunity to share knowledge or to be given opportunities to lead discussions on topics they are knowledgeable about. In the long term this affect career progression and earning potential. Diversity of cultures enables creativity; performance is obtained when team members adopt "good" cultural habits."*

Participants also mentioned that

> *"Culture is a huge barrier to overcome, as different cultures do not necessarily have the same work ethics and sharing ethics. A level ground needs to be established by the leader that provides some common reference points."Model for knowledge sharing amongst South African IT professionals in ISD projects*

The model of knowledge sharing is shown in Figure 6-1. The model only shows those constructs where the hypothesised relationships were supported during the structural modelling.

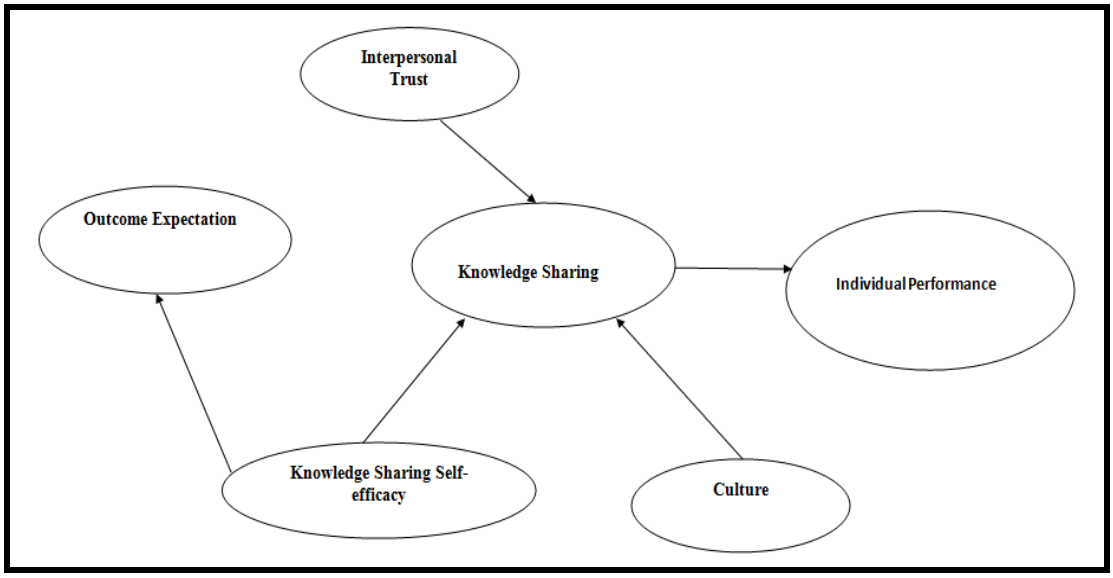

Figure 6-1: Model for knowledge sharing amongst IT professionals in ISD projects

Figure 6-1 shows the final model for knowledge sharing in ISD projects amongst IT professionals after the test of the structural model was conducted using partial least square.

According to the empirical evidence gathered in this study, knowledge sharing was found to have a positive relationship with individual performance. This means that when knowledge sharing takes place, an individual is able to produce a better quality output of the ISD tasks assigned to them.

Interpersonal trust is positively associated with knowledge sharing, this means that when individuals believe that their peers are competent in ISD related tasks and that their peers will not harm them intentionally, they will participate in the knowledge sharing behaviour in the ISD project. Individuals with a more collectivist cultural orientation embrace knowledge sharing in ISD projects. These individuals have the interest of the group at heart than their own interest.

Knowledge sharing self-efficacy has a positive relationship with knowledge sharing, meaning that the self-confidence of individuals has a positive effect in their knowledge sharing behaviour. Lastly, knowledge sharing self-efficacy is positively related to outcome expectations. This means that when individuals have high self-confidence in their own ability to share ISD related knowledge, it will strengthen their belief that sharing knowledge in the project will result in positive outcomes.

6.3 Chapter Summary

This chapter discussed the findings for quantitative data on knowledge sharing, individual performance, interpersonal trust, expected rewards, expected rewards, expected rewards, expected reciprocal relationships, knowledge sharing self-efficacy, outcome expectation and culture based on the empirical evidence. The chapter also presents the model for knowledge sharing amongst IT professionals developed based on the outcomes of this research. The next chapter presents the results of the qualitative analysis.

CHAPTER 7

ANALYSIS OF QUALITATIVE RESPONSES

7.1 Introduction

The previous chapter discussed the quantitative findings of the study based on the statistical analysis conducted in chapter 5. This chapter discusses the qualitative responses of the participants. This chapter the first discusses the qualitative responses of individual performance and knowledge sharing, followed by a discussion of the responses on expected rewards, expected reciprocal relationship and knowledge sharing, and culture and knowledge sharing. The chapter ends with a summary of the qualitative responses.

7.2 Participants' qualitative responses

In order to get contextualised insights, participants were requested to share their views and opinions qualitatively. The qualitative portion of the research was undertaken to get the participants contextualized insights which, in some cases, are often very close to people's hearts as far as human behaviour is concerned.

In the present study, 70 participants responded to the qualitative questions. The qualitative responses were not mandatory, and participants were at liberty to choose whether to complete the qualitative questions or not. Similar responses were aggregated as one and are shown below in italics.

7.2.1 Participants' views on knowledge sharing and individual performance

Part of the thesis argument is that the decision to share experiences and what you know is influenced by social cognition and the need or expectation for social rewards, also known as social exchange.

It is not a secret that knowledge plays a very important part in ISD Projects. This includes amongst others:

- knowledge about the purpose of the project at hand, knowledge about the business and technical domain
- knowledge about what need to be done in order to achieve the objectives of the project,
- knowledge regarding what to do when problems or issues arises, and
- Knowledge of what was done in previous projects of a similar nature or learning's from previous projects that can be used to prevent similar mistakes.

Participants indicated that knowledge sharing in ISD projects is very important and that it plays a very important role in enabling an individual IT professional to perform better in the project, thus ensuring that they are able to complete tasks and produce better quality outputs for the assigned tasks in the allocated time.

The feedback from the qualitative responses in this study supports the quantitative findings that an individual IT professional's knowledge sharing positively influences individual performance in ISD projects. Participants believe that knowledge sharing plays a major role in individual performance. This was highlighted by one IT manager as follows:

"Knowledge sharing is important, but often doesn't happen enough. Either because people who don't know, don't ask or people with the knowledge don't share enough. I.e. do you pull for knowledge or knowledge should be abundantly pushed to whoever needs it and those who didn't know they needed it. We need both individual performance and collective team performance. Just like a sport team you can have stars and key team players, but they should all work together to succeed."

These views were supported by a systems analyst who noted that knowledge sharing enables individual performance in ISD projects. He said:

"I believe that there is no one individual in an ISD project who knows everything. Most of the time an individual will need to ask for some more information or clarity from his or her peers on the project so that he or she can accomplish the tasks at hand. I can surely say that knowledge sharing does have an influence in individual performance as the individual may not be able to satisfactory complete some tasks if the knowledge was not shared with them."

Many participants say that they share knowledge during ISD projects because it helps them to learn new things. A business intelligence analyst in the study phrased it like this:

"Knowledge sharing enhances individual's skills because if you have been struggling with something and you receive all the information then the learning process becomes a whole lot easier."

Another participant (a software developer) said:

"Knowledge sharing shortens the lead or delivery times for on projects, because we learn from each other as a community of practice as there no single one of us who knows everything that is there to be known in ISD projects. I know that every time knowledge is shared, the performance of the individuals and the project team increases and everyone seems to participate. I strongly believe that knowledge sharing needs to be both encouraged and enforced within each team, unit, or department. This will not only improve the individual performance during the ISD project but it will also reduce the risk of depending on one individual or fewer individuals to carry out certain functions. Knowledge sharing needs to be part of the business strategy in relation to strategic goals and objectives. Knowledge sharing needs to form part of the company policy."

Another important point raised by participants was the issue of dependency. When knowledge sharing is embraced and present in an ISD project, over-reliance on certain individuals is eliminated. This highlights the fact that an ISD project is a team effort with individuals assigned specific tasks. Most of the time, for an individual to perform well on their task, they are dependent on another individual to complete their tasks. When one person does not perform their tasks well because of a lack of know-how, or if they encounter issues or problems and do not know who to ask for advice, it affects the deliverables of other team members. This was elaborated by a technical specialist:

"I think that each individual should be held accountable for their output in a project team. I also feel that knowledge sharing is very important to ensure that there are no key man dependencies. I have two views on this issues, a) If each individual performs well the project performs well, and b). If there is an individual not performing, then the project owner or project manager should

take it up with this individual so that it does not negatively impact the rest of the project members."

The same sentiments were shared by a solution architect who said that:

"There are good reasons why ISD projects consist of many individuals with different expertise. Individuals rely on each other's expertise to accomplish the project goal. When one individual needs assistance, he or she is able to ask for help from peers so that the individual can accomplish the project tasks assigned to them. I am a firm believer that knowledge sharing that happens within the project enables individual performance."

A software developer also supported the notion of interdependency amongst project team members during ISD projects, highlighting the multidisciplinary expertise jointly possessed by ISD project teams:

"Individuals who are part of a project cannot achieve project success on their own. No matter how good they can be as an individual. They will need to share their know-how with fellow team members so that the entire project can be a success" – software developer."

A solution architect shared the same sentiments:

"None of the work streams in an ISD project can succeed independently, there are interdependencies. All team members should be committed to the end goal. Integration points have to be managed efficiently to successfully build an IT solution."

A Project Manager also supported the notion that individuals should not be afraid to ask for help when they encounter issues in the project. Rather they need to consult and ask their peers for help so that they don't delay the project:

> *"As a project manager, I believe that individuals play a role in knowledge sharing, which in turn assists them to be able to complete the tasks assigned to them, and this helps the entire project to succeed. Individuals will want to perform at their utmost best. When they don't know something in the project; they have to ask their peers so that they can be able to complete tasks thereby contributing to the objective of the entire project."*

Project teams are formed by a range of team members sourced from various functions or departments within the organisation, and some of the individuals have never worked together before. Individuals need to realise that the fact that they were selected to be a member of a project team should be motivation enough because they were selected based on their expertise in either the business or technology domain. They also need to understand that their expertise, experience and knowledge on its own cannot accomplish all the project tasks, rather their expertise and know-how is critical in conjunction with the expertise, knowledge and experience of other project team members. That is why some of their tasks are dependent on someone else completing their tasks first; if the other person delays, for whatever reason, it will negatively affect them. A software developer noted that:

> *"There is no project I know that has ever been successful without knowledge sharing between individuals in the project. On the same note, in ISD projects, tasks are broken down and assigned to various individual based on their experience and knowledge. Most of the tasks are interdepended on each other; that is why individuals will tap in to the knowledge or expertise of others when*

they need assistance so that they can accomplish the assigned tasks within the allocated time. Knowledge sharing does have a positive influence and enable individual performance."

Information Systems skills are in short supply, especially in South Africa, and companies always poach the best talent from one another. Project leaders need to ensure that they have a backup plan for the continuity of the project in a situation where one or more individuals leave the project due to resignation, reassignment to another project or death. The project needs to continue as normal is such events. For this to happen, knowledge sharing needs to be encouraged in the project. Each individual needs to know what is happening on the project at any given time, and such tasks should not be left to the project manager alone. One participant said that:

"It is crucial that knowledge sharing takes place in organisations in order for every project member to have the same knowledge and understanding of the project. If one member of the team resigns or leaves the project, the remaining team should have knowledge of the project and development so that the project is not held back because someone who knew something left the project."

Collaboration amongst individual team members was also raised by participants as one of the key ingredient for knowledge sharing in ISD projects. They mentioned that ISD projects need team work because the type of tasks in ISD projects are so diverse and challenging that no individual that can accomplish all of them on their own as they don't have all the expertise that are needed. This was explained by a software developer who said:

"As a team member in an ISD project team, sharing knowledge with team members makes the progress of the project move faster and the project is productive. Individual performance is OK, but not at the expense of the entire

project team. It is essential to merge individual performance with team members."

The issue of knowledge-hording or "*knowledge is power"* was also raised by participants as one of the challenges facing knowledge sharing in ISD projects. They felt that some individuals who have in-depth knowledge of ISD project domains in ISD projects do not want to share their knowledge because they believe that they will become redundant, or that everyone will know what they know and this may render their expertise useless in the project team. This is similar Individuals in projects may indeed hoard knowledge because they fear that sharing their knowledge with others makes them more vulnerable, or that they will no longer be regarded as a gate keeper of whatever expertise he or she possesses. As one systems analyst put it:

"Knowledge sharing is very good for team performance, however individuals within the teams want to use it [knowledge] to get positions and refrain from providing more information as their positions are in threat."

In ISD projects, it is possible that project team members get assigned to transformational projects such as ERPs, digitization and core banking system renewals, to name a few, where they are not familiar with the technology or business domain. In these types of projects where failure is not an option due to the millions spent on the project and the change such projects will bring to the organisations, emphasis is put on delivering results that will satisfy the stakeholders. The only way for such projects to be successful is through collaboration and sharing of both tacit and explicit knowledge amongst the individuals in the project, where team members who encounter problems can get assistance from experts on the project so that they are able to perform their duties in the projects. An IT consultant said:

> *"Knowledge sharing is very important, it provides a sense of belonging. Team work and accomplishment of the project becomes easy. Knowledge sharing can make or break the project, it's a measure ingredient of a project success."*

Lastly, a business analyst said that

> *"My view is that IT professionals, in their different roles bring a wealth of information and knowledge to an ISD project. They need to collaborate and share their knowledge so that they can complete the projects within the stipulated time."*

Summary of themes

The following themes arose from the qualitative findings:

Knowledge sharing and belonging

In ISD projects, individuals are brought to the project team based on their expertise and skills needed to complete the new information systems (Park & Lee, 2014). Individuals in ISD project teams need to feel valued and have a sense of belonging so that they can be able to take part in knowledge sharing activities assigned to them. The nature of ISD projects requires real collaboration amongst team members, where all members are required to work towards achieving the common goal of the project (Hsu, Li & Sun, 2017). In ISD projects, many decisions get taken and that often needs the approval of many individuals and this necessitates that all individuals feel that they belong to the teams so that decisions that need to be made are made quicker and that each individual lead each other one way or another towards the accomplishment of the project goals (Hsu et al., 2017). Social ties amongst individuals in ISD projects is very key as it allows individuals to share knowledge through social interactions when they feel a sense of belonging (Ryan & O'Connor, 2013).

Knowledge sharing and interdependence

Knowledge-intensive industries are highly dependent on the expertise of their employees to deliver finished products (Ryan & O'Connor, 2013). ISD projects, like any other projects, are formed by individuals from various functional areas in the organisation with various expertise and skills in order to deliver a working information system that meet the client's expectations. Due to their cognitive nature, ISD project tasks gets assigned to various individuals based on their skills and expertise and these tasks are interdependent on each other. E.g. An individual may not be able to start with the task assigned to them until another individual completes their own tasks. When task interdependence is very high in ISD projects, it demands shared knowledge about the application problem domain and skills, but when task interdependence is very low, there is no critical need for collaborative work in relation to application problem domain (Chou & He, 2011). According to the social interdependence theory, the theory posits that interdependence in project goals, tasks between individuals in the project team may result in promotive interactions, where individuals will assist one another by sharing resources such as materials and information (Johnson, 2003).

Previous studies have found that perceived tasks, goal and reward interdependencies are positively related to knowledge sharing amongst individual during ISD project (Pee et al., 2010). This shows that when individuals know that they are dependent on their fellow team members to accomplish given tasks, or when they know that the success of the entire project is solely dependent on them working and helping together, they may engage in knowledge sharing. Where they will not see another individual as a competitor, but a complementary resource they need to fulfil their duties as far as the ISD project is concerned. In another

study done on knowledge sharing in ISD projects, dependence between individuals has been found to be positively related to knowledge sharing (Park & Lee, 2014).

Knowledge sharing and hoarding

Knowledge with holding is the opposite of knowledge sharing, it is the likehood that an individual may share less knowledge (Wang, Lin, Li & Lin, 2014). In SET, the actors in a social exchange relationship offer something valuable to each other, and they create, maintain and voluntarily end the relationship based on the rewards expectation from each other (Serenko & Bontis, 2016). An individual in SET weights the benefits versus the cost before engaging in an exchange relationship, and an individual will not engage in a relationship where the cost outweighs the benefits (Wang et al., 2014). When individuals know that there is something in it for them when it comes to knowledge sharing, they would likely share knowledge. According to Wang et al. (2014), knowledge with holding can be caused by social loafing and free rides when an individual does not fully share their knowledge knowingly and with intention of hurting the group by their non-co-operation. The authors further say that other individuals think their knowledge will lose value when they share it with others or in a group, and they rather chose to withhold it. In a study done on knowledge with holding in project team, Lin & Huang (2010) found that knowledge withholding was positively influenced by trust and distributive justice as well as team and personal related outcome expectations. Another study found that expected rewards do not have any positive influence on knowledge withholding intention and that expected association has a positive influence on knowledge wit holding intention (Wang et al, 2014).

Knowledge sharing and team / individual performance

Knowledge sharing will have a positive influence on team performance in ISD project (Park & Lee, 2014). Knowledge sharing has been recognised as an important factor which drives

success in many ISD projects, such as driving the success of enterprise resource planning (Shao et al., 2012). In ISD project environment, the success of the project team depends on the collaboration between individuals, these individuals rely on the integration and sharing of their explicit and tacit knowledge with each other (Lee et al., 2015). ISD projects tasks are knowledge-intensive and project teams are used for complicated and difficult task that cannot be accomplished by a single individual (Lu, Xiang, Wang & Wang, 2011). Knowledge sharing becomes more tacit and a routine task when team social capital increases and provide access to intangible resources which should have not been possible before (Lee et al., 2015). Due to critical decisions that need to be made in ISD projects, knowledge sharing can fast track the decision making process by reducing the times it takes to reach those decisions (Choi, Lee & Yoo, 2010). In a study done by Park & Lee (2014), they found that that knowledge sharing is positively related to team success, meaning that when knowledge occurs in an ISD project environment, it may result in the performance of the project, where all individuals in the project plays their part and work towards the common goals for which the project is trying to accomplish. Another study also found a positive relationship between knowledge sharing and performance of the project team (Lee et al., 2010). This means that when individuals in a project believe that their goals, task are interdependent on their fellow team members, they strive to collaborate with one another and work towards a common goal of completing the project.

7.2.2 Participants' views on expected rewards and expected reciprocal relationships towards knowledge sharing

In order to better understand the data provided by participants, participants were asked about the influence of expected rewards and expected reciprocal expectations on knowledge sharing during ISD projects.

According to Social Exchange Theory, which was used as one of the theoretical lenses of this study, human relationships are the outcome of an exchange process where human beings only participate in a relationship to maximize benefits and minimize cost. This is supported by Davenport and Prusak (1998) who say that people will evaluate the benefits they will get before they can engage in knowledge sharing. In this case, benefits are anything that the individual regards as valuable to them, while costs are those things the individual considers costly.

Different users may have different expectations when engaging in knowledge sharing. A software developer explained that:

> *"Different team members have different expectations during the project implementation. Others are expecting monetary rewards while others are not. But if the project team have the same goal – that is successful project implementation – I don't see expected rewards and expected reciprocal relations influencing knowledge sharing."*

Other participants said that rewards in IT projects should not be given to an individual, but to the entire project team. This will encourage team work and free flow of knowledge and innovative ideas when the entire project team is recognised for their collective efforts. An IT Manager explained that:

> *"Rewarding individuals is not good for knowledge sharing. Rewarding overall team success first, encourages more knowledge sharing."*

Some participants also think that rewards do not have any influence on knowledge sharing, a systems analyst said that:

"I don't think the rewards influence the sharing of knowledge, but success and common understanding and relationships builds team morale and unity."

Individuals are motivated by both intrinsic or extrinsic motivation to share their knowledge (Hau, Kim, Lee & Kim, 2013). Knowledge sharing cannot take place when individuals are not motivated, and motivation is central in encouraging employees to share knowledge (Hau et al., 2013).

Some participants said that individuals should not expect anything in return for their knowledge sharing but should develop a culture of sharing with those who need assistance and thereby gain more insight own expertise. A business analyst explained that:

"It is better not to have expectations, but to share knowledge as a habit to help others understand what you bring to the table; it may also create interest in your field of expertise from which relationships can be fostered and grown."

A few participants mentioned that they don't prefer tangible rewards such as money, but rather value intangible rewards such as reciprocity, where the person they share knowledge with should be in a position to return the favour by sharing knowledge with them when they request them to do so in the near future. A software developer explained that:

"For me, I don't expect any monetary rewards when sharing knowledge, but I expect the person to be able to share knowledge with me in return."

And a project manager said that

"Communication is the key and projects should be done with or without rewards. People usually put more effort when they have something to gain."

This means that for some participants, tangible rewards, such as money, are not a prerequisite when deciding to share knowledge with their peers in the project. Some participants prefer recognition as a motivator rather than money. They feel that when you are known to be an expert in a particular field, it can yield more benefits in the long run. When you are publicly acknowledged in the project team for being an expert in your field or a good knowledge provider to your peers, you may get referrals and this may open bigger opportunities for you within or outside the organisation.

People may hoard knowledge and share it only when they want to, as they see knowledge as their weapon to get monetary rewards. People thus need to be encouraged to share knowledge and they also need to be properly acknowledged for their good work; this will encourage them to help their peers to the benefit of the entire project. Individuals in ISD projects have different background and expertise, and the outcome they expect as a result of sharing their knowledge with other team members may differ. One project manager said:

> *"Individuals, especially in our company, know that when we deliver projects on time, within budget and with the right quality, the project team will get incentive bonus at the end of the year as part of the company rewards programme. In my team, individuals strive to do their best because they know it will be worth their effort at the end."*

Some participants believe that individuals should not be rewarded for sharing their knowledge in ISD projects. This sentiment was shared by a business analyst who said:

> *"Individuals are supposed to share knowledge in projects even if not given any rewards. The company pays them for the work they do and that should be enough to motivate them"*

This was supported by a software developer who explained that:

> *"Rewards should not be the only motivator for someone to share knowledge. It should be a daily routine for IT professionals to share knowledge with their peers in projects."*

And a business intelligence specialist who said:

> *"Delivering quality work under your name is a reward in itself. Throughout my experience in IT projects, I have learnt that people perform not because they want to get rewarded, but because they love the challenges that come with a new project and their work, as well as opportunities that come after the completion of the project where a person may get a much bigger role elsewhere using their previous project deliverables as a reference."*

And an IT consultant who said that:

> *"Individuals need to be encouraged. Sometimes, it's not about the money, but when individuals have a visionary leadership in the project that nourishes and encourages them, they will strive to work with one another, share knowledge with each other when one needs help for the benefit of the project."*

There were a few participants who believe that rewards will drive them to share knowledge, especially in projects with tight deadlines where one does not find time to share knowledge with whoever needs it. One business analyst said:

> *"There are individuals who would be motivated by rewards in order to share knowledge. Especially if you are always busy with other deliverables and have no time to share knowledge."*

Similarly, an applications specialist said that:

> *"When individuals are given tasks attached to any form of rewards, chances are that they may want to prove beyond reasonable doubt that there is value attached to their knowledge by exhibiting a high level of performance. As a result, individuals would not hesitate to give their very best in sharing the information during ISD when they know the rewards attached to it. On the other hand, expected reciprocal relationships is synonymous to the above in the sense that individuals may want to give their very best because the environment dictates that they seem to share the same knowledge, skills and abilities with the rest of the project team. Therefore, they feel compelled to unleash their knowledge potential because the environment dictates them to do so."*

It is very important for the project leaders to ensure that during the project kick off sessions, the objectives of the project are outlined, along with the professional conduct that should be adhered to by all members. This will assist the project to ensure that all team members are aligned to the overall goals of the project. Participants are motivated by different things when sharing their experiences and know-how with their fellow team members. One participants commented:

> *"Some people prefer public recognition for the knowledge contribution they have made to the team. If credit is given then team members tend to be more willing to exchange information. It also creates a level of trust within the team if you can acknowledge it publicly (i.e. in a meeting or a document) that you received inputs from a specific individual."*

There were some participants who thought money plays a huge role in persuading people to share their knowledge during an ISD project. For example, participants variously stated:

"Expected rewards makes the team members put in more effort if they will be rewarded and will achieve great results."

"Expected rewards is a two-way relationship. Members should be rewarded for good performance. The company benefits from successful projects and people should be rewarded."

Based on SET, individuals are motivated to engage in an exchange relationship when the cost of doing so are less that the benefits. Individuals are motivated to engage in knowledge sharing by both intrinsic and extrinsic rewards. According to SET, the benefits of exchange relationship includes many forms such as monetary (e.g. bonus or promotion) and non-monetary such as reciprocity and enjoyment of helping others (Hau et al., 2013). The qualitative data shows that there were few participants who believed that people will share more knowledge if they know they will be rewarded for it. However, some participants recognised the motivational force of intrinsic rewards, for example some participants believe that they will share knowledge with people whom they believe will do the same to them. This is a very human trait; to do something for people whom you know will return the same favour. In an ISD project, it is very important for the team to let go of their ego and work together so that they can accomplish the project based on the customer requirements. In addition to this certain individuals can be motivated by both intrinsic and extrinsic motivation for different tasks (Kuvaas, Buch, Weibel, Dysvik & Nerstad, 2017).

7.2.3 Participants' views on culture and knowledge sharing

Several past studies have found culture to have an influence on knowledge sharing. Most of these past studies made reference to organisational culture, which are the norms and beliefs of particular organisations. In this study, cultural values that IT professionals embrace was examined for links to knowledge sharing.

In the qualitative questionnaire, participants provided their view on how their cultural value systems influence their knowledge sharing behaviours in ISD projects. The quantitative data for this study showed that there is a positive relationship between individualism / collectivism cultural orientation and knowledge sharing. The qualitative data also supported the findings of the quantitative data where participants said that culture can impede or enable knowledge sharing.

In South Africa, the IT profession is still dominated by white males who occupy all levels of positions, so it is not surprising when some of the participants feel the way they feel. In order for any ISD project to be successful, team members need to swallow their ego, and go beyond the tribal or racial lines and work together in order to achieve the objectives of the project. A software developer with more than nine years' experience commented:

> *"Not everybody wants to share knowledge. Hence you should only commence on a project where you have done some research on the other team members as to how they behave on projects. That will also give you the correct guidance to a successful project."*

It is true that ISD projects often get staffed with people from different cultural backgrounds and if not managed properly, it may result in some cultural clashes which will have a negative impact on the ISD project. Each organisation has its own culture and it is very important that the culture does not prevent the team members from accomplishing the project goals. A software developer in the health care industry says:

> *"Individuals in project teams are from different cultural backgrounds. Project teams should have a culture that does not discriminate against one's culture in the manner in which project tasks gets allocated."*

A business analyst also stated:

> *"Culture impedes or sabotages knowledge sharing because of the competitive environment created by rewarding individuals instead of teams. Knowledge sharing should be in every employee's KPI to grow the culture of giving out information and destroy intra-team competition and drive the organisation towards higher collaboration and cohesive teams."*

This means that project leadership needs to acknowledge that ISD projects happen in an organisational setting that has its own organisational culture. In addition to this, there is a national culture with which the team members embrace or identify themselves with. It is very important that the cultural diversity of the project members is taken into consideration when recruiting team members to join the project team. As one project manager put it:

> *"Culture is a very sensitive issue that needs to be managed very well, especially in a project environment. Individuals have their own cultural backgrounds and an ISD project needs to accept and honour such different cultural backgrounds of their team members so that the project can succeed."*

This implies that people with authority in ISD projects should create an environment that embraces the different cultural backgrounds of all project team members. The manner in which roles and responsibilities are distributed needs to be a true reflection of the diverse workforce assigned to such projects, where individuals are not assigned tasks or roles based on ethnicity, but based on their expertise, skills and experience. The environment should also be welcoming to all team members, where individual team members feel welcome, where their knowledge or input is valued and where experts voluntarily share their experiences and knowledge with their peers. Individuals tend to be sensitive regarding their culture and it is imperative that management should create an atmosphere where individuals, irrespective of

their cultural background, feel welcome, where they are able to do what they need to do in relation to the project without being intimidated by the cultural orientations of their fellow team members. An IT consultant said:

> *"Cultural diversity should first be addressed including allocation of roles and responsibilities. If there is culture clash, these issues are addressed immediately by the respective project leader."*

The same sentiments were shared by an IT manager who said:

> *"Culture has a great impact in our day-to-day life, and I believe that also on knowledge sharing in a project. When a person perceives their team members to be not accepting towards them, then they tend to hold back and not feel free to share knowledge with the team members. Culture and an individual's level of confidence impacts on whether they will share knowledge or not. If an individual feels that they are not valued by their team members, they work independently."*

Project leaders who are responsible for leading ISD projects need to pay attention to the issue of national culture and align it to the cultural backgrounds of their own resources in the projects. In some projects, based on how tasks get allocated, it may promote individualism or collectivism. In a culture where individualism is practiced, individuals will put their own needs first before the needs of the ISD project team, while in collectivism, the individual puts the needs of the group or the ISD projects before theirs. This was highlighted by one of the software developers who said:

"Culture definitely has an impact on knowledge sharing. Some cultures are individualistic in nature and individuals belonging to these tend to keep to themselves and or are only comfortable with others from the same culture."

Other participants also agreed that culture plays a huge role in knowledge sharing. For example, one IT specialist said:

"Culture has an impact on sharing knowledge. Some members, are not used to sharing knowledge with fair intent to contribute to achieve team goals. It is very important that team members know and accept each other as we are all different. Knowing each other, the team will find better ways to extract knowledge or contributions from everybody."

This was supported by a system analyst who said:

"Instilling a culture of sharing and unity on the team will promote the success of the project as everyone will learn from one another and ensure common understanding as well as goal for the project."

Project leadership should make it their job to create an environment where individuals are embraced irrespective of their cultural backgrounds.

Lastly, an Application Specialist says that

"I attribute culture to ethics, and my view on ethics are in such a way that they are so diverse such that they may not produce the best of results in certain situations. For example, project team members may come from backgrounds which taught them "never to play your cards all at once. This means that when you have information or knowledge, never give it all to others because that is

the same tool used for individual success. That is, others may be more successful than you really are tomorrow if you were to share information beyond limits. This idea is synonymous to reward expectation as discussed earlier in this survey. The impact of this on knowledge sharing could be devastating given a period of time within which projects are expected to run. Certain individuals could halt the project, and or even fail the entire project given the cultural background they come from. Furthermore, some cultural practices may restrict individuals from participating in certain project knowledge sharing roles in fear of their cultural practices which may regard such as being cultural blasphemous, religious rules and or even family practices."

One important thing to note is that a hierarchical structure hinders the flow of knowledge as it becomes difficult to get hold of certain people based on the structures. For example, in some certain organisations, as a junior software developer, you may not be allowed to speak directly to the Head of software development without passing via your immediate supervisor and it is cases like this that hinders the quick flow of knowledge. This is also supported by Mueller (2014) who say that when people are accessible within an organisation, it encourages the free flow of knowledge.

7.3 Summary of the findings from the qualitative data

This section summarises the qualitative responses from participants on their views on individual performance, expected rewards, expected reciprocal relationship and culture in knowledge sharing. The central themes emerging from the participants revolved around communication, interdependence, collaboration, recognition, visionary leadership and team work as the most important variables that need to be taken into consideration for knowledge sharing in ISD projects.

7.3.1 Participant's views on knowledge sharing and individual performance during ISD projects

It is clear from the participants' inputs that they regard knowledge sharing as very important and believe that it leads to individual performance which may lead to project success. ISD projects tasks are accomplished by various individuals who are brought together from various areas in order to work together to achieve the objectives of the project. With diverse skills, expertise and knowledge, the individuals in ISD projects are interdependent on each other as none of them can know everything that is there to be known is ISD projects.

The interdependence of individual tasks requires individuals in ISD projects to communicate and collaborate with one another. The qualitative responses highlight that it is through clear communication and collaboration that individuals are able to work together, share their knowledge and help one another when tasks become unclear or when problems or issues arise.

Knowledge hoarding is common in ISD projects, and many participants mentioned that project leadership needs to create an environment where knowledge sharing can thrive, where individuals are aware of the project objectives and understand how their involvement can help achieve the project objectives. Project leadership also needs to create an environment where team members are not afraid to ask questions.

The responses put highlights that stimulating individual performance requires a project manager or the project leader to harness many different interpersonal skills. The level of enthusiasm applied towards project efforts has a direct impact on the overall project success. Because motivation can inspire, encourage, and stimulate individuals to achieve common goals through teamwork, it is in the project manager's best interest to strive towards unity and one common goal.

7.3.2 Participant's views on the influence of expected rewards and expected reciprocal relationships on knowledge sharing

Different individuals have different expectations as far as knowledge sharing in ISD projects is concerned. Some will share knowledge when they are promised some sort of tangible or intangible reward.

In this study, many participants said that tangible rewards such as money do not influence them to share knowledge. They explained that individuals in ISD projects should be motivated by their desire to help each other and to successfully deliver a working product that will meet or exceed the customer's expectations. Participants also said that what they need is intangible rewards such as recognition and appreciation of their knowledge sharing efforts. They need to be acknowledged and this will make them to engage more in knowledge sharing.

Knowledge sharing is voluntary and you cannot force individuals to share their knowledge. It is the duty of the project manager to instill a culture of knowledge sharing and this will enable the continuity of the project in instances where individuals leave the project for various reasons. It is through knowledge sharing that strong relationships between the individuals in the project can be formed and nurtured.

7.3.3 Participants views on the influence of culture on knowledge sharing

ISD projects are staffed by people from different races and ethnicities, and it is very imported that the sensitivity surrounding cultural beliefs be managed careful. Project leadership should promote a culture of openness and individual appreciation, where every idea or knowledge contribution is given a platform to be heard. Instilling a culture of knowledge sharing in the project will contribute to the overall project success. In this study, participants said that

cultural orientations influences knowledge sharing. A single individual can have attributes of both collectivism and individualism of cultural values, and the climate in the project team may force the individual to display either of the two. That is why it is very important for the project environment to be conducive to knowledge sharing. It should be an environment where people feel safe, and where they trust their peers. Above all, individuals should have the desire to contribute to the success of the project.

Collectivist cultural oriented individuals will contribute to the success of the project, where they put the interest of the project before their own interest. The project leadership should ensure that team members embraced the collectivist cultural value in the project as this will result in a project where all individuals are collaboration and working with each other to share their knowledge, to assist their colleagues and this will significantly contribute to the overall success of the project, where the IS project will be delivered on time, within scope, budget and with the right quality that the customer will embrace.

7.4 Chapter summary

This chapter discussed the findings from qualitative data. Participants were asked to share their views on knowledge sharing and individual performance, expected rewards and knowledge sharing, and culture and knowledge sharing. This was followed by the summary of the responses in relation to literature. The chapter ends with a summary. The next chapter provides a summary of the research overview.

CHAPTER 8

EVALUATION OF THE RESEARCH

8.1 Introduction

The previous chapter provided the interpretation of the qualitative findings. This chapter evaluates the entire research study in relation to its contribution as well as its significance to the information systems body of knowledge. It is a reflection of the research journey. This chapter first gives a synopsis of the research by giving a summary of each chapter. The research questions are then revisited and the manner in which they were answered is discussed. The chapter then discusses how the objectives of this study were met and the contribution of the thesis is put forward with specific reference to context, methodological, practical and theoretical contribution. The chapter ends with the discussion of the limitations of the study and recommendations for future studies.

8.2 Overview of the research

This section gives a summary of each chapter of this thesis, starting from chapter one in order to remind the reader what and how each chapter contributed to the thesis.

Chapter 1 introduced the underlying concept of this study. It discussed knowledge and knowledge sharing from the perspective of information systems development projects. It highlighted the problems and challenges of knowledge sharing in information systems development projects in the context of IT professionals in South Africa. The thesis pointed out that ISD projects are formed by many individuals who are brought together from various functional areas of the organisation. These individuals are temporarily brought together to the

project to deliver a working information system based on their expertise and skills. Since an information system cannot be completed by a single individual, these individual needs to create social ties, collaborate and share their knowledge with each other in order to accomplish the objectives of the project at hand. The challenge lies in ensuring that these individuals who may be working together for the first-time rides through the storm of personal or team dynamics and find a workable way where they can all strive to work together for the benefit of the project. This thesis has argued that there is a need for a theoretical model that may be used to explain knowledge sharing amongst team members which may mitigate some of the challenges of putting together an ISD project team.

Chapter 2 reviewed the existing literature on knowledge sharing from the perspective of information systems development projects. The chapter also discussed in detail the social cognitive and social exchange factors which influence knowledge sharing between IT professional during ISD projects. The review of associated literature highlighted a gap in the studies in this field: the influence of knowledge sharing on individual performance has received less attention than the impact on team performance.

Chapter 3 discussed the theoretical lenses that underpin the study. It discussed social cognitive theory and social exchange theory. The main argument of social exchange theory is that an individual will do a cost and benefit analysis benefit before engaging in a knowledge sharing behaviour. If the cost of knowledge sharing is more that the benefit the individual will derive, they are not likely to engage in knowledge sharing. Otherwise, if the act of knowledge sharing will bring more benefit than the cost, they are likely to engage in knowledge sharing behaviour. The argument for SCT is that an individual will engage in an action that has a personal cognition in a social environment and that the influence of social environment moulds and controls their behaviour. The chapter also integrated the two theories to develop the research model. The selection of the two theories was based on their

relevance to the knowledge sharing and prior application in knowledge sharing research. Based on the literature, the chapter also developed hypotheses on the relationships between the variables in the research model.

Chapter 4 discussed the research methodology used in this study. The chapter discussed the research philosophies underpinning the study. The chapter also discussed the research strategies, data collection techniques, sampling techniques, structural equation modelling and operationalisation of constructs.

Chapter 5 discussed the data analysis techniques used in the thesis. The chapter also assessed the validity and reliability of the research model through statistical analysis. The assessment of the structural model was also carried out. The comparative analysis of the SET and SCT was conducted, and hypotheses testing was carried out. The main determinants of knowledge sharing in ISD projects were interpersonal trust, knowledge self-efficacy and culture. In ISD project teams, interpersonal trust plays a huge role in influencing individuals to share their knowledge with their fellow team members. An individual need to know that the person they are sharing knowledge with is competent and that they will not hurt them intentionally. Individual with high self-confidence in their own ability to share ISD project related knowledge will share knowledge no matter what challenges they encounter along the way. Collectivist oriented individuals are highly likely to share their knowledge with other individuals as they put the interest of the team first before their own.

Chapter 6 discussed the interpretation of the results based on the statistical analysis carried out in chapter 5. The chapter also presents the final research model which was based on the empirical evidence.

Chapter 7 presented the analysis of the qualitative responses. In this thesis, participants were given an opportunity to give their views on certain questions. This was done in order to get a

insight on participants' thinking that shed light on why they answered questions in certain ways. The qualitative data highlighted some interesting finds that knowledge sharing is indeed very useful during ISD projects. It also revealed that individuals in project teams should not be given hard rewards such as monetary rewards, because not all individuals are driven by money when sharing their knowledge, but some individuals are driven by the desire to help other individuals achieve the project objectives. Another insight that came from the qualitative data is what has been known all along that some individuals regard their own knowledge as valuable and that they may lose their influence when they share what they know with others. Another insight was on culture where there is indeed a need to cultivate a culture that encourages knowledge sharing, where collectivism need to be favoured and embraced over individualism and create an environment where collectivist oriented individuals can thrive.

8.2.1 Research questions revisited

The primary research question of this study is "Why do individual IT professionals share knowledge during information systems development projects?"

Through data gathering and investigation, the aim was to get a thorough understanding of the factors which persuade IT professionals to share knowledge during ISD projects.

ISD projects are knowledge-intensive and require knowledge and expertise from different individuals in the project. The thesis found that interpersonal trust plays a very significant role in influencing an individual to share their knowledge with others in the project. With respect to trust, benevolence and competency-based trust were of interest in this thesis. An individual will share knowledge with another individual whom they believe have the right expertise and are competent in certain ISD subject areas, and they will also share knowledge with someone whom they believe will not harm them. Knowledge sharing self-efficacy was

found to have a positive influence on knowledge sharing. This means that an individual with high self-confidence in their own ability to share ISD project related knowledge, are highly likely to share such knowledge. Unlike individuals with low self-confidence in their own abilities, high self-confidence will share their knowledge because they have self-trust in their own abilities of engaging in certain behaviour no matter what challenges may come their way.

Individuals who are collectivist cultural oriented are highly likely to share knowledge with other individuals as they value group work rather than their own achievements. Collectivist individuals believe that they need to contribute towards the attainment of group objectives before their own accomplishment. Unlike individualistic cultural oriented individuals, who care more about themselves than the group, collectivist-oriented individuals are highly likely to share knowledge for the benefit of the entire project team. Knowledge-self efficacy has a positive influence on outcome expectation. An individual who is highly confident is highly likely to have high expectations as a result of them partaking in a certain behaviour such as knowledge sharing. This study also revealed that knowledge sharing plays a significant role in individual performance. Knowledge sharing enables individuals to perform better, to meet the deadline assigned to them.

The main research question was further broken down into various sub-questions.

Research Question 1 summary

Research Question 1: What social cognitive and social exchange factors influence IT professionals to share knowledge during ISD projects?

The first research question explored the social cognitive and social exchange factors which influence IT professionals to share knowledge during ISD projects.

The results of the study show that interpersonal trust is the social exchange factor which influences IT professionals to share knowledge during ISD projects. The results also show that knowledge sharing self-efficacy is the social cognitive factor influencing IT professionals to share knowledge during ISD project.

Research Question 2 summary

1. Research Question 2: To what extent do social cognitive factors (trust, expected rewards, expected reciprocal relationship), social cognitive factors (knowledge sharing self-efficacy, outcome expectation) and culture influence knowledge sharing?

In this thesis, empirical evidence shows that interpersonal trust has a significant influence on knowledge sharing. When individuals trust that the other team members are competent in ISD project-related knowledge and where they trust that the other team members will not hurt them intentionally, they will engage in knowledge sharing behaviour with their fellow project team members.

Unlike the findings of previous studies, the results of the study show that expected rewards do not have any significant relationship with knowledge sharing. In this study, individuals were not motivated by monetary rewards to share their knowledge. Participants mentioned that they are mostly driven by status and recognition to share their knowledge. They also mentioned that monetary rewards are a negative motivator in ISD projects and that knowledge sharing should be part of the project's mandate. The qualitative work revealed that individuals prefer recognition instead of hard rewards such as money. They revealed that when one is recognised in the project for a job well done, it will bring more opportunities for them within the organisation in the near future. They can also use the recognition as a

reference for some future roles within their organisation. The qualitative responses also revealed that individuals favour intrinsic rewards over extrinsic rewards, where some believe they get enjoyment from helping others.

Expected reciprocal relationships were also found not to influence IT professionals to share knowledge in ISD projects. Qualitative data reveal that participant knowledge sharing should not be about expecting something in return, but a person should do it as a way of assisting the other individual who may be in need. It is only doing this where you will be able to become an expertise in your field.

However, knowledge sharing self-efficacy was found to have a significant influence on knowledge sharing. In addition, knowledge sharing self-efficacy were found to have a positive relationship with outcome expectation.

The results also show that outcome expectation does not have a positive relationship with knowledge sharing.

Lastly, culture was found to have a positive influence on knowledge sharing, though it does not have a positive influence on knowledge sharing self-efficacy.

Research Question 3 summary

The results of the study show that there is no significant relationship between culture and knowledge sharing self–efficacy. This means that even though individuals with collectivist cultural orientation are more likely to share knowledge, it does not mean that they are confident in their own ability to do. Collectivist oriented individuals still requires a strong judgement of their self-efficacy to share knowledge.

Research Question 4 summary

Research Question 4: Which theory best explains individual knowledge sharing during ISD projects?

The fourth research question asked which theory – social exchange theory or social cognitive theory – best explains knowledge sharing between team members during ISD projects.

Comparative analysis was carried out in order to determine which theory better explains knowledge sharing amongst individual team members during ISD projects. The results show that social exchange theory better explains knowledge sharing amongst individuals during ISD projects. That is, knowledge sharing is largely a function of social exchange where individual will only participate in knowledge sharing if the benefits of doing so out weight the cost.

Research Question 5 summary

Research Question : What is the influence of knowledge sharing in individual performance

The results of the study shows that knowledge sharing positively influences individual performance. When knowledge sharing takes place in ISD project, it enables individual IT professionals to perform better on the allocated tasks. That is, knowledge sharing shortens the delivery times associated with task uncertainties, where individuals encounter problems or where they don't have enough knowledge on how to perform certain tasks in the project. When help is offered to them in the form of knowledge pertaining to the tasks at hand, they are able to apply the shared knowledge in problem solving.

8.2.2 Objectives revisited

The following subsection explains how the objectives of the study were met.

Research objective 1 summary

Objective 1: To explore and identify social cognitive and social exchange factors which influence IT professionals to share knowledge during ISD projects.

The social cognitive and social exchange factors were identified as being outcome expectation, expected reciprocal relationships, knowledge sharing self-efficacy, expected rewards and interpersonal trust. These factors were discussed in details in chapter 2 based on the literature.

Research objective 2 summary

Objective 2: To explore and explain the extent to which trust, expected rewards, expected reciprocal relationship, self-efficacy, outcome expectation and culture influence knowledge sharing.

The extent to which these factors influence knowledge sharing was discussed in details in chapters 2 and 3. All the discussions of the factors were based on previous literature.

Research objective 3 summary

Objective 3: To explore and explain the extent to which culture and self-efficacy explains knowledge sharing

The influence of culture and knowledge sharing self-efficacy on knowledge sharing were discussed in detail in chapter 2 and 3. The results of the study showed that culture and knowledge sharing self-efficacy do have a positive influence on knowledge sharing.

Research objective 4 summary

Objective 4: To compare the theory that best explains the individual knowledge sharing during ISD projects.

This was done through a comparative analysis of the two theories (SCT and SET), and the final decision was taken based on the values of the R^2.

Research objective 4 summary

Objective 5 : To explore the influence of knowledge sharing on individual performance.

The influence of knowledge sharing on individual performance were discussed in detail in chapter 2 and 3. The results of the study shows that there is a positive relationship between knowledge sharing and individual performance.

8.3 Relevance of the research

Information Systems scholars should make sure their studies are relevant to the information systems body of knowledge and by so doing, it will eliminate the error of exclusion of IS artefacts (Benbasat and Zmud, 2003). The researchers further note that IS scholars should strive to ensure that their work is distinctive and legitimate to the information systems body of knowledge. Benbasat and Zmud (1999) suggested that for IS studies to be relevant the published articles content and style should be interesting, accessible, current, and applicable. The currency and applicability of this study was discussed in section 1.2.

Research theme and its relevance to Information Systems

The knowledge sharing phenomenon in ISD is a complex issue involving various IT professionals who have different levels of expertise in the ISD domain. ISD projects demands collaborative problem solving where IT professionals collaborate with one another throughout the projects in order to successfully accomplish the project tasks assigned to them. There is a high rate of ISD projects which are reported to be unsuccessful. This study intended to explore and explain the factors that influence when IT professionals share knowledge during ISD projects. Understanding the factors which influence when IT

professionals share knowledge during ISD projects is very important to Information Systems research as it may also assist in reducing the number of unsuccessful ISD projects.

Is the study unit of analysis most appropriate for an Information Systems study?

The purpose of this study was to explore and explain the factors which influence knowledge sharing in the context of ISD projects. The unit of analysis of this study was individual IT professionals with working knowledge and experience of ISD projects in various industries of the South African economy. The choice of IT professionals as a unit of analysis was motivated by the cognitive nature of their work which involves complex systems design which requires collaborative problem solving (Tsai et al., 2013). Therefore, the unit of analysis was appropriate, and the individuals gave the input needed for this study.

Does the data collected in the study support the contextual complexity as well as the research findings?

This thesis holds the view that knowledge sharing takes place in a social settings and that the individual culture of IT professionals plays a huge role in knowledge sharing during ISD projects. Data was collected from IT professionals with working knowledge of ISD projects through a close-ended questionnaire, and participants were also given an opportunity to provide qualitative responses. The data collected gave insights on how IT professionals in South Africa share knowledge during ISD projects within the specific context, namely multi-cultural ISD project teams with team members from different social, educational, economic and work backgrounds.

Is the topic relevant to IS researchers and practitioners?

ISD projects play a major role in the transformations of various organisations as IT assists these organisations to achieve their strategic objectives. However, ISD projects are associated

with high failures and this has prompted a lot of research into this area in order to understand why Information Systems projects fails and what can be done to arrest the high failure rate.

Development of different information systems requires the varied knowledge and expertise from different people throughout the different stages of the systems development, as it consist of knowledge-intensive tasks (Xia & Lee, 2004). Sharing knowledge during ISD projects is not a luxury but a requirement for the successful completion and implementation of the project.

Better understanding the factors that impact knowledge sharing, and therefore individual performance on ISD projects is indeed relevant to practitioners and researchers in the Information Systems discipline.

Can practitioners use the outcomes of the research?

Knowledge sharing is meant to enable IT professionals to engage in collaborative problem solving during ISD projects. This study has valuable practical application. Its outcomes may be used by practitioners involved in ISD projects as it offers insights into what motivates IT professionals to share knowledge during ISD projects. The outcomes of this study could be used to address the knowledge sharing challenges mentioned in this study and so to boost individual and team performance. Firstly, by ensuring that ISD projects are staffed with individuals who have the relevant expertise and skills. Secondly, by making sure that ISD projects environment is not toxic, where trust is nourished and encouraged, an environment where individuals are encouraged to be more collectivist oriented, where they have the interest of the project at hand, where project objectives comes above their own needs, and where individuals are encouraged to be the best they can be, where they can collaborate and give and receive help from their fellow team members without fear of being victimised.

Can the writing style of the thesis be understood by Information Systems

practitioners and scholars?

The study “Knowledge sharing in information systems development projects: a comparative study of social exchange and social cognitive theories” was written in the English language in a manner that can be understood by both information systems practitioners and scholars.

The thesis has been carefully structured to make it more accessible. The thesis presents the challenges and research problem of knowledge sharing in information systems development projects. This was later followed by research questions and objectives that drive the rest of the study. A framework in the form of table of contents was provided in order to make this thesis readable. The framework clarifies what the reader can expect. There is also an introductory section at the start of each chapter that gives a brief overview of what the reader can expect from the chapter, the purpose of the chapter and how it links to the thesis.

8.4 Contribution of the study

The following subsection explains the contribution of this thesis to theory, methodology, context and practice.

8.4.1 Contribution to theory

This study makes a valuable contribution to the relevant theory as it explains the social cognitive and social exchange factors which influence knowledge sharing in the context of IT professionals involved in ISD projects in South Africa.

The results of this study have some implication for theory and for future research.

Firstly, the theoretical contribution of this study made over previous studies such as that of Hsu et al. (2007),who studied knowledge sharing behaviour of individuals in virtual communities using SCT. The advances made by the present study over that of Hsu et al.,

(2007) is that their study draws on SCT, this study draws on both SCT and SET to explore the determinants of knowledge sharing in ISD projects and its influence on individual performance. While Hsu et al. (2007) used SCT based trust such as economy-based, information–based and identification-based types of trust, the present study study draws on trust from the SET perspective and treated it as a multi-dimensional construct where trust belief was studied as benevolence and competency-based trust. Since ISD is a cognitive task which requires in-depth expertise, it is important for individuals in ISD projects to have faith that the person they are sharing knowledge with is indeed competent and is an expert in their field, as individuals will not want to waste their time sharing knowledge with someone who is not competent or who will not use the knowledge shared with them. Another contribution of this study over that of Hsu et al. (2007) is that, in ISD projects, knowledge sharing happens through social interactions between individuals who are part of the project and the medium through which knowledge is shared is face-to-face. This study also contributed through the addition of SET constructs of expected rewards and expected reciprocal relationship which Hsu et al. (2007) did not include in their study. Thus it takes cognizance of the role played by individual motivations (both intrinsic and extrinsic) as the basis of what motivates people to share knowledge (Hau et al., 2013).

Second, the contribution of this study made over that of Tsai & Cheng (2012) is that although they used an integration of SETand SCT, they did not consider the individual motivations that may influence an individual to share their knowledge. This study included expected rewards and expected reciprocal relationship to determine how intrinsic and extrinsic motivations hinder or enable an individual to share knowledge with others during ISD projects. This study also compared SET and SCT to see which one between these two theories explains knowledge sharing better. The comparative analysis revealed that SET explains knowledge sharing better than SCT. This means that irrespective of how confident

an individual may be in their own ability to share knowledge, they will be more likely to always evaluate the cost and analysis benefit before they engage in any knowledge sharing behaviour.

Thirdly, Lin and Huang (2008) explored the antecedents of KMS usage using SCT and task technology fit theories. While the study of Lin and Huang (2008) included self-efficacy and outcome expectations from SCT, it did not include the construct of trust that this study has added in order to determine the influence of trust on knowledge sharing. While the focus of Lin & Huang (2008) was on the use of technology for knowledge sharing activities, this study explored factors that influence knowledge sharing in an ISD project environment where most of the knowledge sharing happens during face-to-face meetings between individuals.

Fourth, Lin and Huang (2010) also explored knowledge withholding effort in project teams using an integration of SET and SCT. Their study focused on negative behaviour of knowledge withholding instead of positive aspect of knowledge sharing which this current study focused on. This study focused on the positive aspect of knowledge sharing and its influence on individual performance. While the study of Lin & Huang (2010) also included trust, the trust constructs was treated as a unidimensional, this study treated trust as a multi-dimensional construct looking at both benevolence and competency based trust. In addition, this study looked at how culture, from the perspective of collectivism/individualism orientation influence an individual to share knowledge in ISD projects.

The present study also made significant contribution over the study of Tsai et al. (2013) who investigated the knowledge intention of IT professionals through KM using knowledge management systems (KMS). While their study used organisational trust to represent the environmental factors, this present study used interpersonal trust using both competency and benevolence-based trust to determine its influence on knowledge sharing. In addition to this,

this present study included intrinsic motivation through expected rewards while Tsai et al (2013) only considered the soft rewards through reciprocal relationship expectancy.

Lastly, Chiu et al. (2006) did a study to investigate knowledge sharing in virtual communities using social cognitive and social capital theory. The contribution of the present study over that of Chiu et al. (2006) is that the present study operationalised knowledge sharing based on tacit and explicit knowledge, while Hsu et al. (2006) investigated knowledge sharing based on quality and quantity of knowledge sharing. The present study also included knowledge self-efficacy to understand its influence on knowledge sharing which was not included in the study of Chiu et al. (2006).

8.4.2 Contribution to methodology

Methodologically, through the use of positivistic research philosophy and the survey research strategy, it was possible to explain the factors which influence knowledge sharing in ISD projects. The methodological approach (e.g. triangulation of data collection methods) used in this study can offer better insights into factors which influence knowledge sharing amongst IT professionals in ISD projects.

This study collected quantitative and qualitative data from participants, the qualitative data was collected to gain contextual insights from participants and the data were used to explain the respective quantitative responses which would have been missed during the collection of quantitative data. The insights derived from qualitative data include the importance of individual motivations as a basis of knowledge sharing. Participants highlighted that they prefer intrinsic motivation (e.g. recognition) over extrinsic motivation. Another interesting insight to arise from qualitative findings is that individuals attaches high value to their knowledge. Where they felt they may lose the value they assign to their knowledge if they share knowledge with others. Another insight was the cultural orientations that characterises

most ISD project teams, where participants indicated that some project teams are in such in a way that the culture is not conducive to knowledge sharing. Participants acknowledged that individuals come from different cultural orientations, and that even though they may have different cultural orientation (e.g collectivism / individualism), there is need a need for a collaborative culture in the project team where knowledge sharing may take place without being hampered by different cultural orientations which various individuals subscribes to. This study ensured that construct validity is achieved by making sure that measurement items measured what they intended to measure.

Lastly, this study used PLS-SEM to model the knowledge for knowledge sharing in ISD projects.

8.4.3 Contribution to practice

The findings of the study provide some practical suggestions for researchers and practitioners. The empirical evidence of the thesis may inform information systems practitioners on ways to improve knowledge sharing amongst IT professionals during ISD projects.

Firstly, information systems practitioners should make an effort to establish trustworthy relationships between team members. The outcome of the study indicate that interpersonal trust plays a significant role in knowledge sharing; team members share knowledge when they are confident that their fellow team members will help them when they got into trouble in a project and when they trust that their fellow team members are knowledgeable and capable of sharing ISD knowledge with them. This is supported by Hsu and Chang (2014) as well as Lee et al., (2015) who note that it is critical for team members to try strengthen the trust between them and their fellow team members.

One of the ways to enhance interpersonal trust amongst project team members is for management to invite experienced members in various domains of the ISD projects to share their experience of previous ISD projects with all the team members of the project. The purpose of this will be to give current team members ideas on how to overcome challenges that may arise in the project. By so doing, team members will be happy to be motivated by someone having many years of experience in ISD projects.

This study also found that communication over rewards is key to knowledge sharing as it enables individuals in ISD projects to approach their peers when they need help with ISD related knowledge. Interdependence of team members in ISD project has also been found to play a major role because ISD project tasks are interdependent on one another. This forces individuals to interact with their peers in order to accomplish assigned tasks. The study found that visionary leadership is needed for knowledge sharing to thrive in ISD projects. Project leadership needs to create an open environment where team members can feel free to ask questions related to the project.

Management should also create an environment where team members believe that their knowledge and hard work is appreciated, an environment where ideas can thrive, and above all, an environment where failure is not punished but where individuals are encouraged to be the best they can be. It is clear from the study that team members do not desire monetary rewards for engaging in knowledge sharing, but they do want to be appreciated. It is imperative for project leaders to create such an environment and embrace a culture of appreciation where individuals in a project are recognized for their hard work. This may encourage others to co-operate with their fellow team members for the benefit of the project at hand.

An environment should be created where team work, in addition to individuals, is recognised and appreciated and where individuals understand that their expertise is enhanced when integrated with other team members' expertise. An ISD project team that works together, learns together, and they can be able to achieve the project goals through collaborating efforts.

8.4.4 Contribution to context

The South African ICT sector is growing at a phenomenal rate and it contributes a significant amount to the country's gross domestic product. One of the challenges faced by the ICT sector in South Africa is the shortage of critical skills that may assist organisations to roll out new application and technologies. The war of ICT talent between organisations is very much alive and only those organisations with deep pockets are able to attract talent. In addition to this, the ICT sector is very diverse and consists of people from different cultural groups across South Africa. The South African population is diverse and consists of black Africans, whites, coloured and Indians with black Africans making 80 % of the total population. There are 11 official languages in South Africa representing the home languages of the majority of the population. English is used as a business communication language and it is spoken as a home language by less than 10 % of the entire population.

An IT professional's decision to share knowledge and experiences is influenced by the social cognition and the need or the expectation of receiving something in return. This thesis contributes to the context by giving a deeper understanding of knowledge sharing which is unique to the South African context.

South Africa is unique in the sense that it has a diverse ICT workforce, with participants from many different cultures. Previous studies say that culture plays a role in knowledge sharing.

In this study it was found that collectivist cultural orientations have a positive relationship with knowledge sharing.

Previous research also mentioned that rewards play a role in knowledge sharing. In this study, rewards were found not to have any significant influence in knowledge sharing. This may mean that IT professionals in the South African context are not after monetary rewards as far as knowledge sharing is concerned; on the other hand, there is anecdotal evidence that the shortage of IT skills makes it easy for them to move from one job to another.

8.5 Limitations and suggestions for future research

The section below discusses the limitations of the present study and makes suggestions for future research.

8.5.1 Limitations of the study

This study has several limitations.

Survey research methodology

The first relates to the choice of a survey research methodology. According to Podsakoff, MacKenzie and Podsakoff (2003), the use of survey research methodology can cause common methods biases which may happen as a result of the following:

1. Obtaining the same measures for both the predictor and criterion variables from the same source may result in "artifactual covariance" in the observed relationships.

2. The use of double-barrelled, technical terms and terms which are not familiar or not used often may result in the complexity or ambiguity of items which may be difficult for participants to respond to and may results in random answers as participants try to

develop their own meaning for those words. This meaning may be different from what the author intended.

3. The use of same scale formats may also influence participants to answer questions in a certain way which may influence the covariation to be based on the consistency of the scale format instead of being based on the content of the items itself.

4. The length of the scale on the questionnare also plays a major role on how participants answers questions. Scales which are short in length may not seem to be a good idea, because it may force participants to provide similar responses to those of previous questions which are still fresh in their memory.

5. Mixing of items of different constructs in the questionnare can also cause problems, especially for constructs that are similar. This may confuse the participants who are responding to the questionnare.

The use of purposive sampling may have resulted in limited external validity of the conclusions (e.g. low generazibility). The use of expert sampling in the selections of participants if full of bias and the conclusion drawn from such partipants may have negative impact on the external valididy. It is not clear whether findings from the study can be generalized to represent all IT professionals in the ISD projects environment. The cross sectional design of the study may have resulted in weak external validity or the problems with causal inference.

Common method variance can cause measurement error which in turn threatens the validity of the findings made on the basis of the measurement items (Podsakoff et al., 2003). The use of self-reported questionnaire can result in measurement error. Even though all participants in the study have working experience in ISD projects, possible biases when responding to

the questions cannot be ruled out (Kuo, 2012). Systematic measurement error causes problems on the validity of the empirical results and may result in erroneous conclusions (Podsakoff, 2003).

IT project methodologies

This study did not differentiate between the types of information systems development methodologies a particular information systems development project embraced. The type of systems development methodology used in a particular ISD project may have an influence on how knowledge flows within the ISD project. For example, the introduction of agile development methodologies has had an influence on how knowledge is shared amongst project team members and other project stakeholders during the development process. For instance, the agile development methodology puts more emphasis on communication keeping the development team in constant contact with customers to get their feedback on the developed product before moving on to the next iteration.

Knowledge sharing platforms

In this study, individual team members were not asked about the type of knowledge sharing mechanisms they use to share knowledge. This study recognises that ISD project team members may be located at the same office or at geographically-dispersed locations where they may need to use different platforms to share knowledge with other project team members. However, this was not factored into the data collection or analysis.

Time horizon

The time horizon for this study was cross sectional. This may limit the understanding of how knowledge sharing happens during a specific ISD project over time. The participants may have answered the questionnaire based on their experience at that specific time and at the current phases that they are involved in the project and not provide information based on

other experiences. The quantity of knowledge sharing may be different across projects or for each phase of the project. Project team members may be expected to share more or less knowledge in various phases such as initiation, planning, execution and close out.

Culture

This study looked at culture only from one dimension such as collectivism / individualism orientation. Consequently, the study may have missed an opportunity to understand how other factors of organisational culture enable or impede knowledge sharing.

Employees vs consultants

Lastly, this study looked at knowledge sharing in ISD projects from the perspective of internal employees only. ISD projects can be very complex and many organisations use external consultants when the ISD project requires additional resources or when they don't have the internal skills to accomplish the project.

These external consultants will have to work with internal employees in order to deliver on the project. As noted by Pee et al. (2010), the use of external consultants is a growing trend in information systems development projects.

This research does not take into account how the use of external consultants in ISD projects influence knowledge sharing.

8.5.2 Suggestion for future research

The impact of the location (e.g co-located or geographically dispersed) of IT professionals during the project on knowledge sharing was not looked at in this study. Future studies may look at the types of knowledge sharing mechanism used by team members to share knowledge during ISD project team when they are co-located or dispersed and examine the effectiveness of those knowledge sharing mechanisms on knowledge sharing.

Future studies can also look at how different types of ISD development methodologies influence knowledge sharing amongst IT professionals. It would be valuable for future studies to assess which types of information systems development methodologies are favourable to knowledge sharing.

Different phases of ISD project require different expertise and a different level of collaboration amongst the project stakeholders. ISD projects come in different forms and some are more complex than others. The more complex a particular project is, the more expertise is needed in order to complete the project to the satisfaction of the customer. Future studies can look at knowledge sharing in information systems development projects using longitudinal studies. This will allow researchers to study knowledge sharing within a specific information systems development project and collect data from the same unit of analysis over a period of time in order to gain insights on how knowledge sharing evolves as the project progresses through different phases. The researcher could then analyse the collected data to gain holistic insights on knowledge sharing in information systems development projects. This may assist organisations in determining how to staff their ISD projects appropriately. Case studies research design can also be used to gain a better understanding of how IT professionals of the selected case shares knowledge during ISD.

In addition to internal employees, ISD projects can get staffed with external consultants from the same or different organisation, and from different nationalities depending on the magnitude and complexity of the project. Some organisations may hire external expertise to assist them in projects they consider to be complex or where their internal resources do not have the required expertise. Future studies can look at how knowledge sharing between internal employees and external consultants influences the performance of the project.

ISD project team members may use various knowledge sharing mechanisms such as face-to-face or internet technology as they may be scattered across various offices and not necessarily on the same place. Future studies can look at how different knowledge sharing mechanisms influence knowledge sharing during an ISD project. They could also determine which knowledge sharing mechanisms are favourable to knowledge sharing.

Past studies have found that organisational culture has an influence in knowledge sharing (Alavi & Leidner, 2001; Kathiravelu et al., 2013). This study found that an IT professional's individual cultural values influence their knowledge sharing. There is scope to expand the insights into how culture affects knowledge sharing. Future studies can look more deeply into how national culture, in addition to the organisational culture, influences individual IT professionals to share or not to share knowledge during ISD projects.

In this study, culture was looked at from the collectivism / individualism perspective. Future studies may look at other factors of organisational culture and climate to determine its influence on knowledge sharing.

Knowledge can exist in a tacit or explicit form; future studies may look at how different factors influence certain type of knowledge sharing in ISD projects. This may assist project team leaders to understand which types of knowledge they should invest adequate resources into.

Lastly, future studies should use whatever techniques such as are available to remove the effect of common method bias in order to ensure that the validity of the study is not contaminated.

8.6 Summary of the chapter

The previous chapter discussed the findings of the study. The intention of this chapter was to

revisit the research process undertaken as part of the research of explaining knowledge

sharing amongst IT professionals during ISD projects. The research was also evaluated against the research objectives and questions. The chapters making up the thesis were summarized. The study also evaluated the research on its relevance to Information Systems research and whether the research can be used by both IS researchers and practioners. The following section provides the conclusion of the research.

8.7 Conclusion of the research

The purpose of the study was to explore and explain the factors which influence knowledge sharing between IT professionals during ISD projects in South Africa. The study examined social cognitive and social exchange factors which influence individual team member's knowledge sharing in this context.

A secure web survey was used to gather data from IT professionals with extensive knowledge and experience of ISD projects. The survey was developed based on an extensive literature survey on knowledge sharing in ISD. Social Cognitive Theory and Social Exchange Theory were used as theoretical lenses. The analysis of the problem and context, the literature survey and the theoretical lenses informed the development of the research questions and research objectives and hypotheses.

The findings of the study confirmed some of the hypothesised relationships in the research model. They showed that interpersonal trust has a positive influence on knowledge sharing and in turn knowledge sharing has a significant influence on individual performance. One interesting finding which was contrary to the findings of other studies was that expected rewards and expected reciprocal relationships did not have any significant influence on knowledge sharing.

In this study, culture had a direct effect on knowledge sharing. The mediating role of knowledge self-efficacy between culture and knowledge sharing was not significant. The relationship between culture and knowledge sharing self–efficacy was also not significant. This means that even though individuals who are collectivist cultural oriented are highly likely to share knowledge, that does not necessarily mean that they have the confidence of doing so. Self – efficacy is an independent predictor of knowledge sharing behaviour.

The relationship between outcome expectation and knowledge sharing self-efficacy was significant and there is a positive relationship between knowledge sharing self-efficacy and knowledge sharing. The relationship between outcome expectation and knowledge sharing were not positive. This mean that even though an individual may expect a favourable outcome that may come as a result of their knowledge sharing, they may not share knowledge especially if sharing their knowledge may result in them loosing valuable that may render them redundant.

As a result of this work, we know that interpersonal trust, specifically benevolence and competency-based trust, influences knowledge sharing during ISD projects. Knowledge sharing happens in a social environment and an environment where there is a presence of interpersonal trust is a necessary condition for knowledge sharing. Individuals need a high self-efficacy in their own capability for sharing ISD related knowledge to promote them to share knowledge. Such individuals will also have high expectations of what may become as a result of knowledge sharing. The study has also revealed that individuals who are collectivist oriented are more likely to share their knowledge than those who are individualistic orientated. Lastly, based on the result of this work, we know that knowledge sharing has a positive influence on individual performance, where it enables individuals to achieve the objectives of the tasks assigned to them.

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APPENDIX A: QUESTIONNARE



Survey on knowledge sharing in information systems development projects

Participants Information Sheet / Informed Consent

Dear participant,

I am a post graduate research candidate at the department of information systems. I am currently collecting data on knowledge sharing in information systems development projects as part of my academic studies. The current study looks at social exchange and social cognitive factors that influence individual team members to share or not to share knowledge during information systems projects, in the context of IT professionals in South Africa. The survey will take between 25 and 30 minutes to complete.

The purpose of this study is to explore and explain the factors that influence knowledge sharing amongst IT professionals during ISD projects. The goal is to conceptualize a model for knowledge sharing amongst South African IT professionals, during information systems development projects.

By understanding the factors that influence individual team members to share or not to share knowledge, managers and decision makers will be able to allocate relevant resources in order to enhance knowledge sharing amongst project team members.

You are invited to participate in this study by giving us your expert view on knowledge sharing in information systems development projects.You were selected because of your knowledge and experience in information systems development projects. You can complete the questionnaire at the comfort of your own place and we will appreciate if you can return it to us within five days after you have received the questionnaire. The study will be reported in conference papers and the thesis will be available at the Wits University library and or the internet.

Participation

Your participation is not mandatory, and you will not be paid any monies for participating in this study. You are free to stop participating at any point if you wish, or if you feel uncomfortable in answering the questions, but your participation is much valuable.

This questionnaire will be distributed via a secure web based survey.

Your withdrawal from participating will not by any means results in a loss of benefit of any kind.

Risks

There is no known risk associated with your participation in this study.

Benefits

There are no rewards for participating (monetary or otherwise). However, it is hoped that through your participation, researchers will learn more about the impact of knowledge sharing amongst team members during ISD projects.

Confidentiality

- All data supplied by participants will remain confidential and you will not be identifiable by your name or any information that may reveal your identity.
- All data obtained from participants will be kept confidential and will only be reported in an aggregate format (by reporting only combined results and never reporting individual ones).
- The data supplied by you will only be used for research analysis and nothing else.
- All questionnaires will be concealed, and no one other than the primary investigator and research supervisor will have access to them.
- The data collected will be stored in survey monkey secure database until it has been deleted by the primary investigator.

Questions about the research

The study will be reported in conference papers and the thesis will be available at the Wits University library and or the internet. Should you require a copy of the research report or should you have any questions regarding the questionnaire, you can contact the researcher at leanmz@gmail.com ; 082 5523525 or the research supervisor, Professor Ray Kekwaletswe at ray.kekwaletswe@wits.ac.za

Next

*** 3. Interpersonal trust**

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly agree
I believe that the project team members i share knowledge with would act in my best interest	○	○	○	○	○	○	○
I believe that the project team members i share knowledge with would do their best to help me if I required help	○	○	○	○	○	○	○
I believe that the project team members i share knowledge with are interested in my wellbeing, not just their own	○	○	○	○	○	○	○
I believe that the project team members i share knowledge with are competent and effective source of expertise	○	○	○	○	○	○	○
I believe that the project team members i share knowledge with perform their role of sharing ISD project knowledge very well	○	○	○	○	○	○	○
I believe that the project team members i share knowledge with are capable and proficient source of expertise and knowledge	○	○	○	○	○	○	○
I believe that the project team members i share knowledge with **are** very knowledgeable in ISD project related knowledge	○	○	○	○	○	○	○

*** 4. Culture**

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly Agree	Agree	Strongly agree
Being accepted as a member of the project team is more important than being independent	○	○	○	○	○	○	○
Being loyal to the project team is more important than individual gain	○	○	○	○	○	○	○
Project team success is more important than individual success	○	○	○	○	○	○	○
Individual rewards are not as important as project team welfare	○	○	○	○	○	○	○
Being accepted as a member of the project team is more important than having autonomy and independence	○	○	○	○	○	○	○

*** 5. Expected rewards**

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly agree
I expect to be rewarded with a higher salary in return for sharing knowledge with my project team members	○	○	○	○	○	○	○
I expect to receive monetary rewards (i.e. additional bonus) in return for sharing knowledge with my project team members	○	○	○	○	○	○	○
I expect to receive opportunities to learn from others in return for sharing knowledge with my project team members	○	○	○	○	○	○	○
I expect to be rewarded with an increased job security in return for sharing knowledge with my project team members	○	○	○	○	○	○	○

*** 6. Expected reciprocal relationships**

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly Agree	Agree	Strongly agree
My knowledge sharing will strengthen the ties between me and my project team members	○	○	○	○	○	○	○
My knowledge sharing will acquaint me with new project team members	○	○	○	○	○	○	○
My knowledge sharing will expand the scope of my association with other project team members	○	○	○	○	○	○	○
My knowledge sharing will result in cooperation with outstanding project team members	○	○	○	○	○	○	○
My knowledge sharing will create strong relationships with project team members who have common interests	○	○	○	○	○	○	○

*** 7. Outcome expectation**

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly Agree	Agree	Strongly agree
Sharing my knowledge will help me make friends with other members in the project team	○	○	○	○	○	○	○
Sharing my knowledge will give me a feeling of happiness	○	○	○	○	○	○	○
Sharing my knowledge will build up my reputation in the project team	○	○	○	○	○	○	○
Sharing my knowledge will give me a sense of accomplishment	○	○	○	○	○	○	○
Sharing my knowledge will strengthen the tie between me and others in the project team	○	○	○	○	○	○	○

*** 8. Knowledge sharing self-efficacy**

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly agree
I have confidence in my ability to provide knowledge that people I work with consider valuable	○	○	○	○	○	○	○
I have confidence in my ability to provide knowledge that people I work with consider informative	○	○	○	○	○	○	○
I have confidence in my ability to provide knowledge that people I work with consider helpful	○	○	○	○	○	○	○
I have confidence in my ability to be informed to provide valuable knowledge	○	○	○	○	○	○	○
I have confidence in my ability to have the expertise, experiences and insights needed to provide valuable knowledge.	○	○	○	○	○	○	○

Prev Next

SECTION B : PERSONAL INFORMATION

We are requesting the following personal information about you that will help us in our analysis of the data we are collecting. This survey is anonymous and no participant will be identified with any information provided. Please your make your selection on the appropriate response.

*** 9. Gender**

- ◯ Male
- ◯ Female

10. Please select your age

- ◯ 20 - 25
- ◯ 26 - 35
- ◯ 36 - 45
- ◯ 46 - 55
- ◯ Over 55

11. Please select your education

- ◯ Matric
- ◯ Certificate
- ◯ Diploma
- ◯ Bachelor
- ◯ Honours
- ◯ Masters
- ◯ PhD
- ◯ Other

12. How many years of work experience do you have?

- ◯ 1 - 2
- ◯ 3 - 4
- ◯ 5 - 8
- ◯ 9 years or more

13. V

14. I

18. Project budget (in South African rands)

- Less than R100 000
- R101 000 - R1 million
- R1 million - R5 million
- over R5 million

19. Please select the phase of your ISD project

- Initiation
- Planning
- Execution
- Closeout

Prev Next

Other (please specify)

15. Company size (number of employees)

- 1 - 50
- 51 - 100
- 101 - 500
- over 500

16. ISD project size (number of team members)

- 1 - 20
- 21 -30
- 31 - 50
- over 50

17. Please select the project duration in months

- 0 - 6
- 7- 12
- 13 - 18
- over 18 months

Please comment on the following:

20. What is your view on knowledge sharing and individual's performance during an ISD project?

21. How does individual performance by project team members influence the success of the project?

22. How does expected rewards and expected reciprocal relationship influence knowledge sharing amongst team members during ISD projects?

23. What is the impact of culture on knowledge sharing in ISD projects

24. Should you have any additional information, please feel free to write it down on the space provided below

Prev Next

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Survey on knowledge sharing in information systems development projects

Please comment on the following

Should you need more information, feel free to contact the researcher at leanmz@gmail.com or the study supervisor; Professor Ray Kekwaletswe ar ray.kekwaletswe@wits.ac.za.

Thank you for your participation

Prev Done

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Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Makhubele

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H15/05/21**
PROJECT TITLE	Towards a knowledge sharing model for information systems development projects
INVESTIGATOR(S)	Mr L Makhubele
SCHOOL/DEPARTMENT	Economics and Business Science/
DATE CONSIDERED	22 May 2015
DECISION OF THE COMMITTEE	Approved unconditionally
EXPIRY DATE	28 June 2017
DATE 29 June 2015	**CHAIRPERSON** (Professor T Milani)

cc: Supervisor : Professor R Kekwaletswe

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

Signature **Date** 23 / 05 / 2015

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

APPENDIX B: ETHICS APPROVAL