

An Empirical Examination of the Influence of Selected Organisational Factors  
on Tacit Knowledge Sharing

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by

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## Abbreviations

A2B	Attitude toward tacit knowledge sharing behaviour
AMOS	Analysis of moment structures
ANOVA	Analysis of variance
AVE	Average variance extracted
CEO	Chief executive officer
CFA	Confirmatory factor analysis
CFI	Comparative fit index
CMV	Common methods variance
COP	Communities of practice
CR	Composite reliability
C.Rt.	Critical ratio
CSIT	Commercial services industry type
CVF	Competing values framework
C&H	Clan and hierarchy
C&M&H	Clan and market and hierarchy
df	Degree of freedom
dp	Data points
DRBV	Dynamic resource-based view
EFA	Exploratory factor analysis
EM	Expectation maximisation
HSF	Harman's single factor
I2STK	Intention to share tacit knowledge
IRS	Ipsative rating scale
JTB	Justified true belief
KBV	Knowledge-based view
KL/KV	Kuala Lumpur/Klang valley
KM	Knowledge management
KMO	Kaiser-Meyer-Olkin
KMS	Knowledge management systems
KN	Knowledge networks

## Abbreviations

LB	Leadership behaviour
L_EO	Example-oriented leadership behaviour
L_RO	Relations-oriented leadership behaviour
L_TO	Task-oriented leadership behaviour
MAR	Missing at random
MCAR	Missing completely at random
Ment	Mentoring
MI	Multiple imputation
MIT	Manufacturing industry type
ML	Maximum likelihood
MTA	Malaysian translators association
MTMM	Multi-trait multi-method
M&H	Market and hierarchy
MUHREC	Monash university human research ethics committee
NC	Normed chi-square
NKEA	National key economic area
NNFI	Nonnormed fit index
NRBV	Natural resource based view
ns	Not significant
OCAI	Organisational culture assessment instrument
OCB	Organisational citizenship behaviour
<i>p</i>	Probability value
PAF	Principal axis factoring
PBC	Perceived behavioural control toward sharing tacit knowledge
PCA	Principal component analysis
POIHL	Privately owned institutes of higher learning
PN	Perceived norm about sharing tacit knowledge
R_I	Resources (Intangible)
R_T	Resources (Tangible)
RBV	Resource-based view

## Abbreviations

RMSEA	Root mean square error of approximation
RO	Research objectives
RQ	Research questions
SD	Standard deviation
SE	Standard error
SEM	Structural equation modelling
SET	Social exchange theory
SIT	Social identity theory
SPM/STPM	Sijil pelajaran Malaysia/Sijil tinggi persekolahan Malaysia
SRMR	Standardised root mean square residual
SRS	Simple random sampling
SRW	Standardised regression weight
TKSB	Tacit knowledge sharing behaviour
TLI	Tucker-Lewis index
TPB	Theory of planned behaviour
TRA	Theory of reasoned action
USA	United States of America
USD	United States Dollar

## **List of papers: Published in journals and presented at conferences**

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**Visvalingam, N. Suppiah**  
**8 May, 2014**

## **Declaration of authorship**

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of this thesis.

Signed: 

Date: **8 MAY, 2014**



## **Abstract**

Human society has evolved from the days of the hunters-and-gatherers to its current state, in which the landscape of the economy is defined by a radical shift toward information and knowledge as a key factor of production. Knowledge may be broadly categorised as explicit and tacit. Explicit knowledge is knowledge which has already been explicated from the individual's mind; and may be found in, for example: documents and databases. Tacit knowledge, in contrast, resides in the minds of individuals, and will require the willingness of the holder to share such knowledge with others.

There is increasing recognition that tacit knowledge is valuable to organisations; however individuals do not habitually share their knowledge. Among the reasons suggested in literature are: fear of loss of expert power, inability to articulate cogently, corporate confidentiality, and lack of trust. Difficulties in forging exchange of tacit knowledge among employees are challenging issues for organisations. Despite evidence that the concept of tacit knowledge and its value has been recognised since days of the early philosophers, leaders have yet to adequately find ways to harness tacit knowledge in their respective organisations for the benefit of its stakeholders.

The study reviewed extant literature and assessed prior studies in order to: (i) identify and select organisational factors which offer sufficient theoretical justification to be included in the theoretical model; and (ii) robust theories which adequately fit the research objectives and research questions. Three organisational factors were selected to construct the theoretical model of this research, that is: leadership behaviour, knowledge networks, and resources. Leadership behaviour was disaggregated into, task-orientation, relations-

orientation, and example-orientation. Resource was similarly decomposed into tangible resource and intangible resource. The study proposed that such disaggregation will provide more valuable and useful information.

The study collected data from 421 respondents from 29 organisations in three different industry sectors, that is: manufacturing, commercial services, and public services, and used structural equation modelling as the primary analysis tool. Among the key findings are: (i) knowledge networks will positively influence tacit knowledge sharing intention and behaviour; (ii) instructing employees to share tacit knowledge alone may not suffice. Managers, aside from providing directions should also lead by example for tacit knowledge sharing behaviour to manifest; (iii) existing tangible resources may not be appropriate to spark tacit knowledge sharing; however knowledge workers perceive that intangible resources, like: regular constructive feedback, autonomy, and learning opportunities, will encourage tacit knowledge sharing.

Key theoretical and practical implications of this research have been articulated in this thesis. Theoretical contributions of this study include: the theoretical model which examined key organisational factors which the study found will influence tacit knowledge sharing behaviour; and contextualisation of the organisational factors using a disaggregated approach. Practical contributions have both policy and operational implications. Organisations may review their confidentiality, recruitment, and incentive, policies to foster tacit knowledge sharing. Operational implications include: recognising and providing support to encourage formation of knowledge networks; providing tangible resources particularly to operationalise tacit knowledge sharing; and to underpin relevant

management practices on religiosity as the study found that this would positively influence tacit knowledge sharing. These contributions will provide valuable insights for future researchers, policy makers and operations managers, in effectively democratising knowledge within the organisation.

# **CHAPTER 1**

## **INTRODUCTION**

---

*“We know more than we can tell.”*  
- Polanyi (2009, p. 4)

## **1.1. Pre-amble**

Knowledge is often credited as the driving force behind the evolution of human societies. For example, the shift from a hunter-gatherer to an agrarian society, predicated on knowledge about soil structure and crops, transformed nomadic tribes into larger and more permanently settled communities (Chichilniskya, 1998). The gradual evolution of society from an agriculture into an industrial and post-industrial base, has also been similarly attributed to knowledge (Kluge, Stein, & Licht, 2001). The current stage in the economic revolution continuum is often termed as the “knowledge economy”, underlining the increasing importance and intensity of knowledge as a primary factor of production of goods and services (Adler, 2001; Dang & Umemoto, 2009; Felin, Zenger, & Tomsik, 2009; Uhl-Bien, Marion, & McKelvey, 2007). In this new economy, a radical shift toward information and knowledge intensive industries and services has been observed (Dang & Umemoto, 2009; Felin et al., 2009; Godin, 2006).

In the new economy, knowledge is the key catalyst for organisations to sustain competitive advantage, and organisations are compelled to create a knowledge ecosystem that fosters the creation, exchange, and dissemination of new knowledge, ideas, and innovation (Uhl-Bien et al., 2007). In this respect, knowledge sharing is no longer an option for organisations (Davenport & Prusak, 2000; Nonaka & Takeuchi, 1995). “Knowledge shared is knowledge multiplied” (Buckman, 2004, p. vii). While this statement resonates with the trajectory of a knowledge-driven economy; the challenge organisations are faced with is: how to create a sustainable knowledge sharing environment in which knowledge is accumulated and shared? (Uhl-Bien et al., 2007).

Such challenges, however, opened-up avenues for scholarly inquiry into factors which will influence knowledge sharing in organisations; particularly tacit knowledge, which resides in the minds of individuals and is not routinely shared (Davenport & Prusak, 2000). Findings are expected to inform both theory and practice. This study was largely guided by these imperatives.

This chapter commences with a section which provides a background of this research. This is followed by the research problems, relevant research objectives and research questions, proposed in this thesis. The final section will describe the significance of this research.

## **1.2. Background**

The resource-based view (RBV) holds that an organisation is a bundle of resources in pursuit of economic rent (Barney, 1991; R. M. Grant, 1996b; Penrose, 1959) and among organisational resources, knowledge has been recognised as the “one and only distinct resource” (P.F. Drucker, 1993, p. 5). Resonating this, the knowledge-based view (KBV), an outgrowth of the RBV, holds that knowledge is critical for organisations to sustain competitive advantage (R. M. Grant, 1996b).

Knowledge, has been increasingly recognised as integral to organisations (e.g. Assudani, 2009; Davenport & Prusak, 2000; P.F. Drucker, 1993; R. M. Grant, 1996b; Nonaka & Takeuchi, 1995), is an important factor of production of firms (Johannessen & Olsen, 2010; Walker, 2010), a key source of wealth for organisations and the engine of economic and social development (Cantu', Bustani, Molina, & Moreira, 2009), and critical for sustainable competitive advantage of organisations and nations in the knowledge-driven economy

(Adams & Lamont, 2003; Davenport & Prusak, 2000; Ichijo & Kohlbacher, 2008). Cohorts of scholars, authors, and world leaders, have acknowledged the advent of the knowledge economy, in which there is a radical shift toward information and knowledge intensive industries and services (Dang & Umemoto, 2009; Felin et al., 2009; Godin, 2006).

Knowledge has been broadly categorised as explicit and tacit (Davenport & Prusak, 2000; Nonaka & Krogh, 2009; Reychav & Weisberg, 2010). Explicit knowledge is typically embedded in organisational systems and processes and is highly visible in all kinds of documents and databases (Kreiner, 2002). However; tacit knowledge is embedded in the minds of people, and sharing requires the active and willing participation of the individual (Davenport & Prusak, 2000; Nonaka & Takeuchi, 1995).

The importance of knowledge sharing has been underlined in literature (e.g. Davenport & Prusak, 2000; P.F. Drucker, 1993; Nonaka & Takeuchi, 1995) and is gaining the attention of researchers (Cabrera & Cabrera, 2002; S. Kim & Lee, 2006; Yi, 2009); however in practice it is an “exception rather than a rule in organisations” (Bock, Zmud, Kim, & Lee, 2005, p. 88). There are fundamental differences between explicit and tacit knowledge sharing. Explicit knowledge sharing is visible in utterances and documents (Nonaka & Krogh, 2009) and is self-evident (R. M. Grant, 1996b; C.-P. Lin, 2007; Reychav & Weisberg, 2010). In contrast, tacit knowledge is not easily shared (J.-K. Wang, Ashleigh, & Meyer, 2006), and attempts to share can be slow and costly (Kogut & Zander, 1992; Nonaka & Krogh, 2009); however, the volume (Buckman, 2004; Goffin & Koners, 2011) and value (Davenport and Prusak, 1998; Reychav and Weisberg, 2010) of tacit knowledge makes it a knowledge sharing imperative.

Tacit knowledge exists because of people's limited ability to express their knowledge through language and other current forms of expressions (Endres, Endres, Chowdhury, & Alam, 2007). Tacit knowledge will only be shared if the individual is intrinsically motivated (Janowicz-Panjaitan & Noorderhaven, 2009). If individuals are able to motivate themselves, given the various reasons that have been cited as barriers to tacit knowledge sharing, organisations have no issues to contend with; however there is sufficient support in extant literature to conclude that tacit knowledge sharing is a challenging problem for organisations (Cordeiro-Nilsson & Hawamdeh, 2011; Goffin & Koners, 2011; Janowicz-Panjaitan & Noorderhaven, 2009; Nonaka & Krogh, 2009).

While there is recognition of the advent of the knowledge economy, the RBV and KBV, and the importance of, and issues related to, tacit knowledge sharing in organisations, there is a paucity of studies which had investigated tacit knowledge sharing in relation to organisational factors. There is however evidence in extant literature that organisational factors influence the behaviour of employees (e.g. Bock et al., 2005; Buckman, 2004; Cabrera & Cabrera, 2002; Cameron & Quinn, 2006; Davenport & Prusak, 2000; Nonaka & Takeuchi, 1995).

This study took cognisance of the current challenges in the economy, the imperative for organisations to extract more value from a key resource, that is: knowledge, and the dearth of empirical studies on organisational factors which will influence tacit knowledge sharing. Based on these premises and a review of literature, this study will examine the influence of organisational factors like, leadership behaviour, knowledge networks, and resources, on



tacit knowledge sharing behaviour. The primary aim is to contribute to the body of knowledge in both, theory and practice.

### **1.3. Research problems**

There are far greater challenges for organisations in the new economy than before, defined by its increased reliance on knowledge. It is important for scholars and practitioners to understand the urgency of revising old models, assumptions and practices, or develop entirely new ones (Felin et al., 2009).

The organisation, according to the RBV, is a bundle of resources and knowledge is one of the most important and distinct resource. It is an imperative, therefore, to manage knowledge deliberately, efficiently and effectively (Davenport & Prusak, 2000; Kulkarni, Ravindran, & Freeze, 2007; Nonaka & Takeuchi, 1995). Knowledge is largely tacit and resides in the minds of individuals who do not habitually share such knowledge or are intrinsically motivated to do so (Janowicz-Panjaitan & Noorderhaven, 2009). While explicit knowledge sharing largely predicated on knowledge stock is easier, tacit knowledge sharing is more difficult (Bélanger & Allport, 2008). A deeper understanding of tacit knowledge, and factors that influence its creation and sharing, have significant theoretical and practical implications.

While there has been a notable increase in literature on knowledge management since the mid-1990's (Serenko, Bontis, Booker, Sadeddin, & Hardie, 2010); in contrast, there is a dearth of empirical research in tacit knowledge sharing despite increased recognition of its importance to organisations (Goffin & Koners, 2011). Management practitioners find it

difficult to operationalise tacit knowledge sharing in organisations (Ambrosini, 2001), which perhaps may be explained by the paucity of research in this area.

The research problems which this study had identified, aside from suggestions that research in tacit knowledge is sparse, are as follows:

**a) Dearth of practically effective theoretical models**

Literature suggests that individuals may not routinely share tacit knowledge (Davenport & Prusak, 2000; D. Leonard & Sensiper, 1998) and it is not easily operationalised in organisations (Ambrosini, 2001). The value of tacit knowledge for individuals and organisations is increasingly recognised both in research (e.g. Goffin & Koners, 2011; Reyhav & Weisberg, 2010) and practice (e.g. Davenport, 2005; Gawande, 2006). For example organisations such Nucor Steel (Gupta & Govindarajan, 2000), Chevron Corporation (Derr, 2006), Buckman Laboratories (Buckman, 2004), reported substantially improved performances after implementing various knowledge sharing initiatives. In another example of the impact of tacit knowledge sharing, five New England medical centres reported a 24 percent drop in mortality rates (Davenport & Prusak, 2000, p. xxiii).

The paucity of empirical research (Goffin & Koners, 2011), coupled with inferences that tacit knowledge sharing practices are often not consciously developed in organisations (Davenport, 2005; Davenport & Prusak, 2000; Nonaka & Takeuchi, 1995); suggests that the existing theoretical models may not be practically sound. This study's theoretical model will be premised on operationalising tacit knowledge sharing in organisations.

**b) Sharing explicit knowledge is not the same as sharing tacit knowledge**

Manifestations of explicit knowledge sharing is easier to observe than tacit knowledge (Davenport & Prusak, 2000; Nonaka & Takeuchi, 1995). The inherent differences between tacit and explicit knowledge preclude its management and sharing in the same manner (Davenport & Prusak, 2000; Haldrup-Herrgard, 2000). Individuals willing to share tacit knowledge will also share explicit knowledge; however the reverse is less likely (Reychav & Weisberg, 2010). These differences suggest that studies observing knowledge sharing behaviour should discern between tacit knowledge and explicit knowledge; however some prior studies did not (e.g. Barachini, 2009; Bock et al., 2005; Chatzoglou & Vraimaki, 2009; Ford & Sandy, 2010). This study will specifically examine tacit knowledge sharing. Why tacit knowledge and not explicit knowledge? Tacit knowledge: because it has greater value to organisations than explicit knowledge (Davenport & Prusak, 2000; Reychav & Weisberg, 2010). Furthermore, individuals sharing tacit knowledge are likely to share explicit knowledge; however the reverse is less likely (Reychav & Weisberg, 2010).

**c) Generalisation of findings from different culture settings**

Malaysia is a rapidly developing country and the government has implemented a number of programmes to transform the nation to meet challenges in the knowledge economy (EPU, 2002). Limited research on tacit knowledge sharing behaviour has been conducted in Malaysia.

Empirical studies in tacit knowledge sharing have been conducted in various national contexts, for example: Brazil (Joia & Lemos, 2010), Canada (Kothari et al., 2012), Germany (Goffin & Koners, 2011), Taiwan (C.-P. Lin, 2007), United Kingdom (Ryan &

O'Connor, 2009), and United States of America (N. Leonard & Insch, 2005). Observations from studies from such cultural contexts cannot be generalised across all national cultures, especially for human behavioural studies. However; very few studies have assessed prior models, suggestions, and findings, in the context of national culture in their studies on tacit knowledge sharing behaviour.

This study recognised that variations in national culture may influence behaviour and has taken this into account while assessing findings in prior studies; and during theory development.

**d) Multi-dimensional construct and disaggregation**

The importance of examining organisational factors within the systems viewpoint is a research imperative. The general systems theory holds that organisations are systems composed of inter-dependent and inter-related components (Kast & Rosenzweig, 1972). In resonance, (Richard, Devinney, Yip, & Johnson, 2009) posited that it would be myopic to examine single-dimensional constructs to explain variations in complex systems. Research in tacit knowledge sharing is no exception; some studies were predicated on a single dimension (e.g. Bélanger & Allport, 2008; Chatti, 2012; Ryan & O'Connor, 2009; Yang & Farn, 2009).

In this study, the proposed theoretical model provides a multi-dimensional perspective of tacit knowledge sharing. The model consists of factors such as: task-oriented leadership behaviour, relations-oriented leadership behaviour, example-oriented leadership behaviour, knowledge networks, tangible resources, and intangible resources.

Another problem often noted in empirical research is the level of aggregation of constructs. This study suggests that, where theoretically appropriate and justified, constructs should be disaggregated in order to more accurately capture the key factors that influence tacit knowledge sharing. In this study for example, leadership behaviour is disaggregated into three constructs and resources into two separate constructs.

#### **1.4. Research objectives and research questions**

The overall purpose of this research was to examine the influence of organisational factors on tacit knowledge sharing behaviour. In line with this purpose and for practical reasons, the study will review extant literature and select key factors and examine them accordingly; and will largely be premised on contributions to theory and practice.

Toward the satisfaction of the research purpose, the research objectives (RO) and research questions (RQ) of this study are as follows:-

RO1: To identify key organisational factors which will influence knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour.

RQ1.1: Does leadership behaviour influence knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour?

RQ1.2: Do knowledge networks influence knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour?

RQ1.3: Do resources influence knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour?

RO2: To examine the impact of moderating factors on the influence of key organisational factors on knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour.

RQ2.1 Does gender moderate the influence of leadership behaviour, knowledge networks, and resources, on knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour?

RQ2.2 Does organisational culture moderate the influence of leadership behaviour, knowledge networks, and resources, on knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour?

RQ2.3 Does sector and industry type moderate the influence of leadership behaviour, knowledge networks, and resources, on knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour?

RQ2.4 Does religiosity moderate the influence of leadership behaviour, knowledge networks, and resources, on knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour?

RO3 To examine if knowledge workers' intention to share tacit knowledge will influence tacit knowledge sharing behaviour.

RQ3.1 Does intention to share tacit knowledge influence tacit knowledge sharing behaviour?

### **1.5. Significance of this study**

Knowledge is the one and only distinct resource in most organisations (P.F. Drucker, 1993). The KBV augments this argument with the suggestion that knowledge is necessary to sustain competitive advantage (R. M. Grant, 1996b). The knowledge economy is largely driven by information and knowledge (Dang & Umemoto, 2009; Felin et al., 2009).

While researchers have reported that there has been a marked increase in literature in the area of knowledge management (KM) over the past 15 years (Serenko et al., 2010), such increase is not evident in empirical studies in tacit knowledge sharing (Goffin & Koners, 2011). Assessing this against the knowledge imperative for organisations (Davenport, 2005; R. M. Grant, 1996b; Nonaka & Takeuchi, 1995) and the volume and value of tacit knowledge (Davenport & Prusak, 2000), the theoretical contributions of this study will be significant. In support of this statement, the study holds that, there is a dearth of empirical studies which had examined the influence of leadership behaviour, knowledge networks, and resources, collectively, on knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour. This study infers that the potential for model misspecification may increase, should these factors be examined separately. In this study a comprehensive theoretical model was developed consisting the abovementioned factors to examine variations in tacit knowledge sharing behaviour.

Furthermore, this study modelled sub-factors such as: task-oriented, relations-oriented, and example-oriented leadership behaviour; and tangible and intangible resources. This level of granularity is uncommon in research in tacit knowledge sharing. Leadership theories suggest that leadership behaviour cannot be static. Leaders are expected to be dynamic and

change their behaviour in tandem with situational demands to be effective (e.g. Denison, Hooijberg, & Quinn, 1995; Yukl, 2008). Holding this suggestion, the leadership behaviour construct must be context specific, which this study took cognisance of. Similarly tangible and intangible resources will have differing influence on tacit knowledge sharing, which this study disaggregated so that variations in these sub-factors and their differing influence on tacit knowledge can be examined. The findings will be more useful to inform theory, and also management practice, as it would be more precise, than examining these factors at an aggregated level.

Studies have suggested that tacit knowledge sharing is difficult to operationalise (e.g. Ambrosini, 2001). Davenport (2005, p. 21) suggested that this is an “unnatural act”. A plethora of barriers against tacit knowledge sharing have been cited in literature. In this study it is argued that ignorance may no longer be bliss in the case of leveraging on tacit knowledge in organisations, especially in this knowledge-driven economy. The study will attempt to unravel the ‘tacit knowledge sharing black box’. The findings of this study will draw the attention, of managers, to the factors which will influence tacit knowledge sharing. Instead of operating in the dark, practitioners will have a clear idea of what to focus on. The strength and direction of the relationships between the factors will allow managers to allocate resources, like time, money, and expertise, according to the organisations priorities. Furthermore, additional knowledge can be extracted by examining the impact of the moderators on tacit knowledge sharing. The practical implications of this study will be significant.



This study will be conducted in Malaysia. Malaysia, as a developing country with a multi-ethnic and multi-religious population, is in a unique position of planned transformation into a high-income nation by 2020. The Malaysian Government has initiated various programmes such as the New Economic Model and the Economic Transformation Programme, in order to achieve its vision and its move into the knowledge economy (PEMANDU, 2010). The findings from this study will enable organisations in Malaysia to leverage on factors which will influence tacit knowledge sharing, which is vital for corporate Malaysia to move up the innovation value chain, in line with the nation's knowledge economy strategy.

#### **1.6. Structure of this thesis**

The following chapters in this thesis have been structured as follows:

In chapter 2, the theoretical foundations of this study will be described. The sections on the literature review section will provide a critical review of the concept of tacit knowledge as far back as 2000 B.C., and more recent literature on behavioural theories which will inform the proposed theoretical model of this study.

In chapter 3, the research design and methodology will be discussed. This chapter will be in two parts. In part I, sampling methods used in this study will be explained, followed by the scales and measures and insights into pre and pilot studies which were conducted. Part II will describe the analytical procedures used in this study, with particular emphasis on structural equation modelling, which was the main econometric method employed by this study.

Chapter 4 will describe the results of data analysis. The initial sections will briefly describe data examination and data cleaning, response rates, and relevant descriptive statistics. This will be followed by a detailed analysis of the fit of the model to the data collected in this study.

In chapter 5, the empirical results will be described in the context of this study. The hypotheses which were established in chapter 2 will be examined in relation to the results and meaning drawn from the data obtained for the sample observations.

In chapter 6, the study will discuss the theoretical and practical implications of the findings of this research. Key contributions of the study will be highlighted in this section.

Chapter 7 will conclude this thesis with a summary of the following: the research problems, research objectives, research questions, and the methodology used to capture the factors explaining tacit knowledge sharing in Malaysia. This will be followed by the limitations of this study, and future research directions.

## **1.7. Conclusion**

This chapter outlined the importance of tacit knowledge sharing in a knowledge economy and more importantly the factors that encourage tacit knowledge sharing. The chapter also provides the research objectives and significance of the study in the context of a country which aspires to embrace a knowledge intensive economy.

In the next chapter a critical review of key theories in the literature will be discussed and a new integrated theoretical framework will be proposed to explain the factors that impact tacit knowledge sharing.

# CHAPTER 2

## THEORETICAL FOUNDATION

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*“Every block of stone has a statue inside it and it is the task of the sculptor to discover it. I saw an angel in the marble and carved until I set him free.”*

- Michelangelo (1475-1564) cited in Golan (2014, p. 19)

## **2.1. Introduction**

Knowledge as a key organisational resource has been recognised and substantial research can be found in extant literature; however, empirical research in tacit knowledge sharing, often acknowledged as an important knowledge component, is scarce (Goffin & Koners, 2011). The knowledge driven economy has given rise to new challenges in which the creation of knowledge and finding new ways to share knowledge has become an imperative for organisations and nations to sustain competitive advantage.

In this chapter, literature relevant to this study will be explored and examined, of which some contribute significantly to the development of the theoretical framework proposed in this thesis. Exploring the origins of a concept or theory is fundamentally prudent in any scholarly inquiry endeavour. In this respect, extant literature cascading down to philosophical thoughts around the concept of knowledge in early civilisations will be explored. Leveraging on these thoughts, other relevant literature, chronologically sequenced, will be reviewed in order to piece together an integrated perspective and intellectual debates, about the subject. Prior studies in knowledge sharing in general and tacit knowledge sharing in particular, will be examined to identify gaps relevant to this study; and apart from this, such studies will also be examined to identify pertinent theories and concepts relevant to this research.

This study is concerned with tacit knowledge sharing behaviour in organisations. In line with this, scrutiny is centred on relationships between organisational factors, such as: knowledge networks, leadership behaviour, and resources; and tacit knowledge sharing.

Theories and concepts related to organisational culture, gender differences, and religiosity will also be examined in this study.

The next section commences with a discussion of various epistemological attributes of the core subject matter of this thesis, that is: tacit knowledge. The more commonly described theoretical perspectives in extant literature will be examined, next. The study will then identify the theoretical perspectives most appropriate for this research and provide reasonable grounds for their selection. This will serve as a foundation for the development of theories and the discussions in this study.

The chapter will then outline the theoretical framework for this study, based on: the research purpose, research objectives and research questions, relevant theories and concepts in literature reviewed in this chapter, and gaps in prior empirical studies.

The final section describes the theoretical framework. The various constructs will be explained, together with the hypotheses developed to satisfy the research objectives.

## **2.2. Literature Review**

### **➤ Knowledge**

The concept of knowledge has been a subject of interest, since the early days of civilisation. While this research is not particularly concerned with historical developments in knowledge and knowledge management, relevant extant literature were traced to assemble

a foundation on which to develop a well-grounded theoretical framework. This foundation centres on the philosophy of knowledge: both from the Eastern and Western perspectives.

### **2.2.1. Philosophy of knowledge**

Philosophy is a multi-arrayed multi-dimensional concept and is not confined to any particular discipline, or area of thought. These include: metaphysics, which is the study of the principles of reality transcending those of science and common sense (DeAngelis, 2003); epistemology, frequently referred to as the theory of knowledge, is the study of the “nature, origin and scope of knowledge” (Moser, 2003, p.197); spiritual philosophy, which is, thoughts related to religion; moral philosophy, that is concerned primarily with the most appropriate way to live; and, feminist philosophy, which is anchored on thoughts that being a woman is not about the anatomy but is society’s recognition in relation to men (Hoagland & Frye, 2003).

Philosophy is an abstract concept, and is, in a broad sense, the interpretation of the philosopher’s view of the universe and things within and around the universe. Philosophy is universal, in the sense that, it is not the domain of any particular civilisation, historical period, religion, discipline, or any other entity; however early philosophical thoughts have been known to come from those of ancient Chinese, Indian, and Greek civilisations as they had cultivated the subject systematically and encased them in written form (Skirbekk & Gilje, 2001). The English word : philosophy, is known to originate from the word *philosophia*, literally meaning the love of wisdom (Arendt, 2004) in the Greek language. It describes conceptions of life and the world, underpinned by two factors: the first relates to

“inherited religious and ethical conceptions”; and the other, “the sort of investigation which may be called ‘scientific’ (Russell, 2000, p.13). In this study, interest in philosophy is bordered largely on its intricate, intertwined and often inseparable relationship with the concept of knowledge.

### **Greek philosophy**

Greek philosophy is recognised to have commenced with the thoughts of *Thales of Miletus* (Gadamer, 2003; Russell, 2000; Skirbekk & Gilje, 2001). A host of philosophers, like *Thales* (624 BC – 546 BC), *Heraclitus* (c. 500 BC), *Protagoras* (481 BC – 411 BC), *Socrates* (470 BC – 399 BC), *Plato* (427 BC – 347 BC), and *Aristotle* (384 BC – 322 BC) had contributed immensely to the philosophical thoughts of the Greeks (Skirbekk & Gilje, 2001). *Protagoras*’ thesis was that: “things do not reveal themselves to people the way that the things are in themselves, but it is always only certain aspects or properties of the things that at any one time present themselves to man” (Skirbekk & Gilje, 2001, p.35). From the knowledge management viewpoint, this can be interpreted as ‘contextualism’. *Socrates* has been acknowledged as a man of knowledge, however his thoughts were not articulated in written form by him, but by his students, like *Plato* (Russell, 2000; Skirbekk & Gilje, 2001) and *Xenophon* (Russell, 2000). *Socrates* was fixated with *arête* – the achievement of an individual’s potential through knowledge, and is credited with the view that knowledge is essential for a person to do right (Skirbekk & Gilje, 2001). Russell (2000) credits *Plato* and *Aristotle* as the most influential of all philosophers: ancient, medieval, or modern; however of the two, *Plato* is recognised to have made greater contribution. In *Meno*, *Phaedo*, and *Theaetetus*, *Plato*’s influential view that knowledge is justified true belief (Nonaka &

Takeuchi, 1995) has been the guiding concept for many a researcher. The logic of this view is that: to conclude that an individual (X) has knowledge in a subject (K); K must be true (the truth condition); X must believe that K is true (the belief condition); and X's belief that K is true must be justified (the justification condition). However, *Plato's* view of knowledge has been dismissed, as explained in the famous "Gettier Cases" (Gettier, 1963) and also as lacking logic (Nonaka & Takeuchi, 1995). Unlike *Plato* and most Greek philosophers of the period who subscribed solely to deductive reasoning, *Aristotle* recognised the importance of induction (Russell, 2000). *Aristotle* in *Nicomachean Ethics* posited that knowledge has a complex structure and can be classified as: (i) *epistémé*: factual or scientific knowledge, (ii) *téchné*: skills-based technical and action-oriented knowledge, (iii) *phrónésis*: practical knowledge based on experience, (iv) *noûs*: intuition or gut-feel, and (v) *sophía*: theoretical knowledge of universal truths (Schwartz, 2006).

*Téchné*, according to Aristotelian philosophy, can be explicated and taught; however in contrast, *phrónésis* can only be shared through actual mutual experience (Schwartz, 2006). *Noûs* together with *phrónésis* allows us to infer that the concept of tacit knowledge, while not defined as such, was clearly recognised by the ancient Greek philosophers.

### **European philosophy**

In western philosophy, the term modern (as opposed to medieval) philosophy is often characterised by mental models that depart from a theology-centric perspective and move into a science-centric paradigm (Russell, 2000). European philosophical perspectives fall within this 'modern' classification with thinkers such as *Hume*, *Descartes*, *Locke*, and *Kant*, playing prominent roles among others.



*René Descartes* (1596-1650), a Frenchman, often referred to as the founder of modern philosophy is also famous for his argument: *cogito ergo sum* (I think therefore I am), the kernel of his theory of knowledge (Russell, 2000). A rationalist, *Descartes*, argued that knowledge must be indubitable, meaning that it is not realised by perception but is gleaned through deduction. John Locke on the other hand was an empiricist and he roundly criticised *Descartes'* rationalist view (Nonaka & Takeuchi, 1995). Although doubt is the spark that ignites the quest for knowledge in both, rationalist and empiricist, schools of thought, empiricists in general take a permanent position as opposed to rationalists who particularly take doubt as a temporary position, primarily at the outset. Locke was a proponent of experience as a knowledge source. He argued that individuals at birth have a mind like a blank slate (*tabula rasa*) and ideas evolve from two sources, that is: sensation and perception (Russell, 2000; Skirbekk & Gilje, 2001). Locke's theory of knowledge went along the premise that people can only think in terms of ideas, and that "none of our knowledge can antedate experience" (Russell, 2000, p.589) contrary to the ideas which emerged later from transcendental philosophers, like *Immanuel Kant*, often regarded as the greatest of modern philosophers. Although he leaned toward empiricism, he was not averse to the idea of *a priori* knowledge. *Kant* underpinned his thinking on the concepts of: analytic and synthetic distinction of knowledge, and *a priori* and *a posteriori* judgment (Skirbekk & Gilje, 2001). He argued that in an analytic proposition the predicate concept is contained in the subject, for example: "all bachelors are unmarried". In this example the concept "bachelor" (subject) contains the concept "unmarried" (predicate). However in a synthetic proposition, there is an absence of the predicate concept. A synthetic proposition may go like this: "all bodies are heavy". The concept "bodies" does not contain the concept

“heavy”; “heavy” is not a part of the definition of “bodies”. *Kant* proposed that that people may make judgments from both synthetic and analytic *a priori* knowledge, as well as synthetic *a posteriori* knowledge (Russell, 2000; Skirbekk & Gilje, 2001). *A priori* knowledge is knowledge independent of experience, and in contrast, *a posteriori* knowledge is knowledge with experience. *Kant* eliminated from his epistemological proposition, analytic *a posteriori* knowledge, deeming it self-contradictory (Russell, 2000). The key question at this point is: is synthetic *a priori* knowledge possible? Rational thinking holds that synthetic propositions may be true or false and truth is contingent on validation from experience; however *Kant* contended that there is reality independent of experience. This view has a direct bearing on complexities related to the concept of tacit knowledge.

*Polanyi*, a man of the sciences, meandered intuitively into philosophy. He contributed immensely to the area of knowledge management and is credited with articulating clearly the concept of tacit knowledge (Alwis & Hartmann, 2008; Nonaka & Takeuchi, 1995), which according to *Polanyi's* world view of knowledge, influenced by Gestalt doctrines, held that all knowledge is discovered “as the outcome of an active shaping of experience” (Polanyi, 2009, p.6).

### **Eastern philosophy**

Philosophical thoughts originating from the West and the East differ on a number of premises. In Western philosophy, in general, dualism is often expressed as paradoxes, like mind and matter (*Descartes*), and phenomenon and noumenon (*Kant*). However; in Eastern

philosophy dualism is often inclusive, like *yin* and *yang* (Liu, 2003), *sāṅkya* and *yoga* (Zimmer, 1989), and body and mind (Nishida cited in Nonaka & Takeuchi, 1995). Orthodox Eastern philosophical thoughts are, in general, steeped along religious lines, but in contrast, Western philosophy is largely described as analytic. There is ongoing debate concerning the legitimacy of philosophical thoughts originating from the East, as they are frequently benchmarked against Eurocentric approaches (Skirbekk & Gilje, 2001). There are counter arguments that the Western approach is too rigid and scientific to be even considered, in the essence of the love of wisdom, as philosophy (Rosker, 2009). Notwithstanding such debates, it would be self-defeating to fixate on the syntax and semantics of the concept and miss the opportunity to benefit from the diversity of both these main philosophical streams, that is, the Eastern and Western views.

### **Indian philosophy**

Classic Indian philosophy, similar to most in the East, was steeped along the lines of religion (Mohanty, 2000; Zimmer, 1989). In this respect, this study will to a large extent examine Hindu philosophy, the predominant religion in India, within the context of Indian philosophy. The *Vedas*, believed to have been composed around two thousand years B.C., although containing a myriad of themes ranging from hymns and sacrifices to music and supernatural musings, succeeded in conveying the essence of inquiry to great effect (Mohanty, 2000). Following the *Vedic* texts, the *Upanishads*, developed from around one thousand years B.C. onward, further enhanced Indian philosophical thoughts; however it is important to note: Indian philosophy did not develop in a linear trajectory but is represented around a number of *darśanas*' (systems), like: *Lokāyata*, *Buddhism*, *Cārvāka*, *Vaiśeṣika*,

*Sāṃkhya, Nyāya, Vedānta, Pūrva Mīmāṃsā, and Vedānta* (Mohanty, 2000). These schools had their own ideas about the theory of knowledge, and the premise that perception is a *pramāṇa* (means of knowledge) was common among them; however, they differed on what it represented. Similarly there were ontological differences, with the schools recognising selectively: inference, comparison, postulation and word, as sources of knowledge (Mohanty, 2000).

*Pratibhā* prevalent in Indian philosophy is of considerable interest in relation to the concept of tacit knowledge. *Pratibhā*, described exaggeratedly, alludes to “supra-rational supra-sensuous intuitive awareness of all things past, present and future in a simple flash” (Chakrabarti, 1999, p.267). However most *darśanas* dismissed all superfluous understanding and adopted a more reasonable use of the concept of *pratibhā* (Chakrabarti, 1999). Bharthari, an Indian philosopher believed to have lived around the 7<sup>th</sup> century AD, although questioning the then description of *pratibhā*, confirms acceptance of the concept of knowledge arising from the “inner experience” of an individual (Chakrabarti, 1999). Similarly the *Nyāya and Sāṃkhya darśanas*’ submit that cognition is an inner perception and is not self-revelatory (Matilal, 1968). The significance of these philosophies, in relation to this study, is that Indian philosophy has taken cognisance that knowledge exists largely in tacit form in the minds of people.

### **Chinese philosophy**

Chinese philosophy is generally described within three main periods, that is: the classical period (c. 600 BC to 200 BC), the *Buddhist* influence period (c. 100 BC to 1000), and the

*Neo-Confucianism* period (1100 to 1600) (Höchstmann, 2004). The two main schools often cited in Chinese philosophy are the *Dao* and *Confucian* schools believed to have had a direct influence on Chinese society (Rosker, 2009). *Daoism* is practiced in two popular ways. One stream is based on philosophical thoughts and the other is fundamentally premised on religion; however there is no clear demarcation between these two. For example, the philosophers, *Laozi* and *Zhuangzhi*, were honoured and worshipped in temples, although their philosophies were not contributory to such aggrandisement (Rosker, 2009). It is necessary to be aware of the nuances in *Daoism*, which many non-Chinese scholars have been unable to detect, as there is a fundamental difference between philosophical *Daoism* and religious *Daoism* (Rosker, 2009). The concept of *Dao*, essentially a fundamental premise in Chinese philosophy, “represents the essence of the universe, of society, and of every personality” (Liao Cited in Rosker, 2009, p. 231). *Confucianism* on the other hand, has also been erroneously categorised as a religion in view of the many temples found in China under its influence. Its philosophy manifested in a framework of values guiding citizens, and governance doctrines directed at the state (Rosker, 2009); and a moralised concept of wisdom (Yao, 2006). Aside from *Daoism* and *Confucianism*, one other philosophical school in ancient China, *Mohism*, which professed universal love and opposition to war, also had some influence on society in general (Höchstmann, 2004).

Chinese philosophy, in general, placed great emphasis on the concepts of *chih* (wisdom), moral and ethical values; while knowledge viewed largely along its actionable context (Liu, 2003; Yao, 2006) was often described alongside these concepts (Birdwhistell, 1984).

*Confucius*, and *Mengzi* (or *Mencius*), arguably the most famous *Confucian* after *Confucius* himself, describe a wise person as being more than knowledgeable. Wisdom, they exhort, does not only mean putting knowledge into practice, but also the act of practicing well (Yao, 2006, p.352). The prominence given to the moral dimension of knowledge is evident and frequently reinforced in Chinese philosophy.

*Mengzi* introduced the notion of *liang-chih* (innate knowledge), which describes ability without learning and knowledge without deliberation (Liu, 2003). This view recognises the existence of *a priori* knowledge, which essentially is tacit knowledge. *Confucianism* advocated *ren*, which implored benevolence as a virtue. Within the ambit of this expression, *Confucius* articulated the need for conscientiousness (*zhong*), altruism (*shu*) and the principle of reciprocity (Höchsmann, 2004). Although not explained as such in literature on Chinese philosophy, current debates on the subject indicate that these values are among the fundamental drivers of tacit knowledge sharing behaviour in individuals (e.g. Davenport & Prusak, 1998).

It is apparent that Chinese philosophy, like most others, had emphasised and expressed the importance of knowledge and had recognised that knowledge is in the minds of people and sharing such knowledge is a moral obligation of good citizenship.

### **Islamic philosophy**

Most of the works of ancient Greek philosophers were lost in the west between the fall of the Roman Empire and the Renaissance in the twelfth and thirteenth centuries; however

during this period the Arabic-Islamic schools not only preserved these works, but actively contributed to the development of philosophical thought, particularly Islamic philosophy (Skirbekk & Gilje, 2001). The Islamic knowledge sphere developed rapidly with enormous contributions from philosophers such as, *Abu Bakr al-Razi* (865 - 925), *Ibn-Sina* (980 – 1037), *Al-Ghazali* (1058 – 1111), and *Ibn-Rushd* (1126 – 1198).

Islamic philosophy has the Holy *Qur'ān* at its epicentre. *Al-Ghazali* in his book *Destruction of the Philosophers* commented that the Holy *Qur'ān* according to Islam, has all necessary truths and as such speculation is not advocated or condoned (Russell, 2000). This is echoed consistently by most Islamic religious and philosophical literature (Afridi & Khan, 2007; Ansari, 2001; Choudhury, 1989). Islamic philosophy suggests that knowledge stems from: inference (*ilm al-yaqin*), perception or observation (*ain al-yaqin*), and personal experience or intuition (*haqq al-yaqin*) (Afridi & Khan, 2007). The Islamic theory of knowledge according to the *Ikhwan-Al-Safa* school of thought holds that knowledge may be acquired by way of the senses, reasoning, and from an authorised elder, like a teacher. The argument that knowledge handed down by a teacher, originates from God, delivered by the Prophet (PBUH) through proxies such as *Imams'* (religious leaders) render all edicts in the Holy *Qur'ān* mandatory religious imperatives for anyone professing the Islamic religion (Afridi & Khan, 2007).

*Al-Ashari*, once an ardent follower of the *Mutazilite* movement, which was founded on rationalism, became disillusioned, questioned its doctrines and consequently revised his philosophical outlook. The *Al-Ashari* philosophy, although steeped in orthodox Islamic

theology, in opposition to extreme orthodoxy, employed the dialectical approach (Afridi & Khan, 2007). The *Asharite* system is credited with checking unbridled theological thoughts which religious leaders claim may lead to deviationism. The *Asharite* philosophy was further propagated by *Al-Ghazali*, and it has become “practically the theology of the *Muslim* community in general and has continued to remain so up to the present time” (Afridi & Khan, 2007, p.299). Asharites subscribe strongly to the doctrine of faith (*īmān*); wherein faith is defined as “very firm belief”, and such belief may be contained anywhere within a supported-to-unsupported continuum (Uslu, 2007, p.164). According to Hicks (cited in Uslu, 2007, p.164) in the absence of strong evidence, believers in general “make up or fill that evidential gap by an act of will”. Along this line of argument, the concept of *taqlīd*, which literally translates into “unquestioning acceptance of the guidance of others or the uncritical acquiescence to the opinions and teaching of people whom one holds in esteem” (Frank, 1989, p.37) is significant.

The Holy *Qur’ān* had established, among others, covenants meant to guide Muslims in their duties as rational beings. In this respect, the quest for knowledge was given prominence. The Holy *Qur’ān* commands that: (i) “acquisition of knowledge is a sublime and spiritual pursuit”, (ii) “cultivation of knowledge is one of most basic needs and, hence, one of the most basic duties, of a human being”, and (iii) “proper knowledge forms one of the most basic requirements of proper moral life” (Ansari, 2001, p.70). The prominence the Holy *Qur’ān* gives the acquisition and sharing of knowledge underlines its status and importance for Muslims.



The Holy *Qur'ān* emphasises:

Spiritual achievement through knowledge: “... *Those only among His Servants who are learned (i.e. possessors and pursuers of knowledge) truly fear Allah*” (XXXV: 28 cited in Ansari, 2001, p.70). In this context, fear, together with the love for God, serves to motivate true followers of Islam as it becomes a duty (Ansari, 2001).

Acquisition of greatness through knowledge: “*Allah will exalt those who have Faith among you, and those who have knowledge, to high ranks*” (LVIII: 11 cited in Ansari, 2001, p.71). There is sufficient evidence in this verse to allow us to interpret that gaining knowledge commands an exalted position in Islam. A position that is almost equivalent to faith in God. Such an honoured position cannot be ignored by a true follower of Islam (Ansari, 2001).

Duty relating to the intellectual development of people: “*And He imparted to Adam the knowledge of the nature of all things*” (II: 31 cited in Ansari, 2001, p.393). God, according to the Holy *Qur'ān* educated Adam, the progenitor of mankind (Ansari, 2001). “... *and do thou good (to others) as Allah has been good to thee ...*” (XXVIII: 77 cited in Ansari, 2001, p.393). These verses translate into commands that imply that knowledge must be shared unselfishly for the benefit of mankind (Ansari, 2001).

In summary, it is understood that the Holy *Qur'ān* unequivocally implores Muslims to actively create, seek and share knowledge. Although the subject of tacit knowledge is not amplified in most Islamic literature, there are valid inferences to indicate that the concept is embedded deep in Islam. For example, Muslims believe that God is omnipresent, is not visible to man, and cannot be expressed in any physical form (Ansari, 2001). This principle, which is also encased within the concept of tacit knowledge, has a profound influence on most Islamic doctrines.

### **2.2.2. Description of knowledge**

The topic of knowledge has intrigued mankind since the early civilisations; however defining and understanding the concept has never been established to the satisfaction of

scholars (Alavi & Leidner, 2001; Kogut & Zander, 1992). Although this phenomenon is not uncommon in the social sciences (Guba, 1990), it is appropriate that a working description of knowledge for the purpose of this research is identified.

What is knowledge? The myriad definitions in literature, offer sufficient reason to intimate that there is no unique or universally accepted definition for this expression. In the social sciences this is quite common. For instance, the term “paradigm” was used no less than 21 different ways by Thomas Kuhn, the man responsible for creating collective awareness of its expression; however in support of such ambiguity, Guba argued that “having the term not cast in stone is intellectually useful”, as it gives us room to reshape definitions according to improvements in our understanding of its implications (Guba, 1990, p.17). Resonating such arguments, Alavi and Leidner (2001, p. 107) describe knowledge as a “broad and abstract notion that has defined epistemological debate in western philosophy since the classical Greek era”. Review of extant literature allows us to infer that, despair of knowing what knowledge is, is common across most philosophies.

There has always been, and there still is in current times, a lack of consensus about the definition of knowledge among scholars (R. Williams, 2008). However; the study extracted from extant literature, and listed in Table 2.1 the more commonly referred to definitions to appreciate the extent of ambiguity and divergence.

Table 2.1: Common definitions of knowledge in literature

Source	Definition
(Nonaka, 1994, p. 15)	Justified true belief (definition attributed to Plato in <i>Meno</i> , <i>Phaedo</i> , and <i>Theaetetus</i> )
(Baker, Barker, Thorne, & Dutnell, 1997, p. 65)	Knowledge = Information + [Skills + Experience + Personal Capability].
(Davenport & Prusak, 2000, p.5)	Knowledge is a fluid mix of framed experience, values, contextual information, and expert insights that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms.
(Bender & Fish, 2000, p. 126)	Knowledge originates in the head of an individual and builds on information that is transformed and enriched by personal experience, beliefs and values with decision and action-relevant meaning. It is information interpreted by the individual and applied to the purpose for which it is needed. The knowledge formed by an individual will differ from another person receiving the same information. Knowledge is the mental state of ideas, facts, concepts, data and techniques, recorded in an individual's memory.

Most current research, debates and thoughts on knowledge are influenced predominantly by the western world and these influences are highly visible in comparison against philosophies from the eastern world. Epistemology originating from the east largely grounded on transcendental knowledge and wisdom, although given scant attention by western philosophers for a long time, explain some of the hitherto unexplainable or at times contentious issues around the concept of knowledge. However the lack of empirical evidence and coherent reasoning had not done any favours to the eastern view of knowledge, especially when it is seen through the science driven western lens. While the concept of knowledge will be grounded along western ideas in this study, due consideration was given to thoughts originating from the east in order to have a more balanced understanding of the subject.

Plato's influential view that knowledge is justified true belief (JTB) had for a long time been accepted and cited in many scholarly works (Cox, 2007) including that of *Descartes* (Russell, 2000). This definition gained acceptance and had dominated western philosophy (Nonaka & Takeuchi, 1995); however, questions about JTB gained momentum from the time Gettier adduced counter examples, and raised pertinent questions which exposed fundamental flaws (Gettier, 1963). He raised two main points: (i) the knowledge, that the knower believes is true, may in fact be false, and (ii) for a proposition P (knowledge) that S (knower) justifiably believes, "and P entails Q, and S deduces Q from P and accepts Q as a result of this deduction, then S is justified in believing Q" (Gettier, 1963, p.121). For the sake of brevity, the study will not explore Gettier's counter examples; however, it may be interesting to note that aside from raising doubt about JTB, Gettier did not offer any solution or counter definition. He even attempted to substitute Chisholm and Ayer's (cited in Gettier, 1963) conditions about knowledge to falsify them, which was unnecessary. These approaches to knowledge have a positivist orientation in that they had reduced knowledge into an object instead of it being what this study understands it to be: complex, dynamic, and amorphous. This study also suggests that these definitions are in violation of the concept of tacit knowledge, which has been underpinning oriental philosophical thoughts.

Another knowledge definition of note is Davenport and Prusak's (please refer to Table 2.1) for the definition), which has been cited extensively in peer-reviewed journals from the period 1998 to 2007 (Ma & Yu, 2010). Davenport and Prusak recognised that knowledge is fluid, meaning it is formless, which is far removed from the idea that knowledge is an

object. The 'mix' denotes that knowledge is multi-dimensional; however the use of term 'framed' in "... mix of framed experience ...", conveyed concreteness, which defies that concept of tacit knowledge. Davenport and Prusak acknowledged that knowledge "originates and is applied in the minds of knowers". The part of application is acceptable; however the origin of knowledge in this definition is contentious, more so from the non-Western epistemological viewpoint. For example: In Islam, all knowledge originates from God and is laid out in the Holy *Qur'ān*. Others have a very high acceptance of transcendental knowledge. The nature of such knowledge precludes any definitive attributions including its origin. Davenport and Prusak's definition of knowledge is wanting in many aspects. First, it is vague and verbose. Next, it attempts to be definitive about an abstract concept. It also superficially describes how knowledge in organisations exists.

Review of literature, in and around the concept of knowledge, suggests that:

- a) most literary contributions that have methodically treated the concept of knowledge originate from the West: predominantly those from Europe (the ancient Greek literature onward) and North America (since the 1990's);
- b) knowledge is explained largely from the rationalist and empiricist view point in most literature, which suggests that the concept is approached from the scientific viewpoint. Limited attention has been given to transcendental knowledge, which alludes that knowledge may precede experience;

- c) researchers, in general and of late, have avoided defining knowledge. Most either adopted extant definitions, or described knowledge in general, and stopped short of committing a definition.

Decisions are, in general, underpinned by knowledge (R. M. Grant, 1996b). Although at the point of decision making, the decision maker may not be inclined to feel that there is complete knowledge; decisions are made on the belief of some knowledge of the outcome (Cannon & Kmietowicz, 1974). Where decisions relate primarily to cognition, actions relate to the physical. Knowledge has been touted regularly by scholars (Alavi & Leidner, 2001; Nonaka & Takeuchi, 1995) and practitioners (Buckman, 2004) as the capacity for action. This study supports that decisions underpin action, although not all the time as in the case of action that is routine or perfunctory. The study will not pretend to define knowledge, a concept which arguably cannot be generally defined conclusively; furthermore it is not a determinant factor underpinning this research.

In this study, knowledge is described as a combination of one or more of the following:-

- a) is a source of understanding of things in and around us (Neta, 2011). Such understanding may or may not lead to action, and may not originate solely from experience;
- b) is the capacity for action (Alavi & Leidner, 2001; Nonaka, 1994); however, this study is not suggesting that what constitutes knowledge should be judged against the effectiveness and efficiency of the action. It has to be viewed within the context in which the action is taken;

- c) supports the rational decision making process (Cannon & Kmietowicz, 1974; R. M. Grant, 1996b; Mitchell, Shepherd, & Sharfman, 2011).

### **2.2.3. Tacit Knowledge**

Knowledge has been broadly categorised as explicit or tacit (Davenport & Prusak, 2000; Nonaka & Krogh, 2009; Reychav & Weisberg, 2010). Explicit knowledge is typically embedded in organisational systems and processes and is highly visible in all kinds of documents and databases (Kreiner, 2002). Conversely, tacit knowledge is embedded in the minds of people and requires the active and willing participation of the individual to be shared (Davenport & Prusak, 2000; Nonaka & Takeuchi, 1995).

The introduction of the concept of tacit knowledge, in KM literature, is often attributed to Polanyi (e.g. Davenport & Prusak, 2000; Nonaka, 1994; Nonaka & Takeuchi, 1995; Ryan & O'Connor, 2009; R. Williams, 2006); however our review of extant literature allows us to challenge this notion. For example the personal construct theory (G. A. Kelly, 1955) which holds that people develop constructs in their minds about their perception of things has profound resonance to the concept of tacit knowledge. Kelly's scholarly works in this area were published just before Polanyi's. *Kant's* view on *a priori* knowledge is another example of the concept of tacit knowledge, pre-dating Polanyi. Regressing further, the concept of tacit knowledge is congruent with views about transcendental knowledge in ancient Eastern religious and philosophical literatures like, the *Vedas* and *Upanishads*, *Daoism* and *Confucianism*, and the Holy *Qur'ān*. The argument here is that, while the concept of tacit knowledge has received increase attention in recent times, it is not new and

should not be confused as a novel discovery by Polanyi. Various contemporary factors have amplified the need to manage and leverage on tacit knowledge in organisations.

Tacit knowledge is a broad term which describes knowledge that resides in the minds of individuals. Such knowledge may exist in various dimensions, like: (i) yet to be codified knowledge which may be articulated easily, (ii) knowledge which cannot be codified but which can be explicated with some effort, like swimming, cycling, and negotiation skills, and (iii) knowledge which cannot be adequately shared, for example, highly personal experiences like the intensity of pain, feeling of euphoria, and intuition.

Some authors interchangeably use the terms, tacit knowledge and implicit knowledge, to mean the same thing (e.g. Nonaka & Krogh, 2009), and in contrast some describe implicit knowledge as knowledge which can be articulated but yet to be (e.g. Baumard cited in Ryan & O'Connor, 2009). In this study, tacit knowledge describes knowledge embedded in the minds of individuals, irrespective of its degree of explicability.

Authors have suggested that it is only for illustration purposes that there exists a distinction between explicit and tacit knowledge. Nonaka & Krogh (2009) posited that although by description they may appear as different entities, they are in effect inseparable. Tsoukas (1996, p. 14) contended that there cannot be a clear distinction between tacit and explicit knowledge, as such taxonomies must be “discrete, separate, and stable”, which he suggested they are not in this instance. While this is not in contention, tacit and explicit knowledge sharing activities and practices have discernible differences and if this is not



recognised in research, then the risk of confounding the research is real. Nonaka & Konno (1998) suggested that explicit knowledge is more easily extracted and measured than tacit knowledge. Haldin-Herrgard (2000) postulated that tacit knowledge cannot be shared the same way as explicit knowledge as different methods are used.

#### **2.2.4. Tacit knowledge sharing**

Knowledge sharing is widely recognised as value enhancing (Cabrera & Cabrera, 2002). In other words, as knowledge is shared it is often subject to modification and amplification which increases its value. Furthermore, knowledge sharing will not reduce or remove its value from the source, which is the knowledge sharer.

Knowledge sharing among individuals in an organisation, in general, improves its competitiveness (Alavi & Leidner, 2001; Davenport & Prusak, 2000; Nonaka & Takeuchi, 1995); however, in contrast, unwillingness to share knowledge is often cited as unethical behaviour (C.-P. Lin, 2007).

The concept of tacit knowledge sharing, the primary focus of this study, is multi-dimensional and multi-disciplinary. Sharing tacit knowledge requires the active and willing participation of the individual (Davenport & Prusak, 2000; Nonaka & Takeuchi, 1995). In order to share tacit knowledge, the individual must first be conscious of such knowledge and be able to communicate effectively (Haldin-Herrgard, 2000). Unless consciousness is kindled, such knowledge may be recessed indefinitely.

### **2.2.5. Theories explaining tacit knowledge sharing behaviour**

A considerable body of research had investigated the role of cognitive factors in predicting human behaviour in the social context. Theories and concepts such as, the theory of reasoned action (TRA; Fishbein & Ajzen, 1975), theory of planned behaviour (TPB; Ajzen, 1991), social identity theory (Ashforth & Mael, 1989; Tajfel, 1970), self-efficacy theory (Bandura & Adams, 1977), and groupthink (Janis, 1972), offer some insights into the extent of scientific inquiry in the study of human behaviour. General conjectures are poor predictors of behaviour (Ajzen, 1991); robust, reliable and empirically grounded predictive theories, are highly desirable for a study about human intentions and behaviour. The TPB has been empirically validated in this respect (e.g. Ajzen, Brown, & Carvajal, 2004; Armitage & Conner, 2001; Cooke & French, 2008).

The TPB holds that intentions, predicated on the attitude toward behaviour, subjective norms, and perceived behavioural control (PBC), is a good predictor of behaviour (Ajzen, 1991). Attitude toward the behaviour refers to how an individual feels about performing the behaviour. Subjective norm refers to the perception of social pressure to execute or not to execute the behaviour. PBC is predominantly about the perception of the individual on his or her ability to accomplish the behaviour (Ajzen, 1991). The author, citing theories from other scholars, contends that behaviour is predicated on peoples' confidence in actualising the behaviour. Ajzen eloquently established caveats on TPB predictive validity, in that: (i) the context in which intention and behaviour is to be measure should correspond. For example, if the behaviour to be predicted is "sharing tacit knowledge", then we must evaluate intentions "to share tacit knowledge", and not intentions "to share knowledge in

general”, or intentions “to improve organisational performance”; (ii) the stability of intentions and PBC must remain during the course of their assessment and observation. Intentions and PBC may be influenced by interceding events, resulting in an effect on the original measures of these variables, and rendering them untenable; (iii) the accuracy of PBC. PBC should realistically reflect actual control. PBC is primarily about the perception of the individual about his or her ability to accomplish the behaviour (Ajzen, 1991); which this study contextualised as the degree in which the individual feels empowered toward the behaviour.

The constructs in the TPB have been extensively investigated and validated by a host of researchers (e.g. Ajzen et al., 2004; Armitage & Conner, 2001; Bock et al., 2005; Cooke & French, 2008; Martin et al., 2010; Richetin, Conner, & Perugini, 2011; Rise, Sheeran, & Hukkelberg, 2010). Sheppard, Hartwick & Warshaw (1988) examined 45 studies, published in top-tier journals, and found that there was sufficient evidence to show that intentions predict behaviour. Similarly, Armitage and Conner (2001) in a meta-analysis of 185 independent studies of TPB reported that there was sufficient evidence to indicate that the TPB is able to predict intentions and behaviour, satisfactorily.

The main area of investigation in this study is, the behaviour of knowledge workers in sharing tacit knowledge, which will be investigated using the TPB. The reasons include: (i) the validity, reliability, and the general acceptance of the theory in empirical research (Armitage & Conner, 2001; Sheppard, Hartwick, & Warshaw, 1988); (ii) barring extraordinary situations and events, the study does not foresee instability that will influence

intentions and PBC significantly during the course of the study. This is to address one of Ajzen's cautions about the use of the TPB; and (iii) tacit knowledge sharing behaviour is largely under the control of the individual; which is in line with requirement related to PBC.

➤ **Organisation**

Tacit knowledge is highly personal, however this study is predicated on examining factors which will influence tacit knowledge sharing behaviour in an organisational setting. Admittedly, while the unit of analysis in this research remains at the individual level; the selected factors are largely at the organisational level. Therefore this study will also examine and synthesise relevant theories and concepts related to the organisation.

**2.2.6. Resource-based view**

In the field of strategic management, there has been increased interest in identifying and understanding sources of sustained competitive advantage (Castanias & Helfat, 1991; Porter, 2004). In this quest, resource was identified as one of the most important source. This came to be known as the RBV of firms (Barney, 1991; Conner, 1991; R. M. Grant, 1991; Wernerfelt, 1984). The RBV holds that an organisation is a collection of resources (Barney, 1991; R. M. Grant, 1996b; Wernerfelt, 1984) and focuses on costly-to-copy attributes of the firm as sources of economic rents (Conner, 1991). The RBV "suggests that sources of sustained competitive advantage are firm resources that are valuable, rare, imperfectly imitable, and non-substitutable" (Barney, 1991, p. 116). Although the roots of the RBV can be traced back to previous research (Penrose, 1959; Wernerfelt, 1984),

management practitioners only became aware of the argument in the early 1990s (Wernerfelt, 1995) and is commonly associated with the works of Barney (1991), Conner (1991), Grant (1991), Mahoney & Pandian (1992), and Peteraf (1993). They postulated that resources are the fundamental drivers of the firm's performance and competitive advantage; however Grant (1996a) argues that resources themselves do not account for sustained competitive advantage; integrating resources through managerial capabilities does. The RBV is often acknowledged as one of the most cogent (Barney, Ketchen Jr., & Wright, 2011) and influential theories in management literature (Kraaijenbrink, Spender, & Groen, 2010). Furthermore, current literature increasingly refer to the RBV as the resource-based theory (e.g. Barney et al., 2011; Barratt & Oke, 2007; Sirmon, Hitt, Ireland, & Gilbert, 2011) underlining its maturity, acceptance, and relevance.

Current debates in the area of organisational resources have ignited interesting theoretical developments. One of them is the "dynamic resource-based view" (DRBV; Helfat & Peteraf, 2003) of the firm. DRBV, incorporating the concept of dynamic capabilities of firms (Teece, Pisano, & Shuen, 1997), holds that organisational resources do not remain static throughout the capability lifecycle, and that there are evolutionary developments in resources and capabilities over time (Helfat & Peteraf, 2003). Another development that is in recent times of great interest is the impact of human business activities on the environment. The natural-resource-based view (NRBV), postulated by Hart (1995), is gaining increased attention (e.g. Etzion, 2007; Hart & Dowell, 2011; Schoenherr, 2011). The NRBV argues that, although the RBV is logical and a compelling argument, it ignores the dynamics between the organisation and its natural environment (Hart & Dowell, 2011),

and that resources and capabilities that the firm develops in relation to its natural environment is a source of sustained competitive advantage (Barney et al., 2011). Organisational resources are complex, interdependent, and are primarily skills and capabilities that are tacit knowledge (Barney, 1991; Helfat & Peteraf, 2003; Toms, 2010). These arguments enhance the view that tacit knowledge is very important for organisations to sustain competitive advantage.

### **2.2.7. Knowledge-based view**

The KBV, an outgrowth of the RBV (R. M. Grant, 1996b), is fundamentally grounded on the premise that among all organisational resources, knowledge is the key differentiator, and is crucial for firms to sustain competitive advantage (Fransson, Hakanson, & Liesch, 2011; R. M. Grant, 1996b; Reus, Ranft, Lamont, & Adams, 2009; Spender, 1996). The KBV has been widely recognised and has had the support of a large number of scholars (e.g. Barney et al., 2011; Davenport & Prusak, 2000; R. M. Grant, 1996b; Makadok, 2011; Meyer, Wright, & Pruthi, 2009; Schoenherr, 2011). Proponents of the KBV argue that the major determinants of sustained competitive advantage and superior corporate performance of firms are because of the knowledge-based resources which are usually difficult to imitate.

### **2.2.8. Organisational factors**

#### **i. Leadership behaviour**

Leadership is often touted as a critical variable in defining the success and failure of organisations (Schein, 2004). “Leadership is that process in which one person sets the

purpose or direction for one or more other persons, and gets them to move along together with him or her and with each other in that direction with competence and full commitment” (Jaques & Clement, 1994, p. 4). Leadership as a distinct phenomenon has been a subject of much controversy among theorists (Yukl, 1989); however there is increasing recognition that leadership is a social influence process (Wood, Lundgren, Ouellette, Busceme, & Blackstone, 1994; Yaffe & Kark, 2011). Research demonstrates that leadership is one of the most important factors to determine organisational learning and creativity (Berson, Nemanich, Waldman, Galvin, & Keller, 2006; Hannah & Lester, 2009), and the behaviour of leaders has a significant influence on the behaviour of subordinates (Z. Li, Zhu, & Wang, 2010; Yukl, 2008). Notwithstanding the many schools of thought on leadership, like: charismatic and transformational leadership style (Conger, 1999), trait theory (Zaccaro, 2007), contingency theory (Kriger & Seng, 2005), and situational leadership theory (G. Thompson & Vecchio, 2009); this study selected the leadership behaviour approach (Yukl, 2008) as it more relevant to the complexities surrounding tacit knowledge sharing.

From among the many leadership behaviour descriptions, Yukl (2008) identified three, that is, task-oriented, relations-oriented, and change-oriented leadership behaviour, which the author argued, have implications for organisational effectiveness. Task-oriented leadership behaviour is effective for improving efficiency, relations-oriented leadership behaviour improves subordinate relations, and change-oriented behaviours is suited for transformation related activities (Yukl, 2008). Task-oriented behaviours are in essence managerial activities that include short-term planning, work activity scheduling, ascertaining resource

and staffing requirements, tasks allocation, organising, supervising, directing and coordinating organisational activities, effective communication of organisational objectives to subordinates, and the handling of operational matters (Yukl, 2008).

Relations-oriented leadership behaviours manifest often in displaying support and often motivate the subordinate. Performance recognition, leader-subordinate consultative decision making, and a collaborative work environment, are some of the hallmarks of the relations-oriented leadership behaviour (Yukl, 2008). Change-oriented leadership behaviour, while important for organisational effectiveness, is not a major concern of this study as organisational transformation is not being examined. Instead the study will focus on leadership by example (Yaffe & Kark, 2011), which has greater relevance to this study. This is termed, example-oriented leadership behaviour, in this study.

Most leadership theories recognise that leading by example or role modelling is an important follower-behaviour shaping factor (Yaffe & Kark, 2011). Leading by example in the context of this research means that the leader visibly engages in tacit knowledge sharing behaviour in order to influence the behaviour of subordinates to follow in tandem. In a recent study, Yaffe & Kark (2011) provided evidence that leading by example promotes group behaviours. Anecdotal evidence of the impact of role modelling in knowledge sharing can be found in literature about organisations, like Buckman Laboratories (Buckman, 2004). Robert H. Buckman, the chief executive officer embraced knowledge management and developed a knowledge sharing culture in the organisation, largely by



setting examples. He was reputed to increase his firm's revenue during his tenure as leader of the organisation.

Organisations are highly complex and dynamic (Lawrence, Lenk, & Quinn, 2009), and in this respect, leaders are increasingly expected to be behaviourally complex (Denison et al., 1995). This means that leaders will have to change their behaviour, depending on the situation and demands, to be effective.

Sharing tacit knowledge requires the active participation of the individual (Davenport & Prusak, 2000; Nonaka & Takeuchi, 1995), and furthermore, people cannot be coerced into sharing such knowledge (Janowicz-Panjaitan & Noorderhaven, 2009). Alwis & Hartmann (2008) posited that the behaviour of leaders and their power to reward are success factors in tacit knowledge sharing. Kulkarni et al. (2007) also argued that although KM is complex, commitment and leadership by example, will encourage knowledge sharing behaviour in organisations. The study posits that leadership behaviour in motivating individuals to share such hidden knowledge would be very important, as leaders create and articulate shared norms, amplify the importance of activities which benefit the organisation and its employees, have the power to recognise and reward, provide direction, among the many other tasks which they perform.

A number of prior empirical research has shown that leadership behaviour has a strong influence on the behaviour of followers in the organisation (e.g. Z. Li et al., 2010; Walumbwa, Wang, Wang, Schaubroeck, & Avolio, 2010; H. Wang, Tsui, & Xin, 2011;

Yaffe & Kark, 2011); however there is a dearth of such literature that had examined the influence of leadership behaviour on organisational tacit knowledge sharing behaviour. In a study, Yaffe & Kark (2011) analysed group member beliefs about the leader using confirmatory factor analysis. The data-model fit was good and the study tested and confirmed that follower belief of a worthy role model leader enhances group organisational citizenship behaviour (OCB), and concluded that leading by example promotes group-level behaviours in the organisation. This study fundamentally differs from that of Yaffe & Kark. There are stark contrasts in the research purpose, objectives and methodology, and to underscore this point, where this study examines the influence of leadership behaviour on the intention to share tacit knowledge, Yaffe & Kark investigated leadership OCB and its effect on group OCB.

In another study, Wang, et al. (2011) examined the impact of CEO leadership behaviours and employees' attitudes in 125 firms in China. The study found that CEO relationship focused leadership behaviour strongly influenced employee's attitudes. Although Wang, et al. (2011) did examine CEO task-focused leadership behaviour on firm performance, they did not investigate its impact on employee behaviour. This study will address this gap as task-oriented leadership is important for ensuring systematic and methodical implementation of tacit knowledge sharing activities.

In a study on the influence of leadership behaviour on tacit knowledge sharing behaviour, Z. Li et al. (2010) examined selected influencing factors, of which authorised leadership was one of the factors, on the intention to share tacit knowledge in a university research

team. Authorised leadership was defined as “a leadership style to mobilise and motivate team members to carry on research work by authorising power” (Z. Li et al., 2010, p. 540). Their study however was not able to reject the null hypothesis, which this study suggests is not surprising. As explained above in this section, leadership behaviour is complex and dynamic. Examining just one facet of leadership behaviour may not provide sufficient breadth to capture effect variations. This study differs from that of Z. Li et al. (2010), in at least the following areas: (i) it will address the weakness of their leadership construct by examining diverse leadership behaviours which will influence tacit knowledge sharing behaviour; (ii) it will examine other important factors which Z. Li et al. (2010) did not investigate, like: knowledge networks, and also resource at a more disaggregated level; and (iii) the sampling methodology.

In summary, while there are limited studies which had examined the role of leadership in knowledge management (e.g. Politis, 2001; Srivastava, Bartol, & Locke, 2006; Viitala, 2004) and leadership in the context of tacit knowledge sharing (e.g. Janson & McQueen, 2007; Z. Li et al., 2010; Ribiere & Sitar, 2003; Singh, 2008), there is a dearth of empirical research which had examined leadership behaviour at the degree of granularity this study will investigate.

## **ii. Knowledge networks**

The structure of an organisation is created or changed in order to achieve certain rational organizational object and this process is termed organisational design (Bolman & Deal, 2008). Most planned structures are formal (Krackhardt & Stern, 1988); however there is

increased recognition of the informal network and its importance in organisations (Borgatti & Foster, 2003; Cross, Parker, & Sasson, 2003; Lazer & Friedman, 2007; McDermott & Archibald, 2010). Informal networks arise spontaneously based on personal relationships that may be generated anywhere within organisations (Selznick, 1943). The concept of connections among a group of people in organisations was introduced by Moreno in 1934 (Cross, Parker, & Sasson, 2003; Rivera, Soderstrom, & Uzzi, 2010). Since then, substantial theoretical contributions have been made to the social network theory by scholars and its influence has transcended scholastic-discipline boundaries (Guimera, Uzzi, Spiro, & Amral, 2005; Rivera et al., 2010).

The social network theory, has resonance with other social theories, such as, the social identity theory (SIT; Tajfel, 1974), that explains the individual's need to belong to social groups, and the social exchange theory (SET; Homans, 1958), which holds that people, in general, develop relationships with others in anticipation of reciprocal exchanges (Tekleab & Chaburu, 2011). Tajfel postulated that SIT is composed of four elements: (i) categorisation – where people often label others, and themselves, into categories, for example, race, religion, social status; (ii) identification – association with certain groups which serves to bolster self-esteem; (iii) comparison – people compare groups that they belong to against other groups and usually see a favourable bias toward the group that they belong to; and, (iv) psychological distinctiveness – the desire to be positively distinct from other groups. Thibaut & Kelley (1959) further developed SET and suggested that people engage in the social exchange process for reasons such as: anticipated reciprocity, expected

gain in reputation and influence on others, altruism and perception of efficacy, and direct reward.

Networks develop and evolve in organisations for various sociological reasons. Rivera et al. (2010, pp. 92-93) postulated that these reasons largely stem from: (i) the assortative perspectives, that is the individual's innate need to seek out others who are compatible and can complement them; (ii) the relational perspectives, that is based on the belief that, relationship with others is developed on introductions, information, and the perception of trust and reciprocity, emanating from those in the individuals social network; and, (iii) the proximity perspective, that largely deals with "social interactions in time and space". Although Rivera et al. (2010) made no mention of the works of Homans (SET) and Tajfel (SIT) in their article, there were obvious overlaps.

While the social network theory holds that ties hold people together, Granovetter (1973) studied the degree of information exchange and argued that ties can be either weak or strong between nodes, and that weak ties have greater strength than strong ties in information exchange. Granovetter's argument is a paradox: the central proposition is that weak ties are seen as indispensable to an individual's opportunities and to their integration into communities; and on the contrary, strong ties, breeding local cohesion, lead to overall fragmentation.

Social networks may form for diverse reasons and contexts; for example, they may be professional-discipline-based, project-based (Liben-Nowell & Kleinberg, 2007), cultures

experimenting new technologies (Lazer & Friedman, 2007), health related (K. P. Smith & Christakis, 2008), or myriad others. While the concept of social networks in organisations has been examined largely in a generic context in most extant literature, its relevance to knowledge management in general, and tacit knowledge sharing specifically, is of particular interest in this research.

In the area of knowledge management, the topic of social capital has generated considerable interest (McElroy, Jorna, & Engelen, 2006). The knowledge network (Cowan & Jonard, 2009; Liebowitz, 2005; Nirmala & Vemuri, 2009), an outgrowth from the concept of social network, has been subject to increased attention in recent years (Schonstrom, 2005). Hansen (2002, p. 232) eloquently described the importance of knowledge networks in knowledge sharing by submitting that “knowledge networks explain why some business units are able to benefit from knowledge residing in other parts of the company while others are not”.

Cross, Parker, Prusak & Borgatti (2003, p. 208) posited that “a significant component of a person’s information environment consists of the relationships he or she can tap for various informational needs”. To underscore this point, they cite a summary of Tom Allen’s (of Massachusetts Institute of Technology) decade long studies which found that “engineers and scientists were roughly five times more likely to turn to a person for information than to an impersonal source such as a database or a file cabinet”. This finding has resonance to this study’s argument that knowledge networks are important tacit knowledge sharing enablers.

Although there is support for Granovetter's proposition about the strength-of-weak-ties (e.g. Baer, 2010), in the area of knowledge sharing, Hansen (1999) contended that while weak ties may facilitate search, they may be a barrier to knowledge sharing, especially the sharing of complex tacit knowledge. Hansen contended that trust is important in tacit knowledge sharing within a knowledge network. Similarly, other studies have supported this view by showing that higher levels of trust manifest in stronger ties (e.g. Holste & Fields, 2010; Rost, 2011).

In his study of new product development projects, Hansen (2002) found that project teams with a high degree of closeness-centrality completed their projects faster when they had access to other units that possessed related knowledge. Although Hansen's findings supported the importance of networks in knowledge sharing in organisations, project teams are largely formal units, and do not necessarily explain knowledge sharing in the informal social context. In this study, knowledge networks will be examined in the context of an informal organisation and underpinned by the social network theory.

In a recent study, He, Qiao, & Wei (2009) examined KM systems (KMS) usage in a social relationship context using a case study approach on a retail chemical company in China. The study found significant evidence of social relationships on KMS usage. Although the study had its merits, the findings were not generalisable as it was a case study of one firm in one country. Furthermore their study examined KMS usage using a KMS tool, which subjected the study to methods bias. This study is not similar to that of He et al.'s in a

number of areas, including: the purpose, theoretical framework, and research design and methodology.

The importance of knowledge networks in organisations has not been given the attention it deserves. Tacit knowledge sharing takes place largely within the informal network (Alwis & Hartmann, 2008). Practitioners, in general, are unaware of the enormous value that can be extracted from systematically stimulating knowledge networks in the organisation (Cross, Parker, & Sasson, 2003). The problem may largely be awareness. This research will examine the importance of knowledge networks in tacit knowledge sharing.

### **iii. Resources**

As organisations need resources to operate and leverage to sustain competitive advantage, individuals, similarly rely on resources to perform their jobs. At the individual level, resources influence employees' job performance (Schaufeli, Bakker, & Rhenen, 2009). Resources, in relation to individuals, may be tangible or intangible (Mårtensson, 2000). In the context of tacit knowledge sharing, some examples of, tangible resources are: information technology (Venkatesh, Brown, Maruping, & Bala, 2008; Yousafzai, Foxall, & Pallister, 2010), and office space (Steiner, 2005). Examples of intangible resources, include: money, skills, time, cooperation of other people (Ajzen & Madden, 1986), autonomy, social support, opportunities to learn, feedback (Schaufeli et al., 2009), coaching, and team climate (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009).



Tacit knowledge sharing is not a traditional, and in general a formalised, organisational activity (Bollinger & Smith, 2001; Kreiner, 2002). Resources that were considered sufficient for job performance may not be sufficient for tacit knowledge sharing. Empirical research suggests that practitioners have to be cognisant of the need for new, additional, enhanced, and adequate resources, to encourage tacit knowledge sharing. For example, Goffin & Koners (2011) suggested that in mentoring, metaphors and stories are powerful tacit knowledge sharing tools. Z. Li et al. (2010) found that adequate basic material resources, like time, space and technical support, encourage tacit knowledge sharing; Kulkarni, et al. (2007) suggested access to subject matter experts, and Grace (2009) postulated making available and accentuating the use of technology.

Limited studies had investigated the influence of resources on tacit knowledge sharing behaviour in organisations, and among them, Z. Li et al. (2010) examined the influence of a number of factors, like: need satisfaction, authorised leadership, resource adequacy, altruism, and a few others; on intention to share tacit knowledge in a university research team. Resource in their study was a composite construct, which means that there was no differentiation between tangible and intangible resources. Mårtensson (2000) postulated that there is logical requirement for differentiation between tangible and intangible resources; which is resonated in this study. Furthermore, the research purpose, theoretical framework, and research design and methodology, of this study are far removed from that of Z. Li et al.

### **2.2.9. Moderating factors**

Aside from the organisational factors which will be examined in this study which were explained in the section above, the study will also examine the moderating effects of the following on the relationship between the organisational factors and knowledge workers tacit knowledge sharing intention and behaviour:-

#### **i. Gender**

Studies had demonstrated that gender differences exist in the workplace. For example Roth, Purvis, and Bobko (2012) observed that women scored marginally higher than men in job performance measures. Similarly other studies had examined gender differences and reported variations in communal inclinations (Eagly & Steffen, 1986), guilt (Else-Quest, Allison, Higgins, & Morton, 2012), knowledge sharing (Lin, 2006), and leadership (Eagly, Karau, & Makhijani, 1995). There is no empirical research, to the best of the knowledge of the author of this thesis, which had examined the moderating effect of gender on knowledge workers tacit knowledge sharing behaviour. This study will address this gap.

#### **ii. Organisational culture**

The argument, or assumption, that organisational performance is intricately intertwined to certain organisational cultures has been the subject of the interest of many researchers and practitioners (e.g. Cameron & Quinn, 2006; Denison, 1990; Hartnell, Ou, & Kinicki, 2011; Schein, 2004; Tseng, 2010). Scholars and practitioners have taken numerous approaches and employed various terminologies on culture (A. B. Cohen, 2009; Triandis, 1996), however; it would be necessary to avoid superficial treatment and take-for-granted, this

very important organisational factor (Cameron & Quinn, 2006; Schein, 2004). Early literature on organisations and culture focused on the impact of society's culture on organisations, and not on the cultural properties of the organisation itself. The notion that organisations, as such, have cultures of their own began in the 1970s and only gained traction in the 1980s (Cameron & Quinn, 2006). They also postulated that organisational culture is difficult to understand and is often ignored in management strategies and decision making.

Understanding and diagnosing culture, especially organisation culture, has been the subject of much debate. Various theories and tools have been presented by scholars (Cameron & Quinn, 2006; Denison, 1990; Schein, 2004) and among them, is the Competing Values Framework (CVF; Quinn & Rohrbaugh, 1983), which has been widely used in research in organisational culture (e.g. Hartnell et al., 2011; Román-Velázquez, 2005; Tseng, 2010; Zu, Robbins, & Fredendall, 2010). The fundamental premise of CVF is that organisation culture can be diagnosed coherently and classified as any one or a combination of four culture types, that is: Clan, Adhocracy, Market and Hierarchy.

Clan culture organisation is a friendly place to work where people share a lot about themselves. Typical characteristics of an organisation with a dominant clan culture orientation are; teamwork, employee involvement programmes, high employee commitment to organisation and co-workers, and high corporate commitment to employee.

Adhocracy culture organisations are typically characterised by a dynamic, entrepreneurial and creative workplace. Employees are empowered and risks taking encouraged. Effective leadership is visionary, innovative and risk-oriented. The core values that employees in organisations with an adhocracy culture have are; innovation and change, new ideas, visionary thinking and trying new concepts (Román-Velázquez, 2005).

The major focus of organisations with a market culture type is to conduct transactions with other stakeholders to create competitive advantage. Competiveness and productivity basically form the foundation of market culture driven organisations. Winning is everything in a market culture type organisation (Cameron & Quinn, 2006).

The hierarchy culture organisations are, in general, characterised by formalised and multiple hierarchical structures. Standardised procedures govern people's actions and there is minimal or no discretionary powers vested in employees. Emphasis is on rule reinforcement and the long term concerns of the organisation are stability and predictability. The hierarchy culture nurtures the use of standard operating procedures and best practices, and has multiple layers of vertical (position) and horizontal (work units) silos operating relatively in isolation.

Prior studies have shown that organisational culture influences knowledge sharing activities (e.g. Al-Alawi, Al-Marzooqi, & Mohammed, 2007; Barachini, 2009; McDermott & O'Dell, 2001; Rivera-Vazquez, Ortiz-Fournier, & Flores, 2009; Román-Velázquez, 2005; Roman,

Ribiere, & Stankosky, 2004; Suppiah & Sandhu, 2011); however, very few examined the influence of organisational culture on tacit knowledge sharing behaviour.

Al-Alawi et al. (2007) investigated the role of organisational culture on knowledge sharing in public and private sector organisations in Bahrain. Their study concluded that organisational culture is an important factor in knowledge sharing. Although the study found that factors such as, trust, communication, information systems, rewards and organization structure are important for knowledge sharing, they failed to discern between tacit and explicit knowledge sharing. This research differs from that of Al-Alawi et al.'s theoretical framework. Even in the case of organisational culture, this study will employ the CVF, and in contrast Al-Alawi et al. used Gupta and Govindarajan's framework. Although Gupta and Govindarajan purport that their framework is supported by empirical research, there is insufficient evidence of the framework's use in other scholarly research to suggest that it is robust and well accepted. This is in contrast to the CVF which has been validated by empirical research (e.g. Braunscheidel, Suresh, & Boisnier, 2010; Cameron & Quinn, 2006; Hartnell et al., 2011; Prajogo & McDermott, 2011; Román-Velázquez, 2005; Shih & Huang, 2010).

In a study that investigated the success of KM systems, Roman et al. (2004), using CVF and the organisational culture assessment instrument (OCAI), found that organisational culture types have differing influences on KM activities in organisations. Their study conducted in U.S. Government and non-profit organisations examined codification and personalisation knowledge flows. Although their study did not classify them as such, the

codification and personalisation domains aptly represented explicit and tacit knowledge respectively. This study differs from that of Roman et al., in at least the following aspects; (i) the location of the study (Malaysia against the U.S.), (ii) the study will investigate other factors (leadership behaviour, knowledge network and resources) together with controlling variables that Roman et al. did not investigate.

Suppiah & Sandhu (2011) investigated the influence of organisational culture types, using the CVF and OCAI, on tacit knowledge sharing behaviour. However their study only examined one factor, which is: organisational culture, and its influence on tacit knowledge sharing. This study premised organisational culture as a moderator and not a factor which will influence tacit knowledge sharing. Furthermore, one exogenous factor will not adequately explain variations in tacit knowledge sharing, which is a limitation of Suppiah & Sandhu's study. In this study, six exogenous factors were constructed, in the theoretical model.

### **iii. Sector and industry type**

Several studies have shown differences between the public and private sectors in myriad areas (Perry & Rainey, 1988). Among the many such differences are that, the public sector compared to the private sector, has more intangible goals, less incentive for cost reduction, and more dysfunction as a result of bureaucracy (Dahl & Lindblom cited in Perry & Rainey, 1988). Private sector managers often had higher "goal and action" competencies, but in contrast public sector managers did not have clear performance measures (Perry & Rainey, 1988). Lachman (1985, p. 671) postulated that the private and public sector

differences are essentially that of “dissimilar tasks and business purposes”. Profit largely defines the private sector, and in contrast the public sector is largely concerned with non-profit and regulatory services. Fottler (1981) took a process approach to define the differences. The author posited that planning, organising, directing, and the control process differentiate organisations in the public and private sector.

Prior research had identified the potential of industry type as a moderator in studies in knowledge sharing. For instance, Lin (2007) collected data from nine different industry types and did not examine its effect; however, underlined that future research examine the effect of industry types on knowledge enablers and processes, for tacit knowledge sharing. Other studies had also cited the lack of industry focus in their research as a limitation (e.g. Reychav & Weisberg, 2010).

In contrast, Park and Shaw (2013) could not find evidence that industry type was a moderator, in their study. Perhaps some of these reasons may explain their finding: (i) the study was a meta-analysis, where inconsistencies in sampling and data collection methods in the original data set, cannot be ruled out; and (ii) the study was about employee turnover and organisational performance; however economic cycles in the various industries are likely to have an impact on such turnover, and the study had apparently not factored this in.

This study will examine the moderating effects of sector and industry type in relation to tacit knowledge sharing in organisations and address the gap in literature.

#### **iv. Religiosity**

McCullough and Willoughby (2009) postulated that religion has self-regulation and self-control influence on individuals. Studies have demonstrated that religiosity will positively influence prosocial behaviour in individuals and groups (e.g. Ahmed, 2009; Galen, 2012). Prosocial behaviour generally alludes to the behaviour of individuals which will benefit those whom such behaviour is directed at (Brief & Motowidlo, 1986).

Literature suggests that tacit knowledge is not easily shared because of various barriers., such as, the fear of loss of expert power (D. Leonard & Sensiper, 1998), and lack of trust (Holste & Fields, 2010; C.-P. Lin, 2007). Tacit knowledge sharing is also recognised as volitional behaviour (Janowicz-Panjaitan & Noorderhaven, 2009). Davenport (2005, p. 21) called it an “unnatural act”.

In this study it is postulated that an individual’s propensity to be prosocial, due to the influence of religious belief system, may overcome some of these barriers to tacit knowledge sharing, and will investigate this accordingly.

#### **2.2.10. National culture**

Before concluding this section on literature review, this study will discuss some pertinent areas concerning national culture, which may influence investigations and discussions, in this research. The study suggests that the influence of national culture on individuals may account for variations in behaviour in different cultures.



Two concepts which may have a bearing in this research are: power distance and collectivism (Hofstede, Hofstede, & Minkov, 2010). Power distance refers to individuals' perception of how big a gap there may be in a hierarchy, in terms of power. In other words; in high power distance cultures, the general perception will be that power distribution is unequal between members in a hierarchy, and higher position alludes to more power. In low power distance cultures, in contrast, the perception that power is skewed toward those who are higher-up in the hierarchy, is less pronounced. The concept of collectivism suggests that group-interest will often supersede individual interest (Hofstede et al., 2010).

In the context of tacit knowledge sharing, this study posits that elements such as power distance and individualism-collectivism, will have a bearing on empirical findings.

For example, in high power distance cultures, subordinates expect to be instructed by superiors, and will generally comply; however in low power distance cultures, subordinates expect to be consulted and empowered (Hofstede et al., 2010). In prior sections, we have seen that people do not share tacit knowledge for various reasons. This study suggests that individuals who are reluctant to share tacit knowledge may comply when instructed by their superiors in high power distance cultures, but in contrast, individuals in low power distance cultures may not comply. Similarly, in collectivist cultures, individual interest will often be overshadowed by group-interest (Hofstede et al., 2010). Organisational factors may have greater influence on individual behaviour in a collectivist culture, compared to cultures in which individualism prevails.

A review of extant literature shows that national culture is not often assessed in behavioural studies in tacit knowledge sharing (e.g. Janowicz-Panjaitan & Noorderhaven, 2009; Z. Li et al., 2010; Reychav & Weisberg, 2010; Ryan & O'Connor, 2009; Whyte & Classen, 2012)

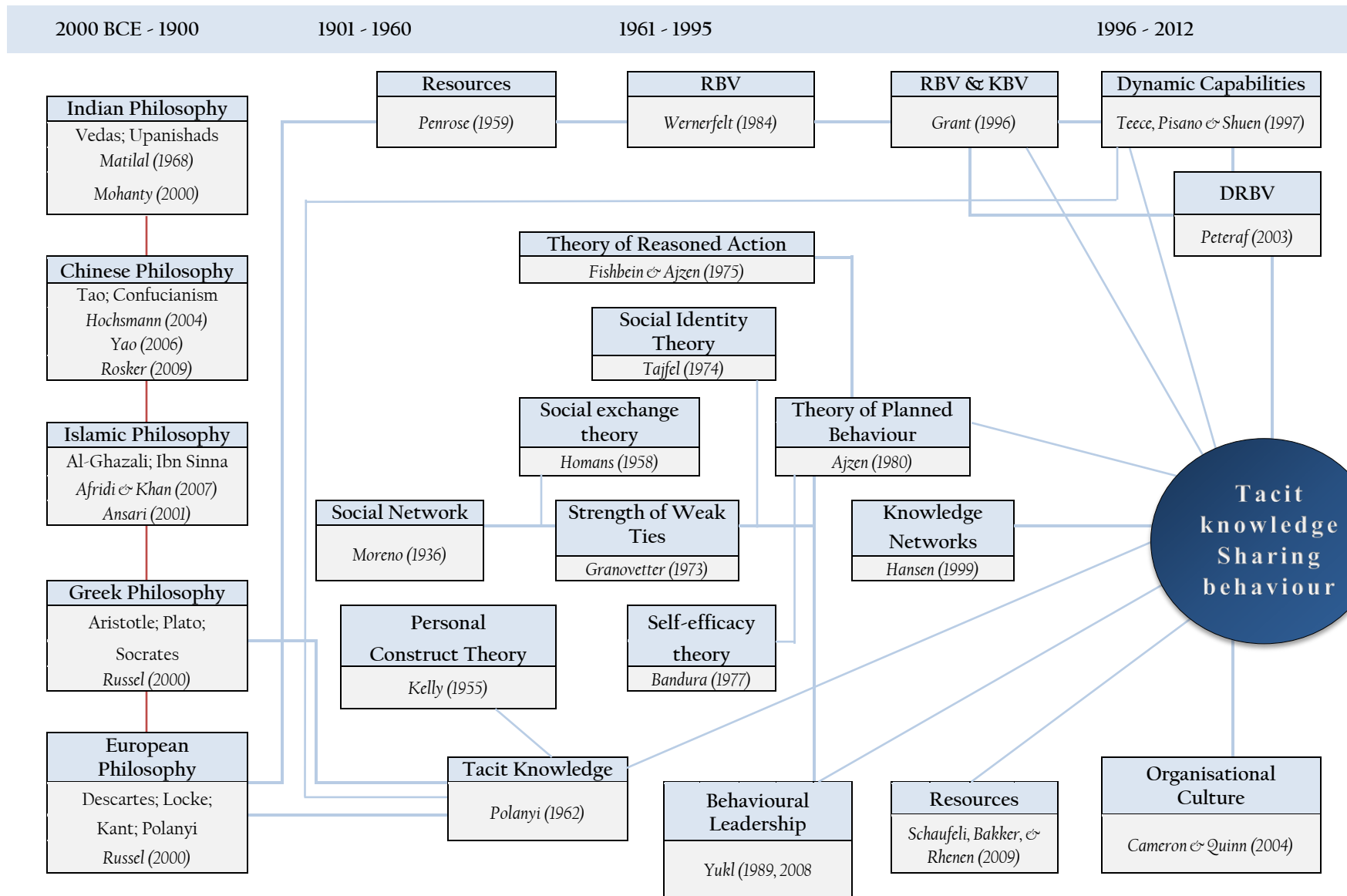
This study suggests that examining empirical results in the context of national culture may provide valuable insights about behavioural differences in tacit knowledge sharing. Aside from this, any contrasting findings from that of other studies, in different cultures, can also be explained, rationally.

### **2.3. Theories: an integrated schema**

The literature review consists of theories selected from a plethora of sources from ancient to contemporary literature. A large segment came from disparate studies, sources, and disciplines. In the course of formulating this research framework, various attributes, factors, and other commonalities which contributed toward the development of an integrated theoretical schema were identified. Figure 2.1 provides an integrated schema that links the various theories from 2000 BCE to more recent theories.

As mentioned in the previous section, the concept of tacit knowledge can be traced back to the various ancient works from the East (Indian, Chinese, and Islamic thoughts) and the West (Greek and other European thoughts).

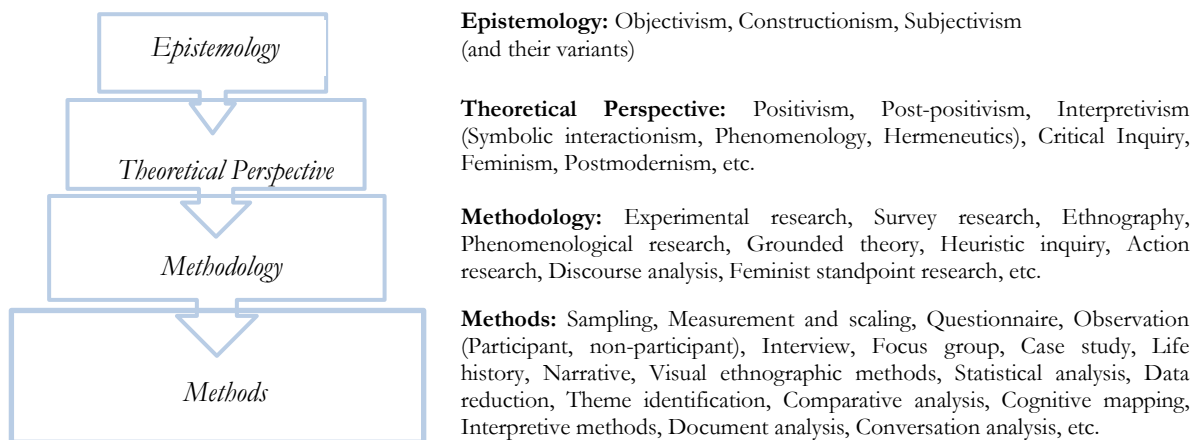
**Figure 2.1: Theories – An integrated schema**



## 2.4. Research philosophy

Crotty (2009) postulated that it is necessary for research to establish its research philosophy at the outset. The author proposed a research paradigm (Figure 2.2), in which there is a cascading relationship between the various dimensions which are hierarchically structured as a hierarchy. This would contribute toward, systematic and methodical knowledge discovery. Crotty's research paradigm suggests that the choice of epistemological direction would impact the theoretical perspectives of the research, which in turn will influence the methodology and subsequently the methods.

Figure 2.2: Research paradigm (Crotty, 2009, p. 5)



### 2.4.1. Epistemology

Epistemology is a branch of philosophy which is frequently referred to as the theory of knowledge. It concerns with the study of the “nature, origin and scope of knowledge” (Moser, 2003, p.197). Over time, developments in thoughts about knowledge have resulted in various approaches to inquiry, and among them the more conspicuous ones are: objectivism, constructionism, and subjectivism (Crotty, 2009). Objectivists hold that reality

exists apart from our consciousness (Crotty, 2009). Effectively it means that in any investigation, the results will be the same in the hands of any competent investigator. The scientific method is often associated with objectivism (Audi, 2003). A view diametrically opposed to objectivism is, constructionism, which holds that truth is constructed according to experience and beliefs. Meaning is predicated on thinking and it “is not discovered but constructed” (Crotty, 2009, p. 8). This school of inquiry, has given rise to, among others, existential phenomenology, which was tagged as “militantly anti-objectivist and thoroughly constructionist” (Crotty, 2009, p. 61). Subjectivism, on the other hand, absolutely relies on the lens in which the subject (knower) creates meaning (White, 2007).

This study’s epistemological foundations are established on objectivism and subjectivism. Objectivism which will inform the methodology and methods, and subjectivism at the point of interpreting the results

#### **2.4.2. Theoretical Perspective**

All modes of inquiry have theoretical underpinnings, whether deliberately determined or otherwise. A decent understanding of the various popular and documented theoretical perspectives is expected to offer a solid foundation in the choice of the methodology and methods, in the pursuit of new knowledge. Perspective essentially is the lens in which something is viewed, and theoretical perspective describes the standpoint in which meaning is created. The western approach to knowledge seeking was largely positivistic during until the early 1900s. Subsequently, to name a few, other perspectives, like interpretivism, critical realism, post-positivism, and postmodernism, emerged (Baert, 2010; Crotty, 2009).

These perspectives were instrumental, to a certain extent, in disambiguating epistemological abstractions.

Positivism, credited largely to the thoughts of *Augustus Comte*, was guided by the premise that knowledge is acquired scientifically through the senses, experience, and indubitable verification (Audi, 2003; Crotty, 2009; Seidman, 2008). Positivists, in general, have an objectivist epistemic orientation (Crotty, 2009). Scientists, recognising that scientific practice is contradictory, began to question the weaknesses of the positivist school of thought (Crotty, 2009). A revised form of positivism, generally referred to as post-positivism emerged with significant contributions from eminent thinkers like Karl Popper, Thomas Kuhn, and Paul Feyerabend (Crotty, 2009). Popper introduced the principle of falsification, wherein he proposed that it is impossible to ascertain true beliefs; however, it is possible to reject false propositions. Kuhn studied what scientists do, leading him to question the “alleged objectivity and value-free neutrality of scientific discovery (Crotty, 2009, p. 34). He argued that researchers work with a set of beliefs within a background of theories, which he termed a paradigm. Any attempt to challenge prevailing paradigms, at least at the start, will be dismissed summarily by the community (Crotty, 2009). Kuhn’s revolutionary ideas about scientific inquiry and the misplaced intellectual arrogance of the positivistic school, further contributed to the development of post-positivism.

Interpretivism, premised on the thesis that knowledge is judgement dependent, holds that preconceptions of the inquirer predicates his or her understanding of the subject matter (Walsham, 1995). This theoretical perspective has guided scholarly inquiry since the days

of the ancient philosophers. Aside from the ancient Greeks (Crotty, 2009), primordial Indian (Matilal, 1968), Chinese (Defoort, 2006) and Islamic philosophies (Heck, 2006) were primarily interpretivistic. In scholarly inquiry it is apparent that interpretivism pre-dates positivism; however, as it is epistemologically constructivist or subjectivist, or a combination of both: generalisation is impossible (Denzin (1983) and Guba & Lincoln (1982, 1994) cited in M. Williams, 2000). The interest of this study in interpretivism stems from its significant relevance to tacit knowledge sharing, especially in the areas of: symbolic interactionism, phenomenology and hermeneutics.

Symbolic interactionism; largely cast against the backdrop of pragmatism: which was popularised by Charles Pierce and William James, holds that the outcome “provides a standard for the determination of truth in the case of statements, rightness in the case of actions, and value in the case of appraisals” (Rescher cited in Crotty, 2009, pp. 72-73); articulates that: (i) “human beings act towards things on the basis of meanings that these things have for them”, (ii) “the meaning of such things is derived from, and arises out of, the social interaction that one has with one’s fellows, and (iii) “these meanings are handled in, and modified through, an interpretive process, used by the person in dealing with the things he encounters” (Blumer, 1969, p. 2). In symbolic interactionism, the interpretation of truth in the minds of individuals is cardinal. This view resonates with the concept of tacit knowledge, in that meaning is generated and embedded in the mind.

Phenomenology, another variation within interpretivism, holds that casting aside understanding of things and a revisit of experiences open up possibilities of new meaning

emerging, failing which “at least, an authentication and enhancement of former meaning” (Crotty, 2009, p. 78). Phenomenology essentially appeals to the individual’s tacit knowledge to revitalise thoughts in order to enhance knowledge.

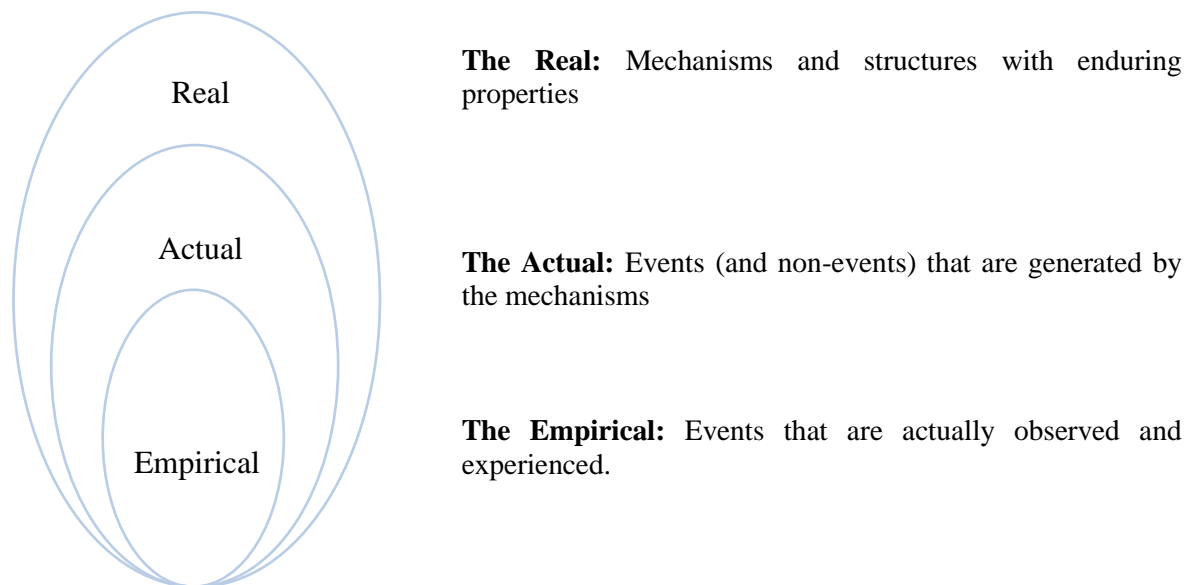
Hermeneutics, popularised in its modern form in the 17<sup>th</sup> century, is largely credited as the science of the interpretation of the Bible and traced to the Greeks (Crotty, 2009). Artefacts in eastern philosophy like the *Hadith* (interpretation of the Holy *Qur’ān*), the various textual interpretations of, for example, the *Vedas*, *Daoism*, *Confucianism*, *Sikhism*, and *Buddhism*, show that the concept of interpretivism and hermeneutics has been understood and exercised long before these terms were coined by western philosophers. Hermeneutics has morphed from being a purely text interpretation paradigm to include “human practices and human events” (Crotty, 2009, p. 87). Interpretation of knowledge embedded in the minds of individuals is predominantly supported by the hermeneutic theoretical approach (Gummesson, 2005).

Other theoretical perspectives of note, aside from those described above, are postmodernism (Baert, 2010), and critical realism (Bhaskar, 2002). Postmodernism, an outgrowth of the concept of modernism, is hard to define and is in a constant state of flux. It holds that ostensible realities are socially constructed and contextual (Alvesson, 2002). Roy Bhaskar, introduced critical realism as a critique of “the seeming incapacity of philosophies of science to really say anything about the world” (Bhaskar, 2002, p. 4). Critical realism is premised on Bhaskar’s theoretical propositions of transcendental realism and critical naturalism. Transcendental realism promotes the idea of reality independent of



experience, and critical naturalism “concerned itself with the dispute between naturalists and anti-naturalists, between positivism and hermeneutics, and it tried to resolve this dispute” (Bhaskar, 2002, p. 3). Critical realism holds that there is a structure to reality (Figure 2.3) (Mingers, 2004).

Figure 2.3: The three domains of the real (Mingers, 2004, p. 94)



The domain of the real is, according to *Bhaskar*, the “generative mechanisms” or “causal mechanisms” which are mind and society independent. The actual refers to events that occur within the domain of the real; and empirical evidence is superficial observations as a result of the interactions of our senses (Bhaskar, 2002). Critical realism submits that there is truth independent of experience. It does purport predictive capabilities, and is explanatory by description.

Polanyi's concept of tacit knowledge is steeped on the critical realist theory. His classic, "we know more than we can tell", coupled with his view that the world is multi-dimensional and these dimensions are intricately interwoven with each level predicated on the next (Polanyi, 2009) support this study's assessment of Polanyi's theoretical inclination.

Table 2.2: Theoretical perspectives

Perspective	Explanation	Eminent Proponent(s)	Source(s)
Positivism	Premised on the scientific method of gathering knowledge through the senses, experience and indubitable verification.	Comte, Descartes, Wittgenstein	Audi (2003); Seidman (2008); Crotty (2009).
Post-positivism	Knowledge is not steeped on foundationalism nor is it unchallengeable. Knowledge is conjectural.	Popper, Kuhn, Feyerabend	Crotty (2009).
Interpretivism	Knowledge is judgement dependent. Preconceptions influence inquiry.	Weber, Heidegger, Gadamer, Denzin, Guba, Lincoln	Crotty (2009); M. Williams (2000).
Critical Realism	There is reality independent of experience and simultaneously it rejects the view of the external world as it is perceived.	Bhaskar	Baert (2010); Bhaskar (2002).
Post Modernism	Ostensible realities are socially constructed and contextual	Foucault, Lyotard, Bauman	Alvesson (2002); Seidman (2008).

In this study, analysis will largely be based on the post-positivistic school of research philosophy; however discussions and implications will be predicated on interpretivism and critical realism to enable and support productive speculation. Post-positivism because the study will not hold on to propositions as though they were cast in stone, like the positivists allude. Hypotheses will be falsified and tested which fits well into the post-positivistic

theoretical perspective. The findings will also be interpreted and discussed, which supports that suggestion that interpretivism will also apply in this study; however the element of transcendentalism in tacit knowledge also suggests that the critical realism theoretical perspective may influence some of the interpretations.

## **2.5. Theoretical framework**

The theoretical framework developed for this study (Figure 2.4) was based on the synthesis of theories, concepts, and prior empirical research. Disparate organisational factors such as leadership behaviour, knowledge networks, and organisational resources were associated with attitude toward behaviour, perceived norm, and perceived behavioural control, in order to predict their influence on tacit knowledge sharing behaviour in organisations; using intention to share tacit knowledge to as a predictor of such behaviour.

While prior studies had examined organisational culture (e.g. Al-Alawi et al., 2007; Román-Velázquez, 2005; Suppiah & Sandhu, 2011), leadership behaviour (e.g. Z. Li et al., 2010; Yaffe & Kark, 2011), knowledge network (e.g. M. T. Hansen, 2002; He et al., 2009), and resources (e.g. Z. Li et al., 2010), very few studied their influence on tacit knowledge sharing behaviour. Furthermore in studies which investigated some aspect of knowledge sharing, other limitations such as, examining a limited number of factors (Al-Alawi et al., 2007; Román-Velázquez, 2005; Suppiah & Sandhu, 2011), and construct validity (Z. Li et al., 2010), were detected. The model in this study will address these gaps.

### **2.5.1. Contextualisation**

Context is defined as “situational opportunities and constraints that affect the occurrence and meaning of organisational behaviour as well as functional relationships between variables” (Johns, 2006, p. 386). Hong, Chan, Thong, Chasalow, and Dhillon (2006) demonstrated the value of context in theory development. The authors took a decomposition approach to construct context specific theoretical models, which informed the theoretical constructs in this study.

Leadership behaviour was disaggregated and examined as: task-oriented leadership behaviour, relations-oriented leadership behaviour, and example-oriented leadership behaviour. Literature on leadership behaviour suggests that leaders will have to change their behaviour in tandem with the situation, which calls for behaviourally complex leaders (Denison et al., 1995; Yukl, 2008).

In this study, resource was disaggregated as tangible resource and intangible resource. Aside from the definition of these resources, knowledge workers may perceive their utility in tacit knowledge sharing, differently. Mårtensson (2000) postulated that there must be distinction between tangible and intangible resources

In summary, this study adopted the decomposed context-specific approach in theory development.

## 2.5.2. Constructs

The constructs underpinning the theoretical framework in this study have been listed in Table 2.3, and the moderating variables in Table 2.4, below.

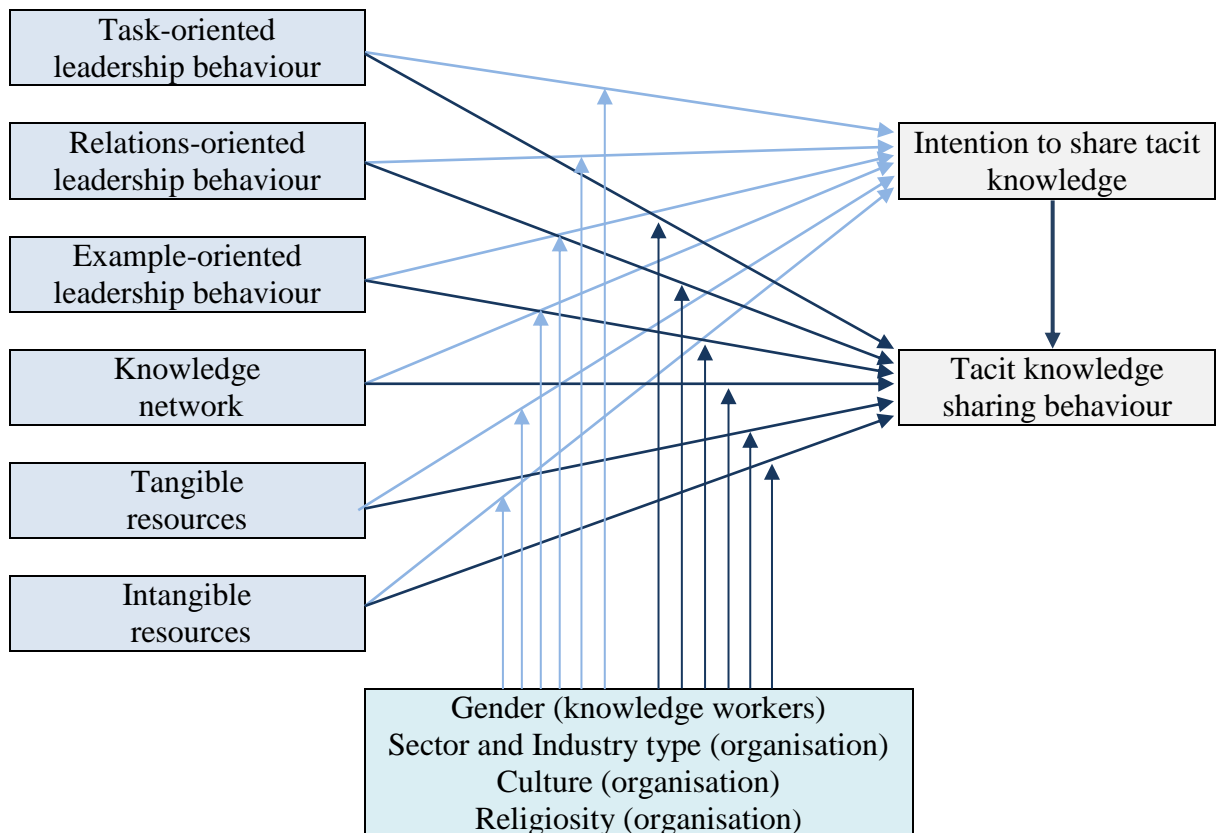
**Table 2.3: Definition of constructs – exogenous and endogenous latent variables**

	<b>Construct</b>	<b>Description</b>	<b>References</b>
1	Tacit knowledge sharing behaviour	Personal interaction  Communities of practice	Yi (2009)  Yi (2009); Adler, Kwon, and Heckscher (2008)
2	Intention to share tacit knowledge	Attitude toward tacit knowledge sharing  Perceived norm about sharing tacit knowledge  Perceived behavioural control toward sharing knowledge	The belief that determines the individual's propensity to share tacit knowledge  The normative belief that important individuals or groups approve or disapprove, and the performance or non-performance of these referents themselves, in the sharing of tacit knowledge.  The individual's perception of empowerment over personal and environmental factors in sharing tacit knowledge.  Ajzen (1991)
6	Knowledge networks		Informal groups in an organisation largely engaged in knowledge sharing activities.  M. T. Hansen (2002)
7	Leadership behaviour	Task-orientation  Relation-orientation  Example-orientation	Managerial activities focussed on accomplishment of tasks necessary to achieve planned outcomes.  Manager is friendly and develops close relationships with subordinates in work related matters, particularly knowledge sharing.  Manager is visibly engaged in tacit knowledge sharing activities in the organisation.  Yukl (2008)  Yukl (2008)  Yaffe and Kark (2011)
8	Resources	Tangible resources  Intangible resources	Tangible resources such as equipment (especially technology), space, and facilities to facilitate tacit knowledge sharing.  Intangible elements that provide support to employees in the sharing of tacit knowledge.  Yousafzai et al. (2010)  Schaufeli et al. (2009)

**Table 2.4: Definition of moderating variables**

	<b>Construct</b>	<b>Description</b>	<b>References</b>
1	Gender	A sex based social construct in which males and females are differentiated.	Roth et al. (2012)
2	Organisational culture	Organisational culture diagnosed along the following four domains: clan, adhocracy, market, and hierarchy.	Cameron and Quinn (2006)
3	Sector and industry type	The broad classification of organisations as public or private and the narrower industry type classification which will describe the core function of the organisation.	S. Kim and Lee (2006); (United Nations, 2008).
4	Religiosity	The influence of religious precepts on people.	Galen (2012)

**Figure 2.4: Theoretical framework**



### **2.5.3. Endogenous latent variables**

#### **Tacit knowledge sharing Behaviour**

The responses and reactions of individuals in the organisation toward sharing tacit knowledge encapsulate the essence of tacit knowledge behaviour: the primary focus of this study. Tacit knowledge sharing behaviour will be inferred from the perception of knowledge workers about practices and activities related to mentoring and communities of practice in their respective organisations.

#### **Intention to share tacit knowledge**

Intention, according to the TPB, is predicated on attitudes towards behaviour, perceived norm and PBC. Empirical studies have found that intention is a reliable predictor of behaviour (Armitage & Conner, 2001; Richetin et al., 2011; Rise et al., 2010). In line with the TPB, this study proposes that knowledge workers intention to share tacit knowledge will influence tacit knowledge sharing behaviour.

H1: Knowledge workers' intention to share tacit knowledge will positively influence tacit knowledge sharing behaviour.

### **2.5.4. Exogenous latent variables**

#### **Knowledge networks**

Social networks form spontaneously in organisations (Selznick, 1943), and one such variant is the knowledge network (Cowan & Jonard, 2009; Liebowitz, 2005; Nirmala & Vemuri, 2009). Literature suggests that knowledge networks facilitate knowledge sharing (e.g.

Alwis & Hartmann, 2008; Levin & Cross, 2004); however there is a dearth of empirical research examining the influence of knowledge networks on, specifically, tacit knowledge sharing.

H2a: Knowledge networks in organisations will positively influence knowledge workers intention to share tacit knowledge.

H2b: Knowledge networks in organisations will positively influence tacit knowledge sharing behaviour in knowledge workers.

### **Leadership behaviour**

Empirical research has adduced evidence that leadership behaviour has a strong influence on the behaviour of followers (e.g. Ajzen, 1991; Alwis & Hartmann, 2008; Kulkarni et al., 2007; Yaffe & Kark, 2011; Yukl, 2008). From among the leadership behaviour categorised and described by scholars, this study will examine the following:-

a) Task-oriented leadership behaviour is effective for improving efficiency among subordinates (Yukl, 2008). The leader establishes goals, objectives, oversees work-related activities, and monitors performance. Task-oriented leaders will establish expectations about tacit knowledge sharing activities in the workplace.

H3a: Task-oriented leadership behaviour will positively influence knowledge workers intention to share tacit knowledge.

H3b: Task-oriented leadership behaviour will positively influence tacit knowledge sharing behaviour in knowledge workers.



b) Relations-oriented leadership behaviours manifest often in displaying support and often motivate the subordinate. Leader-subordinate consultative decision making, empowerment and a collaborative work environment, are some of the hallmarks of the relations-oriented leadership behaviour (Yukl, 2008). Mentoring, which is predicated on relationship-oriented leadership has been touted as a key employee development and knowledge sharing tool (Ramaswami & Dreher, 2010). Tacit knowledge sharing requires the active participation of the knower and cannot be coerced. Relation-oriented leadership will be an important motivator in encouraging tacit knowledge sharing in the organisation.

H4a: Relations-oriented leadership behaviour will positively influence knowledge workers intention to share tacit knowledge.

H4b: Relations-oriented leadership behaviour will positively influence tacit knowledge sharing behaviour in knowledge workers.

c) Example-oriented leadership behaviour research has produced evidence that followers-behaviour is often shaped by the examples leaders display (e.g. Ajzen, 1991; Yaffe & Kark, 2011). In this study leading by example means that the leader displays clear and visible signs of engaging in tacit knowledge sharing.

H5a: Example-oriented leadership behaviour will positively influence knowledge workers intention to share tacit knowledge.

H5b: Example-oriented leadership behaviour will positively influence tacit knowledge sharing behaviour in knowledge workers.

## **Resources**

Organisational members require adequate resources in order to perform in their jobs (Schaufeli et al., 2009). Resources are diverse and are not just the tangible, but also the intangible (Mårtensson, 2000), which this study will discern and examine separately. The study suggests that adequate resources will facilitate tacit knowledge sharing.

H6a: Providing adequate tangible resources to knowledge workers will positively influence their intention to share tacit knowledge.

H6b: Providing adequate tangible resources will positively influence tacit knowledge sharing behaviour in knowledge workers.

H7a: Providing adequate intangible resources to knowledge workers will positively influence their intention to share tacit knowledge.

H7b: Providing adequate intangible resources will positively influence tacit knowledge sharing behaviour in knowledge workers.

### **2.5.5. Moderating variables**

#### **Gender**

The assumption of homogeneity in the workforce has been increasingly questioned. In line with such arguments, gender differences in the workplace have been increasingly examined in research (e.g. Eagly et al., 1995; Lin, 2006; Roth et al., 2012).

Tacit knowledge sharing is highly volitional. Individuals and groups may exhibit varying behaviour toward tacit knowledge sharing. This study suggests that there is sufficient theoretical justification to examine the moderating influence of gender.

H8: Gender, will moderate the influence of the exogenous variables on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour.

### **Sector and industry type**

Purpose, goals and objectives, the environment in which it operates, and a host of other factors will determine how an organisation functions. Organisations essentially differ in the way they are structured and develop their strategies. The public and private sectors differ in these aspects a great deal. Where the public sector is concerned with non-profit and regulatory services, the private sector in contrast is often largely focused on returns-on-investments and sustaining competitive advantage. These differences have the potential to influence the way knowledge workers in the public and private sectors may view tacit knowledge sharing. In the private sector, the adage that knowledge-is-power may be more prevalent than in the public sector. Such differences are also expected to manifest between industry types. Similarly their business focus, market factors, operating environment and other factors identified above will explain variations between the industry types.

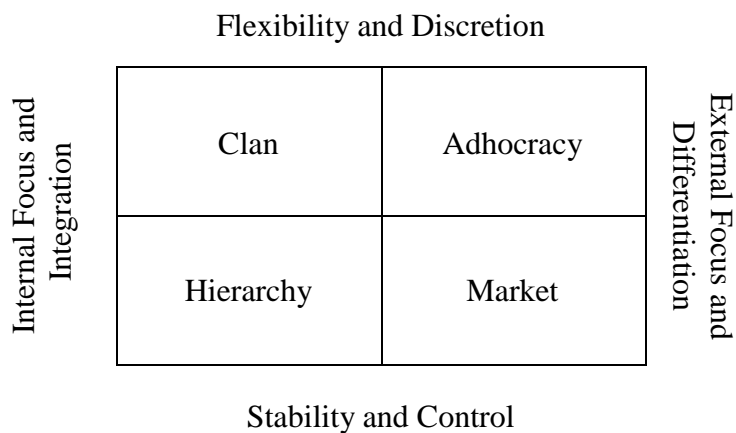
This study therefore premises that differences between, the public and private sectors, and the industry types, will impact the way tacit knowledge is shared in these organisations.

H9: Sector and industry type will moderate the influence of the exogenous variables on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour.

## Organisational culture

Cameron and Quinn (2006) identified two major competing dimensions, that is: (i) flexibility and discretion, versus, stability and control, and (ii) internal focus and integration, versus, external focus and differentiation. From these competing dimensions, four clusters (clan, adhocracy, hierarchy and market) of organisational culture emerged. These dimensions and clusters make up the CVF (Figure 2.5).

**Figure 2.5: Competing values framework (Cameron & Quinn, 2006)**



The study will diagnose organisational culture with the aid of the CVF and OCAI, and profile organisations according to the dominant culture type in the respondents' organisation. Organisations are expected to be classified as:

- a) Clan culture – A friendly place to work where people share a lot about themselves. Typical characteristics of an organisation with a dominant clan culture orientation are: teamwork, employee involvement programmes, high

employee commitment to organisation and co-workers, and high corporate commitment to employee. Trust, respect for people, honest communication, and cohesive relationships (Román-Velázquez, 2005) are among the core values within Clan culture type organisation. People in organisations with these core values generally are at ease with each other and operate as a community instead of being individualistic; and this facilitates knowledge sharing.

- b) Adhocracy culture – organisations dominant in this culture type are generally organic and not mechanistic, characterised by a dynamic, entrepreneurial and creative workplace. Employees are empowered and risks taking encouraged. Effective leadership is visionary, innovative and risk-oriented. The core values that employees in organisations with an Adhocracy culture have are: innovation and change, new ideas, visionary thinking and trying new concepts (Román-Velázquez, 2005). Centralised power or authority relationships are non-existent in an Adhocracy culture, instead power flows from individual to individual and so does knowledge. Knowledge sharing is a pre-condition for success.
  
- c) Market culture – competitiveness and productivity form the foundation of market culture driven organisations, and winning is everything (Cameron & Quinn, 2006). Among the factors that influence the development a market culture in organisations, market structure is significant. Market structure is often classified as, perfect competition, oligopoly, monopolistic competition, and pure monopoly (Baumol & Blinder, 2009). Markets in which competition is

prevalent would, in general, influence the organisational culture of participating firms. Knowledge would be an important source in order to sustain competitive advantage, and this would broadly be a barrier to resource sharing between firms. Such attitude would permeate within the organisation and impede tacit knowledge sharing.

- d) Hierarchy culture – organisations dominated by this culture are generally characterised by formalised and multiple hierarchical structures. Standardised procedures govern people’s actions and there is minimal or no discretionary powers vested in employees. Emphasis is on rule reinforcement and the long term concerns of the organisation are stability and predictability. The hierarchy culture nurtures the use of standard operating procedures and best practices, and has multiple layers of vertical (position) and horizontal (work units) silos operating relatively in isolation. The structures and power relationships would act as barriers to tacit knowledge sharing in these organisations.

H10: Organisational culture type will moderate the influence of the exogenous variables on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour.

### **Religiosity**

There has been increasing interest in research on religiosity and its influence on the behaviour of individuals (e.g. Sedikides & Gebauer, 2010; Weaver & Agle, 2002). Research interest in religion was strong before the 1930s and ebbed between then and the

1960s, however there has been renewed attention since the 1960s (Gorsuch, 1988). The over-arching influence of religion on people may be evident when one appreciates the plethora of areas in which it had been examined. For instance Zukerman, Silberman, and Hall (2013) examined religion in the context of human intelligence ; Weaver and Agle (2002) on ethical behaviour; Saroglou (2010) on personality traits; and (Bloom, 2012) on morality. The area of interest in religion in relation to this research is: prosocial behaviour.

Prosocial organisational behaviour generally describes a behaviour, prescribed or otherwise, which is performed with the intent and expectation that the behaviour would benefit others in the organisation, and consequently the organisation (Brief & Motowidlo, 1986; George & Bettenhausen, 1990). Prosocial behaviour in organisations has been extensively researched in the social sciences (e.g. Brief & Motowidlo, 1986; A. M. Grant & Berry, 2011; Keysar, Converse, Wang, & Epley, 2008) and Galen (2012, p. 876) posited that substantial studies had alluded to prosocial behaviour as an outcome of religiosity, and such outcomes include: “greater moral behaviour, self-control, and helpfulness”, and it often subsumes the individuals self-serving intentions. Saroglou, Pichon, Trompette, Verschueren, and Dernelle (2005) suggested that religiosity leads to increasing altruistic behaviour and empathy.

Sharing, cooperating, altruism, helping, generosity, morality, defending, rescuing, comforting, and a myriad other factors have often been cited in literature as manifestations of prosocial behaviour in people (e.g. Brief & Motowidlo, 1986; Eagly, 2009; Galen, 2012; Saroglou et al., 2005). The study suggests that tacit knowledge sharing is essentially,

prosocial behaviour. It is obviously a sharing initiative; however aside from that, it may also simultaneously involve, for example: generosity, helpfulness, cooperation, and altruism. Tacit knowledge sharing requires the active and voluntary participation of the individual. Prosociality therefore underpins an individual's motivation to share tacit knowledge.

In summary, the study suggests that there is sufficient reason to examine whether religiosity will moderate the influence of the various factors examined in this study on knowledge workers tacit knowledge sharing intention and behaviour.

H11: Religiosity will moderate the influence of knowledge networks and leadership behaviour on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour.

## **2.6. Conclusion**

This chapter established the theoretical foundations for the study. Review of literature suggested that there was sufficient theoretical support to meet the research objectives of this study. While these theories were disparate, the study found common grounds to integrate them in support of this research. Based on these theories and concepts, the study then constructed a theoretical framework which will adequately address the research objectives and questions. The hypotheses were then developed to reduce the levels of abstraction further in the pursuit of meeting the aim of this study, that is: to contribute to the body of knowledge, in the areas of both, theory and practice.



In the next chapter, that is chapter 3, the study will describe in detail the research design and methodology. Sampling method, sampling frame and sample sizing will be explained in detail followed by pertinent details regarding data collection. The second part of the next chapter will primarily discuss the analytical procedures which this study will employ. Relevant details regarding structural equation modelling, which is the key analytical procedure in this study, will be explained.

# CHAPTER 3

## METHODOLOGY

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*“For want of a nail, the shoe was lost.  
For want of the shoe, the horse was lost.  
For want of the horse, the rider was lost.  
For want of the rider, the battle was lost.  
For want of the battle, the kingdom was lo  
And all for the want of a nail.”*

- cited in MacKenzie (2003, p. 323)

### **3.1. Introduction**

Chapter 2 provided insights into the theoretical foundations upon which this research was developed. It commenced with a review of literatures, based on theories and scholarly inquiries, relevant to this study. While these theories appeared disparate, closer examination revealed that they could be semantically integrated along the concept of knowledge and tacit knowledge sharing. This was explained succinctly in the chapter, together with a graphical overview (Figure 2.1) which chronologically sequenced the relevant theories and concepts relevant to the area of focus of this study. Chapter 2 then went on to describe the research philosophies which largely guided this study. The final sections of the chapter saw the establishment of the theoretical framework of this research, followed by the hypotheses which will be examined.

The next phase in this study involved the development of the methodology for the research, which was largely predicated on a number of important elements, including but not limited to: the research purpose, objectives, and questions; the theories underpinning the study; the research philosophy; availability of and access to data analysis tools and expertise; and constraints such as time and cost.

Chapter 3 is presented in two parts. The first part (Part I) describes the research design approaches which will guide the study. This is followed by a detailed explanation of the sample, including the sampling methods, sampling frame and sizing. Subsequently, the data collection methods employed and scales and measures used in the study will be described.

This will be followed by relevant details pertaining to the pilot study which was conducted in order to identify weaknesses and to subsequently strengthen the research instruments.

The second part (Part II) largely describes the analytical procedures which will be employed in this study. This part commences with a brief description of some of the data examination techniques which will be used in this study. This is followed by a section describing how common methods variance will be assessed in this study. Subsequently, brief details on the types of descriptive statistics which this study will report will be described, followed by a section on exploratory factor analysis.

Contributing to the body of knowledge will always be the main priority in this research. Analytical procedures will be robust, effective, and offer information which can be interpreted effectively. In this respect, structural equation modelling (SEM) will be the main analytical method which will underpin this research. A reasonably in-depth explanation about SEM, its processes, and justification of fit indices selected to evaluate model integrity, will follow. The chapter continues with a short description of the reliability and construct validity tests which will guide the study and will end with a description of the type of multi-group analysis which was conducted to assess effects of the moderating variables identified in this study.

Before proceeding further, it may be beneficial to take a brief moment to absorb Jacoby's (1978, p. 78) comment about the quality of research report:

*“However, judging from papers which continue to be published in our most prestigious journals and from research reports which often form the basis for important marketing management and public policy decisions, it is all too apparent that too large a proportion of the consumer (including marketing) research literature is not worth the paper it is printed on or the time it takes to read.”*

Jacoby essentially was making an impassioned plea to researchers to pay serious heed to, among others, scholastic methodological considerations in research. Perhaps, the rhyme on the cover page of this chapter encapsulates this call for attention to details. Literally translated in the context of research, for want of more robust methodological procedures, the findings of a study may not be contributing to the body of knowledge as much as it should. This, in a nutshell, guided the study’s approach toward the development of the methodology for this research.

## **Part I: Research design**

### **3.2. Research design approaches**

Social science research is substantially non-experimental because most of the variables are not manipulable (Johnson, 2001). Historically the social sciences had moved away from experimental studies where a few variables are manipulated to study their effects on other variables. In non-experimental research, the investigator examines associations and effects between the variables in order to draw inferences (Punch, 2003). Having considered the various attributes of this study, like the research domain, past studies, literature on research in the social sciences, the research objectives of this study and its theoretical framework, and a host of other factors, this study was designated as non-experimental.

The next task was to evaluate pertinent aspects of research design to establish with clarity the type of study that will be conducted and the data collection approach. The study was then classified according to the taxonomy introduced by Johnson (2001), which has two main dimensions, that is: (i) classification based on purpose, and (ii) classification based on time. Each of these two dimensions has three categories. Belli (2009) postulated that Johnson's classification scheme remedies a void which was prevalent in non-experimental research

### **Classification based on purpose (Dimension 1)**

Johnson (2001) suggested that non-experimental research can be classified as descriptive research, explanatory research, and predictive research. Descriptive non-experimental research revolves around the description and documentation of the characteristics of a phenomenon. If the research is attempting to develop or test a theory about a phenomenon to explain cause and effect, then the research is classified as explanatory non-experimental research. Predictive non-experimental research is the term Johnson attributes to research which predicts or forecasts some event or phenomenon in the future, without investigating cause and effect. Based on Johnson's classification, this study will primarily qualify as an explanatory research.

### **Classification based on time (Dimension 2)**

A research may be classified cross-sectional research, prospective or longitudinal research, and retrospective research (Johnson, 2001) . In cross-sectional research data collection takes place "at a single point in time or during a single, relatively brief in time" (Johnson,

2001, p. 9). Data is usually collected in longitudinal research at periodic intervals during the research. Some research will look back in time and examine existing data, which Johnson classifies as retrospective research.

After examining Johnson's Dimension 2 classification, in relation to this study, it was deemed that the cross-sectional approach using data collected during the study (one point in time) is the most appropriate. Reasons supporting this decision include:

- a) The research purpose and its objectives were crafted to examine the influence of selected factors on tacit knowledge sharing behaviour in organisations. In order to avoid the influence of extraneous factors which may bias findings, it was necessary that data be collected from all organisations in the study within the shortest possible time frame. Furthermore, this research will not manipulate any of the variables and will examine the stated factors as they exist. In this respect, collecting data during a single-point in time is most appropriate to make comparisons across the various types of organisations in the study. There are no known sources of existing data for this study, which effectively eliminated the retrospective research data collection technique.
- b) The nature of this study, and practical and realistic time and cost considerations, preclude any consideration of the longitudinal research method for data collection for this research.

- c) Other empirical studies in areas similar to this research had also adopted the cross-sectional data collection approach (e.g. Al-Alawi et al., 2007; Cordeiro- Nilsson & Hawamdeh, 2011; Dong, Zhongfeng, & Dongtao, 2011; Fullwood, Rowley, & Delbridge, 2013; Zboralski, 2009).

### **3.3. Sampling**

Sample design is an important component of research; however, weak or inappropriate sampling may compromise the quality of the observations, analysis, and findings. Literature often amplify this, like Lohr's (1999, p. 104) postulate that: "if the survey is badly designed, then no amount of analysis will yield the needed information". In this respect considerable time was expended to ensure that the sampling methods and techniques, and the sample size, employed in this study have been rigorously examined and in accordance to established academic best practices.

#### **3.3.1. Evaluation of sampling methods**

Foremost in the minds of the researcher in sample design, is to select respondents who resemble the characteristics of the population as accurately as possible (Dattalo, 2010). Broadly, there are two sampling methods: probability sampling and nonprobability sampling (Gravetter & Forzano, 2012; Lohr, 1999). In probability sampling the researcher has to use an unbiased selection method in which all sampling units in the sampled population will have an equal chance of being selected. In this context, randomised selection of elements within the population is a prerequisite function (M. H. Hansen, Madow, & Tepping, 1983). In contrast, nonprobability sampling revolves around the



subjective judgement of the researcher. However; the question of how representative nonprobability sampling is of the target population from the methodology viewpoint is largely indefensible.

In probability sampling, there are a few sampling methods, of which the more commonly referenced and employed are: simple random sampling method, systematic random sampling method, stratified random sampling method, and cluster sampling method (Lohr, 1999; S. K. Thompson, 2002).

### **3.3.2. Sampling frame**

The principal focus of this study is the examination of tacit knowledge sharing behaviour of knowledge workers in organisations. In essence, the unit of analysis is the knowledge worker. In a broad sense, this study suggests that the population will be made up of all knowledge workers; however, for practical reasons the research paradigm was defined realistically. In this respect, the study narrowed the geographic location, in which the sampling units will be drawn from, to the Kuala Lumpur/Klang Valley (KL/KV) region in Malaysia. The KL/KV has the highest concentration of economic activities in the country and accounts for a population of approximately 6 million and it contributes Ringgit Malaysia 263 billion to the nation's gross national income (Pemandu, 2011); which translates into approximately 20% of the population of the country contributing about 30% of the nation's gross national income. Pemandu (2011), the performance management and delivery unit, a unit under the Malaysian Prime Minister's department, designated the KL/KV area as a NKEA (national key economic area). The KL/KV area is also the seat of

the Malaysian capital, Putrajaya, in which most of the headquarters of the public sector is housed. Similarly most of the major firms in Malaysia have their headquarters in the KL/KV region. Against this backdrop, the sampling frame for this study was developed based on organisations in the KL/KV region.

Industry type was another factor the study considered in developing the sampling frame. Industry type classification was determined based on the Malaysian Standard Industrial Classification 2008, which conforms to the International Standards Industrial Classification published by the United Nations (DOSM, 2012a). Data published by the Department of Statistics Malaysia (DOSM, 2012b) was analysed. Based on the logistics of the study, including: time-frame, cost, and proportional sample sizing; the study deemed that three industry types, that is, two from the private sector, and one from the public sector, may provide sufficient information for meaningful comparative analysis.

In identifying the industry types to be examined in this study, the degree and graduate diploma employment data published by Department of Statistics Malaysia was analysed (Table 3.1). The study reiterates that the context in which the term, knowledge worker, is used in this study is: an employee who has a minimum education at the level of a graduate diploma or degree. Therefore, the statistics in Table 3.1 were deemed suitable for the purpose of this study.

Table 3.1: Knowledge workers by industry type

<b>Industry Type<sup>1</sup></b>		<b>Knowledge Workers</b>	
		<b>Headcount<sup>3</sup></b>	<b>%</b>
1	Agriculture, forestry and fishing	24,300	1.20
2	Mining and quarrying	18,000	0.89
3	Manufacturing	267,100	13.15
4	Construction	116,200	5.72
5	Commercial services <sup>2</sup>	446,800	22.00
6	Transport and storage	54,900	2.70
7	Public administration and defence; compulsory social security	178,200	8.78
8	Electricity, gas, steam and air conditioning supply	17,200	0.85
9	Water supply, sewerage, waste management and remediation activities	6,800	0.33
10	Wholesale & retail trade, repair of motor vehicles and motorcycles	194,100	9.56
11	Accommodation & food service activities	43,300	2.13
12	Education	527,800	25.99
13	Human health & social activities	116,200	5.72
14	Arts, entertainment & recreation	15,900	0.78
15	Activities of households as employers	2,000	0.10
16	Activities of extraterritorial organisations and bodies	1,700	0.08
<b>Total:</b>		<b>2,030,500</b>	<b>100.00</b>

<sup>1</sup> Malaysian Standard Industrial Classification 2008

<sup>2</sup> Information and communication; financial and insurance/takaful activities; real estate; professional, scientific and technical activities; administrative and support service activities.

<sup>3</sup> Source : (DOSM, 2012b)

The next tier in the sampling frame of this study is that of the organisations in which the knowledge workers are employed. A comprehensive list of knowledge workers in the 3 industries in the KL/KV region would be the ideal choice to select sampling units for this study; however such a list is non-existent. The next best alternative was to obtain a list of organisations within the industry types selected for this study and to draw samples from them. For practical reasons, the study decided that 40 organisations proportionately distributed across the selected industries should allow for sufficient diversity and variance for meaningful data analysis. The study kept the number of sampling units in each of the

organisation constant at 15 knowledge workers per organisation. There are a few reasons for this: first, the organisation is not a unit of analysis, therefore precision is not expected to be gained by proportionately selecting sampling units according to the size of knowledge workers in the organisation; second, is the risk of oversampling especially when samples are drawn on the strength of knowledge worker headcount. Organisation specific knowledge sharing attributes may unduly influence observations about the industry; and third, is to ensure that there is sufficient variability in observations in the stratum.

### **3.3.3. Sample size**

The sample size of the study, has regularly been the subject of discussion in the research community (e.g. Iacobucci, 2010; Shen et al., 2011; Sivo, Fan, Witta, & Willse, 2006). A review of extant literature indicates that there is no consensus on how sample size estimates should be made. Authors too often do not explicitly qualify the adequacy of sample size in their studies (McCallum & Austin, 2000). Bentler and Chou (1987) suggested that sample size may take a 10:1 response to free parameter ratio. This was similarly echoed by Hair, Black, Babin, and Anderson (2010); however they qualified that 50 should be the absolute minimum sample size. Anderson and Gerbing (1984) demonstrated that convergence is achieved with three or more indicators per factor. They also inferred that fewer indicators per factor would suffice as sample size increases. McQuitty (2004) posited that sample sizes should not be less than 100, and larger samples increase estimation precision. Some authors suggested that a sample size of a minimum of 200 should provide adequate statistical power for data analysis (e.g. Garver & Mentzer, 1999; Hoelter, 1983). Muthen and Muthen (2002) demonstrated a number of options and models of sample size

estimation. For normal factor indicator distributions with no missing data, a sample size of 150 was suggested; however with missing data the size was revised to 175. As for non-normal factor indicator distributions, the sample sizes suggested were 265 and 315 respectively. In another study conducted by Shen et al. (2011, p. 1055), which examined sample characteristics in articles published in the *Journal of Applied Psychology* from 1995 to 2008, the authors observed that the median sample size was 200, which they reported remained fairly constant over the said period. Tomarken and Waller (2005) argued that 200 is the minimum sample size which they inferred should be applicable under most contexts; however they also postulated that for complex models, a sample size larger than 200 should be considered, especially when assumptions of multivariate normality are likely to be violated.

After reviewing a reasonable volume of literature on sample sizing, this study's sample sizing was broadly guided by: (i) a minimum of 200 responses will be necessary to provide adequate statistical power for data analysis (Garver & Mentzer, 1999; Hoelter, 1983; Shen et al., 2011); and (ii) larger samples increase estimation precision (McQuitty, 2004). These suggestions were consistent with sample sizing using structural equation modelling which this study had selected (described in more detail below). Largely underpinned by these guidelines, and study time-line, the sample size for this study was established at 400 responses. This range satisfies the 200 minimum responses suggested in literature, aside from being larger by a factor of 2, which should contribute toward increased estimation precision.

The next step was to determine the number of respondents to target in order to safely achieve the sample size determined above. The study set out to examine the response rates in recent empirical studies in contexts as close as possible to that of this research (Table 3.2).

Table 3.2: Questionnaire response rates for studies in KM in Malaysia

Sampling Method	Questionnaires			Study
	Distributed	Returned Number	Rate	
Convenience sampling – respondents from 1 organisation	204	154	75%	Syed Ikhsan and Rowland (2004a)
Convenience sampling – unspecified number of organisations	800	289	36%	Chong, Chong, and Wong (2009)
Convenience sampling – respondents from 1 organisation	365	203	56%	Chong, Salleh, Ahmad and Sharifuddin (2011)
Purposive sampling – respondents from 7 organisations	540	408	76%	Suppiah and Sandhu (2011)
Probability sampling – respondents from 25 organisations	450	129	29%	Ooi, Cheah, Lin, and Teh (2012)

Data from these studies showed that response rate of self-administered questionnaires ranged from 36% to 76%. The sampling method, sampling frame, theoretical model, and scope of these studies were examined closely and it was estimated that a response rate of 65% would be practical and realistic for this study. Some of the factors contributed towards determining this estimate were:

- a) Official consent is a pre-requisite for the study to be conducted in an organisation. Such consent was expected to imply that the study has been sanctioned by the respondent's management and the study expects a higher response rate as a result; however it must be made clear that this was not the intention.

- b) The use of response enhancing technique. Prior studies have evidenced that incentives in the form of money or gifts contribute to increased response rates (Anseel, Lievens, Schollaert, & Choragwicka, 2010). Church (1993) observed that prepaid incentives significantly increase response rates. In this study, a voucher from a popular international fast food restaurant was attached to the questionnaire. Predicated on the social exchange theory (Homans, 1958), this was expected to influence the respondent to reciprocate accordingly.

The target sample was then established based on these parameters: sample size (400), expected response rate (65%). Using these estimates, the number of respondents targeted in this study was established at 600.

#### **3.3.4. Sampling method used in this study**

After evaluating the strengths and weaknesses of these probability sampling methods, and mapping them against the research design of this study, the study then decided to adopt the stratified random sampling method with proportional allocation, as the most suitable for this study. The reasons include:

- a) It is a recognised and widely used probability sampling technique which substantiates generalisation of the research findings to a domain larger than the sample, that is: the target population. This is in line with the aims of this study.
- b) While the population in this study is heterogeneous; they can be segmented homogeneously and stratified accordingly. For example, knowledge workers can

be segregated by industry types in order to control for variances as a result of industry characteristics.

- c) Stratified random sampling with proportional allocation allows for the sampling units to be proportional to the composition of the population. The probability of selection remains the same for all strata unlike in simple random sampling which does not allow for any such differentiation (Lohr, 1999). For example if a given sub-group makes up 10% of the population, then the members in that sub-group will make up 10% of the sample. Lohr (1999) also demonstrated that more precision can be gained by using proportional allocation.

Once the strata had been defined, samples will be drawn from each stratum using the simple random sampling (SRS) method in order to remain within the confines of the probability sampling paradigm. Samples may be drawn either with or without replacement. SRS with replacement means that a sample drawn from the sampling frame is returned to the pool and may be repeatedly selected. In contrast, SRS without replacement implies that samples will not be retained for repeated selection (Lohr, 1999; S. K. Thompson, 2002). The study opted for SRS without replacement as sampling the same organisation or same knowledge worker, as the case may be, will not produce any additional information; and furthermore it may turn out to be counter-productive.

Sampling was carried out using a multi-stage approach. Stage 1 involved stratifying the industry types based on the knowledge workers headcount (Table 3.1). The public sector



was selected because of the large number of knowledge workers employed in the sector and also for comparison from the sectorial perspective (that is: public-private sector).

In the domain of the private sector, commercial services and manufacturing industry types were selected accordingly. The three industry types which had the most number of knowledge workers were: education, services, and manufacturing, contributing approximately 26%, 22%, and 13% to the knowledge workers headcount respectively. A cursory approach would have meant that education and the commercial services industry types should have been selected by virtue of the proportion of knowledge workers in these sectors. However; the study investigated further and learnt that the knowledge worker headcount in the education sector included those in primary and secondary educational institutions across the country. Aside from this, the core value proposition of the education sector is knowledge sharing, particularly tacit knowledge; a view which scholarly literature resonate (e.g. Kember, 2001; Pfeffer & Fong, 2004; Price, Handley, & Millar, 2011). Extending this argument, the study suggests that tacit knowledge sharing behaviour in the education industry may be influenced by the knowledge sharing characteristic which is embedded in the industry. The other two industries, that is, commercial services: which is an agglomeration of various businesses offering a plethora of services; and, manufacturing, which essentially is an industry providing physical products, may not share such deep rooted tacit knowledge sharing attributes. The study decided not to examine the education industry as a stratum; however, the industry was not completely disregarded either. A segment of the education sector, that is, privately owned institutes of higher learning (POIHL), was re-categorised and included as a sub-group under the service industry type.

The inclusion of POILHs' in this study is appropriate as: (i) they are privately owned institutions; (ii) they offer education services which falls within the ambit of the commercial services industry type; (iii) the proportion of POIHLs' is small and is not likely to significantly influence the sample distribution in this sector.

Stage 2 saw the proportional distribution of sampling units (knowledge workers) and sampling frame (organisations) into the 3 stratum, that is: (i) the public sector, (ii) services, and (iii) manufacturing. However prior to computing the proportions, the knowledge workers' headcount for the services industry type was adjusted with the inclusion of 29,292 (MOHE, 2010) knowledge workers from POIHLs'. With this adjustment, the commercial services industry's knowledge workers' headcount expanded to 476,092. Subsequently, the proportion of knowledge workers in the 3 industries was determined. These proportions and the study sample size of 600 returned stratum sample sizes of 174, 310, and 116, for the manufacturing, commercial services and public services, respectively. However these computed stratum sample sizes were not directly divisible by 15, the sample size in each organisation. Therefore, the sample size in each stratum was rationalised so that it can be grouped in multiples of 15, and the rationalised sample size is within the range of  $\pm 5\%$  of the calculated sample size to ensure that proportional distribution is not distorted significantly. The sizing of the sampling units and the number of organisations from which these sampling units will be drawn can be found in Table 3.3.

Table 3.3: Sampling units targeted

Industry Type <sup>1</sup>	Knowledge Workers			Organisations
	Headcount <sup>3</sup>	%	Calculated Sample Size	
1 Manufacturing	267,100	29	174	11
2 Services <sup>2</sup>	476,092	52	310	19
3 Public administration and defence; compulsory social security	178,200	19	116	10
<b>Total:</b>	<b>892,100</b>	<b>100</b>	<b>600</b>	<b>40</b>

<sup>1</sup> Malaysian Standard Industrial Classification 2008

<sup>2</sup> Information and communication; financial and insurance/takaful activities; real estate; professional, scientific and technical activities; administrative and support service activities; and educational services (privately owned institutes of higher learning).

<sup>3</sup> Source: (DOSM, 2012b; MOHE, 2010)

Once the sampling frame and sampling units had been determined, the sampling activities moved on to stage 3 in which organisations were selected using the simple random sampling method. For each of the stratum, the study selected a reliable source from which a list of organisations in the KL/KV region was available. This was quite possible for the manufacturing and public sector; however for the commercial services industry type, the diverse nature of the business and their distinct service identity gave rise to a plethora of service types and agencies which represented them. The study identified a few service types from which to draw the samples from and where possible, assembled a list of firms in the KL/KV region providing such services. The industry types and the sources from which the study obtained the list of organisations are as laid out in Table 3.4.

For each of the stratum, a list of organisations was assembled and a sequence number generated. Selection of sample was undertaken using, *Research Randomizer*, a random number generating software (Urbaniak & Plous, 2011). Once a random number was

generated, the name of the organisation was then picked out as a candidate. Random selection was made without replacement. This process was repeated until the required number of organisations had been selected. For each organisation selected, the study gathered relevant background information, like: (i) the current nature of business in case events such as categorisation error in the database, or a change in the nature of business since the last database update, and (ii) knowledge workers in the organisation, in the event that the headcount is below the targeted threshold (that is, 15) for this study. Such factors may disqualify the organisation from this study. Once this checkpoint was cleared, the study then contacted the organisations and explained the nature of the study, and initiated a cycle of activities to provide as much information as possible about the study, to these organisations.

In each of the organisations which agreed to participate, the study requested for a complete list of knowledge workers. For purposes of anonymity, the knowledge workers were de-identified in this list. A brief explanation on how to generate this list and the definition of what a knowledge worker in in the context of this study was given to the organisation. To a large extent, the study liaised with a senior official from the human resource department of the organisations, and this made the task of getting the list of knowledge workers easier. Once this list was generated, the knowledge workers were assigned a sequence number starting from one. With this list, the participants were then picked using the simple random sampling method. The same software which the study used in the selection of the organisations was also used for this purpose. Fifteen knowledge workers were selected, accordingly.

Table 3.4: Source of organisations within industry types

	<b>Industry Type/Sub-sector</b>	<b>Source</b>	<b>Reference</b>
1	Manufacturing	Federation of Malaysian Manufacturers	(FMM, 2012)
2	Services		
	2.1 Information and Communications Technology	Persatuan Industri Komputer dan Multimedia Malaysia (The National ICT Association of Malaysia)	(PIKOM, 2012)
	2.2 Finance	Bank Negara Malaysia	(BNM, 2012a)
	2.3 Insurance	Bank Negara Malaysia	(BNM, 2012b)
	2.4 Privately Owned Institutes of Higher Learning	Ministry of Higher Education (Malaysia)	(MOHE, 2010)
	2.5 Private Hospitals	The Association of Private Hospitals of Malaysia	(APHM, 2012)
	2.6 Application Service Providers	Malaysian Communications and Multimedia Commission	(MCMC, 2012a)
	2.7 Postal & Courier Services	Malaysian Communications and Multimedia Commission	(MCMC, 2012b)
3	Public administration and defence; compulsory social security	Unit Pemodenan Tadbiran dan Perancangan Pengurusan Malaysia (Malaysian Administrative Modernisation and Management Planning Unit)	(myGovernment, 2012)

### 3.4. Research instrument for the study

Data was collected for this study using a close-ended survey questionnaire. The questionnaire was structured in three parts; however this was largely transparent to the respondents. The first part involved the collection of demographic data related to the respondents.

The second part captures the perception of culture in their respective organisations, using the OCAI. In prior studies, organisational culture dimensions using OCAI, are measured using either one of these two scales, that is: the *ipsative rating scale* (IRS; e.g. Cameron & Quinn, 2006; Hooijberg & Petrock, 1993) or the Likert scale (e.g. Helfrich, Li, Mohr, Meterko, & Sales, 2007; Kalliath, Bluedorn, & Gillespie, 1999). With the IRS, respondents divide 100 points among the alternatives in each of the content dimensions (Cameron & Quinn, 2006). While the Likert scale is more common in research, the IRS has its advantages in examining organisational cultural uniqueness. For example, a drawback of the Likert scale highlighted by Cameron and Quinn is that respondents have the option to rate all quadrants high or all quadrants low, therefore, providing less differentiation; which is not the case with the IRS. However there are inherent weaknesses in the IRS in relation to statistical analysis, especially correlational statistics (Cameron & Quinn, 2006). Furthermore, the study conducted a pre-test of OCAI, using ten knowledge workers. The study also designed this pre-test OCAI questionnaire in two sections. The first section used the IRS, and the second, the Likert scale. Most of the participants reported that, IRS was confusing and they were unable to respond with confidence. Three participants did not complete this section. All ten completed the Likert scale section and expressed confidence that they responded to the best of their abilities. It was decided at this stage that OCAI will be measured using the Likert scale.

The third part of the questionnaire constituted observed variables which measured the latent constructs in the model. The scale used for the observed variables was the Likert-7 point scale.

Aside from the above, the assessment of religiosity requires detailed explanation at this stage. All data for this study will be collected in Malaysia. Statistics published by the official organ of the Malaysian government states that Muslims make up 61.3% of the population. Buddhists (19.8%), Christians (9.2%), and Hindus (6.3%) largely make up the rest of the population (DOSM, 2010). The position of Islam is also spelled out as the religion of the federation in the Malaysian constitution (Fernando, 2006). These and the efforts of the Malaysian government, and non-governmental organisations established to propagate Islamic teachings, suggest that the probability of organisations operating under *Syariah* influence would be higher than that the other religions practiced in Malaysia. In Islam, *Syariah* largely means: the laws of god (Ansari, 2001).

In line with these inferences, this study predicates that religiosity will be ascertained by degree in which the organisations comply with the *Syariah*. The first criterion used in this study is that, the workforce must be largely Muslims (50% or higher). The second criterion was whether the organisation is *Syariah* compliant, in which business activity benchmarks and financial ratio benchmarks were assessed according to the guidelines established by the Malaysian Securities Commission (2012). Aside from these criteria, the study also interviewed two senior managers, selected at random, in the organisations participating in this study, and interviewed them on the following additional *Syariah* related practices: (i) Cafeteria rules in line with Islamic practices; (ii) official recognition of other Islamic practices like: the provision of suitable prayer rooms, and time-off to conduct prayer according to the *Syariah*.

### 3.5. Scales and measures

Two types of scales were used in this study, that is, nominal scale for respondents' demographic and organisational attributes, and the ordinal scale (Likert scale) for all measured variables in the questionnaire. Table 3.5 displays the latent constructs and the associated scales, and Table 3.6 presents the moderators and their scales.

Table 3.5: Measures and scales - constructs

Latent constructs	Scale
1. Mentoring (Roman et al., 2004)	Likert <sup>1</sup>
2. Community of practice (Roman et al., 2004)	Likert <sup>1</sup>
3. Attitude toward tacit knowledge sharing behaviour (Ajzen, 1991)	Likert <sup>1</sup>
4. Perceived norm about sharing tacit knowledge (Ajzen, 1991)	Likert <sup>1</sup>
5. Perceived behavioural control toward sharing tacit knowledge (Ajzen, 1991)	Likert <sup>1</sup>
6. Example-oriented leadership behaviour (Yaffe & Kark, 2011; Yukl, 2008)	Likert <sup>1</sup>
7. Relations-oriented leadership behaviour (Yaffe & Kark, 2011; Yukl, 2008)	Likert <sup>1</sup>
8. Task-oriented leadership behaviour (Yaffe & Kark, 2011; Yukl, 2008)	Likert <sup>1</sup>
9. Knowledge networks (He et al., 2009; Wasko & Faraj, 2005)	Likert <sup>1</sup>
10. Resources (Tangible) (Barney, 1991; R. M. Grant, 1991; Helfat & Peteraf, 2003)	Likert <sup>1</sup>
11. Resources (Intangible) (Conner & Prahalad, 1996; Helfat & Peteraf, 2003; Salanova, Agut, & Jose, 2005)	Likert <sup>1</sup>

<sup>1</sup> - Likert 7-point scale

Table 3.6: Measures and scales – moderating variables

Moderating variable	Scale
1. Gender (Roth et al., 2012)	Nominal
2. Organisational culture (Cameron & Quinn, 2006)	Likert <sup>1</sup>
3. Sector (public or private) and Industry type (S. Kim & Lee, 2006; D. Li, Chau, & Lai, 2010; United Nations, 2008) (Greenwood, Deephouse, & Li, 2007)	Nominal
4. Religiosity (Galen, 2012)	Nominal

<sup>1</sup> - Likert 7-point scale



### **3.6. Questionnaire design and development**

The questionnaire was designed using the structured questionnaire approach which was deemed appropriate for the sampling design of this study. Essentially all participants respond to the same questions and in the same sequence using this approach. The self-report aspect of the questionnaire meant that there would be no room for clarifications, unlike in cases where respondents can interact with the researcher. Keeping this in mind the questions were crafted in simple and unambiguous language. In crafting the questionnaire, suggestions made in literature (e.g. Fanning, 2005; Presser et al., 2004; Schaeffer & Dykema, 2011) were largely used as a guide. This includes:

Translating questionnaires into multiple languages, which is increasingly common in survey based research, due to increased diversity of the population in many countries (Presser et al., 2004). In this study, the questionnaire was developed in English; however a *Bahasa Malaysia* (Malay language), version was also prepared to cater to the needs of knowledge workers who may prefer this language. *Bahasa Malaysia*, is the national language in Malaysia and predominantly used in the public sector, while the English language is often used extensively in the private sector. A qualified translator registered (MTA Registration Number: 1270) with the Malaysian Translators Association (MTA, 2012), a non-governmental organisation of professional translators in Malaysia, was engaged to translate the English version of the questionnaire into the Malay language. The study re-translated the Malay version of the questionnaire into English with the assistance of another translator to determine the quality of the English to the Malay language

translation. No serious lexical issues were detected and the questionnaire translation was thus accepted.

The overall length of the questionnaire was limited, in order not to overwhelm the respondent. Simple and clear instructions were provided to guide the respondent, accordingly. Question length and question complexity were given due attention. Words which were deemed ambiguous were replaced with others which left very little room for misinterpretation. Aside from this, levels of abstraction of some of the concepts were diligently mitigated.

The survey questionnaire for this study was developed using various approaches. The first was by way of adopting instruments with no changes (denoted as “A” under Method in Table 3.7). In this study, items measuring organisational culture were adopted with no changes, from the OCAI (Cameron & Quinn, 2006). The second was by modifying relevant items used in prior empirical research (denoted as “M” under Method in Table 3.7), largely to accommodate respondents to whom English is not the first language. The third approach was by crafting the questions in line with the construct measured (denoted as “D” under Method in Table 3.7). The fourth approach was heuristically developed, in relation to demographic items (denoted as “N” under Method in Table 3.7). For example: age group, gender, religion, position, and work experience. A summary of the sources from which the questionnaire items were developed from, can be found in Table 3.7, below.

Table 3.7: Instrument development – sources

Construct	Method	Source
<b>Endogenous variables</b>		
a. Tacit knowledge sharing behaviour	M & D	(Dreher & Ash, 1990; Majewski, Usoro, & Khan, 2011; Yi, 2009)
b. Intention to share tacit knowledge	M & D	(Jeon, Kim, & Koh, 2011)
<b>Exogenous variables</b>		
a. Knowledge network	M & D	(He et al., 2009)
b. Leadership behaviour Task-oriented leadership Relations-oriented leadership Example-oriented leadership	M & D	(Hardy et al., 2010; Nonaka & Takeuchi, 2011; Northouse, 2007)
c. Resource Tangible resource Intangible resource	M & D	(Mårtensson, 2000; Nonaka & Takeuchi, 2011)
<b>Moderating variables</b>		
a. Organisational culture	A	(Cameron & Quinn, 2006)
b. Sector/Industry type	N	
c. Gender	N	
d. Religiosity	*	The value of this variable was assessed at the organisation level (explained in section 3.4, above)
Method:	M & D: modified some items from the sources, and developed some items for the study. A: Adopted with no changes. N: Nominal scale used for items capturing demographic data. *: Not captured in the questionnaire. Assessed at the organisation level.	

An explanatory statement to inform the respondents about the nature and scope of the research, and other relevant information was developed (Appendix 3.2). A copy of the questionnaire can be found in Appendix 3.3. The questionnaire items were tagged with dummy codes. A cross-reference table is made available in Appendix 3.4 which points to the actual labels used in the model during data analysis.

The final task during questionnaire development was a pre-test (explained below). Based on observations during the pre-test, the questionnaire was strengthened where possible and appropriate.

### **3.7. Ethics**

Primary research involves collecting data from subjects in the real world, and irrespective of whether such subjects are animate or inanimate, certain standard ethical guidelines in conducting research on them should be the norm. In this research, guidelines instituted by the Monash University Human Research Ethics Committee (MUHREC) were adhered to. A copy of MUHREC's approval (Project number: CF12/0032 – 2012000009 dated 3 Feb. 2012) for this study has been appended herein (Appendix 3.1).

### **3.8. Pre-test and pilot study**

Pre-test and pilot studies are essential for most that undertake primary data collection. Factors which dictate the extent, criticality and usefulness of these tests depend on the complexity of the study, financial and time constraints, consequences of the study, validity and reliability of the instruments, and the researcher's or researchers' prior experiences, among other factors. In this research, relevant pre-tests and a pilot study were conducted in order to minimise, if not eliminate, problems which may confound the study at a later stage. It is not uncommon for authors to use the term pilot study as a broad term for all tests and studies conducted before the research proper (e.g. Kwan & Walker, 2004). The context in which the term pre-test is used in this study is, as suggested by Varkevisser, Pathmanathan, and Brownlee (2003): a small scale trial of particular research components.

### **3.8.1. Pre-test**

A two-phase pre-test was conducted. The first phase involved a series of discussions with two experienced academics and three knowledge management consultants to establish face validity. Their feedback exposed some gaps in the survey questionnaire, which were all duly addressed, after a number of iterations. The second phase of the pre-test was conducted using a cognitive interviewing technique. The survey questionnaire was distributed to selected respondents who were tasked to interpret the items in the questionnaire and explain in their own words, their interpretation of the questions. A representative sample (Johanson & Brooks, 2010) of ten participants were selected from organisations in Malaysia. These participants fit the profile of the sample population of this study.

Six responses were received and the interpretations collated and evaluated. A few minor issues were detected in the questionnaire, such as: certain words were not clearly understood, some questions were ambiguous, and some words appeared to have been ignored by a sizeable (more than 30%) of the respondents. For example the word “direction”, which was meant to denote the course, approach, or style which a superior is seen to be taking was misconstrued as an instruction or command. Although the context in which the word was phrased was clearly the former, some participants took the latter meaning and responded accordingly.

The basis upon which this study evaluated the interpretations from the respondents and the general course of action, are as follows:-

- a) Words which the respondents had difficulty interpreting were appended with a brief explanation in brackets.
- b) Words which were ambiguous were substituted with others which were less ambiguous.
- c) All questions which were misinterpreted were given additional attention and where necessary, changes were made.

### **3.8.2. Pilot study**

A pilot study on the other hand is a mini version of a full-scale study. It serves various purposes, like: instrument development (Johanson & Brooks, 2010), feasibility of the study, determining instrument fit and adequacy, identifying potential practical problems (Prescott & Soeken, 1989), and a scrutiny of the researchers cultural competency (Y. Kim, 2011). Pilot studies “can help develop an experiential understanding that reshapes the final study in profound and important ways” (Kezar, 2000, p. 385).

The sampling was conducted for the pilot study using the purposive sampling method (Martin Jr. & Bridgmon, 2009). This method was deemed more appropriate for the purpose of the pilot study because its nature and purpose (described above), and these were different from that of the study proper.

Using this method, participants were deliberately selected based on pre-determined criteria, like: profile (e.g. education level, and industry employed in) of respondents in the pilot

study must be similar to the profile of the participants of the study, and access to respondents for follow-up inquiry.

One common debate often associated with pilot study is determining the appropriate sample size. However, despite the increasing popularity of pilot studies in the social sciences, there are limited literature on sample size recommendations (Johanson & Brooks, 2010). Furthermore there are also noticeable differences in published guidance on sample size (Hertzog, 2008; Johanson & Brooks, 2010). Some authors had cited a size (n) of between 10 to 30 as appropriate (Issac and Michael, 1995; and Hill, 1998, cited in Johanson & Brooks, 2010). However Hertzog (2008) inferred that too broad and generalised pilot sample size guidelines may be inadequate, and illustrated that typical sample size range common in pilot studies generally yield imprecise and often biased statistical estimates; a view which is supported by Johanson & Brooks (2010). Johanson & Brooks (2010) demonstrated that, *ceteris paribus*, precision increase as sample size expands; however any such increase in precision is non-linear. Grounded on this premise, they recommended a minimum of 30 participants as reasonable for preliminary surveys or studies for scale development.

In this pilot study 60 participants were targeted to respond to the survey questionnaire. This was in-line with some of the recommendations in literature, especially those made by Johanson & Brooks (2010) and Hertzog (2008).

60 survey questionnaires were distributed, of which 40 were targeted at respondents from the private sector and 20 from the public sector. 39 (97.5%) questionnaires from the private sector, and 19 (95%) from the public sector were returned.

The responses to the survey questionnaire were coded and analysed to determine internal consistency, which is reported below. Aside from performing statistical analysis from the responses, some of the other objectives of the pilot study were to:

- a) Estimate the time it takes for the questionnaire to be completed in an environment as close to the eventual study as possible. It was found during the pilot study that generally participants took about 30 to 45 minutes to complete the questionnaire. The explanatory statement accompanying the questionnaire in the full study was edited to reflect this. Among the reasons for doing this was to manage the expectations of the respondents during the study proper.
- b) Examine if there are missing data and if a pattern can be detected to indicate that any such data are not missing at random (Little, 1988). As there were only 58 cases to examine, it was not impractical to visually inspect for the missing data pattern.

While it was confirmed that there were some missing data in the some of the responses in this pilot study, they were broadly missing at random. Furthermore missing data analysis indicated that less than one percent were missing, which was acceptable (Hair et al., 2010).



Prior to running reliability statistics tests and exploratory factor analysis, all responses to reverse phrased questions were recoded to align response polarity.

The Cronbach's Alpha values have been listed in Table 3.8, below. The Alpha values of all the latent constructs were equal to or greater than .70, except resources (tangible) which returned a value of .60. While authors have suggested that .70 be considered the minimum standard for demonstrating internal consistency (e.g. MacKenzie, Podsakoff, & Podsakoff, 2011; Yi, 2009); Kline (1999, cited in Field, 2005, p. 668) inferred that "when dealing with psychological constructs, values below even 0.70 can realistically be expected because of the diversity of the constructs being measured". Resonating this, Schmitt (1996) posited that in determining internal consistency, the use of any cut-off value (including .70) is myopic.

Table 3.8: Pilot study - Cronbach's alpha statistics

	Latent construct	Cronbach's Alpha
1	Mentoring	.82
2	Community of Practice	.91
3	Attitude toward tacit knowledge sharing behaviour	.70
4	Perceived norm about sharing tacit knowledge	.75
5	Perceived behavioural control toward sharing tacit knowledge	.72
6	Knowledge network	.73
7	Task-orientated leadership behaviour	.79
8	Relations-orientated leadership behaviour	.92
9	Example-orientated leadership behaviour	.85
10	Resources (tangible)	.60
11	Resources (intangible)	.87

Item-total statistics were also examined and there were no substantial improvements were observed. Overall, the pilot study suggested that internal consistency of the measurements

used is not a serious concern and no instrument modification took place at this point during the study. Furthermore, this study included the use of structural equation modelling (SEM) as the main data analysis method and literature had suggested that there are more robust reliability tests which can be done using SEM (this will be explained in more detail in the section on SEM in Part II of this Chapter).

One important aim of a pilot study is to identify common themes, dimensions, components, or factors, intrinsic within a large data set. We do this using a data reduction technique called factor analysis (Meyers, Gamst, & Guarino, 2006), wherein underlying components (factors) can be identified by way of the correlation between a set of variables.

In this study, the constructs were identified *a priori*, and logically the next step would be to perform confirmatory, instead of exploratory, factor analysis. However; most of the measures used in the constructs in this study were a combination of: (i) items used in other studies; (ii) items from other studies but contextually re-crafted for this study; and (iii) items developed for this study. These factors suggested that exploratory factor analysis (EFA) may be necessary.

In factor analysis, sample size adequacy is often iterated in literature. For example, Meyers et al. (2006) provided a general rule of thumb, as follows: 50 (very poor); 100 (poor); 200 (fair); 300 (good); 500 (very good); and 1000 (excellent). However studies have demonstrated that common rules of thumb lack validity and do not provide a basis for factor analysis sample size estimation (e.g. MacCallum, Widaman, Zhang, & Hong, 1999).

An alternate approach to sampling adequacy commonly used in research is to examine the Kaiser-Meyer-Olkin (KMO) measure. Authors have recommended that sampling adequacy is ascertained if KMO is above the desirable threshold of 0.60 (Ashing-Giwa & Rosales, 2012). All KMO indicators returned values above 0.60 (Table 3.9) in this study.

Separate PAF analysis was performed, for each of the constructs. Other parameters, upon which factor loadings were derived, included: analytic rotation using the Promax criterion and eigenvalues > 1.

Table 3.9: Pilot study – KMO measures of constructs

Endogenous	Exogenous	KMO*	BTS#	Sig
Tacit knowledge sharing behaviour	Mentoring Community of practice	.88	799.74	.000
Intention to share tacit knowledge	Attitude toward tacit knowledge sharing behaviour Perceived norm about sharing tacit knowledge Perceived behavioural control toward sharing tacit knowledge	.78	946.01	.000
	Knowledge network	.68	211.93	.000
	Task-orientated leadership behaviour Relations-orientated leadership behaviour Example-orientated leadership behaviour	.89	1625.12	.000
	Resources (tangible) Resources (intangible)	.84	659.10	.000

\* KMO – Kaiser-Meyer-Olkin measure of sampling adequacy

# Bartlett’s test of sphericity (approx. Chi-Square)

Factor loading essentially depicts the correlation coefficient between a variable and a factor. While authors had proposed various factor loading suggestions, ranging from, simple cut-off indicators, to more detailed strength based segmented indicators, there is no

consensus on what is “high” and “low” (Peterson, 2000). For example: Hair et al. (2010) suggested that loadings of around 0.30 are the absolute minimum for consideration, loadings around 0.40 are acceptable and loadings of 0.50 or higher are considered practically significant. Peterson (2000) conducted a meta-analysis of 803 factor analyses reported in 568 peer-reviewed articles published in selected academic journals, including: Journal of Applied Psychology, Journal of the Academy of Marketing Science, Journal of Marketing, Journal of Marketing Research, Journal of Retailing, and Marketing Letters. He suggested that the “average percentage of variance accounted for was 56.6%, and the average (absolute) factor loading was 0.32” (Peterson, 2000, p. 261).

In the pilot study, EFA was done with the following criteria in mind. First, only factors with eigenvalues greater than 1.0 were selected. Subsequently the percentage of variance accounted for and percentage of cumulative variance were scrutinised in tandem with the eigenvalues. This allowed the study to determine the point at which to eliminate additional factors which do not contribute significantly to the cumulative variance. The study established a criterion by which the cumulative variance of the selected factors should preferably be 56.6% or above, in line with Peterson’s (2000) suggestion.

There were sufficient reasons to accept the design of the constructs in this study based on the findings of the EFA during the pilot study. Factor loadings were reasonably reflective of the constructs; however there were some observed variables loaded below the threshold of .30.

## **Part II: Analytical Procedures**

This section is the second part of the Methodology chapter. While the previous section described the research design and sampling methods, the primary aim of this section is to inform and justify the analytical procedures which were selected and were employed in this research.

### **3.9. Data examination**

#### **3.9.1. Missing data**

Literature is abound with various reasons for the occurrence of missing data in field research (Graham, 2009; Hair et al., 2010) and while it often acknowledged as a common problem (Baraldi & Enders, 2010; Graham, 2009), treating such ‘missingness’ inattentionally, or worse by ignoring them completely, may bring about a distorted understanding of the data which may impact the findings of a research. In this study deliberate attention was given to the area of missing data, with particular focus on maintaining closely the original distribution of values in the event of any remedial treatment.

It is prudent to identify whether the missing data is ignorable or non-ignorable at the outset (Graham, 2009; Hair et al., 2010). The design and data collection methods indicate that missing data in this study, are non-ignorable: “failure to complete the entire questionnaire” by respondents is categorised as such (Hair et al., 2010, p. 46). The authors suggest that while the researcher may not have control in these instances of missing data, remedial measures may be applied if they occur at random.

Among various methods suggested by scholars to treat data which are missing completely at random (MCAR) is imputation using replacement values (Hair et al., 2010; Tabachnick & Fidell, 2007). Hair et al. suggested that any of the common imputation methods may be applied in instances when the extent of missing data is less than 10%. Such common imputation methods include: the complete case approach, which is also referred to as list wise deletion, pair wise deletion, means substitution, expectation maximization, and regression. While the complete case and pair wise deletion methods are quite common in statistical software packages, like IBM SPSS, SAS and R, to treat missing data, literature often cautions against using them indiscriminately (e.g. Allison, 2003; Baraldi & Enders, 2010; Graham, 2009; Hair et al., 2010). Graham (2009) suggested that the expectation maximisation (EM) technique in treating missing data is preferred over the means substitution method

While the SPSS statistics software offers a few methods to impute missing values, in this study the EM method was employed because of the weaknesses in the listwise and pairwise deletion, and the some of the other means estimation methods, and that the EM method is relatively more robust. The EM method is an iterative two pass algorithm. The expectation step estimates a conditional expectation of the missing data, and in the maximisation step values are computed using maximum likelihood estimates (Graham, 2009). While the multiple imputation (MI) and the maximum likelihood (ML) procedures have been recognised as excellent missing data techniques (Baraldi & Enders, 2010); Yuan, Fan, and Bentler (2012) in their study demonstrated that ML is the more preferred method between the two as it has a smaller bias under non-normal distribution conditions, and is more

efficient in parameter estimation, which offers further support for the choice of EM in this study.

### **3.9.2. Outliers**

In research it is commonly acknowledged that unusually high or low responses may distort findings. Such outliers cannot simply be dismissed, but instead viewed within the context of the research and evaluated accordingly. Hair et al. (2010) suggest that outliers can be classified as those: (i) arising from procedural errors; (ii) resulting from extraordinary events; (iii) which are unexplainable observations; and (iv) that contain observations which may be within the range of expected values, however are substantially removed from the sample mean. The last category of outliers is particularly relevant to this research.

Aguinis, Gottfredson, & Joo (2013) observed that researchers often do not have clear ideas of dealing with outliers. They identified 39 different outlier detection techniques and 20 methods of treating outliers. In contrast, Hair et al. (2010) suggested that outliers may be detected based on the number of variables, that is: univariate, bivariate, or multivariate detection. The number of variables used in this study warrant the use of multivariate detection method, in which the Mahalanobis measure of multivariate assessment is often considered appropriate (Aguinis et al., 2013; Hair et al., 2010; Penny, 1996).

### **3.9.3. Normality**

In multivariate analysis, the assumption of normal distribution may be necessary (Kline, 2011), and it is often suggested that it can be ascertained either by using statistical tests or by visual inspection of graphical plots (Hair et al., 2010). Literature often cautions on

relying solely on such normality tests because small deviations in normality in large samples may produce significant results (e.g. Field, 2005; Hair et al., 2010). In this study, the distribution of data will first be examined using the Kolmogorov-Smirnov test and also by inspecting Q-Q plots. Subsequently in SEM, Mardia's coefficient will be examined.

This study took note that literature has also suggested that in practice data distribution is often nonnormal (Yuan & Zhong, 2013). Therefore steps to mitigate nonnormal distributions, using the bootstrapping technique in SEM (Byrne, 2010) have been identified and will be performed if necessary. Aside from this, the study also takes cognisance that in SEM fit indices may not be extensively impacted by violations of multivariate normality (Hu & Bentler, 1998).

### **3.10. Common Methods Variance**

A potential problem with self-report questionnaires is the concern about common methods variance (CMV; Chang, Witteloostuijin, & Eden, 2010), which may seriously influence research findings (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Friedrich, Byrne, & Mumford (2009) suggested that failure to account for common methods variance as an endemic problem in research. CMV is described as “variance that is attributable to the measurement method rather than to the constructs the measures represent” (Podsakoff et al., 2003, p. 879). The idea that CMV inflates correlations between variables measured with the same method can be traced back to the work of Campbell and Fiske (1959). Since then this issue has been consistently brought to the attention of researchers by various scholars (e.g. Bagozzi, Yi, & Phillips, 1991; Podsakoff et al., 2003; Spector & Brannick, 2010).



It is quite apparent that there is no silver bullet in addressing concerns about CMV. Some authors contend that concerns about CMV have been overstated (e.g. Lindell & Whitney, 2001; Spector, 2006). Notwithstanding such counter arguments, CMV is a serious concern and cannot be discounted summarily. To underline the importance of addressing CMV, editors of reputable journals have parcelled out valuable space in their journals to amplify the issue and offer good remedial suggestions. Some journals, like the *Journal of International Business Studies*, have unambiguously declared that manuscripts which had not given due attention to CMV will be rejected outright (Chang et al., 2010).

What are the common causes of CMV in research? Podsakoff et al. (2003, p. 882) postulated that there are several potential sources of CMV in research. They clustered these sources under four main categories, that is: (i) common rater effects; (ii) item characteristic effects; (iii) item context effects; and (iv) measurement context effects. Common rater effects may occur when both the dependent and explanatory variables are derived from perceptual responses from the same respondent. Item characteristic effects refer to perceptual responses from participants in a study largely influenced by the “specific properties or characteristics the item possesses”. Item context effects may occur when a respondent is unduly influenced by other items in the instrument when responding to an item. Measurement context effects refers to inaccurate covariation which may manifest due to the dependent and independent variables observed at: the same point in time, or same location, or using the same medium; or any combination of these confounding influences.

Various measures have been suggested by scholars in order to, pre-empt, mitigate, or remedy, the impact of CMV, in research. In this respect some of the suggestions by authors (e.g. Chang et al., 2010) leveraged on recommendations made by Podsakoff et al. (2003). They suggested a few techniques to control CMV, broadly categorised under procedural techniques and statistical techniques:

### **Procedural remedies**

- a) Using different sources (respondents) of information for the dependent and independent variables.
- b) Separating the measurement of the dependent and independent variables, by introducing a time lag between these two groups of variables, or using different scales to measure them.
- c) Mixing the order of the questions to disarray patterns which may emerge in the minds of the respondents.
- d) Improving scale items by giving careful consideration when crafting questions in order to reduce: ambiguity, complicated syntax, and vague concepts.
- e) Anonymity of the respondents to reduce apprehension.

### **Statistical remedies**

- a) Harman's single factor test which is often touted as the most widely used technique for this purpose.
- b) Partial correlation procedure.
- c) Controlling for effects of a directly measured latent methods factor.

- d) Controlling for effects of an unmeasured latent methods factor.
- e) Multiple methods factors.

This study took a serious view of CMV and had adopted some (listed below) of the preventive procedures at the design stage, proactively. However the study acknowledges that while the procedural remedies listed above are sound, various barriers such as time and cost constraints, challenges in recruiting respondents, and logistics issues prevented extensive adoption of all of these suggestions.

The remedial approaches that were adopted are both procedural and statistical. They include:

- a) Procedural remedies: mixing the order of the items in the survey questionnaire, removing or re-wording ambiguous questions, and conducting the survey under strict conditions of anonymity.
- b) Statistical remedies: one often suggested method to remedy CMV is the multi-trait multi-method (MTMM) introduced by Campbell and Fiske (1959). However MTMM dictates that there will be more observed variables than what has been conventionally designed. This has the potential to lead to further complications, like: research scope reduction to reduce complexity, or response rate issues resulting from the inflated survey instrument (Lindell & Whitney, 2001). While the merits of MTMM cannot be denied, this study decided not to use this method to remedy CMV as the trade-offs were not appealing especially

in terms of cost, time frame, and increased complexity of the model. This study instead adopted the Harman's single factor test.

Harman's single factor test, which, described by Podsakoff et al. (2003, p. 889) is a "diagnostic technique for assessing the extent to which common method variance may be a problem". It may be worth noting that some authors have voiced their reservations about the Harman's single factor test. Chang et al. (2010, p. 181) commented that "seemingly reassuring outcomes from Harman's single factor test is insufficient to prove that CMV is not a pervasive issue". However Podsakoff et al. (2003, p. 889) posited that it is "one of the most widely used techniques that has been used by researchers to address the issue of common method variance". This study took refuge in this statement.

### **3.11. Descriptive statistics**

In studies using quantitative methods to analyse data, descriptive statistics are often employed to explain certain characteristics of the sample. There are various descriptive statistics which offer further insights into the sample and have their respective function, in research. Some among them are: mean, median, mode, variance, standard deviation, standard error, and frequency statistics.

In this study, relevant descriptive statistics have been reported to give further insights into the data and among them are:

- a) frequency statistics through which response rates and respondents profile was reported. They provide some insights into the efficacy of the sampling method, and demography of the respondents, which was useful in extracting more meaning from the sample data during data analysis and results interpretation.
- b) mean and standard deviation of the constructs were also reported.

### **3.12. Exploratory factor analysis**

Factor analysis is often used to identify interrelationships among measures of latent constructs which provides a basis for the description of underlying dimensions or factors (Hair et al., 2010). Factor analysis is commonly used (Floyd & Widaman, 1995) and is extremely important in human behavioural research (Treiblmaier & Filzmoser, 2010). There are two main approaches in factor analysis, that is: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). This section will predominantly deal with EFA, as at this stage the focus is more on identifying and understanding underlying structures and data reduction, instead of CFA where *a priori* theoretical assumptions will be tested. CFA will be performed and the results reported later on in this study.

EFA is used in research for two main outcomes, which are: data summarisation and data reduction (Hair et al., 2010). Conceptually data summarisation is described as common factor analysis, and data reduction as principal component analysis (PCA) (Floyd & Widaman, 1995; Hair et al., 2010). Floyd and Widaman (1995) also describe common factor analysis as principal factor analysis. These two techniques largely define the use of

EFA in research. In data summarisation, the researcher's main interest is in the definition of a structure, where the data set is composed into a smaller number of factors or latent constructs than the original individual items. Data reduction, on the other hand, is a technique in achieving parsimony in situations where there are multiple items measuring a latent construct. The objective largely is to select items which contribute most in determining the construct in order to simplify subsequent multivariate analysis (Hair et al., 2010).

There is an apparent lack of a common taxonomy in the area of factor analysis. Some authors term common factor analysis as EFA, or plainly as factor analysis, and then go on to describe PCA as another form of factor analysis separate from EFA (e.g. Fabrigar, Wegener, MacCallum, & Strahan, 1999; Tabachnick & Fidell, 2007).

In evaluating factorability, the study employed a few methods commonly suggested (e.g. Hair et al., 2010; Tabachnick & Fidell, 2007) for this purpose, which are: (i) visual assessment of the correlation matrix. It is expected that items which measure a construct must to a certain extent be correlated, and that any such correlation should be at least .30 (J. Cohen, 1988) but preferably be above this threshold between items, to indicate that they collectively contribute satisfactorily toward the factor which they are measuring and are therefore suitable for factor analysis (P. Allen & Bennet, 2010). The degree of such correlation will explain the extent to which the construct has convergent validity (Carlson & Herdman, 2012); (ii) the assessment of the measure of sampling adequacy using the Kaiser-Meyer-Olkin (KMO) variant which measures the degree of inter-correlations among

the items; and (iii) Bartlett's Test of Sphericity which tests to see if there is sufficient correlations among the items.

Another key consideration in EFA is the rotation method, which simplistically described: serves the purpose of simplifying the "factor matrix to facilitate interpretation" (Hair et al., 2010, p. 115). There are two rotation methods which most literature converse about, namely: orthogonal and oblique. While Hair et al. (2010) suggested that are no specific guidelines for selecting either of these rotation methods, they mentioned that the oblique method is more flexible and realistic. The oblique factor rotation method does not assume that latent dimensions should be uncorrelated with each other, unlike the assumption in orthogonal rotation (Treiblmaier & Filzmoser, 2010); and the items are clustered more accurately (Hair et al., 2010). In this study, it is not assumed that latent factors would be uncorrelated, which largely supports employing oblique rotation instead of orthogonal rotation. A point of interest is that, among some of the popular oblique rotation variants, Promax rotation is often either recommended, or used, by researchers (e.g. Floyd & Widaman, 1995; Nelson & Canivez, 2012), which served as a guide to this study.

Oblique rotation unlike orthogonal rotation produces two matrices, that is: factor pattern matrix and factor structure matrix. The factor pattern matrix reflects the factor loadings of the variables, and in contrast the factor structure matrix will display the "correlation coefficients between the factors and the variables" (Norušis, 2008, p. 417). The question here is: which matrix should the study employ to evaluate the items? Hair et al. (2010) suggested that factor pattern matrix is preferable to factor structure matrix. They argued

that with the factor structure matrix it is more challenging to ascertain which items load uniquely on each factor because it does not control for correlations among the factors. Tabachnick and Fidell (2007) concurred with Hair et al.'s views. However other authors' (e.g. Pett, Lackey, & Sullivan, 2003) took an opposite position by contending that factor structure matrix is preferable. This study is interested in evaluating factor loadings in order to identify items which poorly contribute to the measure of a construct. In this respect, the factor pattern matrix became the focus of factor analysis.

In summary, EFA was conducted in this study using the PAF technique and factors rotated using the Promax option, for reasons explained above. The various indices produced during EFA in this study, were evaluated according to the guidelines (Table 3.10) popularly cited in empirical research and other scholarly literature (e.g. Hemphill, 2003; Peterson, 2000; Zhang & Lei, 2012). The minimum acceptable criteria used in EFA to indicate factorability, in this study are:-

- a) Correlation: at least .30 with at least one other item
- b) Measure of sampling adequacy:  $\geq .60$
- c) Bartlett's Test of Sphericity: Sig.  $< .05$



Table 3.10: Factorability reference ranges used in this study

Test	Reference	Remarks	Reference
1. Correlation	.10	Small effect	J. Cohen (1988)
	.30	Medium effect	
	.50	Large effect	
2. Measure of sampling adequacy	$\geq .80$	Meritorious	Hair et al. (2010)
	$\geq .70$ to $< .80$	Middling	
	$\geq .60$ to $< .70$	Mediocre	
	$\geq .50$ to $< .60$	Miserable	
	$< .50$	Unacceptable	
3. Bartlett's test of sphericity	Sig. $< .05$	Sufficient correlations exist among variables to proceed with factor analysis	Hair et al. (2010)
4. Factor loading	$\pm .30$ to $\pm .40$	Minimal level acceptable	Hair et al. (2010)
	$\pm .50$ to $< \pm .70$	Practically significant	
	$> \pm .70$	Well-defined	

### 3.13. Structural Equation Modelling

Structural equation modelling (SEM) is not a single statistical technique, but an overarching term describing a family of statistical procedures (Kline, 2011). SEM has developed progressively since the 1970s (MacCallum & Austin, 2000) and is increasingly favoured by researchers in a variety of disciplines (Jackson, Gillaspay, & Purc-Stephenson, 2009; Kline, 2011; Lai & Kelly, 2011). Unlike other standard statistical techniques, such as ANOVA and multiple regression, which analyse only observed variables, SEM has the capacity to analyse both observed and latent variables (Kline, 2011).

Confirmatory factor analysis (CFA) is often suggested as a powerful SEM tool. In research, often *a priori* theoretical assumptions are made, hypotheses developed and models designed. CFA tests hypothetical relations between observed and latent variables (Jackson et al., 2009; Kline, 2011; Lai & Kelly, 2011; Loehlin, 2004).

In this study, in addition to those described above, SEM was selected for reasons, which include but not limited to, the following: (i) its complex-model handling capabilities, which many other multivariate data analysis techniques do not support. For example, functionality to estimate a number of independent and interdependent multiple regression equations simultaneously, is a unique to SEM (Hair et al., 2010; Kline, 2011). This is necessary to test the theoretical assumptions and propositions made in this study; and (ii) robust validity and reliability estimates of measured variables. For instance, SEM takes into account measurement error which is largely ignored in other techniques, such as: multiple regression (Schumacker & Lomax, 2004).

### **3.13.1. Software**

There is tacit understanding that widespread availability of computer systems, particularly software solutions, has been largely responsible for the prolific use of SEM in research (MacCallum & Austin, 2000). Various applications software have been made, and among the more popular ones are LISREL, EQS, AMOS, MPlus, SAS PROC CALIS, and RAMONA (Jackson et al., 2009). While most of these software are generic in some ways; there are also areas in which they may differ. For example: the user interface is often different from product to product. Certain functions may be available in one or a few, but

not in all. An example of this is the Satorra-Bentler scaling correction for the chi-square statistics which is available in EQS but not in AMOS (Byrne, 2010). Aside from such subtle differences, there are also some which may be important for the reader's understanding of the results. A case in point is the researcher's decision to fit the model to the correlation matrix (R) or the covariance matrix (S). While, R offers interpretational advantages, S is more suited for studies with multi-samples (MacCallum & Austin, 2000). For these and other reasons, reporting guidelines suggest that the software used for SEM analysis be communicated accordingly (Jackson et al., 2009; MacCallum & Austin, 2000).

In this study, AMOS (Arbuckle, 2012) version 21 from IBM Corporation was used. AMOS is an acronym for analysis of moment structures. This is the most up-to-date version of the software at the time the data analysis in this study was performed. Jackson et al. (2009) suggested that AMOS is among the more popular, and its use in research using SEM, widely reported. AMOS was selected because of its:

- a) Functionality - most of the functions required for data analysis in this study are embedded in the software.
- b) Stability - AMOS is commercially available software from a reputable information technology firm. Authors of repute have also included AMOS among their list of recommended software for SEM (e.g. Hair et al., 2010; Kline, 2011; Schumacker & Lomax, 2004).

- c) Learning curve - AMOS is well known for its user friendliness and excellent graphical user interface. Reasonable access to technical advice from the vendors of AMOS was also available.

### **3.13.2. SEM Strategy**

There are three main SEM strategies postulated by Jöreskog (cited in Kline, 2011). The first is the strictly confirmatory approach in which a single *a priori* model is tested, and should not be modified to fit the data. The second option is known as the alternative models approach, wherein more than one *a priori* model is configured; however all such alternative models must have theoretical support. The model which best fits data will be retained and the rest may be rejected. The third and final strategy is called the model generation approach. Kline (2011, p. 8) suggests that this is the most popular approach. An initial model is constructed and tested. If its fit indices do not meet the criteria established, then the model is modified and tested again. This process is iterated until it meets these three properties: (i) it is theoretically sound; (ii) it is reasonably parsimonious; and (iii) the model fits the data well. Kline (2011) postulated that model generation is the most common strategy in research using SEM.

In this study, the model generation approach was adopted, for the following reasons:

- a) The measurement and structural models were constructed for this research, are not models which have been tested *a priori*. As such a strictly confirmatory

approach was not feasible. This strategy may be well suited in research which may be validating models which had already been tested in other contexts.

- b) Alternative models were not developed, in view of the complexity of the theoretical framework. Furthermore, any such models should have been proposed *a priori*, and this was not deemed necessary as there were sufficient theoretical justifications for the initial model.
- c) The observed variables are reflective indicators of the latent constructs. Removing them during the model generation process will not change the theoretical structure of the construct (Jarvis, MacKenzie, & Podsakoff, 2003).
- d) The quest for parsimony will not substantially change the latent constructs of the initial model, in this study. In other words, the model generation process will not compromise the theoretical foundation underpinning the initial model.

### **3.13.3. Types of variables**

In SEM, variables may be observed, latent, exogenous, or endogenous. Observed variables are those which are usually measured or recorded using a research instrument. Some authors acknowledge that they use the term, indicator, item, observed measure, and observed variable, interchangeably (e.g. Bollen & Lennox, 1991). Latent variables are not observed directly but are derived from one or more observed variables (Byrne, 2010). For

example, organisational culture may not be measured directly but can be inferred from other justifiable measures of the characteristics of the organisation's citizens.

Endogenous and exogenous are another set of variables which will feature prominently in SEM. Endogenous latent variables are synonymous with dependent variables, and exogenous latent variables are synonymous with independent variables (Byrne, 2010, p. 5). Endogenous latent variables are influenced by other variables in the model; however, exogenous latent variables are not (Schumacker & Lomax, 2004).

Other statistical techniques, such as, analysis of variance (ANOVA), and multiple regression, assume that independent variables are measured completely (Kline, 2011). However in reality this is an impractical and seriously flawed assumption. SEM features a "special characteristic", known as the residual or error term, in which variances unexplained by a measuring variable will be represented (Kline, 2011).

#### **3.13.4. Indicators: formative and reflective**

Some studies largely focus on theoretical associations between constructs, and seemingly ignore the direction of relationships between observed variables and latent factors, which potentially may lead to measurement model misspecification (Jarvis et al., 2003; MacKenzie, 2003; Petter, Straub, & Rai, 2007). Findings from such studies may be misleading (Coltman, Devinney, Midgley, & Venaik, 2008). However; there is growing awareness and this can be evidenced in studies which addressed and articulated the issue (e.g. Bagozzi, 2011; Camison & Villar-Lopez, 2012; Gefen, Rigdon, & Straub, 2011; S.

Kim, 2011; Tan, Benbasat, & Cenfetelli, 2013; Treiblmaier, Bentler, & Mair, 2011; Yi, 2009).

The reflective measurement model has a long tradition in the social sciences and is based on the classical test theory; however the focus on formative indicators is relatively recent (Jarvis et al., 2003). The choice of formative or reflective indicators in a study is largely influenced by the conceptual definition of the construct in question and will influence the analytical procedures significantly (Jarvis et al., 2003; MacKenzie et al., 2011). Therefore there is an imperative in research for vigilance in this area.

a) Reflective

When the direction of causality is from the latent construct to the observed variable, the measure is termed reflective. Some authors term them as effect indicators (e.g. Bollen & Lennox, 1991). A, one factor-three items, reflective measurement model is illustrated in Figure 3.1, below. In a reflective model, items measuring a latent construct may be removed without seriously influencing its meaning (Jarvis et al., 2003).

b) Formative

The direction of causality is from the observed variable to the latent construct in the formative measurement model. A, one factor, three items, formative measurement model is illustrated in Figure 3.2, below. Unlike the reflective

model, items measuring a latent construct in a formative construct cannot be removed without influencing its meaning (Jarvis et al., 2003).

Figure 3.1: Reflective construct

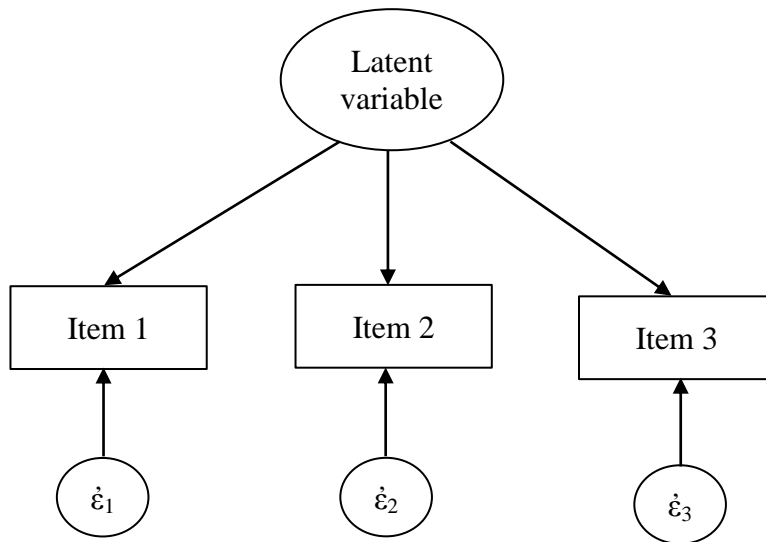
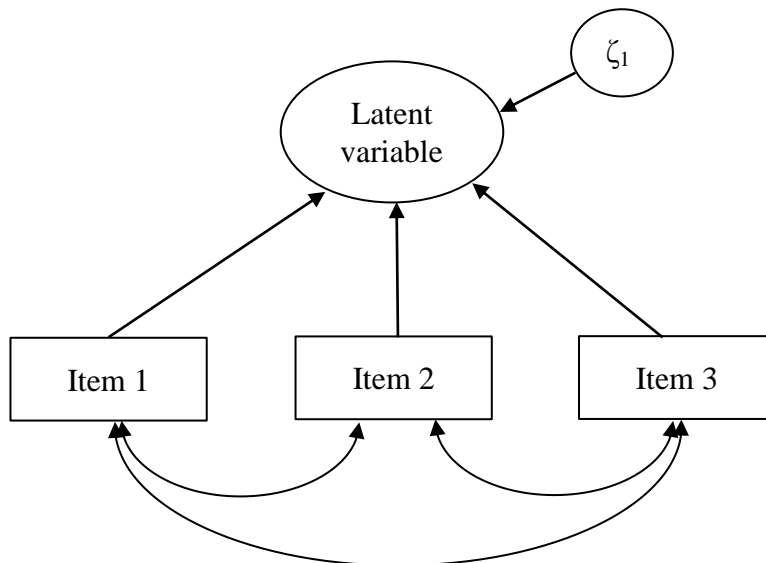


Figure 3.2: Formative construct





In this study all measured variables are reflective indicators. During the research design stage, considerable attention was given to the direction of causality. From the outset, literature review indicated that validated scales to measure the constructs hypothesised in this study were sparse. The measurement model for this study was developed based on a synthesis of measures from various related models found in extant literature. Very few items were adopted in toto, and they were largely reflective. Focused attention was placed during questionnaire design to ensure that the questions will reflect the factor which is measured.

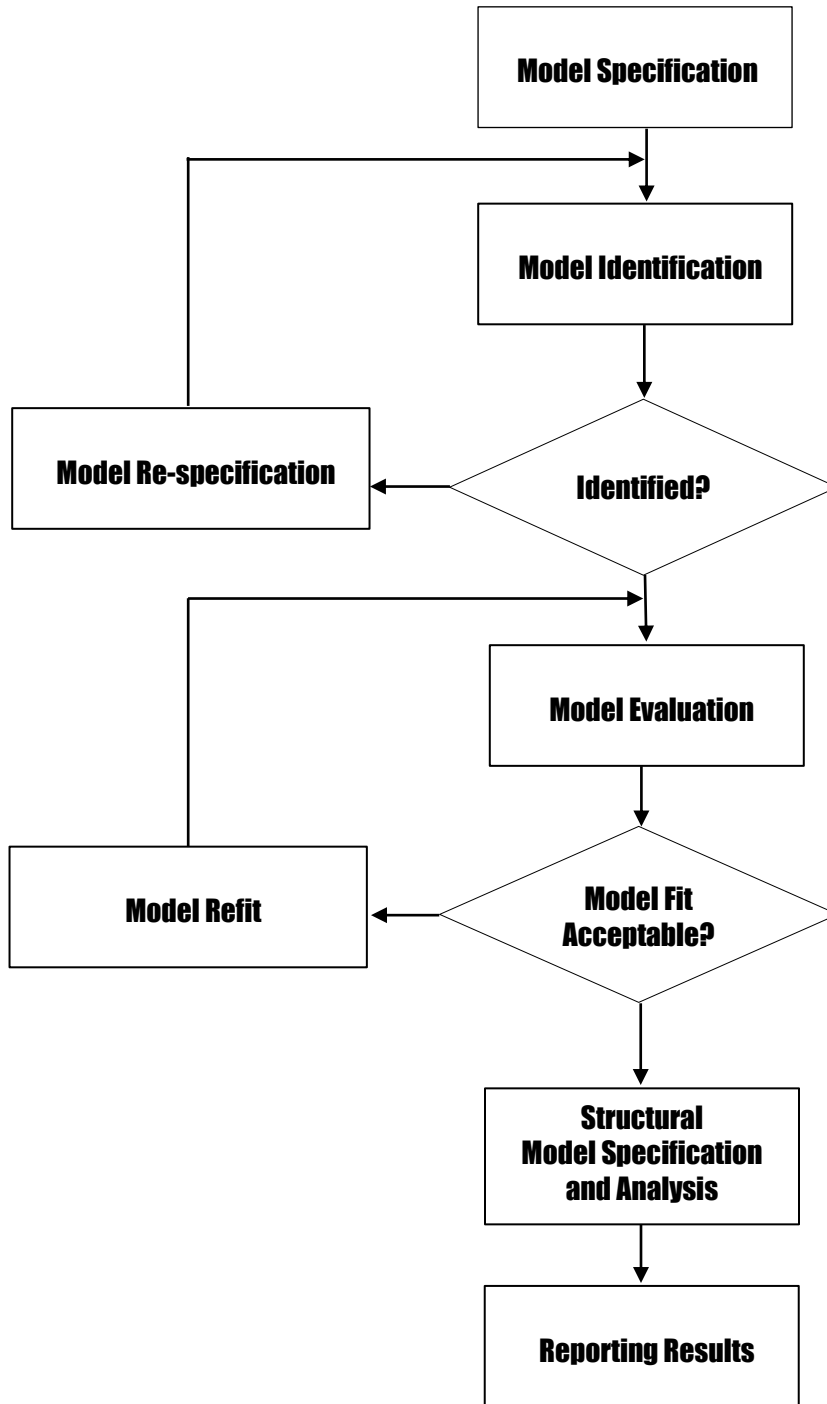
### **3.13.5. Data modelling approach**

Modelling, in this study is a five stage process, and is largely a synthesis of literature from various authors (e.g. Bagozzi & Yi, 2012; Bentler & Chou, 1987; Boomsma, 2000; Byrne, 2010; Hair et al., 2010; Hu & Bentler, 1998; Hu & Bentler, 1999; Jackson et al., 2009; Kline, 2011; MacCallum & Austin, 2000). The five stages identified are: (i) model specification; (ii) model identification; (iii) model evaluation; (iv) structural model specification and analysis; and (v) reporting results.

A flow chart (Figure 3.3) offers a graphical view of the modelling processes, the decision nodes, and the direction of the process flow. While this flow chart broadly explains the modelling process flow, it is not a step-by-step process flow of all the activities which were undertaken. For instance, the measurement model was specified and then fit indices examined. The first three steps, that is, model specification, model identification, and model evaluations, are essentially processes evaluating the measurement model. Only after the model was able to fit the data satisfactorily was the structural model defined and

estimates calculated. Such details have not been included in the flow chart as it was not meant to be didactic.

Figure 3.3: Flowchart of modelling process



Source: Developed for this study based on the flowchart outlined in Kline (2011, p. 92)

### **3.13.6. Model specification**

Kline (2011) describes, model specification, as the most important step in SEM. The hypothesised theoretical framework of the research is defined unambiguously. An understanding of basic concepts, symbols, and rules governing SEM are pre-requisites for model specification. However; the importance of sound theoretical justification in establishing the model cannot be overemphasised (Bentler & Chou, 1987; Byrne, 2010; Kline, 2011).

An SEM model is technically made up of two sub-models, that is: the measurement model and the structural model (Byrne, 2010). Anderson and Gerbing (1988) were among the early proponents of this two-step process which has since become a *de facto* standard in SEM. The measurement model defines the relationship between observed variables and latent factors, and provides pathways to assess convergent and discriminant validity (Schumacker & Lomax, 2004). The structural model, in contrast, defines the relationship between the latent variables in the model and is typically supported by theory (Byrne, 2010; Hair et al., 2010; Schumacker & Lomax, 2004). Assessment of nomological validity is another attribute of the structural model (Schumacker & Lomax, 2004).

In this study, the measurement model was first specified. Theoretically grounded relationships between observed and latent variables were established at this stage. All measured variables were reflective indicators, as such, sufficient attention was given to the direction of the links between these variables and their latent constructs.

Hierarchically in SEM, the structural model is usually defined and examined once the measurement model satisfactorily fits data. All hypothesised relationships between latent variables are defined and then examined, accordingly.

### **3.13.7. Model identification**

Models in SEM must be identified, otherwise the model cannot be analysed. SEM literature forewarn that it is extremely important to sum up the number of parameters to be estimated before analysis is performed, in order to affirm whether the model is statistically sound (Byrne, 2010; Hair et al., 2010; Kline, 2011). Model identification refers to the uniqueness of the parameters in the model. In other words, the model can be deemed as identified if the parameters provide a unique solution; and in contrast, if different parameter values can define the same model, then the model will be considered unidentified.

There are three categories of identification, that is: under-identified, just-identified, and over-identified (Byrne, 2010; Kline, 2011). Under-identified refers to models in which the number of parameters to be estimated exceeds the data points (the number of variances and covariances); in other words, the degrees of freedom will be negative ( $df < 0$ ). In just-identified models, the parameters to be estimated will equal the data points. There will be no degrees of freedom ( $df = 0$ ) in just-identified models, which means that the model cannot be rejected “but will have little scientific value” (Kline, 2011, p. 189). The model identification category of interest in any research using SEM is the over-identified model. The over-identified model is the direct opposite of the under-identified model, and is a prerequisite for SEM. The degrees of freedom will be greater than zero ( $df > 0$ ).

Identification can be calculated by determining the number of observed variables ( $p$ ) in the model, calculating the number of data points ( $dp$ ), ascertaining the number of parameters ( $np$ ) to be examined. Using the following formula, the degrees of freedom ( $df$ ), can be computed:

$$df = (dp = (p(p+1)/2) - np$$

Positive  $df$ , will mean that the model is over-identified. Over-identification, while mandatory, is not the only condition to satisfy identification conditions in SEM. Latent variables must have their scales defined, as they are unobserved; which means that they are devoid of any metric scales (Byrne, 2010). This is usually satisfied by constraining one factor loading parameter, in each set of observed variables measuring a particular latent factor.

AMOS, like most other SEM applications, is able to detect identification issues and will not calculate estimates in the event of violations; however, there is a critical difference between model identification grounded on theoretical justification and model identification to enable the software to calculate estimates. In this study, considerable attention was given to theoretical reasoning during model refit.

### **3.13.8. Model evaluation**

Model evaluation essentially should focus on these two areas, that is: (i) the adequacy of parameter estimates; and (ii) the adequacy of the model as a whole (Byrne, 2010, p. 67).

#### **i. Adequacy of parameter estimates**

While reporting the adequacy of parameter estimates in model fit assessment is an integral component of model evaluation, researchers often fail in this respect (Kline, 2011). Nevertheless, this study took cognisance of the importance of evaluating the adequacy of parameter estimates in determining model fit.

In evaluating the adequacy of parameter estimates, these three areas were examined:

##### **(a) feasibility of the parameter estimates**

Parameter estimates should be consistent with the underlying theory and return the hypothesised sign. Estimates which are spurious may reflect model misspecification. For example standardised loadings above 1.0 or below -1.0 are not feasible (Hair et al., 2010).

##### **(b) appropriateness of the standard errors**

The precision of estimation of parameters can often be evaluated by the size of the standard error. Parameters which return excessively small or large standard errors may indicate poor model fit. What is large or small is not definitive; however standard errors very close to zero may possibly be problematic (Byrne, 2010).

(c) statistical significance of the parameter estimates

Authors have used various significance levels to determine whether or not to reject the null hypothesis in empirical studies. While the .05 significance level is often used in research in the social sciences, some authors (e.g. Skipper, Guenther, & Nass, 1967) questioned the obsession with this level. This study takes cognisance that in research in the social sciences significance levels of  $p < .10$ ,  $p < .05$ , and  $p < .01$  have often been used (e.g. Greenwood et al., 2007; D. Li et al., 2010; Sanz-Valle, Naranjo-Valencia, Jimenez-Jimenez, & Perez-Caballero, 2011) and will guide this study accordingly.

**ii. Adequacy of the model as a whole**

A number of test statistics to assist in the evaluation of models in SEM can be found in literature, and many more are added from time to time. Researchers often select a few of these statistics and report them for self-directed, or other relevant reasons (Byrne, 2010; Jackson et al., 2009; Kline, 2011; MacCallum & Austin, 2000). However, the main point in model evaluation is “the ability to discriminate well-fitting from badly fitting models” (Hu & Bentler, 1998, p. 424).

The subject of model fit indices in SEM is one which is often contentious. There are quite a number of model fit indices suggested in literature; however some authors suggest that three or four fit indices should adequately provide evidence of model fit (Hair et al., 2010). The question then is: which of the many would adequately explain model fit? Suggestions from well cited scholars published in top tiered journals and

selected texts were evaluated, and the model fit indices which was used in this study were determined. A detailed explanation follows.

Another issue to address in model evaluation is whether the recommended fit indices are observed for the full model, or construct by construct. Hair et al. (2010, p. 653) cautioned against performing model evaluation, construct by construct. They argued that there should be “one analysis for the entire model” as it is relatively easier for single constructs to return acceptable model fit indices in comparison to testing the entire model. This study took cognisance of this suggestion.

Notwithstanding the wide variety of model fit indices, studies often select a few appropriate ones and report them. This study is no different; however, such selections were made after synthesising suggestions in extant literature. For example, Bagozzi and Yi (2012) cited  $\chi^2$ , RMSEA, NNFI (or TLI), CFI, and SRMR. Tabachnick and Fidell (2007) posited that at least CFI and RMSEA should be reported. Jackson et al. (2009) observed that the commonly reported measures of model fit are: CFI, TLI,  $\chi^2$ , and RMSEA. Bentler (2007) recommended that one statistical test of model fit (like  $\chi^2$ ) coupled with perhaps SRMR, CFI and RMSEA should have enough depth to report model fit in SEM. MacCallum and Austin (2000) insisted that RMSEA must always be reported, aside from other fit indices. Hair et al. (2010, p. 659) suggested that reports on model fit should include:  $\chi^2$  value and the associated *df*, one absolute fit index (GFI, RMSEA, or SRMR), one incremental fit index (CFI or TLI), one goodness-of-fit index (GFI, CFI, or TLI), and one badness-of-fit index (RMSEA or



SRMR). After reviewing such recommendations, the model fit indices which were selected for reporting in this study are:  $\chi^2$ , normed chi-square, CFI, TLI, RMSEA, and SRMR.

Closely associated with selecting appropriate fit indices, is the issue of cut-off values. Jackson et al. (2009) a large number of studies select fit indices reasonable well; but fail to explicitly declare cut-off values. In this section, aside from identifying the fit indices which were selected for this study, their respective cut-off values have also been clearly indicated. Table 3.11 offers a consolidated view of some of these details

For the sake of brevity, only the model fit indices selected for this study have been described below.

**a) Chi-Square ( $\chi^2$ )**

The chi-square test is often cited in literature as a popular model fit indicator in SEM (e.g. Bagozzi & Yi, 2012; Byrne, 2010; Hu & Bentler, 1998; Kline, 2011). Barrett (2007, p. 815) postulated that this test is “the only substantive test of fit for SEM”.

The chi-square test is not without its limitations. It is prone to distortions, due to violations of normal distribution, and sample size (Bagozzi & Yi, 2012; Kline, 2011; Schumacker & Lomax, 2004). Kline (2011, p. 200) aptly commented that “more information about fit is needed, so passing the chi-square test is hardly the final word in model testing”.

In determining chi-square goodness of fit, the researcher is advised to examine the probability value of the statistic. Under the conventional null hypothesis significance test (Barrett, 2007) chi-square  $p$ -value  $> .05$  infers that the null hypothesis is not rejected, and the model is deemed to fit the data. However; a  $p$ -value  $< .05$  does not mean that the converse may be true (Bagozzi & Yi, 2012; Hu & Bentler, 1998; Kline, 2011). Anderson and Gerbing (1988, p. 417) posited that a measurement model may arguably be deemed acceptable even if the chi-square  $p$ -value is significant, as long as any such suggestion can be “supported by the values of the normed fit index and the other fit indices, particularly the root-mean-square residual index”.

Despite shortcomings of the chi-square test, authors still suggest that research should report this statistic (e.g. Bagozzi & Yi, 2012; Bollen, 1989; Kashy, Donnellan, Ackerman, & Russel, 2009; Yuan & Zhong, 2013).

**b) Normed Chi-Square (NC)**

Jöreskog (1969) suggested that model fit can be assessed by comparing  $\chi^2$  and its degrees of freedom. The author inferred that a large difference between  $\chi^2$  and degrees of freedom is desirable. NC is derived by dividing chi-square by the degree of freedom ( $\chi^2/df$ ). This index addressed the limitations of chi-square statistics in SEM (Byrne, 2010), and is widely used (Hair et al., 2010).

How large or small should NC be to be accepted as a good indicator of model fit? The ratio suggested in literature, generally ranges from 2:1 to 5:1. For example: Wheaton, Muthén, Alwin, and Summers (1977, p. 99) suggested that “a ratio of around 5 or less” should be reasonable; Hair et al. (2010) indicated that 3:1 or less should indicate good model fit; however Tabachnick and Fidell (2007, p. 715) were apparently more cautious when they postulated that NC should be  $\leq 2.0$ .

In this study, the NC value of 2.0 or below will be deemed as the cut-off value for model fit assessment, as it is the more stringent among the suggested ratios in literature, and also that of the cut-off values used in some recently published studies (e.g. Hazel, Vazirabadi, & Gallagher, 2013; Tam, Twigg, Boey, & Kwok, 2013; Yang & Farn, 2009)

### **c) Comparative Fit Index (CFI)**

The CFI (Bentler, 1990), an improvement of the normed fit index (Hair et al., 2010) is often used in studies reporting model fit indices (Byrne, 2010; Kline, 2011). CFI takes into account sample size and performs reasonably well even with small samples (Tabachnick & Fidell, 2007). It is an improvement from the normed fit index (NFI), which is one of the earliest fit indices used in SEM (Hair et al., 2010).

In this study, the cut-off value (that is: .90) for CFI suggested by Hair et al. (2010) was adopted. Hair et al.’s recommendations took into account sample size and number of observed variables, and this resonates well with remarks made by Hu and

Bentler (1998) on the issue of generic cut-off values. This will be explained a bit more in detail below.

**d) Tucker-Lewis Index (TLI)**

The TLI, which is also known as nonnormed fit index (NNFI), is a relative index derived from the placement of a substantive model along a null-model-to-ideal-model continuum (Widaman & Thompson, 2003). Hu and Bentler (1998) postulated that TLI is sensitive to model misspecification, and recommended its use in assessing model fit.

Hu and Bentler (1999) suggested a cut-off value of  $>.95$  for TLI is indicative of a good fit. However; Hair et al. (2010) submitted that taking into consideration asymptotic samples and complex models a cut-off value of  $>.90$  will suffice. In the case of this study, the sample size and model complexity parameters support Hair et al.'s recommendation.

**e) Root Mean Square Error of Approximation (RMSEA)**

RMSEA, is often cited as a badness-of-fit index, and a value of zero demonstrates best fit (Kline, 2011). While this index was proposed in 1980, recognition as “the most informative in criteria in covariance structure modelling”, only came about recently (Byrne, 2010, p. 80). MacCallum and Austin (2000, p. 219) gave unequivocal support for the inclusion of RMSEA in model fit assessment. RMSEA is adequately sensitive to model misspecification (Hu & Bentler, 1998); and guidelines

for interpretation largely yield appropriate conclusions about model quality (Hu & Bentler, 1999). Aside from these valuable attributes, RMSEA in AMOS, also typically returns a 90% confidence interval (CI) and  $p$ -value which “tests for the closeness of fit” (Byrne, 2010, p. 81). MacCallum, Browne, and Sugawara (1996) strongly suggested CI should be reported as a narrow band would provide additional information in support of the precision of RMSEA, in reflecting good model fit. The index’s test of close fit probability value is also expected to be  $> .50$  in further support of the precision of RMSEA (Byrne, 2010).

Hair et al. (2010) suggested that  $RMSEA < .07$  would establish good model fit on condition that  $CFI \geq .90$ . Hu and Bentler (1998) proposed that  $< .06$  would be an acceptable cut-off point for RMSEA. Another viewpoint put forward by MacCallum et al. (1996), while accepting Browne and Cudeck’s proposal that  $RMSEA < .05$  shows good model fit, between  $.05$  to  $.08$  indicates fair fit, and  $> .10$  poor fit, they suggested that RMSEA between  $.08$  to  $.10$  is a sign of mediocre fit. Synthesizing these propositions, the study found Hair et al.’s suggestion quite consistent with the cut-off values suggested by other authors (e.g. Hu & Bentler, 1998; Steiger, 2007) and decided to use it as the threshold for RMSEA.

**f) Standardised Root Mean Square Residual (SRMR)**

SRMR is proposed as the better alternative, when compared against the root mean-square residual (RMR) index in determining model fit (Hu & Bentler, 1999). They further contended that SRMR is “the most sensitive index to models with

misspecified factor covariance(s) or latent structure(s)” (Hu & Bentler, 1999, p. 5). Kline (2011) postulated that SRMR transforms into correlation matrices, the sample covariance matrix and the predicted covariance matrix, and assesses the overall differences between them.

Hu and Bentler (1999) suggested a cut-off value of  $<.08$  for SRMR, which was also echoed by Hair et al. (2010), however the latter included a caveat that to use  $.08$  as the cut-off value, CFI should be greater than  $.92$ .

Table 3.11: Some common model fit indices and suggested cut-off values

Fit indices	Hair et al. (2010, p. 654) <sup>1</sup>	Hu and Bentler (1998, p. 449)
$\chi^2/df$	$\leq 3.0$	
CFI	$> .90$	$\geq .95$
TLI	$> .90$	$\geq .95$
SRMR	$\leq .08$ with CFI $> .92$	$\leq .08$
RMSEA	$< .07$ with CFI $\geq .90$	$< .06$

<sup>1</sup> Suggested for  $N > 250$  and number of observed variables exceeding 30

The problem with cut-off values for model fit indices is that researchers often adopt them as though they are commandments. For example: Hu and Bentler (1999) suggested that CFI values greater than  $.95$  are indicative of a good-fitting model. This is often cherry-picked and broadcast in literature; however in the process, the context surrounding the value is lost (e.g. Bagozzi & Yi, 2012; Jackson et al., 2009; Yuan & Zhong, 2013). Hu and Bentler (1998, p. 449) posited that “it is difficult to designate a specific cut-off value for each fit index because it does not work equally well with various types of fit indices, sample sizes, estimators, or distributions”. This caveat was reiterated by (Kline, 2011, p. 197), when the author remarked that “Hu and

Bentler (1999) never intended their rules of thumb for approximate fit indexes to be treated as anything other than that". Researchers often adopt such suggestions as "golden rules".

In this study, most of the cut-off values will be adopted from suggestions made by Hair et al. (2010), but with the exception of NC which will be informed by Tabachnick & Fidell's cut-off criteria of  $\leq 2.0$ . The reasons are: (a) they take into account sample size and model complexity, which most other suggestions either had not or failed to report; (b) the cut-off values are quite close to those suggested by other scholars, including Hu and Bentler; and (c) the authors are highly respected scholars and their work has been extensively cited.

Since it was proposed that this study will use cut-off values suggested by Hair et al. (2010), an important condition is reiterated and amplified. Both SRMR and RMSEA model fit indices have an additional condition that the validity of the respective cut-off values is incumbent on CFI returning a value  $> .92$  in the case of SRMR and  $\geq .90$  in the case of RMSEA. Essentially this means that acceptable index for CFI was a condition precedent in the use and application of SRMR and RMSEA, in this study.

The final word in research should never be about model fit, as any model, even those which are highly misspecified, can be made to fit the data by adding free parameters (Kline, 2011). Therefore goodness of fit "does not imply that a model is correct or true, but only plausible" (MacCallum & Austin, 2000, p. 218). The researcher is often

reminded that the real goal in research is largely to offer theoretical justification for a model (Byrne, 2010; Kline, 2011; McDonald & Ho, 2002). This study assimilated these suggestions, accordingly.

### **3.13.9. Model refit – number of indicators**

The SEM strategy adopted in this study allows for model re-fit in the event that the initial model does not fit the sample data adequately. In line with this strategy, measured variables may be dropped to improve model fit. The question at this point was: are there any restrictions as to what can be considered as the minimum number of items in a construct? Hair et al. (2010, p. 675) postulated that this is “somewhat of a dilemma” researchers face. While many indicators may fully represent a construct and maximise reliability, they may not necessarily be better.

While some research using SEM have been conducted with just one indicator representing a latent construct, it is more practical to have at least three observed variables in a construct (Hair et al., 2010). Kline (2011, p. 114) suggested that “the absolute minimum for CFA models with two or more factors is two indicators per factor”.

Blunch (2008, p. 129) proposed two rules, that is, the two and three indicator rules. He suggested that a model may have two indicators, on condition that: (i) a manifest variable cannot be an indicator for more than one latent factor; (ii) the error terms are not correlated; and (iii) the covariance matrix for the latent variables does not contain zeros. As for the three-indicator rule, only conditions (i) and (ii) of the two-indicator rule apply.



In this study, the number of observed variables per construct ranged from five to ten, in the initial model. This adequately met the criteria suggested in literature. In the final model, model re-fit may necessitate removing items. With this in mind, it was established that the bare minimum will be two indicators in a construct; on condition that without such flexibility, the entire construct will have to be removed from the model. Otherwise the minimum number of observed variables will be three.

#### **3.13.10. Structural model specification and analysis**

The measurement model was largely reasoned on relationships between observed variables and their constructs. The structural model, in contrast, focuses primarily on theoretically grounded relationships between latent constructs (Hair et al., 2010).

Fit indices identified earlier to assess the measurement model were again employed for the same purpose for the structural model. While good model fit is important, it is not the only criteria to determine the validity of the structural model. Parameter estimates representing each and every hypothesis will have to be examined (Hair et al., 2010). Therefore, parameter estimates were examined to determine if they are statistically significant and manifest in the hypothesised direction, that is, positive or negative relationship.

#### **3.13.11. Reporting results**

A good and well-structured conversation is absolutely necessary in research; otherwise its value will remain hidden. Reporting research findings cogently is therefore not an option but a necessity. Jackson et al. (2009) underlined the importance of good reporting practices,

as the foundation of progress in science. However, notwithstanding the availability of excellent guidelines, the quality of reporting SEM results is generally poor in published studies (Boomsma, 2000; Jackson et al., 2009; MacCallum & Austin, 2000; McDonald & Ho, 2002).

What should be reported in SEM? There are no commonly accepted guidelines; however there is a pattern of consistency in the suggestions in literature addressing this question (Jackson et al., 2009). SEM reporting in this study was largely guided by suggestions from Jackson et al. (2009) and other authors (e.g. Boomsma, 2000; MacCallum & Austin, 2000; McDonald & Ho, 2002; Raykov, Tomer, & Nesselroade, 1991)

#### **3.14. Reliability**

Reliability tests are usually conducted to assess an instruments ability to measure what it is designed to measure, consistently. Hair et al. (2010, pp. 618, 687) suggested that “reliability is also an indicator of convergent validity”, and “is inversely related to measurement error”. There are a few commonly used tests of reliability, like: cronbach’s alpha (N. R. Kelly, Gow, Mitchell, & Trace, 2012), kuder-richardson formula 20 (Fife, Mendoza, & Terry, 2012), and composite reliability (CR; Peterson & Kim, 2013). However there is no consensus on which is the more robust among them (Hair et al., 2010).

While Cronbach’s alpha is acknowledged as the most widely reported estimator of reliability, it has also been subject to criticism as inadequate for this purpose (Peterson & Kim, 2013). For instance, Schmitt (1996) postulated that cronbach’s alpha is not an

appropriate indicator of reliability; and (Cortina, 1993, p. 103) suggested that it “is not a panacea” and should be used with caution. Resonating this, Hair et al. (2010) suggested that Cronbach’s alpha may understate reliability, which was consistent with Peterson and Kim’s finding. Peterson and Kim (2013) concluded that CR is a better estimator of reliability than Cronbach’s alpha.

In this study, reliability was tested using CR, which Hair et al. (2010) observed is often reported in studies using SEM. Similar to AVE, AMOS version 21, does not return CR values. This was done in Microsoft Excel and reported accordingly.

CR was calculated using the following equation (Hair et al., 2010, p. 687):

$$CR = \frac{\left(\sum_{i=1}^n L_i\right)^2}{\left(\sum_{i=1}^n L_i\right)^2 + \left(\sum_{i=1}^n e_i\right)}$$

where:  $L_i$  represents the standardised factor loading; and  $n$  is the number of observed variables; and  $e_i$  is the error variance term of the observed variable in the construct.

Reliability  $\geq .70$  is indicative of good reliability; however estimates between .60 and .70 are also acceptable on condition that other indicators of construct validity have been met (Hair et al., 2010). This study was guided by these benchmarks.

### 3.15. Construct validity

Measurement error is an area in which researchers should never be complacent about, as it has the potential to confound interpretation of findings of empirical studies. It is therefore important that researchers “validate measures and disentangle the distorting influences of these errors” (Bagozzi, 1993, p. 50). Construct validity may be assessed when we “examine convergent, discriminant, and nomological validity” (Hair et al., 2010, p. 699).

#### Convergent validity

Convergent validity is often determined in SEM by examining the average variance extracted (AVE). AVE informs the degree of variance which can be explained by a latent variable. In the event that the measurement error is greater than the variance which can be explained by a construct, then the validity of the construct is questionable (Fornell & Larcker, 1981). In this respect, AVE above .50 will suggest that the construct satisfies a requirement of convergent validity (Carlson & Herdman, 2011; Fornell & Larcker, 1981; Hair et al., 2010).

AVE is not an intrinsic function in AMOS version 21, and as result it was calculated using the following equation (Hair et al., 2010, p. 687):

$$AVE = \frac{\sum_{i=1}^n L_i^2}{n}$$

where:  $L_i$  represents the standardised factor loading; and  $n$  is the number of observed variables in in the construct.

### **Discriminant validity**

Discriminant validity may be assessed by assessing inter-construct covariances. An often used approach is to compare the AVE of a latent construct with the squared inter-construct correlations ( $R^2$ ) with other associated factors (Hair et al., 2010). Discriminant validity is established when the construct AVE is greater than the corresponding inter-construct  $R^2$ .

In this study, all latent constructs in the initial measurement model were covaried and their respective squared inter-construct correlations were assessed for discriminant validity.

### **Nomological validity**

Apart from convergent and discriminant validity, another validity assessment is often suggested in establishing construct validity of a model, that is: nomological validity. Cronbach and Meehl (1955, p. 290) postulated that “the interlocking system of laws which constitute a theory” will form a nomological network. Hair et al. (2010) described that nomological validity is about making sense out of a measurement theory.

Nomological validity may be established by examining the correlations among constructs in a model (Hair et al., 2010). In this study, correlations between constructs were examined to assess nomological validity of the model. Essentially the direction and significance level of the standardised correlation matrix was examined for this purpose.

### **3.16. Multi-group analysis**

All earlier described analyses were founded on a single sample. However; this study had also hypothesised that moderating variables may influence the direction and/or strength of the relation between the exogenous and endogenous variables. The moderating variables examined in this research are: gender, sector and industry type, organisational culture, and religiosity.

Two methods are generally used in determining whether or not a given variable moderates the relationship between the exogenous and endogenous variables. The first is by way of a  $\chi^2$  difference test ( $\Delta\chi^2$ ), in which noninvariance is established when its  $p$ -value is statistically significant, that is, it is  $<.05$  (Byrne, 2010). The second method suggested in literature is by examining the  $\Delta CFI$ , whereby a cut-off value  $\leq -.01$  informs that the model is invariant (Cheung & Rensvold, 2002, p. 251). It is not uncommon for divergent findings to be established in these two methods; however Byrne (2010) postulated that the researcher may use either one of these methods and suggested a preference for the  $\Delta\chi^2$ , which was also employed in this study to examine model invariance.

#### **Multi-group invariance model configuration**

Byrne (2010, p. 199) postulated that tests for equivalence be conducted “in a logically ordered and increasingly restrictive fashion”, and the more common parameters which explain multi-group equivalence are: (i) factor loadings; (ii) factor covariances; and (iii) structural regression paths. Founded on this suggestion, this study examined multi-group invariance as follows:-

- Model-1 - configural model; no equality constraints applied.
- Model-2 - measurement weights constrained.
- Model-3 - measurement weights; and structural weights constrained.
- Model-4 - measurement weights; and structural weights; and structural covariances constrained.

### **3.17. Conclusion**

In this chapter, the study described the research design and methodology used to capture the factors that will influence tacit knowledge sharing in organisations. The first part described the many facets of sampling and the approaches which this study adopted in line with the purpose of the research. The second part was largely about analytical procedures upon which the data collected will be examined and as much information as possible extracted. In this respect, as much details about SEM in relation to this research was described.

In the next chapter, the study will report the results of the study, largely guided by the analytical procedures determined and described in this chapter. Chapter 4 will describe the respondents profile and also response rates in order to provide some background information about the type participants in this study. Data examination and how inconsistencies were remedied will also be reported. Subsequently SEM will inform how well the model fits the data. Path estimates will also be examined and findings reported accordingly. The chapter will finally examine factorial noninvariances and report the effect of moderators on the factors which were examined in the study.

# CHAPTER 4

## RESULTS

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*“Water, water, everywhere,  
And all the boards did shrink;  
Water, water, everywhere,  
Nor any drop to drink.”*  
- Coleridge (1836, p. 6)



#### **4.1. Introduction**

Chapter 3 commenced with a section on research design, followed by details about the sampling methods used in this study. In the section: common sampling methods were examined to draw reference from, and to select the most suitable method, for this study. This was followed by a description of the sampling frame and sample sizing, and data collection methods employed in the research. The pre-tests and pilot study which were conducted were then described. Some details pertaining to ethical considerations which this research adopted were also elaborated. The final part of chapter 3 described the analytical procedures, which largely guided the framing of the results in this study.

Samuel Coleridge's ballad, "*Water, water, everywhere, And all the boards did shrink; Water, water, everywhere, Nor any drop to drink*", would resonate well with most people's distress with data. Independently, data is meaningless unless it is analysed and transformed into information coherently, and information contextualised into knowledge. With this in mind, data analysis was accorded due recognition and importance in this study.

Chapter 4 commences with relevant details informing the response rates experienced in this study. The respondents profile is then described, followed by a section on data examination, which is an essential component of any research. Spurious data will have an impact and may distort findings and as Jacoby (1978, p. 90) concisely postulated, "what does it mean if a finding is significant, or that the ultimate in statistical analytical techniques have been applied, if the data collection instrument generated invalid data at the outset?". Churchill (1979) aptly described such data using the popular information technology metaphor: "garbage-in, garbage-out". Based on suggestions made in literature on data analysis (e.g. Aguinis et al., 2013; Hair et al., 2010; Pett et al., 2003; Tabachnick & Fidell, 2007), this

study focused on three basic areas in data examination, which are: missing data, outliers, and normality tests. This is followed by exploratory factor analysis in order to compare the conceptualised theoretical assumptions of factor structures and the structures which manifested from the data collected for this study, and to detect items which were problematic. Based on such information, the study then went through a phase of data cleaning before detailing descriptive statistics, like mean and standard deviation. This was followed by a report on the common methods variance test.

The last two sections of this chapter essentially form the core of data analysis in this study. Data was analysed using structural equation modelling, and model fit indices and path analysis reported accordingly. The final section in this chapter will examine the moderators for noninvariance and report the findings accordingly.

#### **4.2. Response rate**

This research, similar to many in the social sciences, depends on the willingness of selected participants to respond to the survey questionnaires. Scholars have inferred that the quality of survey data is often indicated by the response rate (Wagner, 2010). Blaike (2010) posits that while it is acknowledged that the comprehensiveness of sampling units will determine the usefulness of any sampling design, a poor response rate will destroy its credibility. A 100 percent response rate is the ultimate goal of any researcher; however this is rarely achieved (Rogelberg & Stanton, 2007). Baruch and Holton (2008) suggested a benchmark of between 35 to 40 percent response rate as adequate; however Dooley & Lindner (2003) were more stringent when they postulated that a response rate of at least 85 percent will sufficiently mitigate any risks associated with nonresponse.

While the unit of analysis is the knowledge worker, consent from the employer was obtained in conformance to the data collection guidelines established prior to the commencement of the research. Organisations were selected from three strata, that is: manufacturing, commercial services and public services. An initial batch of 40 organisations, proportional to the target, was approached. Various methods of contact, starting with telephone calls, emails, and personal visits were made. This process was iterated until the targeted numbers were achieved.

A total of 160 organisations were approached in stages, from the three industry types. In the manufacturing sector, 82 firms were approached, however only 7 (9%) of these firms eventually participated in the study. 64 firms were contacted in the commercial services sector, of which 12 (19%) consented and participated. As for the public services sector, 14 organisations were approached, of which 10 (71%) consented and participated. These details are illustrated in Table 4.1. In the same table, it can be noted that 100% of the targeted number of organisations in the public services sector consented and participated in the study. As for the manufacturing and commercial services sectors, the targets met were 64% and 63%, respectively.

Table 4.1: Response rates – organisations selected to participate in the study

Industry type	Organisations		Consented and participated		
	Targeted	Approached	No.	% against approached	% against target
Manufacturing	11	82	7	9%	64%
Commercial services	19	64	12	19%	63%
Public services	10	14	10	71%	100%
<b>Total :</b>	<b>40</b>	<b>160</b>	<b>29</b>	<b>18%</b>	<b>73%</b>

A total of 461 questionnaires were distributed of which 422 were returned giving a 92% response rate. Questionnaires were scrutinised for incompleteness, which may be problematic for data analysis. Only one questionnaire was rejected for this reason. The relevant response data has been laid out in Table 4.2. In the manufacturing sector, 105 questionnaires were distributed of which 98 (93%) were returned. An almost similar response rate was detected in the public services sector, where 163 questionnaires were distributed and 153 (94%) were returned. However there was a slight drop in the commercial services sector, where out of 193 questionnaires which were distributed, 171 (89%) were returned. The eventual sample size (n=421) of this study exceeded the targeted sample size of 400. The expected response rate was 65% (described in chapter 3), while the actual response rate came to 92%. This study also suggests that the high response rate (> 85%) may have mitigated potential risks associated with nonresponse.

Table 4.2: Response rates – questionnaire responses from knowledge workers

Industry type	Distributed	Returned	% <sup>1</sup>	Accepted
Manufacturing	105	98	93%	98
Commercial services	193	171	89%	170
Public services	163	153	94%	153
<b>Total:</b>	<b>461</b>	<b>422</b>	<b>92%</b>	<b>421</b>

<sup>1</sup> Percentage of questionnaires returned against distributed

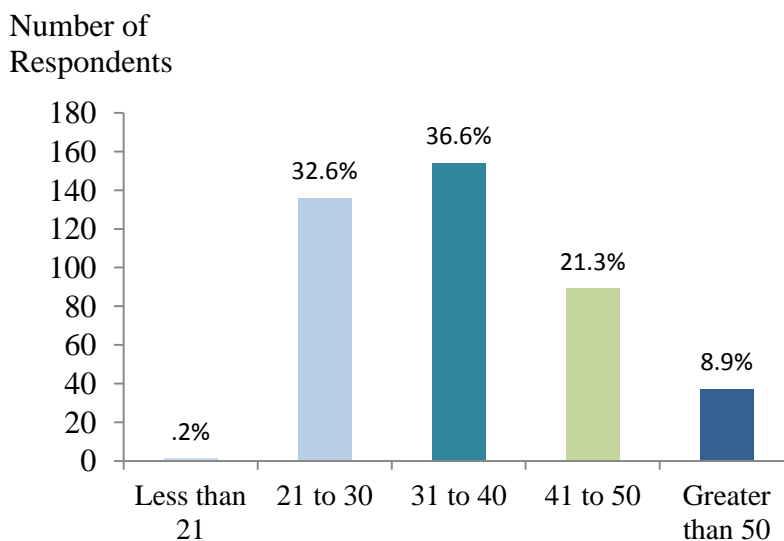
### 4.3. Respondents profile

This section offers some insights into the profile of the respondents, some of which will be examined later on in the study in greater detail in relation to the organisational factors and tacit knowledge sharing behaviour.

### Knowledge workers: Age group

Respondents in this study were grouped into five categories (Figure 4.1). Four participants failed to record their age group which worked out to approximately 1% of the total responses. Most of the participants in this study came from the 21 to 30 (32.6%), and 31 to 40 (36.9%) age groups. Cumulatively this group accounted for approximately 69.5% of respondents. The distribution of knowledge workers in the Malaysia workforce for this age group was approximately 63% in 2011 (DOSM, 2013a, 2013b, 2013c). The study suggests that the age group composition of respondents in this study is quite similar to the distribution of knowledge workers in the Malaysian workforce.

Figure 4.1: Number of respondents – by age group

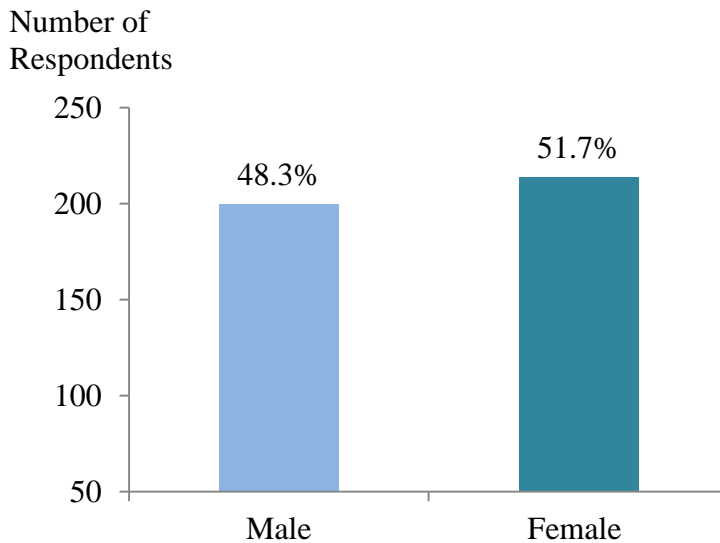


### Knowledge workers: Gender

Gender statistics (Figure 4.2) indicated that the participation of males and females were almost equal. Males accounted for 48.3% and females 51.7% of the participants. Seven participants did not respond to this field and as this percentage (1.7%) was negligible, no

action was deemed necessary as the missing data was not expected to influence the findings significantly.

Figure 4.2: Number of respondents – by gender



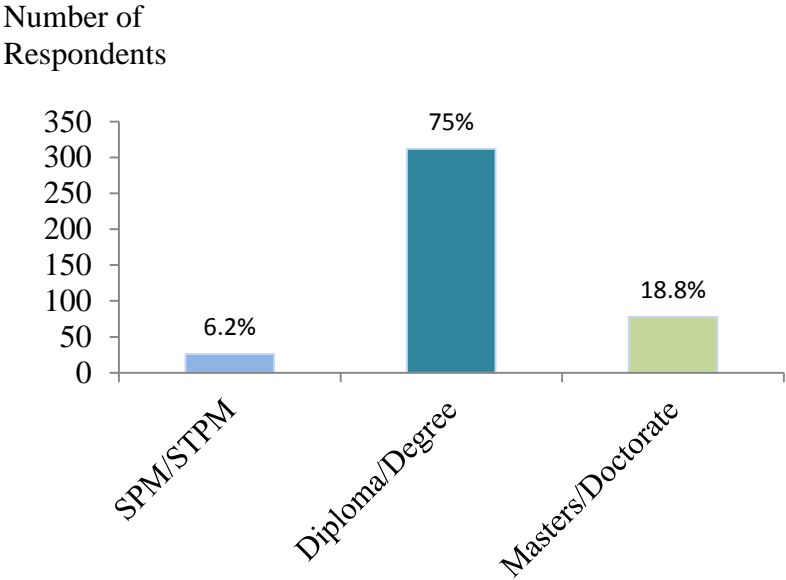
### **Knowledge workers: Highest education level**

This study defined a knowledge worker as anyone in the employ of an organisation with a minimum education at the level of a graduate diploma or degree. In this respect, it was deemed necessary at the outset that the respondents' highest education qualification be scrutinised accordingly. Frequency statistics have been presented in Figure 4.3, below. Five participants failed to respond to this question and as this gap was negligible (< 1.2%), no action was deemed necessary. Furthermore this field, was included largely to determine that the majority of respondents meet the knowledge worker definition in order not to confound the findings of the study, and was not earmarked for further investigation.

During the process of recruiting organisations for the study, the relevant officials were made aware of the participants' selection criteria. During this process and as a result of

request for further clarifications from these officials, it was explained to them that the education level is merely a relative indicator of a knowledge worker and is not an absolute criteria. What is relevant for this study is whether the participant's main job activities in the workplace revolve around knowledge, which includes among others, aspects of: creation, acquisition, discovery, distribution, organising, and sharing. With better understanding of what a knowledge worker is, some of these officials suggested that a few of their staff qualify as knowledge workers even though they do not have any tertiary qualifications and requested for them to be included in the study as participants. This was agreed on before the survey questionnaires were distributed. In this respect, only 26 respondents making up approximately 6% of the valid respondents had SPM/STPM qualifications, which are essentially pre-university qualifications. This was quite a small proportion compared to the approximately 94% whom were educated to the diploma/degree level or beyond. In summary, none of the responses were rejected.

Figure 4.3: Number of respondents – by highest education level

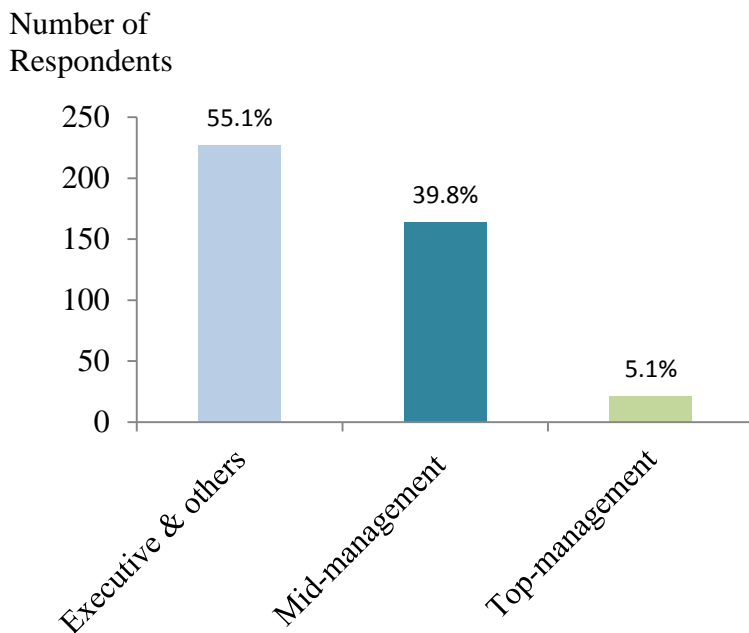


### Knowledge workers: Position

While the knowledge workers position was not designed for investigation, it was included to determine the profile of the respondents in order to extract more meaningful information from the other findings of this study, if required. Frequency statistics related to the respondents' position in their respective organisations have been presented in Figure 4.4, below. Nine participants did not respond to this question, which constituted approximately 2% of the observations.

Knowledge workers were represented in three distinct categories, of which the Executives and Others (n=117) category was the largest, comprising 55.1% of the respondents in the study. This was followed by the mid-management (n=164; 39.8%) group. Top-management made up approximately 5.1% of the total valid respondents.

Figure 4.4: Number of respondents – by position

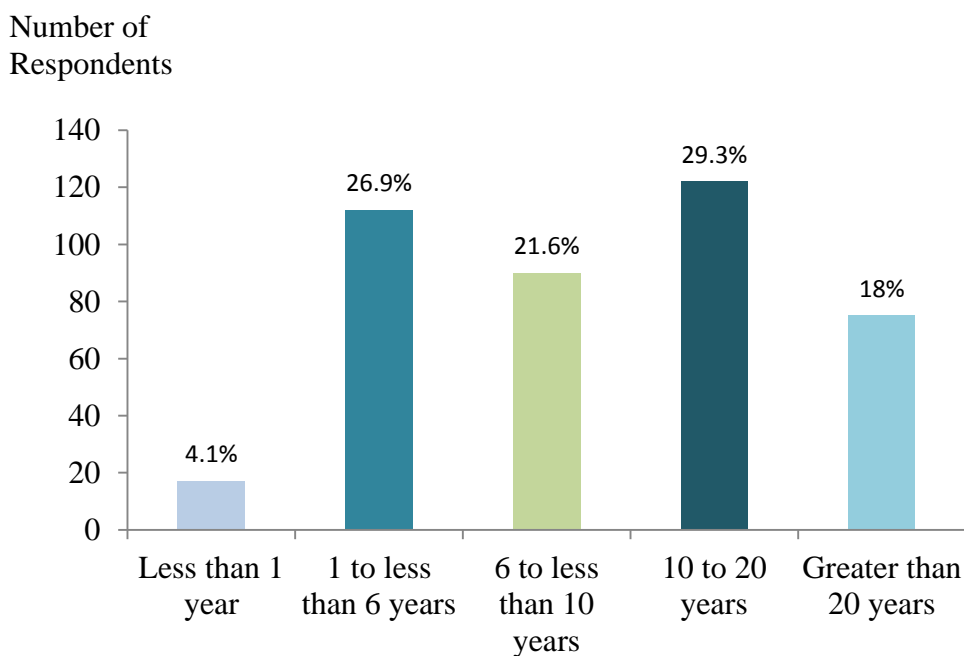




### Knowledge workers: Work experience

While education level is often used as a guide to define a knowledge worker in order to reduce ambiguity and arbitrariness, it may be too simplistic to just rely on it as a sole indicator. Experience is an equally important constituent. In this study participants were requested to respond to five categories of work experience. Frequency statistics of participants' response to work experience have been presented in Figure 4.5, below. Five respondents did not answer this question, 112 (26.9%) participants had between one to six years' work experience, 90 (21.6%) had between six to ten years' work experience, 122 (29.3%) had between 10 to 20 years' work experience, and 75 (18%) had greater than 20 years' work experience.

Figure 4.5: Number of respondents – by work experience



It was assuring to observe that approximately 96% of respondents had between one to more than twenty years work experience. This coupled with the observation that 94% of the

respondents had at least diploma/degree level education, provides adequate support that the participants were appropriate for this study.

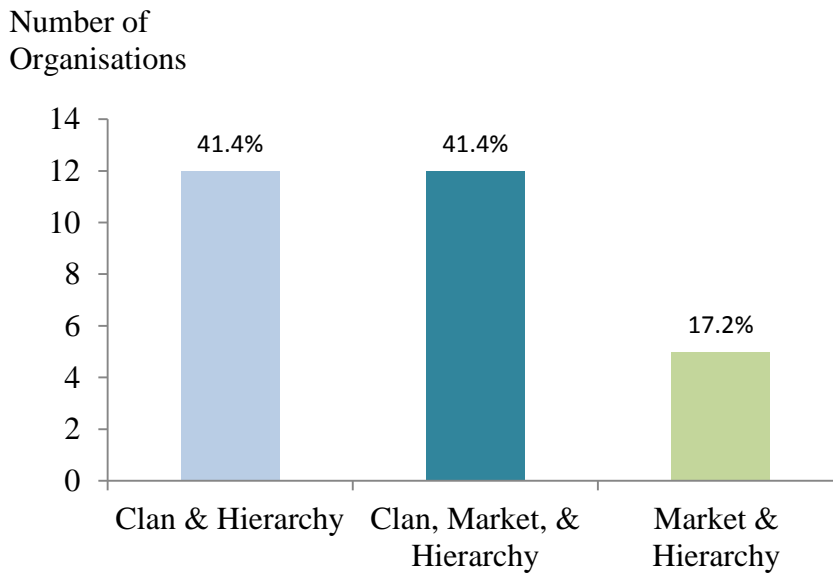
### **Organisations: Organisational culture**

Diagnosis of organisational culture was conducted using the Organisational Culture Assessment Instrument (OCAI; Cameron & Quinn, 2006) in which organisations may be of, any one or a combination, of these four culture types: clan, adhocracy, market, and hierarchy. These culture types were described in greater detail in Chapter 2.

An analysis of the culture types of organisations in which the participants in this study were employed showed that all these organisations did not have a single dominant culture type but instead they had a combination of, two or in some cases three dominant culture types. Relevant frequency statistics have been graphically represented in Figure 4.6, below. Twelve organisations had a combination of the clan and hierarchy (C&H) culture types. An equal number of organisations displayed a mixture of the clan, market, and hierarchy (C&M&H) culture types. The last five organisations had a combination of the market and hierarchy (M&H) culture types.

It is quite obvious that the hierarchy culture is common in all the 29 organisations which consented to participate in this study. It was also apparent in this study that not even one of the participating organisations displayed skew toward an adhocracy culture; which is consistent with another study by Suppiah and Sandhu (2011) in the Malaysian context.

Figure 4.6: Organisational culture type of participating organisations

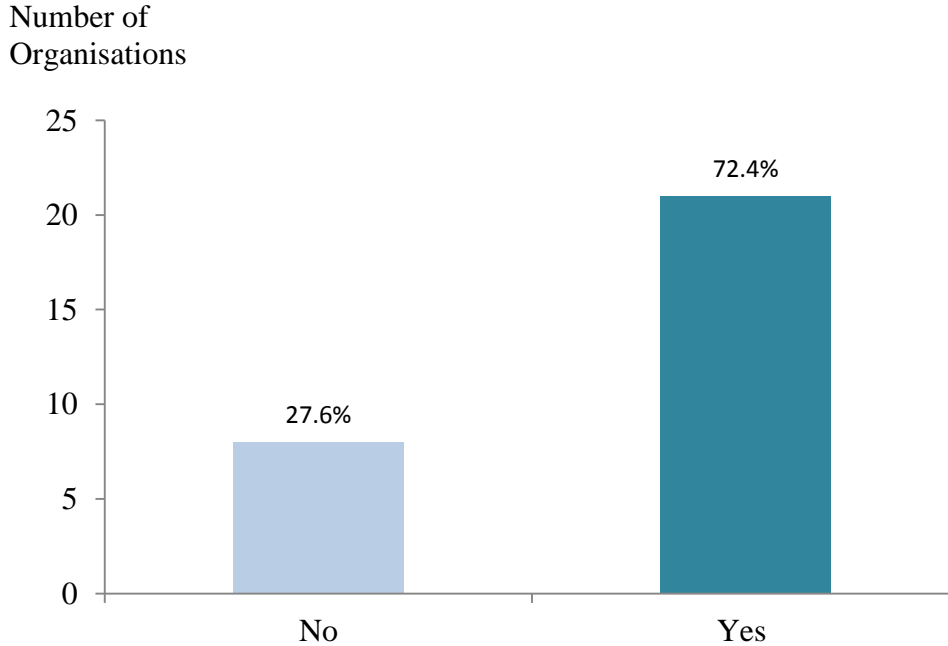


### Religiosity

The study examined whether religiosity moderated the influence of the exogenous factors on knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour. Religiosity was represented by *Syariah* influence in this study, and was explained in more detail in chapter 3.

Data analysis of the 29 organisations which participated in this study was performed and the results presented in Figure 4.7, below. The results show that 21 (72.4%) were deemed as organisations in which the *Syariah* has an influence on management practices, and eight (27.6%) of organisations did not qualify as such.

Figure 4.7: Influence of *Syariah* teachings on participating organisations



#### 4.4. Data Examination

Examining data for inconsistencies, while acknowledged as compelling, is often overlooked by researchers as it is tedious and time-consuming (Hair et al., 2010). Data collected were examined for inconsistencies and violations of assumptions in performing multivariate statistical analysis.

##### 4.4.1. Missing data

The extent of missing data was examined. Researchers often use deletion methods, listwise or pairwise (e.g. Graham, 2009), to resolve missing data problems. While this practice is quite common, Wilkinson & American Psychological Association Task Force on Statistical Inferences (cited in Baraldi & Enders, 2010, p. 6) commented that these “are among the worst methods available for practical applications”. Aside from bias resulting from such deletions, one other weakness of the deletion method is that, the sample size may be

reduced during analysis whereby an adequate sample has the potential to degenerate into an inadequate sample (Hair et al., 2010). In this study, only 0.31% (198) of data points were missing against a total of 64,413. Aside from this, it was observed that missing data by variable did not exceed 2.1%, which according to literature (Hair et al., 2010; Tabachnick & Fidell, 2007) is not a cause for serious concern.

The pattern of missing data was then analysed, which according to Tabachnick & Fidell (2007) is more important than the volume of missing data. The primary purpose was to ascertain whether data were missing at random (MAR), missing completely at random (MCAR), or in a non-random fashion. It is not uncommon for studies to assume that data are MCAR, ignoring formal tests (Little, 1988). In this study, a visual observation of the data to detect nonresponse bias was first made and no discernible pattern emerged. While randomness may be inferred from this observation, it was deemed insufficient and a more rigorous statistical method, that is: Little's MCAR test (Hair et al., 2010; Little, 1988) was employed. Little's MCAR ( $p = .313$ ) was non-significant, which suggested that missing data in this study were MCAR.

#### **4.4.2. Outliers**

In this study, Mahalanobis distance ( $D^2$ ) was computed for each observation using SPSS. Higher  $D^2$  indicate that the observation is further removed from the general distribution of observations in the dataset.  $D^2/df$ , where  $df$  denotes the number of variables involved in computing  $D^2$ , forms the t-value (Hair et al., 2010). The authors suggested that responses returning  $D^2/df$  value greater than 2.5 for small samples (80 or fewer observations), and 3 or 4 for large samples may be potential outliers.

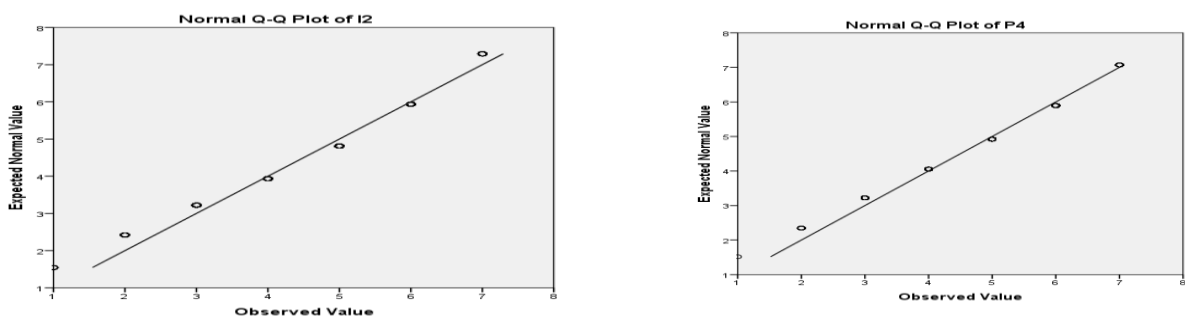
In this study (n=421), 420  $D^2/df$  observations were below 2.0 and only one observation recorded a value of 2.14. All these observations were well below 3, which suggested that no intervention was necessary.

#### 4.4.3. Normality

In this study the Kolmogorov-Smirnov test (Appendix 4.1) was executed as a first step in determining that the variables are normally distributed. All items were significant ( $p < .05$ ), was not able to suggest that there were no violations of the assumption of normal distribution.

Literature often cautions on relying solely on such normality tests because small deviations in normality in large samples may produce significant results (e.g. Field, 2005; Hair et al., 2010). A visual inspection of graphical plots was performed and it was found that some of the variables did not indicate that the observations therein were not normally distributed. This observation supports suggestions made by authors not to rely absolutely on statistical tests as the only method to examine data distribution. An example of some of these graphical plots can be found in Figure 4.8, below.

Figure 4.8: Q-Q plots of selected variables



It was apparent that the findings of, the normal distribution statistical tests and visual inspection of the graphical plots, do not converge satisfactorily. While this study may take some refuge in Hair et al.'s (2010) suggestion that large sample sizes (above 200) will trim the adverse effects of nonnormality, it was decided at this stage to subject tests of data distribution to further examination in SEM using the AMOS application.

### **Assessment of normality in SEM**

Most of the model assessment functions in SEM assume multivariate normality (Byrne, 2010; Kline, 2011; Ullman, 2006); however in practice data distribution is often nonnormal (Yuan & Zhong, 2013).

Multivariate normality may be visually inspected or with statistical tests. The study observed earlier that the Kolmogorov-Smirnov statistical test was not able to indicate that the data was normally distributed, which was in contrast to observations made in the Q-Q plots. As described above, the assessment of normality was done at this stage using SEM.

In SEM, the AMOS software provides a critical ratio (C.R.), which is the normalised estimate of multivariate kurtosis. This C.R. value, while not labelled as such in AMOS, is in essence Mardia's coefficient, and is often used to evaluate multivariate normality (Byrne, 2010; Ullman, 2006). Mardia's coefficient greater than 5.0 indicates that the data may not be normally distributed (Bentler cited in Byrne, 2010). In this study Mardia's coefficient of 102.27 (Appendix 4.2) was not able to support the assumption that the sample data was normally distributed.

While authors (e.g. Byrne, 2010; Kline, 2011), have postulated that violation of multivariate normality may be a cause for concern, Hu and Bentler (1998, p. 450) demonstrated that in SEM, “violation of multivariate normality assumption alone seems to exert less impact on the performance of the fit indices”. Other scholars, like Hair et al. (2010) had also suggested that asymptotic sampling will reduce the effect of nonnormality. Furthermore in this study, bootstrapping was employed during model estimation. Bootstrap is often suggested as an effective technique to mitigate nonnormal distribution (Byrne, 2010). Premised on these suggestions, the study infers that nonnormality may not be a serious concern in this study.

#### **4.5. Exploratory factor analysis (EFA)**

EFA was conducted (n=200) using PAF and rotation using the Promax technique. The data used for this purpose was a randomly selected sub-set of the data collected for this study. The objective was: (i) to identify significant factors; and (ii) remove measured items which offer weak support ( $l < .50$ ) to the identified factors, and unacceptable cross-loadings ( $l > .50$ ) in two or more factors (Hair et al., 2010).

The results of EFA (details in Appendix 4.3) have been described below. For ease of reference, the items codes used to identify the items in the data set are as laid out in Table 4.3, below.



Table 4.3: Item codes reference

Variable	Item Codes
Tacit knowledge sharing behaviour	
Mentoring	I1-I8
Communities of practice	J1-J8
Intention to share tacit knowledge	
Attitude toward tacit knowledge sharing behaviour	L1-L7
Perceived norm about tacit knowledge sharing	M1-M10
PBC toward tacit knowledge sharing	N1-N7
Knowledge networks	O1-O7; P1 – P6
Leadership behaviour	
Task-oriented leadership behaviour	R1-R8
Relations-oriented leadership behaviour	S1-S12
Example-oriented leadership behaviour	T1-T8
Resources	
Tangible resources	U1-U7
Intangible resources	V1-V11

### **Tacit knowledge sharing behaviour**

The scale for tacit knowledge sharing behaviour (TKSB) in the study's conceptual framework was constructed on 2 indicators, that is: mentoring, and communities of practice. Initially, the factorability of the 16 TKSB items was examined. Several well recognised criteria for the factorability of a correlation were used. First, all 16 items correlated at least .30 (Appendix 4.4) with at least one other item, which suggested that they were factorable. Next, the KMO test returned a value of .93 which is greater than .60 (minimum threshold established) and Bartlett's Test of Sphericity ( $p < .001$ ) was significant. Both these tests further confirmed that the items in the TKSB scale are suitable for factor analysis.

PAF (Appendix 4.3) was then employed, to identify factors and to assess the degree of contribution of the items describing these factors for appropriate action. Initial eigenvalues

returned three factors above the value of one and they accounted for cumulative total of approximately 70% of variance, of which the first factor explained about 51% of the variance, the second factor close to 13% of the variance, and the third factor approximately 6% of the variance. The first two factors were retained as they cumulatively explain approximately 64% of the variance, which is acceptable in the social sciences (Hair et al., 2010). The variance explained by the third factor is only about 6%, which is quite small. Furthermore the two factor solution is also preferred, as it is in line with this study's theoretical framework.

The pattern matrix for TKSB (Appendix 4.3) was then examined. Items with factor loading  $< .30$ , items cross-loading, and items loading significantly on factor three, were tagged as candidates for removal.

### **Intention to share tacit knowledge**

The scale for intention to share tacit knowledge (I2STK) in the study's conceptual framework was constructed on 3 indicators predicated on 24 items. The indicators are: attitude toward behaviour, perceived norm about tacit knowledge sharing, and perceived behavioural control (PBC) about tacit knowledge sharing. Initially, the factorability of the 24 I2STK items was examined. Several well recognised criteria for the factorability of a correlation were used. First, all 24 items correlated at least  $.30$  (Appendix 4.4) with at least one other item, which suggested that they were factorable. Next, the KMO test returned a value of  $.89$  which is greater than  $.60$  (minimum threshold established) and Bartlett's Test of Sphericity ( $p < .001$ ) was significant. Both these tests further confirmed that the items in the I2STK scale are suitable for factor analysis.

PAF (Appendix 4.3) was then employed, to identify factors and to assess the degree of contribution of the items describing these factors for appropriate action. Initial eigenvalues returned five factors above the value of one and they accounted for cumulative total of approximately 62% of variance, of which the first factor explained about 33% of the variance, the second factor close to 10% of the variance, the third factor about 8% of the variance, and the fourth factor about 6% of the variance. The fifth factor only explained approximately 5% of variance and further examination indicated that only three items had acceptable ( $l > .30$ ) factor loadings, therefore this factor was dropped. The four accepted factors cumulatively explain slightly more than 56% of the variance, which is acceptable in the social sciences (Hair et al., 2010). While all four factors were largely supported by the theory of planned behaviour, the indicator, perceived norm, was split into two factors instead of one. However as there were no theoretical justifications for this sub-division, the factor as was originally constructed was maintained.

The pattern matrix for I2STK (Appendix 4.3) was then examined. Items with factor loading  $< .30$ , items cross-loading, and items loading significantly on factor three, were tagged as candidates for removal.

### **Knowledge networks**

The scale for knowledge networks (KN) in the study's conceptual framework was constructed using 13 items. Several well recognised criteria for the factorability of a correlation were used. First, except for items: O1, P5 and P6, all other items correlated at least .30 (Appendix 4.4) with at least one other item, which suggested that they were factorable. Next, the KMO test returned a value of .76 which is greater than .60 (minimum threshold established) and Bartlett's Test of Sphericity ( $p < .001$ ) was significant. Both these tests further confirmed that the items in the KN scale are suitable for factor analysis.

PAF (Appendix 4.3) was then employed, to identify factors and to assess the degree of contribution of the items describing these factors for appropriate action. Initial eigenvalues returned three factors above the value of one; however upon closer examination of factor loadings of the items, it was apparent that constructing substantive factor structures may be a challenge as many of the items were cross-loading and in some factors less than three items were loading above .30, which was deemed inadequate to explain the measure of the factor. In such instances, literature often suggests that the researcher may respecify the factor model (Hair et al., 2010). Some of the items which returned weak reliability test scores were removed and the factor model was re-constructed accordingly.

The pattern matrix for KN (Appendix 4.3) was then examined. Items with factor loading  $< .30$ , items cross-loading were tagged as candidates for removal.

## **Leadership behaviour**

The scale for leadership behaviour (LB) in the study's conceptual framework was constructed on 3 indicators predicated on 28 items. The indicators are: leaders task-orientation, leaders relations-orientation, and leaders example-orientation. Initially, the factorability of the 28 LB items was examined. Several well recognised criteria for the factorability of a correlation were used. First, all 28 other items correlated at least .30 (Appendix 4.4) with at least one other item, which suggested that they were factorable. Next, the KMO test returned a value of .96 which is greater than .60 (minimum threshold established) and Bartlett's Test of Sphericity ( $p < .001$ ) was significant. Both these tests further confirmed that the items in the LB scale are suitable for factor analysis.

PAF (Appendix 4.3) was then employed, to identify factors and to assess the degree of contribution of the items describing these factors for appropriate action. Initial eigenvalues returned four factors above the value of one and they accounted for cumulative total of approximately 67% of variance, of which the first factor explained close to 51% of the variance, the second factor about 7% of the variance, and the third factor approximately 5% of the variance, and the fourth factor about 4% of the variance. The first three factors were retained as they cumulatively explain slightly more than 63% of the variance, which is acceptable in the social sciences (Hair et al., 2010). The variance explained by the fourth factor is only 4%, which was not very significant. Furthermore the three factor solution is also preferred as it is in line with this study's theoretical framework.

The pattern matrix for LB (Appendix 4.3) was then examined. Items with factor loading  $< .30$ , items cross-loading, and items loading significantly on factor three, were tagged for as candidates for removal.

## **Resources**

The scale for resources in the study's conceptual framework was constructed on 2 indicators predicated on 18 items. The indicators are: tangible resources and intangible resources. Initially, the factorability of these 18 items was examined. Several well recognised criteria for the factorability of a correlation were used. First, all 18 items correlated at least .30 (Appendix 4.4) with at least one other item, which suggested that they were factorable. Next, the KMO test returned a value of .92 which is greater than .60 (minimum threshold established) and Bartlett's Test of Sphericity ( $p < .001$ ) was significant. Both these tests further confirmed that the items in the resources scale are suitable for factor analysis.

PAF (Appendix 4.3) was then employed, to identify factors and to assess the degree of contribution of the items describing these factors for appropriate action. Initial eigenvalues returned four factors above the value of one and they accounted for cumulative total of 63% of variance, of which the first factor explained 40% of the variance, the second factor 9% of the variance, and the third factor 8% of the variance. The fourth explained 6% of the variance.

The first three factors were retained as they cumulatively explain slightly more than 57% of the variance, which is acceptable in the social sciences (Hair et al., 2010). The variance explained by the fourth is only 6%, which is not very significant. During theory development, the study only identified two factors, which are tangible and intangible resources. Items measuring tangible resources loaded significantly on the first factor. However items measuring intangible factors loaded on the second and third factors. It was

not the design of this study to investigate intangible resources at a more granular level, and as such, the original construct was maintained.

The pattern matrix for Resources (Appendix 4.3) was then examined. Items with factor loading  $< .30$ , items cross-loading, and items loading significantly on factor three, were tagged as candidates for removal.

#### **4.6. Data cleaning**

The primary objective of data cleaning was to remove items which were not able to withstand commonly accepted statistical justification as a measure of a latent variable, before proceeding further into more complex statistical analysis.

A list of items which returned weak statistical support and tagged accordingly, were examined and removed when no compelling reason could be found to retain them. At the risk of repetition, it was deemed necessary to reiterate here that the measures in this study are reflective and not formative. Removing items reflecting a latent construct is not expected to “alter the conceptual domain of the construct” (Jarvis et al., 2003, p. 203). The risk of model misspecification due to the removal of items was minimal, in this study.

Various tests and visual examination were conducted, including reliability tests, assessment of correlation between items measuring a factor, and factor loadings. The reference values suggested by Hair et al. (2010) for factor loadings were used for the purpose of identifying items for removal. Items loading below  $.40$  on all retained factors were removed. Items with factor loadings ranging from  $.40$  to  $.50$  were retained only if the item is considered an

important reflection of the construct. The items which were removed at this stage have been listed in Table 4.4, below.

Table 4.4: Items deleted

Item	Comments
I4	This item loaded ( $l = .70$ ) highly on factor 3, which did not have justification for consideration as it had only this one item loading above the cut-off value.
J2	This item did not load above the cut-off value (.40) on any of the factors.
L7	This item cross-loaded ( $> .40$ ) on two factors.
M4	This item loaded ( $l = .76$ ) highly on factor 5, which did not have sufficient justification for consideration as a significant indicator of the construct.
M6	This item did not load above the cut-off value (.40) on any of the factors.
N5	This item loaded ( $l = .44$ ) just above the cut-off threshold on factor 4, which did not have sufficient justification for consideration as a significant indicator of the construct.
O2	This item did not load above the cut-off value (.40) on any of the factors.
O4	This item did not load above the cut-off value (.40) on any of the factors.
O6	This item did not load above the cut-off value (.40) on any of the factors.
P2	This item did not load above the cut-off value (.40) on any of the factors.
P5	This item did not load above the cut-off value (.40) on any of the factors.
P6	This item did not load above the cut-off value (.40) on any of the factors.
R7	This item loaded ( $l = .53$ ) reasonably well on factor 4, however this factor did not have sufficient justification for consideration as a significant indicator of the construct.
S8	This item did not load above the cut-off value (.40) on any of the factors.
S11	This item loaded ( $l = .89$ ) highly on factor 4, which did not have sufficient justification for consideration as a significant indicator of the construct.
T3	This item loaded ( $l = .77$ ) highly on factor 4, which did not have sufficient justification for consideration as a significant indicator of the construct.
T6	This item did not load above the cut-off value (.40) on any of the factors.
T8	This item did not load above the cut-off value (.40) on any of the factors.
U2	This item did not load above the cut-off value (.40) on any of the factors.
U3	This item loaded ( $l = .88$ ) highly on factor 4, which did not have sufficient justification for consideration as a significant indicator of the construct.
V2	This item did not load above the cut-off value (.40) on any of the factors.
V8	This item loaded ( $l = .56$ ) reasonably well on factor 4; however this factor did not have sufficient justification for consideration as a significant indicator of the construct.



#### **4.7. Descriptive statistics**

Relevant descriptive statistics from the responses to the questionnaire have been described in this section, and the details listed in Appendix 4.5. The questionnaire elicited responses from participants using a seven point Likert scale ranging from strongly disagree (1) to strongly agree (7). This scale was used for all items reflective of the latent constructs in the study.

##### **Tacit knowledge sharing behaviour (TKSB)**

Two indicators constituted the measurement of TKSB in this study. The first TKSB indicator is, mentoring (items I1 - I8) in which participants were requested to communicate its importance and effectiveness in the organisation. Responses ranged from one to seven for all items and the mean for the items ranged from  $M=4.18$  ( $SD=1.771$ ) to  $M=5.13$  ( $SD=1.220$ ). Community of practice (items J1 - J8) was constructed as the second reflective indicator of TKSB. Questions were crafted to gauge the level of development of such communities in relation to knowledge sharing in the organisation. Responses ranged from one to seven for all items and the mean for the items ranged from  $M=3.52$  ( $SD=1.610$ ) to  $M=4.49$  ( $SD=1.225$ ).

##### **Intention to share tacit knowledge (I2STK)**

Three indicators constituted the measurement of I2STK in this study, predicated on the theory of planned behaviour (Ajzen, 1991). The first indicator was, attitude toward tacit knowledge sharing behaviour (items L1 - L7), in which participants were requested to indicate how they feel about sharing their tacit knowledge with others in their organisation. All items had at least one maximum score, that is: seven; however this consistency was not evident in the minimum scores. Three items had a minimum score of one, another three had

a minimum score of two and one item had a minimum score of three. Means for the seven items ranged from  $M=5.75$  ( $SD=1.044$ ) to  $M=5.97$  ( $SD=.856$ ). The second I2STK indicator was, perceived norm about sharing tacit knowledge (items M1 – M10) in which participants responded to questions pertaining to their perception of normative behaviour in the organisation on matters related to tacit knowledge sharing. With the exception of three items where the minimum score detected was two, the rest had a minimum score of one. All items recorded at least one response with seven. Means for the ten items ranged from  $M=4.57$  ( $SD=1.502$ ) to  $M=5.52$  ( $SD=.972$ ). The final indicator in the I2STK construct was perceived behavioural control toward sharing tacit knowledge (items N1 – N7). Questions were designed to elicit responses about the respondents feeling of empowerment in sharing tacit knowledge in the workplace. Respondents marked scores ranging from one to seven for all seven items. Means for the seven items ranged from  $M=4.02$  ( $SD=1.493$ ) to  $M=5.45$  ( $SD=1.065$ ).

### **Knowledge networks (KN)**

The construct, knowledge networks, was measured by 13 items (O1 - P7) in which the survey questions were crafted to elicit the respondents conviction of the strength of their ties and level of trust they have with people in their organisation. Respondents marked scores ranging from one to seven for most items, except for one in which the minimum score was two. The mean for the thirteen items ranged from  $M=3.13$  ( $SD=1.237$ ) to  $M=5.56$  ( $SD=1.030$ ).

### **Leadership behaviour (LB)**

Three indicators constituted the measurement of LB in this study. The first indicator, leader's task-orientation (items R1 – R8), in which respondents were requested to indicate to what extent their managers focus on the tasks at hand and the level of their involvement. Respondents marked scores ranging from one to seven for all eight items. Means for the eight items ranged from  $M=4.55$  ( $SD=1.577$ ) to  $M=5.67$  ( $SD=1.036$ ). The second LB indicator was the leader's relations-orientation (items S1-S12) in which participants recorded their perception about their manager's level of support, empathy, friendliness, and concern toward the subordinate. Respondents marked scores ranging from one to seven for all twelve items. Means for the twelve items ranged from  $M=4.75$  ( $SD=1.509$ ) to  $M=5.62$  ( $SD=.989$ ). The third and last indicator of the leadership behaviour construct was, the leaders example-orientation (items T1 – T8). Herein, participants were asked about how they feel their managers lead by example. Respondents marked scores ranging from one to seven for all eight items. Means for the items ranged from  $M=4.40$  ( $SD=1.395$ ) to  $M=5.30$  ( $SD=1.181$ ).

### **Resources**

Two indicators constituted the measurement of Resources in this study. Items in the first indicator, tangible resources (items U1 – U7), requested for participants to indicate how they feel about the adequacy of equipment provided to them by their organisation, in the performance of their jobs. Respondents marked scores ranging from one to seven for all seven items. Means for these items ranged from  $M=4.78$  ( $SD=1.403$ ) to  $M=5.52$  ( $SD=1.137$ ). The second indicator of resources, that is, intangible resources (items V1-V11) requested participants to respond to questions regarding the adequacy of intangible resources like learning and growth opportunities, moral and financial support, in the

organisation. Respondents marked scores ranging from one to seven for all eleven items. Means for these items ranged from  $M=4.39$  ( $SD=1.596$ ) to  $M=5.43$  ( $SD=1.002$ ).

#### **4.8. Common methods variance (CMV)**

Common methods may introduce spurious correlations between variables, and is something which this study took cognisance of at the outset. Various procedural and statistical remedies to address CMV have been proposed in literature, and this was discussed in Chapter 3.

While procedural remedies were adopted before data collection, the statistical CMV diagnostic procedure which this study adopted could appropriately be done at this point. In this study, the Harman's single factor (HSF) test was used to detect whether CMV would confound the findings. The HSF test, essentially is a diagnostic technique and is not meant for remedial action (Podsakoff et al., 2003), which was sufficient for its adoption in this study. In this test, it is assumed that "if a substantial amount of common method variance is present, either (a) a single factor will emerge from the factor analysis or (b) one general factor will account for the majority of the covariance among the measures" (Podsakoff et al., 2003, p. 889).

The unrotated factor structure of the measured variables was examined and a single-factor analysis was performed, and the results showed that only 26.11% of the variance is explained by the single factor. In summary the test demonstrated that more than one factor emerged, and no single factor was able to account for the majority ( $\geq 50\%$ ) of variance in the data. Therefore CMV was not a cause for concern in this study.

#### **4.9. Structural equation modelling**

In Chapter 3, analytical procedures using SEM were described. In this section these procedures were operationalised. The sample size (n=421) was deemed acceptable for this purpose. The measurement model was first specified and overall model fit determined.

The reliability and validity (discriminant and convergent) of the constructs were examined via the factor loadings, average variance extracted, and composite reliability indicators, of the constructs. Observed variables which were not statistically sound were removed and the measurement model re-examined. This process was iterated until acceptable model fit indices were returned. At the risk of repetition, it is reiterated that the indicators in this model were reflective and removing them will not alter the theoretical framework of the constructs (Jarvis et al., 2003).

Once the measurement model was finalised, the process of specifying the structural model commenced. Hypothesised relationships were examined to test the theories underlying them. Finally, factorial invariances were examined and the influence of moderators on the constructs were established and reported.

## Abbreviations

Relevant abbreviations used in the model and in the descriptions below, have been re-displayed in Table 4.5, for ease of reference.

Table 4.5: Abbreviations used for latent constructs in the model

Abbreviation	Description
A2B	Attitude toward tacit knowledge sharing behaviour
COP	Communities of practice
I2STK	Intention to share tacit knowledge
KN	Knowledge network
L_EO	Example-oriented leadership behaviour
L_RO	Relations-oriented leadership behaviour
L_TO	Task-oriented leadership behaviour
Ment	Mentoring
PBC	Perceived behavioural control toward sharing tacit knowledge
PN	Perceived norm about sharing tacit knowledge
R_I	Resources (Intangible)
R_T	Resources (Tangible)
TKSB	Tacit knowledge sharing behaviour

### 4.9.1. Initial measurement model

The primary task was to specify the measurement model and assess the goodness-of-fit between the hypothesised model and the data collected in this study. The overall initial model was first examined and assessed for goodness-of-fit. Subsequently the reliability and construct validity of the model was assessed.

### **i. Overall model assessment**

Continuing from where the section on data cleaning left off, the measurement model was specified according to the hypothesised framework and model identification was determined. All latent variables were constructed with one regression path from an observed variable constrained to one (1), in order to satisfy one of the model identification criteria.

The initial model (Figure 4.9) in this study had 77 observed variables ( $p$ ), which means that the number of data points ( $dp$ ) came up to: 3003 ( $dp = p(p+1) / 2$ ), and there were 187 parameters to be examined. Therefore, the model fit the criteria for over-identification, with 2816 (3003-187) degrees of freedom.

Model fit indices were then estimated. The initial model returned the following indices:  $\chi^2_{(2816)}=7199.17$ ;  $\chi^2/df=2.6$ ; CFI=.81; TLI=.80; SRMR=.07; RMSEA=.061. These indices and the goodness-of-fit cut off values established earlier in Chapter 3 can be found in Table 4.6. Some of the fit indices were marginally acceptable, while others did not indicate that the initial model was able to fit the sample data satisfactorily.

Normed chi-square (NC) index was 2.6, which is above the cut-off value of  $\leq 2.0$ , indicating that the model did not have a reasonably large difference between  $\chi^2$  and its degrees of freedom. Furthermore; both CFI and TLI indices were also below their respective cut-off values, which meant that the initial model did not fit the data very well.

While both SRMR and RMSEA were below their respective cut-off values when examined in isolation, the additional condition of CFI > .92 for SRMR, and CFI ≥ .90 for RMSEA, implied that any attempt to assess model fit using these two indices may be futile.

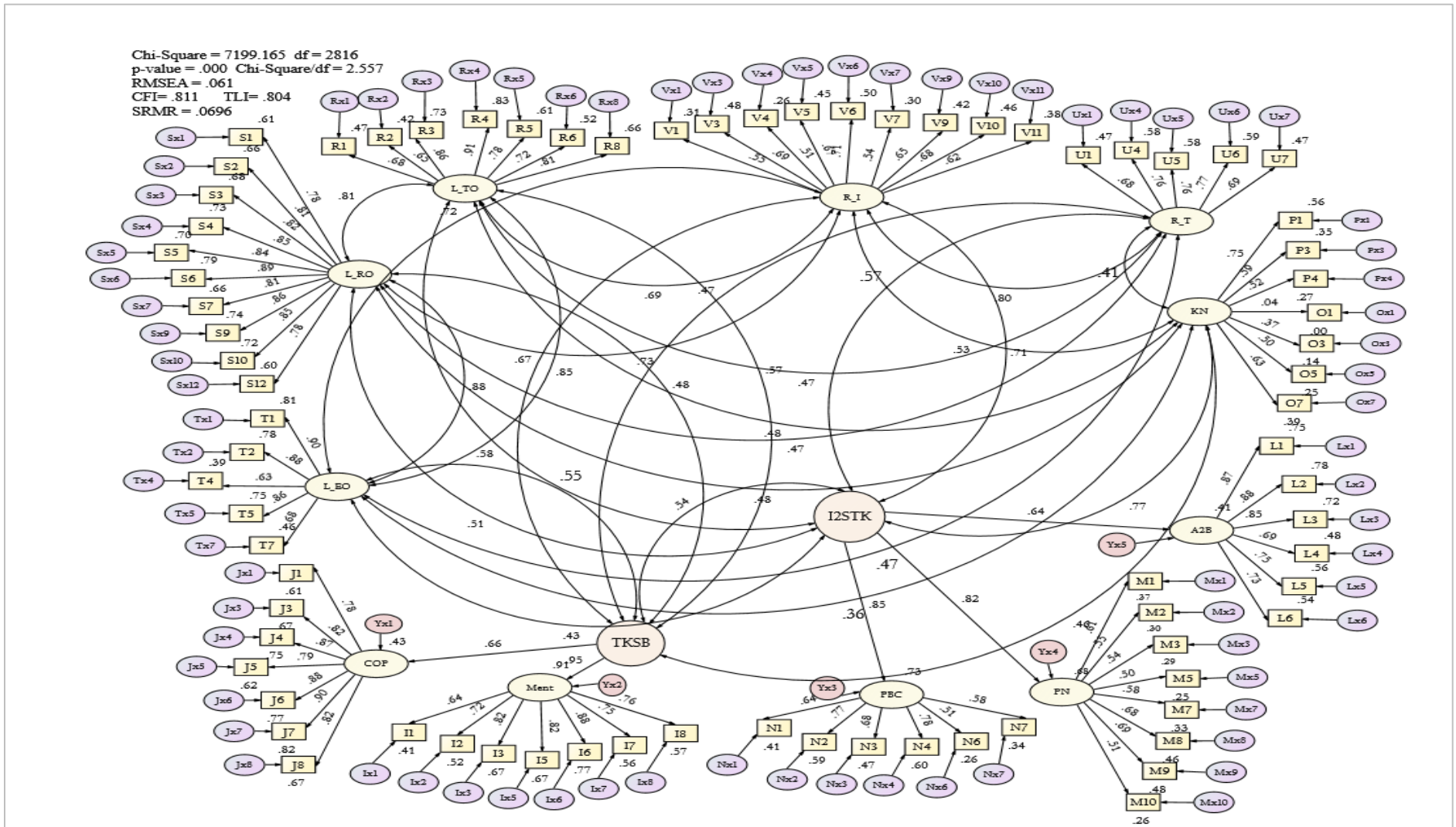
The conclusion was that the model did not fit the data satisfactorily and would have to be re-fitted. Model re-fit was executed by examining, factor loadings, average variance, and composite reliability, construct by construct. Observed variables which loaded weakly or were confounding were removed and parameter estimates re-calculated. This process was iterated until reasonably acceptable model fit indices were returned. Literature had suggested that there is a real risk of not knowing when to stop fitting a model (e.g. Bagozzi & Yi, 2012; Byrne, 2010). Keeping this in mind, the model fit process was terminated when subsequent improvements in fit indices were marginal. The study also ensured that model re-fit had justifiable theoretical support. In this respect, modification indices returned by AMOS were often found to be lacking and were not acted on.

Table 4.6: Measurement model fit indices of the initial model

Index	Initial-model fit indices	Goodness-of-fit cut-off values
$\chi^2$ p-value	.000	> .05
Normed chi-square	2.6	≤ 2.0
CFI	.81	> .90
TLI	.80	> .90
SRMR	.07	≤ .08 with CFI > .92
RMSEA	.061	< .07 with CFI ≥ .90



Figure 4.9: Hypothesised initial measurement model



**ii. Assessment of reliability and construct validity**

While it may be moot at this point to assess reliability and construct validity, keeping in mind that the initial model was not able to fit the data satisfactorily, the study nevertheless proceeded to do so in order to assess the impact of model re-fit on the composite reliability and convergent validity scores. The AVE and composite reliability values of the constructs have been listed in Table 4.7, and Appendix 4.6, in which further details have been included.

In Table 4.7, it can be observed that all constructs returned composite reliability values  $>.70$ . This indicated that the survey instrument developed in this study was measuring what it was designed to measure, consistently. However in the case of the convergent validity test using AVE as the indicator, four of the constructs were observed to have values below the threshold, that is: they were  $< .50$  which is the cut-off value established. Therefore the study was unable to suggest that all the constructs had convergent validity. This issue was re-assessed once the final model was established and is reported below.

Table 4.7: AVE and CR of constructs in the initial model

Construct	AVE	CR
A2B	.64	.91
COP	.70	.94
KN	.33	.74
L_EO	.64	.90
L_RO	.69	.96
L_TO	.61	.91
Ment	.60	.91
PBC	.44	.82
PN	.34	.81
R_I	.40	.85
R_T	.54	.85

In summary, it was not the intention at this stage to delve deeper into tests of reliability and construct validity. All the relevant tests were conducted once the final measurement model was established.

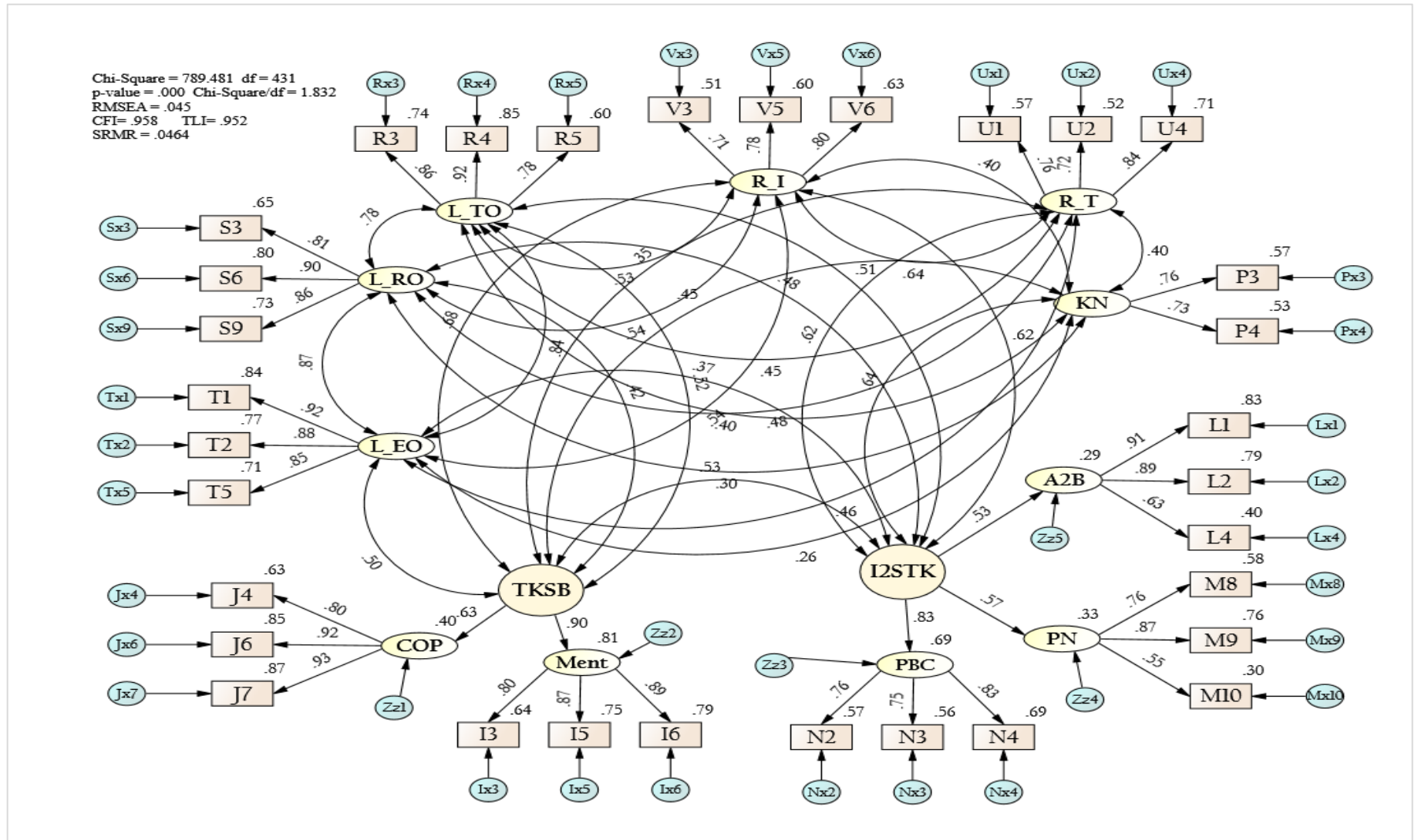
#### **4.9.2. Final measurement model**

A series of model re-fit processes were executed in order to establish a final model which will eloquently balance between good model fit and a sound theoretical foundation. This approach is in line with the model development strategy (described in Chapter 3) established for this research.

Observed variables measuring a latent construct were all reflective in the model in this study. Unlike in a formative model where all observed variables collectively form the latent construct, in a reflective model the latent construct is not predicated on the measures used (Borsboom, Mellenbergh, & van Herdeen, 2003). Reflective variables essentially measure the same concept and may be removed without causing variations in the latent construct (Bollen & Lennox, 1991; Coltman et al., 2008; Jarvis et al., 2003).

Model fit in this study took the approach of removing items which: (i) had relatively low factor loadings compared to other items measuring the latent construct; and (ii) theoretically unjustifiable correlation with indicators in other constructs. This was an iterative process and model fitting continued until a stage when improvements in model fit indices were marginal. A graphical representation of the final measurement model can be found in Figure 4.10, below.

Figure 4.10: Hypothesised final measurement model



i. **Assessment of the reliability and convergent validity: Construct by construct**

**Mentoring: Reliability and convergent validity assessment**

The latent variable, mentoring, was measured by three observed variables (Figure 4.11). Composite reliability (Table 4.8) of .89, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings ranged from .80 to .89. Using these loadings, Average variance extracted (Table 4.8) was computed and a value of .73 was returned. This exceeded the .50 threshold, and therefore suggested that the mentoring construct in the final model satisfied the study's pre-determined criteria for convergent validity.

Figure 4.11: Measurement model – Ment

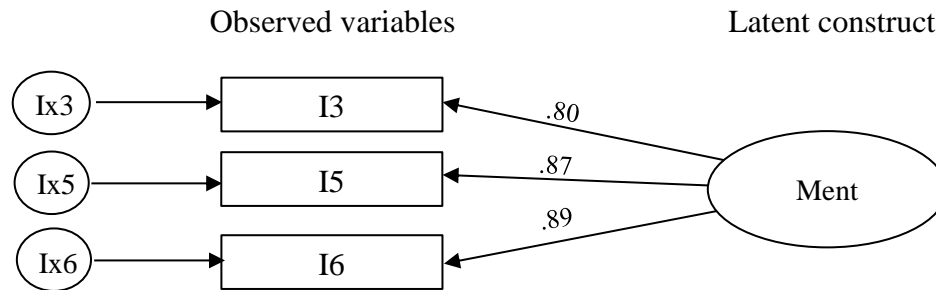


Table 4.8: Factor loading, AVE, and CR – Ment

Observed variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
I3	← Ment	.80	.64	.36	.73	.89
I5	← Ment	.87	.75	.25		
I6	← Ment	.89	.78	.20		

### Communities of practice: Reliability and convergent validity assessment

The latent variable, COP, was measured by three observed variables (Figure 4.12). Composite reliability (Table 4.9) of .92, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings ranged from .80 to .93. Using these loadings, Average variance extracted (Table 4.9) was computed and a value of .78 was returned. This exceeded the .50 threshold, and therefore suggested that the COP construct in the final model satisfied the study's pre-determined criteria for convergent validity.

Figure 4.12: Measurement model – COP

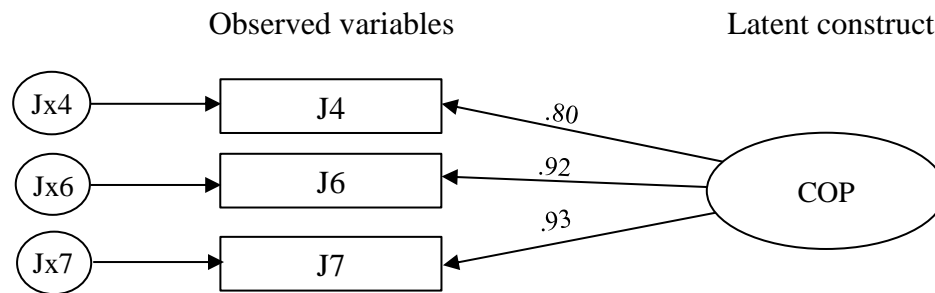


Table 4.9: Factor loading, AVE, and CR – COP

Observed variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
J4	← COP	.80	.63	.37	.78	.92
J6	← COP	.92	.85	.15		
J7	← COP	.93	.87	.13		

**Attitude toward tacit knowledge sharing behaviour: Reliability and convergent validity assessment**

The latent variable, A2B, was measured by three observed variables (Figure 4.13). Composite reliability (Table 4.10) of .86, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings ranged from .63 to .91. Using these loadings, Average variance extracted (Table 4.10) was computed and a value of .67 was returned. This exceeded the .50 threshold, and therefore suggested that the A2B construct in the final model satisfied the study’s pre-determined criteria for convergent validity.

Figure 4.13: Measurement model – A2B

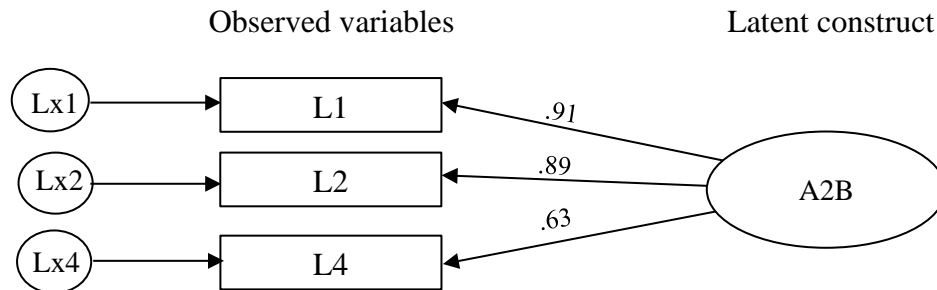


Table 4.10: Factor loading, AVE, and CR – A2B

Observed variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
L1	← A2B	.91	.82	.18	.67	.86
L2	← A2B	.89	.80	.20		
L4	← A2B	.63	.40	.60		

**Perceived norm about sharing tacit knowledge: Reliability and convergent validity assessment**

The latent variable, PN, was measured by three observed variables (Figure 4.14). Composite reliability (Table 4.11) of .78, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings ranged from .55 to .87. Using these loadings, Average variance extracted (Table 4.11) was computed and a value of .55 was returned, which was above the threshold of .50. In the assessment of convergent validity, the initial model returned an AVE of .34 for this construct. The study therefore suggests that the PN construct in the final model is an improvement when compared against the initial model in relation to the convergent validity of this construct.

Figure 4.14: Measurement model – PN

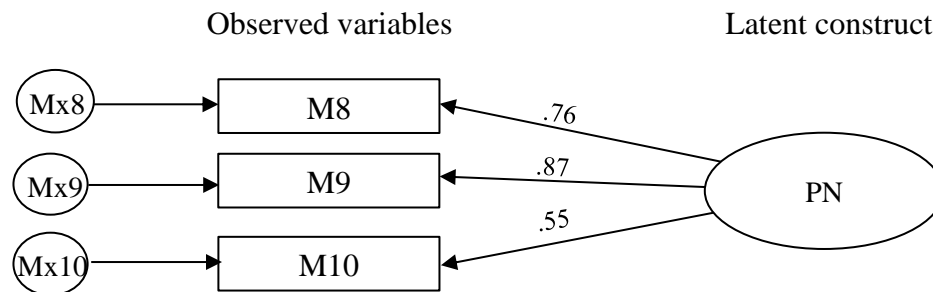


Table 4.11: Factor loading, AVE, and CR – PN

Observed variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
M8	← PN	.76	.58	.42	.55	.78
M9	← PN	.87	.76	.24		
M10	← PN	.55	.30	.70		



### Perceived behavioural control toward tacit knowledge sharing: Reliability and convergent validity assessment

The latent variable, PBC, was measured by three observed variables (Figure 4.15). Composite reliability (Table 4.12) of .82, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings ranged from .75 to .83. Using these loadings, Average variance extracted (Table 4.12) was computed and a value of .61 was returned. This exceeded the .50 threshold, and therefore suggested that the PBC construct in the final model satisfied the study's pre-determined criteria for convergent validity. A further point to note is that the PBC construct in the final model displayed improvement over the construct in the initial model in relation to convergent validity. The initial model's AVE of the PBC construct was .44, and in contrast the AVE of this construct in the final model as can be observed is .61.

Figure 4.15: Measurement model – PBC

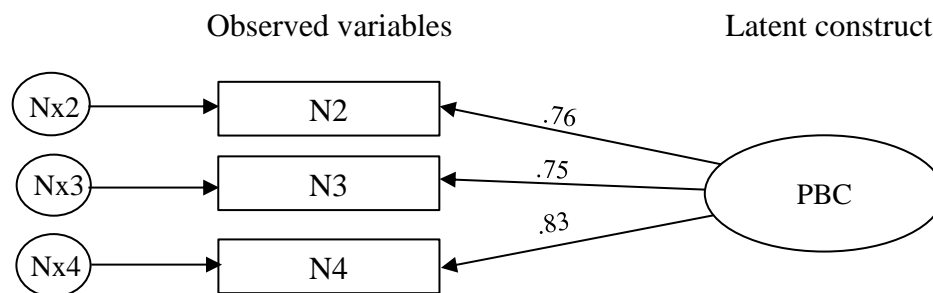


Table 4.12: Factor loading, AVE, and CR – PBC

Observed variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
N2	← PBC	.76	.57	.43	.61	.82
N3	← PBC	.75	.56	.44		
N4	← PBC	.83	.70	.30		

### Knowledge networks: Reliability and convergent validity assessment

The latent variable, KN, was measured by two observed variables (Figure 4.16). Composite reliability (Table 4.13) of .71, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings for the two observed variables were .73 and .76. Using these loadings, Average variance extracted (Table 4.13) was computed and a value of .55 was returned. This exceeded the .50 threshold, and therefore suggested that the KN construct in the final model satisfied the study's pre-determined criteria for convergent validity. The KN construct improved on its AVE in the final model (AVE=.55) against the initial model (AVE=.33).

Figure 4.16: Measurement model – KN

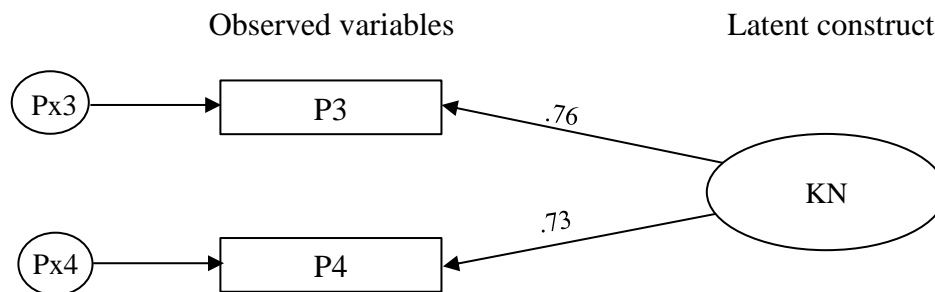


Table 4.13: Factor loading, AVE, and CR – KN

Observed Variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
P3	← KN	.76	.58	.42	.55	.71
P4	← KN	.73	.53	.47		

### Task-oriented leadership behaviour: Reliability and convergent validity assessment

The latent variable, L\_TO was measured by three observed variables (Figure 4.17). Composite reliability (Table 4.14) of .89, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings ranged from .78 to .92. Using these loadings, Average variance extracted (Table 4.14) was computed and a value of .73 was returned. This exceeded the .50 threshold, and therefore suggested that the L\_TO construct in the final model satisfied the study's pre-determined criteria for convergent validity.

Figure 4.17: Measurement model – L\_TO

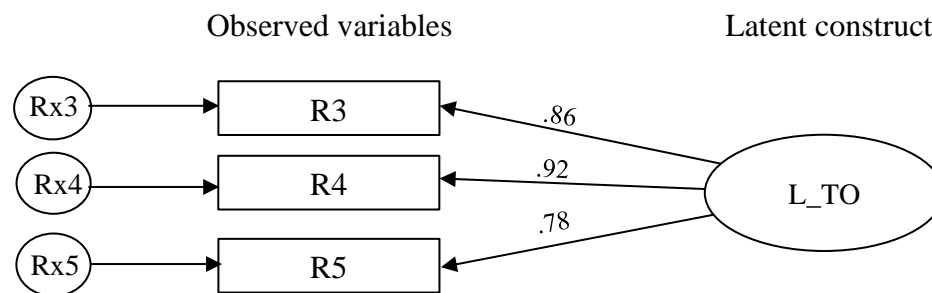


Table 4.14: Factor loading, AVE, and CR – L\_TO

Observed variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
R3	← L_TO	.86	.74	.26	.73	.89
R4	← L_TO	.92	.85	.15		
R5	← L_TO	.78	.60	.40		

**Relations-oriented leadership behaviour: Reliability and convergent validity assessment**

The latent variable, L\_RO was measured by three observed variables (Figure 4.18). Composite reliability (Table 4.15) of .89, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings ranged from .81 to .90. Using these loadings, Average variance extracted (Table 4.15) was computed and a value of .73 was returned. This exceeded the .50 threshold, and therefore suggested that the L\_RO construct in the final model satisfied the study’s pre-determined criteria for convergent validity.

Figure 4.18: Measurement model – L\_RO

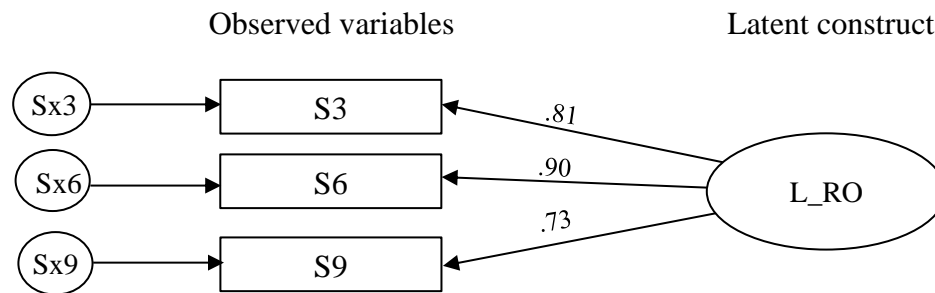


Table 4.15: Factor loading, AVE, and CR – L\_RO

Observed variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
S3	← L_RO	.81	.65	.35	.73	.89
S6	← L_RO	.90	.80	.20		
S9	← L_RO	.86	.73	.27		

**Example-oriented leadership behaviour: Reliability and convergent validity assessment**

The latent variable, L\_EO was measured by three observed variables (Figure 4.19). Composite reliability (Table 4.16) of .91, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings ranged from .85 to .92. Using these loadings, Average variance extracted (Table 4.16) was computed and a value of .78 was returned. This exceeded the .50 threshold, and therefore suggested that the L\_EO construct in the final model satisfied the study’s pre-determined criteria for convergent validity.

Figure 4.19: Measurement model – L\_EO

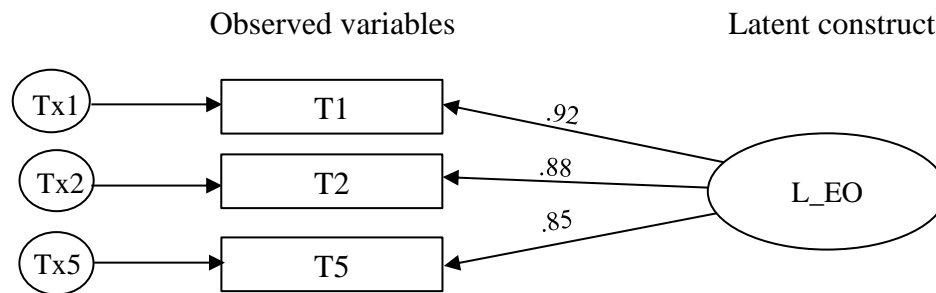


Table 4.16: Factor loading, AVE, and CR – L\_EO

Observed variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
T1	← L_EO	.92	.84	.16	.78	.91
T2	← L_EO	.88	.77	.23		
T5	← L_EO	.85	.72	.28		

### Resources (Tangible): Reliability and convergent validity assessment

The latent variable, R\_T was measured by three observed variables (Figure 4.20). Composite reliability (Table 4.17) of .82, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings ranged from .72 to .84. Using these loadings, Average variance extracted (Table 4.17) was computed and a value of .60 was returned. This exceeded the .50 threshold, and therefore suggested that the R\_T construct in the final model satisfied the study's pre-determined criteria for convergent validity.

Figure 4.20: Measurement model – R\_T

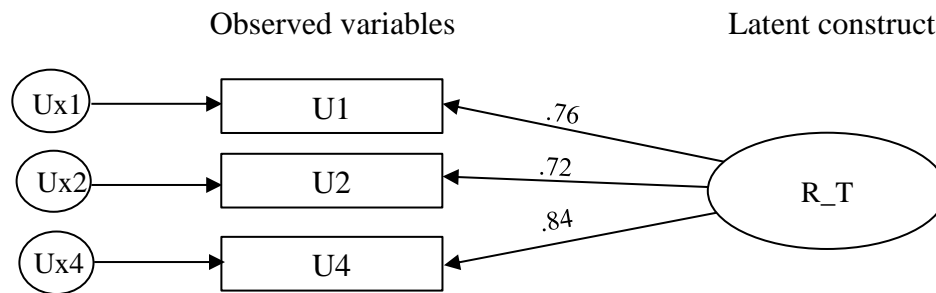


Table 4.17: Factor loading, AVE, and CR – R\_T

Observed variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
U1	← R_T	.76	.58	.42	.60	.82
U2	← R_T	.72	.52	.48		
U4	← R_T	.84	.71	.29		

### Resources (Intangible): Reliability and convergent validity assessment

The latent variable, R\_I was measured by three observed variables (Figure 4.21). Composite reliability (Table 4.18) of .81, which exceeded the .70 threshold, suggested that this construct met the pre-determined criteria for reliability.

The factor loadings ranged from .71 to .80. Using these loadings, Average variance extracted (Table 4.18) was computed and a value of .58 was returned. This exceeded the .50 threshold, and therefore suggested that the R\_I construct in the final model satisfied the study's pre-determined criteria for convergent validity. Similar to other constructs (described above) which displayed better convergent validity in the final model, the AVE of the R\_I construct improved from .40 (initial model) to .58 (final model).

Figure 4.21: Measurement model – R\_I

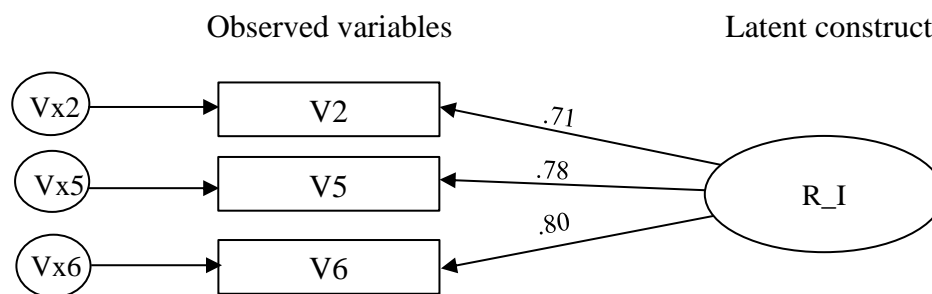


Table 4.18: Factor loading, AVE, and CR – R\_I

Observed variable	Latent Factor	Factor loading ( <i>l</i> )	$l^2$	Measurement error ( <i>e</i> )	AVE	CR
V2	← R_I	.71	.51	.49	.58	.81
V5	← R_I	.78	.60	.40		
V6	← R_I	.80	.64	.36		

## **ii. Assessment of reliability and construct validity**

While the above assessment of reliability and convergent validity was conducted, construct by construct, and reliability and convergent validity of established, other construct validity assessment, such as discriminant and nomological validity, are more appropriate to be made at the overall model level, instead of at the construct level to get a holistic view.

This study deliberately repeated the reliability and convergent validity assessment of the constructs in this section, for completeness and elegance; however all such repetitions were kept as brief as possible.

### **Reliability of the final measurement model**

Composite reliability values of the constructs in the final model ranged from .71 to .92 (Table 4.19). Observing that all composite reliability values were above .70, the study was able to suggest that the final model, similar to the initial model, satisfied the statistical conditions of reliability pre-determined in this study.

### **Convergent validity of the final measurement model**

AVE ranged from .55 to .78 in the constructs in the final model (Table 4.19). It was apparent that all AVE's of the constructs were above the cut-off value of .50, which suggested that the measured variables reflecting each one of the latent constructs in the final model were able to explain more than 50% of the variance in their respective constructs. The model, therefore, satisfies established standards to suggest that it has convergent validity.



Notably, the four constructs in the initial model which failed the convergent validity test, returned AVE > .50 in the final model. This further suggested that the final model is an improvement of the initial model.

### **Discriminant validity of the final measurement model**

The final model was able to satisfy the condition that inter-construct squared correlations should be lower than the AVE of the construct, except in one instance, that is, in the case of relations-oriented leadership behaviour (L\_RO). However in this exceptional case, it was found that: (i) AVE was only marginally lower. The difference was only .02; and (ii) both constructs were within the same domain, that is: leadership. A summary of construct AVE and inter-construct squared correlations have been listed in Table 4.20, below. Details of the inter-construct squared correlations can be found in Appendix 4.7. Overall, the study suggests that the constructs in the final model had sufficient discriminant validity.

### **Nomological validity of the final measurement model**

In research, hypothetical relationships are usually supported by sound theoretical reasoning. Nomological validity is basically an exercise in confirming that these assumptions are empirically realisable (Bollen, 1989), and make sense in relation to the sample data (Hair et al., 2010).

In this study, correlations between the constructs were examined in order to verify the nomological validity of the hypothesised model. All correlations (Table 4.21) between the constructs were positive and significant ( $p < .001$ ) as hypothesised, which suggested that the constructs in the final model had nomological validity.

Table 4.19: Factor loading, AVE, and CR – final model

Observed variable		Latent Factor	Factor loading ( <i>l</i> )	<i>l</i> <sup>2</sup>	AVE	CR
I3	←	Ment	.80	.64	.73	.89
I5	←	Ment	.87	.75		
I6	←	Ment	.89	.78		
J4	←	COP	.80	.63	.78	.92
J6	←	COP	.92	.85		
J7	←	COP	.93	.87		
L1	←	A2B	.91	.82	.67	.86
L2	←	A2B	.89	.80		
L4	←	A2B	.63	.40		
M8	←	PN	.76	.58	.55	.78
M9	←	PN	.87	.76		
M10	←	PN	.55	.30		
N2	←	PBC	.76	.57	.61	.82
N3	←	PBC	.75	.56		
N4	←	PBC	.83	.70		
P3	←	KN	.76	.58	.55	.71
P4	←	KN	.73	.53		
R3	←	L_TO	.86	.74	.73	.89
R4	←	L_TO	.92	.85		
R5	←	L_TO	.78	.60		
S3	←	L_RO	.81	.65	.73	.89
S6	←	L_RO	.90	.80		
S9	←	L_RO	.86	.73		
T1	←	L_EO	.92	.84	.78	.91
T2	←	L_EO	.88	.77		
T5	←	L_EO	.85	.72		
U1	←	R_T	.76	.58	.60	.82
U2	←	R_T	.72	.52		
U4	←	R_T	.84	.71		
V3	←	R_I	.71	.51	.58	.81
V5	←	R_I	.78	.60		
V6	←	R_I	.80	.64		

Table 4.20: Construct AVE and inter-construct squared correlation range - Summary

Latent variable	AVE	Inter-construct $r^2$ Range	Discriminant Validity
KN	.55	.07 to .16	Satisfied
L_EO	.78	.07 to .75	Satisfied
L_RO	.73	.09 to .75	Acceptable
L_TO	.73	.16 to .71	Satisfied
R_I	.58	.16 to .41	Satisfied
R_T	.60	.16 to .41	Satisfied

Table 4.21: Inter-construct correlation matrix

	TKSB	I2STK	KN	L_EO	L_RO	L_TO	R_T	R_I
TKSB	1.00							
I2STK	.53	1.00						
KN	.45	.64	1.00					
L_EO	.51	.37	.27	1.00				
L_RO	.42	.48	.31	.87	1.00			
L_TO	.52	.51	.40	.84	.78	1.00		
R_T	.35	.62	.40	.46	.49	.45	1.00	
R_I	.68	.62	.41	.54	.54	.53	.64	1.00

All correlations were significant at  $p < .001$

In summary, the validity tests indicated that the measures used in the model had adequate reliability, and convergent, discriminant, and nomological validity.

### **iii. Model evaluation**

In the evaluation of the final measurement model, this study examined two main areas, that is: (i) the adequacy of parameter estimates; and (ii) the adequacy of the model as a whole.

#### **Adequacy of parameter estimates**

Relevant parameter estimates for the purpose of examining their adequacy vis-à-vis the final measurement model have been presented in Table 4.22. First the feasibility of the parameter estimates was examined. Standardised loadings were between .55 and .93. The minimum observed (.55) was above the threshold of .50 suggested for such loadings, and the maximum (.93) was below the unfeasible benchmark of 1.0 (Hair et al., 2010). The signs were all positive as theorised. Standard errors (SE) of the parameters were examined next. SE ranged from between .03 to .12. They were neither too small nor too large to be deemed as problematic. Finally the critical ratios (C.Rt.; this abbreviation was deliberately created in this study in order not to confuse critical ratio with composite reliability) were examined. The parameters returned C.Rt.  $> 1.96$  and their  $p$ -values were  $< .001$ . Therefore, there was sufficient basis to suggest that the parameters in the model were reasonable and statistically significant and all standard errors were within the acceptable limits.

Table 4.22: Parameter estimates of the final measurement model

		Regression weight		S.E.	C.Rt.	P
		Unstandardised	Standardised			
I3	← Ment	.87	.80	.04	20.04	***
I5	← Ment	.99	.87	.04	22.72	***
I6	← Ment	1.00	.89			
J4	← COP	.88	.80	.04	22.46	***
J6	← COP	.98	.92	.03	30.30	***
J7	← COP	1.00	.93			
L1	← A2B	1.00	.91			
L2	← A2B	1.01	.89	.05	21.00	***
L4	← A2B	.84	.63	.06	14.32	***
M8	← PN	1.00	.76			***
M9	← PN	1.12	.87	.08	13.79	***
M10	← PN	.77	.55	.07	10.50	***
N2	← PBC	.98	.76	.07	15.08	***
N3	← PBC	.97	.75	.06	15.73	***
N4	← PBC	1.00	.83			
P3	← KN	1.00	.76			
P4	← KN	1.07	.73	.12	9.25	***
R3	← L_TO	1.00	.86			
R4	← L_TO	1.06	.92	.04	26.08	***
R5	← L_TO	.98	.78	.05	19.01	***
S3	← L_RO	.92	.81	.05	19.92	***
S6	← L_RO	1.08	.90	.05	24.03	***
S9	← L_RO	1.00	.86			
T1	← L_EO	1.17	.92	.05	24.77	***
T2	← L_EO	1.10	.88	.05	23.52	***
T5	← L_EO	1.00	.85			
U1	← R_T	1.00	.76			
U2	← R_T	.98	.72	.07	13.59	***
U4	← R_T	1.08	.84	.07	15.58	***
V3	← R_I	1.00	.71			
V5	← R_I	1.06	.78	.08	13.83	***
V6	← R_I	1.11	.80	.08	13.95	***

\*\*\*  $p < .001$  (S.E. – Standard error C.Rt. – Critical ratio)

### **Adequacy of the final model as a whole**

In model refit, it is imperative that the modified model should be able to fit the data better than the initial model, and simultaneously be, theoretically justifiable. These conditions are mutually dependent.

***Caveat:*** For the sake of consistency and elegance, the study restricted the number of decimal places to two, as far as possible. However, in certain instances this condition had to be relaxed, especially when a more precise value would be more informative. One such instance is the reporting of the RMSEA value in assessing its position within the lower and upper boundaries of the 90% confidence interval. Rounding the RMSEA value to two decimal places may compromise its precision, which is posited as an important aspect of this index (e.g. Byrne, 2010; MacCallum et al., 1996).

The goodness-of-fit indices which were examined to assess model fit for the initial measurement model in this study were:  $\chi^2_{(2816)}= 7199.17$ ;  $\chi^2/df=2.6$ ; CFI=.81; TLI=.80; SRMR=.07; RMSEA=.061. In contrast, a similar set of indices for the final measurement model were:  $\chi^2_{(431)}=789.48$ ;  $\chi^2/df=1.8$ ; CFI=.96; TLI=.95; SRMR=.05; and RMSEA=.045. These statistics have been re-presented in Table 4.23 below to make it easier to compare the overall fit of the final model against the initial model. The outputs of the above stated model fit indices, from AMOS, have been listed in Appendix 4.8.

All goodness-of-fit indices for the final measurement model showed marked improvement from the initial model, which suggests that the model re-fit measures

taken were adequate. It is re-emphasised that the nomological net of the initial model was not modified during this process. In other words, theoretical underpinnings of the initial hypothesised model were left intact in the final model. A more detailed analysis of model fit indices of the final model follows.

$\chi^2$  reduced from 7199.17 in the initial model to 789.48 in the final model, which suggests that the final model displayed a marked reduction in the degree of mismatch between the model and sample data, providing sufficient indication that it is a better model. Notwithstanding the use of chi-square statistic to estimate model fit in literature (e.g. Kim, Jeon, Jung, Lu, & Jones, 2012; Prajogo & McDermott, 2011; Sanz-Valle et al., 2011), the limitations (Anderson & Gerbing, 1988; Bagozzi & Yi, 2012; Hu & Bentler, 1998; Kline, 2011) of largely relying on the chi-square statistic to estimate model fit were recognised and mitigated by assessing other relevant indices.

The normed chi-square (NC) of the final model was 1.8 compared to the initial model's 2.6. This study had determined that  $NC \leq 2.0$  is an indicator of good model fit based on suggestions made in literature (e.g. Tabachnick & Fidell, 2007). Using NC as an indicator, there was sufficient support that the final model had a better fit with the data in this study, compared to the initial model.

The next set of indices which were used to assess the final model and to compare against the initial model were the comparative fit index (CFI) and Tucker-Lewis index (TLI). While the study had noted earlier that both the initial model's CFI (.81)

and TLI (.80) indices were well below .90, the cut-off value established in this study. The final model's CFI (.96) and TLI (.95) were higher than the threshold of .90. It may be of interest to note that both CFI and TLI of the final model also satisfied Hu and Bentler's (1999) threshold of .95 for these two indices.

The RMSEA index was assessed next, using Hair et al.'s criteria:  $RMSEA < .07$  on condition that  $CFI \geq .90$ . The final model's CFI index was .96 and  $RMSEA = .045$ . The RMSEA 90% confidence interval ranged from .040 to .049 and the p-value for the test of closeness of fit returned .97. Therefore, the study suggests with 90% confidence that the true RMSEA value in the population will fall within the bounds of .040 and .049. This clearly attests to the precision of the RMSEA index in the final model. In summary, based on the RMSEA values, the study suggests that the final model fits the data well, given that: (i)  $RMSEA (.045) < .07$ ; (ii) the upper bound of 90% confidence interval (.049)  $< .07$ ; and (iii) the p-value of the test of close fit ( $p = .97$ )  $> .50$ .

The final index which the study assessed was the Standardised Root Mean Square Residual (SRMR). The cut-off value used in this study followed Hair et. al.'s (2010) suggestion that good model fit can be estimated if SRMR is  $< .08$ , on condition that  $CFI > .92$ . In this study it was observed that in the final model,  $CFI = .96$  and  $SRMR = .05$ . The study safely suggests that the SRMR index provides sufficient support that the final measurement model fits the data well.

Notwithstanding the fact that the CFI, TLI, RMSEA and SRMR indices in the final model were within the cut-off values established in this study, which were predicated



on Hair et al.'s (2010) suggestions, all these indices also satisfied the cut-off values suggested by Hu and Bentler (1999) which are also widely cited in literature. In summary, the final model provided sufficient evidence that it fits the sample data, satisfactorily.

Table 4.23: Comparison of fit indices between initial and final measurement models

Index	Initial-model fit indices	Final-model fit indices	Goodness-of-fit cut-off values
$\chi^2$ p-value	.000	.000	> .05
Normed chi-square	2.6	1.8	$\leq 2.0$
CFI	.81	.96	> .90
TLI	.80	.95	> .90
SRMR	.07	.05	$\leq .08$ with CFI > .92
RMSEA	.061	.045	< .07 with CFI $\geq .90$

#### 4.9.3. Structural model

Having established a final measurement model with acceptable model fit indices, the structural model was then created based on hypothesised relationships defined in the theoretical framework of this research. The study then progressed to assess the adequacy of the structural model and to examine the inter-construct relationships. The structural model can be found in Figure 4.22, below.

##### i. Assessment of model adequacy

The set of goodness-of-fit indices which were used to evaluate the measurement model was retained to assess the structural model. Goodness-of-fit indices of the structural model (Table 4.24) was as follows:  $\chi^2_{(431)}=789.48$ ;  $\chi^2/df=1.8$ ; CFI=.96; TLI=.95; SRMR=.05; and RMSEA=.045. All these values were similar to that of the final measurement model and therefore indicated that the structural model fitted the data adequately.

Figure 4.22: Structural model

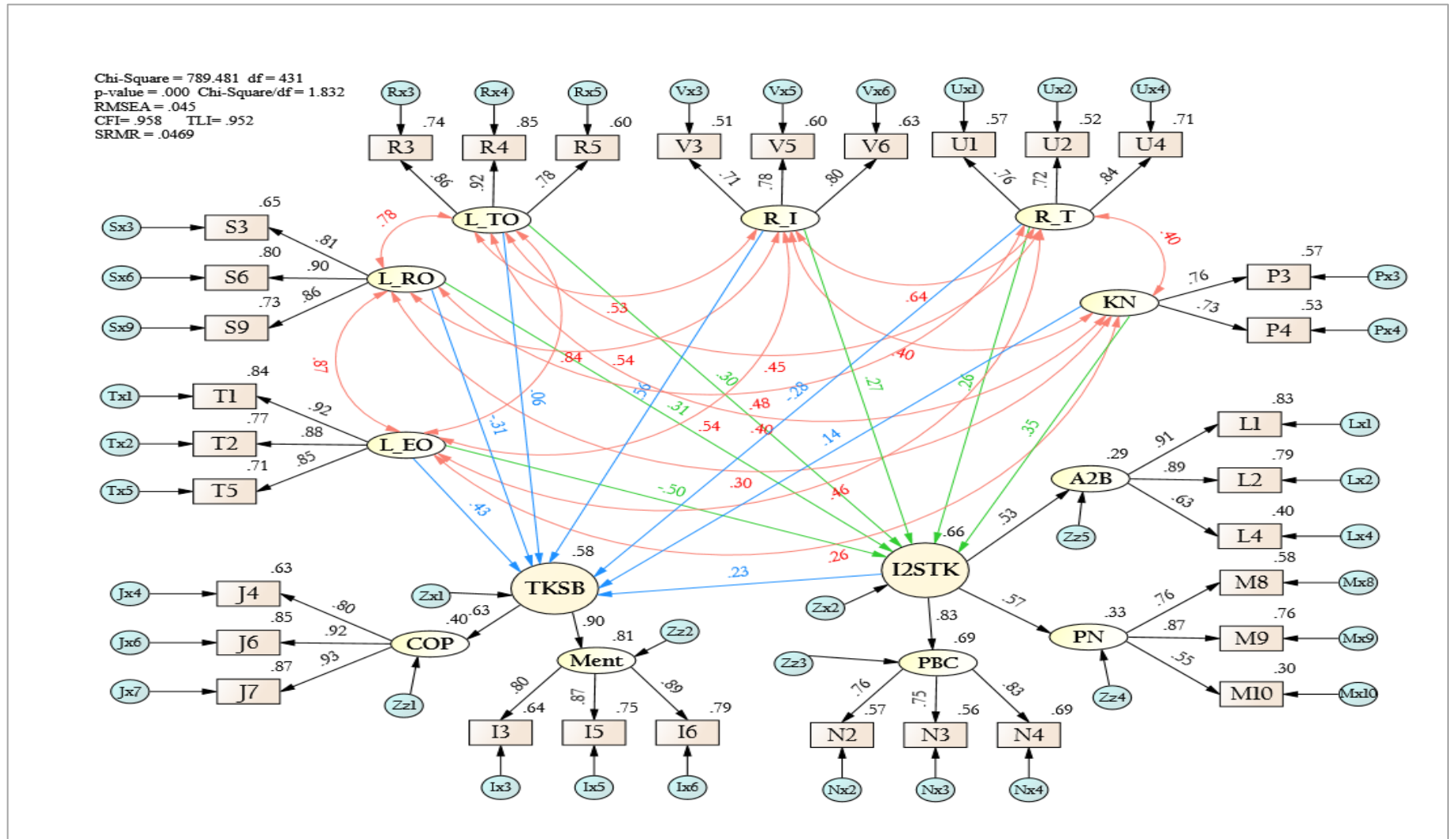


Table 4.24: Goodness-of-fit indices of the structural model

Index	Structural model fit indices	Goodness-of-fit cut-off values
$\chi^2$ p-value	.000	> .05
Normed chi-square	1.8	$\leq$ 2.0
CFI	.96	> .90
TLI	.95	> .90
SRMR	.05	$\leq$ .08 with CFI > .92
RMSEA	.045	< .07 with CFI $\geq$ .90

#### 4.10. Assessment of hypotheses

The unstandardised and standardised path estimates of the hypothesised relationships between latent variables, their critical ratios (C. Rt.) and significance levels have been presented in Table 4.25 and a path diagram of the same in Figure 4.23. With the exception of one hypothesised relationship, all others were significant (at:  $p < .10$ ;  $p < .05$ ; and  $p < .01$ ). A detailed description follows.

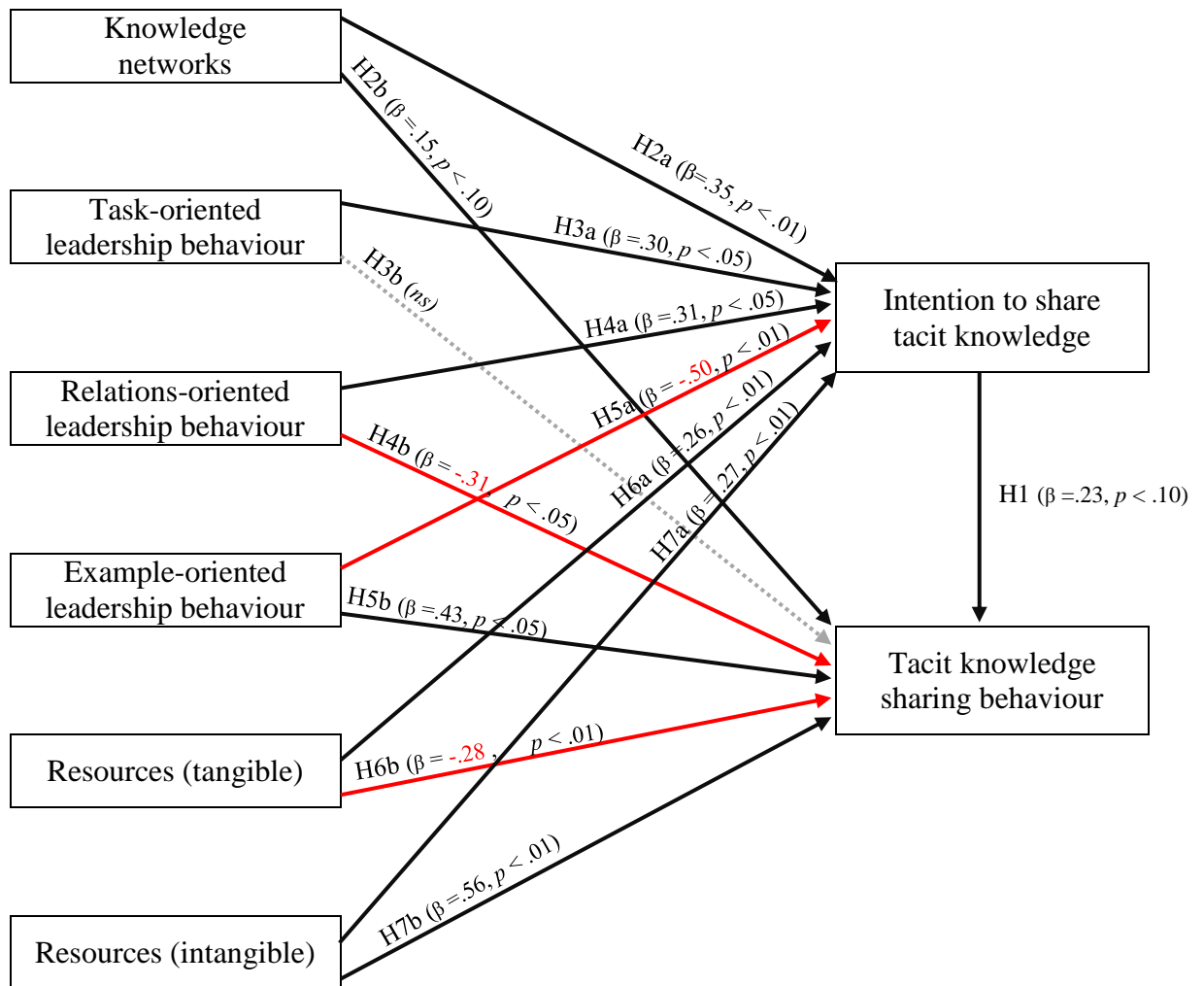
Table 4.25: Hypothesised path estimates

Hypothesis	Structural path	$\beta$	S.E.	C.Rt.	$p$	Status
H1	TKSB $\leftarrow$ I2STK	.23	.33	1.66	*	Supported
H2a	I2STK $\leftarrow$ KN	.35	.05	4.07	***	Supported
H2b	TKSB $\leftarrow$ KN	.15	.12	1.65	*	Supported
H3a	I2STK $\leftarrow$ L_TO	.30	.06	2.31	**	Supported
H3b	TKSB $\leftarrow$ L_TO	.06	.14	.46	<i>ns</i>	Not supported
H4a	I2STK $\leftarrow$ L_RO	.31	.06	2.30	**	Supported
H4b	TKSB $\leftarrow$ L_RO	-.31	.15	-2.26	**	Supported
H5a	I2STK $\leftarrow$ L_EO	-.50	.08	-2.97	***	Supported
H5b	TKSB $\leftarrow$ L_EO	.43	.20	2.37	**	Supported
H6a	I2STK $\leftarrow$ R_T	.26	.04	3.07	***	Supported
H6b	TKSB $\leftarrow$ R_T	-.28	.11	-3.10	***	Supported
H7a	I2STK $\leftarrow$ R_I	.27	.05	2.94	***	Supported
H7b	TKSB $\leftarrow$ R_I	.56	.12	5.78	***	Supported

\*  $p < .10$       \*\*  $p < .05$       \*\*\*  $p < .01$       *ns* – not significant

( $\beta$ ) Standardised regression weight

**Figure 4.23 Hypothesised path estimates**



*ns – not significant*

**H1: Knowledge workers' intention to share tacit knowledge will positively influence tacit knowledge sharing behaviour.**

The standardised regression weight and critical ratio for  $\text{TKSB} \leftarrow \text{I2STK}$  were .23 and 1.66 respectively and was significant at  $p < .10$  (Table 4.25). The result demonstrated support for hypothesis H1, and suggested that intention to share tacit knowledge will positively influence tacit knowledge sharing behaviour.

**H2a: Knowledge networks in organisations will positively influence knowledge workers intention to share tacit knowledge.**

The study found that knowledge networks will positively influence knowledge workers' intention to share tacit knowledge ( $\text{I2STK} \leftarrow \text{KN}$ ). The standardised regression weight of this path was .35, the critical ratio was 4.07, and the relationship was deemed significant as  $p < .01$  (Table 4.25).

**H2b: Knowledge networks in organisations will positively influence tacit knowledge sharing behaviour in knowledge workers in organisations.**

The standardised regression weight and critical ratio for  $\text{TKSB} \leftarrow \text{KN}$  were .15 and 1.65 respectively and was significant at  $p < .10$  (Table 4.25). The result demonstrated support for hypothesis H2b, and suggested that knowledge networks will positively influence knowledge workers to share tacit knowledge.

**H3a: Task-oriented leadership behaviour will positively influence knowledge workers intention to share tacit knowledge.**

The study demonstrated that leaders' task-oriented behaviour will positively influence knowledge workers intention to share tacit knowledge. This was evident when the path estimate of I2STK ← LTO returned a standardised regression weight of .30 and a C.Rt. of 2.31. The relationship was significant at  $p < .05$  (Table 4.25).

**H3b: Task-oriented leadership behaviour will positively influence tacit knowledge sharing behaviour in knowledge workers in organisations.**

The test of the hypothesis that task-oriented leadership behaviour will positively influence tacit knowledge sharing behaviour among knowledge workers in organisations (TKSB← L\_TO) was not significant (Table 4.25). The null hypothesis therefore could not be rejected and there was insufficient evidence that the sample data was able to support this hypothesis.

**H4a: Relations-oriented leadership behaviour will positively influence the knowledge workers intention to share tacit knowledge.**

The study found that relations-oriented leadership behaviour will positively influence knowledge worker's intention to share tacit knowledge, in organisations. When this path (I2STK ← L\_RO) was estimated, the standardised regression weight was .31, the critical ratio was 2.30. The  $p$ -value was significant at  $< .05$  (Table 4.25). There was sufficient support for this hypothesis.

**H4b: Relations-oriented leadership behaviour will positively influence tacit knowledge sharing behaviour in knowledge workers in organisations.**

The path estimate of this hypothesis (TKSB  $\leftarrow$  L\_RO) was significant ( $p < .05$ ); however, the standardised regression weight was  $-.31$  (Table 4.25). The study suggests that the influence of relations-oriented leadership on the knowledge worker's tacit knowledge sharing behaviour is negative instead of the hypothesised positive influence. This phenomenon will be discussed in further detail in the next chapter (that is: chapter 5).

**H5a: Example-oriented leadership behaviour will positively influence the knowledge workers intention to share tacit knowledge.**

The path estimate of this hypothesis (I2STK  $\leftarrow$  L\_EO) was significant ( $p < .01$ ); however, the standardised regression weight was  $-.50$  (Table 4.25). The study suggests that the influence of example-oriented leadership on the knowledge worker's intention to share tacit knowledge is negative instead of the hypothesised positive influence. This phenomenon will be discussed in further detail in the next chapter (that is: chapter 5).

**H5b: Example-oriented leadership behaviour will positively influence tacit knowledge sharing behaviour in knowledge workers in organisations.**

The study found that relations-oriented leadership behaviour will positively influence knowledge worker's intention to share tacit knowledge, in organisations. When this path (I2STK  $\leftarrow$  L\_EO) was estimated, the standardised regression weight was  $.43$ , the critical ratio was  $2.37$ . The  $p$ -

value was significant at  $< .05$  (Table 4.25). There was sufficient support for this hypothesis.

**H6a: Providing adequate tangible resources to knowledge workers will positively influence their intention to share tacit knowledge.**

The standardised regression weight and critical ratio for  $I2STK \leftarrow R\_T$  was .26 and 3.07 respectively and was significant at  $p < .01$  (Table 4.25). The result demonstrated support for hypothesis H6a, and suggested that the knowledge workers intention to share tacit knowledge will be positively influenced when organisations provide them with adequate resources.

**H6b: Providing adequate tangible resources will positively influence tacit knowledge sharing behaviour in knowledge workers.**

The path estimate of this hypothesis ( $TKSB \leftarrow R\_T$ ) was significant ( $p < .01$ ); however, the standardised regression weight was -.28 (Table 4.25). The study suggests that providing adequate tangible resources will negatively influence tacit knowledge sharing behaviour in knowledge workers. This finding is contrary to conventional thinking and findings from other studies; however it is a phenomenon that was discovered in this study and will be discussed further in the next chapter (that is: chapter 5).



**H7a: Providing adequate intangible resources to knowledge workers will positively influence their intention to share tacit knowledge.**

The standardised regression weight and critical ratio for  $I2STK \leftarrow R\_I$  was .27 and 2.94 respectively and was significant at  $p < .01$  (Table 4.25). The result demonstrated support for hypothesis H7a, and suggested that the knowledge worker's intention to share tacit knowledge will be positively influenced when organisations provide them with adequate intangible resources.

**H7b: Providing adequate intangible resources will positively influence tacit knowledge sharing behaviour in knowledge workers.**

The study shows that knowledge workers tacit knowledge sharing behaviour is positively influenced when adequate intangible resources are provided to them in the workplace. This was demonstrated when the path estimate of  $TKSB \leftarrow R\_I$  returned a standardised regression weight of .56 and a critical ratio of 5.78. The relationship was significant at  $p < .01$  (Table 4.25).

**Direct and Indirect effect on tacit knowledge sharing behaviour**

The study also examined the indirect effect of the exogenous factors on tacit knowledge sharing behaviour through intention to share tacit knowledge (Table 4.26). Only in the case of example-oriented leadership behaviour, the study found that the indirect effect was  $> .08$ , which Hair et al. (2010) suggested is sizable enough to be considered to have mediating effect. In all other tests, the intention to share tacit knowledge did not mediate the relationship between the exogenous factor and tacit knowledge sharing behaviour.

Table 4.26: Assessment of indirect effect on TKSB through I2STK

Structural path				Direct effect	Indirect effect	
	TKSB	←	I2STK	.23 <sup>*</sup>	-	
TKSB	←	I2STK	←	KN	.15 <sup>*</sup>	.03
TKSB	←	I2STK	←	L_TO	ns	-
TKSB	←	I2STK	←	L_RO	-.31 <sup>**</sup>	-.07
TKSB	←	I2STK	←	L_EO	.43 <sup>**</sup>	.10
TKSB	←	I2STK	←	R_T	-.28 <sup>***</sup>	.06
TKSB	←	I2STK	←	R_I	.56 <sup>***</sup>	.13

\*  $p < .10$       \*\*  $p < .05$       \*\*\*  $p < .01$

In summary, out of the thirteen hypotheses examined in this study, nine were supported as predicted, three were significant but their relationships were negative instead of positive as hypothesised, and one was not supported.

#### 4.11. Multi-group analysis

This study had hypothesised that other factors may moderate the influence of the exogenous factors on tacit knowledge sharing behaviour. In line with this premise, the following factors were examined: gender, sector and industry type, organisational culture type, and religiosity.

As described in chapter three, the models to test for invariance were established in an increasingly restricted manner, as follows:

- Model-1 - configural model; no equality constraints applied.
- Model-2 - measurement weights (MW) constrained.
- Model-3 - MW and structural weights (SW) constrained.
- Model-4 - MW, SW, and Structural covariances (SC) constrained.

## Gender

In this study, hypothesis H8 proposed that, Gender, will moderate the influence of the exogenous variables on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour. Gender was a categorical variable, with options of either male or female. 200 of the respondents recorded their gender as male, and 214 as female. Seven did not record a response and were not included in this analysis. Relevant goodness-of-fit indices for the configural and constrained models have been exhibited in Table 4.27.

The measurement model (Model-2) was assessed first by constraining all factor loadings. These constraints increased the  $\chi^2$  value from 1451.86 to 1497.90, gaining 21 degrees of freedom (*df*) (Table 4.28). The  $\chi^2$  difference of 46.04 with 21 *df* was statistically significant at  $p < .05$ , which suggested that this measurement model was noninvariant.

A more restrictive model (Model-3) was established by constraining the structural regression weights, and assessed. In comparison with the configural model (model 1), the  $\chi^2$  value increased from 1451.86 to 1530.29 and gained 37 *df* (Table 4.28). The  $\chi^2$  difference of 78.43 with 37 *df* was statistically significant at  $p < .05$ , which suggested that Model-3 was also noninvariant.

The final test of model invariance was conducted using Model-4, in which the prior constraints established in Model-2 and Model-3 were retained and additionally all structural covariances were constrained. In comparison to the configural model (Model-1), the  $\chi^2$  value increased from 1451.86 to 1568.61 and gained 58 *df* (Table 4.28). The  $\chi^2$  difference

of 116.75 with 58 *df* was statistically significant at  $p < .05$ , which suggested that Model-4 was also noninvariant.

Table 4.27: Goodness-of-fit indices for multi-group invariance test for gender

	Model-1	Model-2	Model-3	Model-4
Constraints	-	MW	MW, SW	MW, SW, SC
$\chi^2$	1451.86	1497.90	1530.29	1568.61
<i>df</i>	862	883	899	920
$\chi^2/df$	1.68	1.69	1.70	1.71
<i>p</i>	< .001	< .001	< .001	< .001
CFI	.93	.93	.93	.93
TLI	.92	.92	.92	.92
RMSEA (90% CI)	.041 (.037, .044)	.041 (.038, .045)	.041 (.038, .045)	.041 (.038, .045)
SRMR	.06	.06	.07	.08

Table 4.28: Results of  $\chi^2$  difference test for gender

	Model-1	Model-2	Model-3	Model-4
Constraints	-	MW	MW, SW	MW, SW, SC
$\Delta\chi^2$	-	46.04	78.43	116.75
$\Delta df$	-	21	37	58
<i>p</i>	-	< .001	< .001	< .001

Model fit was also assessed to determine whether the four models (that is: Model-1, Model-2, Model-3, and Model-4) were able to fit the data adequately (Table 4.27). The  $\chi^2/df$  (normed chi-square) of all the four models were < 2.0; CFI and TLI of all four models were > .92; RMSEA of all four models were < .041 and SRMR were  $\leq$  .08. All these indices, when examined along the cut-off values ( $\chi^2/df \leq 2.0$ ; CFI > .90; TLI > .90; RMSEA < .07; and SRMR  $\leq$  .08) used in this study, suggested that these four models were acceptable as they fitted the data adequately.

The study submits that the four models adequately fitted the data, and the factorial invariance tests for Gender suggested that the responses from males and females in this study were noninvariant. Therefore the study infers that hypothesis H8 was supported.

This study then examined the path estimates to identify the direction and strength of noninvariance between males and females (Table 4.29). The structural paths of seven relationships for males and five for females were not significant and were not analysed further.

The study found that the influence of knowledge network ( $\beta = .30, p < .01$ ), leaders' relations-oriented behaviour ( $\beta = .50, p < .05$ ), access to tangible resources ( $\beta = .22, p < .10$ ) and adequate intangible resources ( $\beta = .34, p < .05$ ), will influence male knowledge workers' intention to share tacit knowledge. However; while example-oriented leadership behaviour was significant ( $p < .10$ ) the study found that it will negatively ( $\beta = -.48$ ) influence male knowledge workers' intention to share tacit knowledge. As for male knowledge workers' tacit knowledge sharing behaviour (TKSB), the results showed that only one relationship was significant, that is: providing adequate intangible resources ( $\beta = .62, p < .01$ ) on TKSB.

The results of analysis of intentions and behaviour toward tacit knowledge sharing of female knowledge workers were markedly different from that of their male counterparts in this study. The study found that the influence of knowledge network ( $\beta = .42, p < .01$ ), leaders' task-oriented behaviour ( $\beta = .46, p < .05$ ), and access to tangible resources ( $\beta = .34, p < .01$ ), will influence female knowledge workers' intention to share tacit knowledge. In

contrast to male knowledge workers, the study found that female knowledge workers exhibit greater tacit knowledge sharing behaviour. The following factors influenced this inference: TKS<sub>B</sub> ← KN ( $\beta = .48, p < .01$ ); TKS<sub>B</sub> ← L\_EO ( $\beta = .83, p < .05$ ); TKS<sub>B</sub> ← R\_I ( $\beta = .37, p < .05$ ). However two factors returned negative regression weights, that is: the influence of leaders' relations-oriented behaviour ( $\beta = -.53, p < .05$ ) on TKS<sub>B</sub>, and tangible resources ( $\beta = -.44, p < .01$ ) on TKS<sub>B</sub>.

Table 4.29: Gender moderated path estimates

Structural path	Male		Female	
	SRW	<i>p</i>	SRW	<i>p</i>
TKSB ← I2STK	.11	ns	.32	ns
I2STK ← KN	.30	***	.42	***
TKSB ← KN	.00	ns	.48	***
I2STK ← L_TO	.10	ns	.46	**
TKSB ← L_TO	.16	ns	-.31	ns
I2STK ← L_RO	.50	**	.11	ns
TKSB ← L_RO	-.14	ns	-.53	**
I2STK ← L_EO	-.48	*	-.45	ns
TKSB ← L_EO	.23	ns	.83	**
I2STK ← R_T	.22	*	.34	***
TKSB ← R_T	-.11	ns	-.44	***
I2STK ← R_I	.34	**	.08	ns
TKSB ← R_I	.62	***	.37	**

\*  $p < .10$       \*\*  $p < .05$       \*\*\*  $p < .01$       *ns* – not significant

SRW – Standardised regression weight

## **Sector and industry type**

In this study, hypothesis H9 proposed that, sector and industry type, will moderate the influence of the exogenous variables on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour.

Sector was a categorical variable, with options of either public sector or private sector. 153 of the respondents in the study were from the public sector and 268 were from the private sector. Relevant goodness-of-fit indices for the configural and constrained models have been exhibited in Table 4.30.

The measurement model (Model-2) was assessed first by constraining all factor loadings. These constraints increased the  $\chi^2$  value from 1551.67 to 1581.98, gaining 21 degrees of freedom (*df*) (Table 4.31). The  $\chi^2$  difference of 30.31 with 21 *df* was statistically significant at  $p < .10$ .

A more restrictive model (Model-3) was established by constraining the structural regression weights, and assessed. In comparison with the configural model (model 1), the  $\chi^2$  value increased from 1551.67 to 1622.25 and gained 37 *df* (Table 4.31). The  $\chi^2$  difference of 70.58 with 37 *df* was statistically significant at  $p < .05$ , which suggested that Model-3 was noninvariant.

The final test of model invariance was conducted using Model-4, in which the prior constraints established in Model-2 and Model-3 were retained and additionally all structural covariances were constrained. In comparison with the configural model (Model-1), the  $\chi^2$

value increased from 1551.67 to 1671.61 and gained 58 *df* (Table 4.31). The  $\chi^2$  difference of 119.94 with 58 *df* was statistically significant at  $p < .05$ , which suggested that Model-4 was also noninvariant.

Table 4.30: Goodness-of-fit indices for multi-group invariance test for sector

	Model-1	Model-2	Model-3	Model-4
Constraints	-	MW	MW, SW	MW, SW, SC
$\chi^2$	1551.67	1581.98	1622.25	1671.61
<i>df</i>	862	883	899	920
$\chi^2/df$	1.8	1.79	1.80	1.82
<i>p</i>	< .001	< .001	< .001	< .001
CFI	.92	.92	.92	.92
TLI	.91	.91	.91	.91
RMSEA (90% CI)	.044 (.04, .047)	.043 (.04, .047)	.044 (.04, .047)	.044 (.04, .048)
SRMR	.07	.07	.07	.08

Table 4.31: Results of  $\chi^2$  difference test for sector

	Model-1	Model-2	Model-3	Model-4
Constraints	-	MW	MW, SW	MW, SW, SC
$\Delta\chi^2$	-	30.31	70.58	119.94
$\Delta df$	-	21	37	58
<i>p</i>	-	< .10	< .001	< .001

Model fit was also assessed to determine whether the four models (that is: Model-1, Model-2, Model-3, and Model-4) were able to fit the data adequately (Table 4.30). The  $\chi^2/df$  (normed chi-square) of all the four models were < 2.0; CFI of all four models were > .92; TLI of all four models were > .91; RMSEA of all four models were < .044 and SRMR were  $\leq$  .08. All these indices, when examined along the cut-off values ( $\chi^2/df \leq 2.0$ ; CFI > .90; TLI > .90; RMSEA < .07; and SRMR  $\leq$  .08) used in this study, suggested that these four models were acceptable as they fitted the data adequately.



The study infers that the four models adequately fitted the data, and the factorial invariance tests for sector suggested that the responses from knowledge workers were noninvariant. There was sufficient evidence to infer that hypothesis H9 was supported.

Having ascertained that sector is a moderator, this study then examined the path estimates to identify the direction and strength of noninvariance between public sector and the private sector (Table 4.32). The structural paths of six relationships for the public sector and seven for the private sector were found to be not significant.

The study demonstrated that the influence of knowledge network ( $\beta = .45, p < .01$ ), leaders' task-oriented behaviour ( $\beta = .51, p < .05$ ), and adequate intangible resources ( $\beta = .62, p < .05$ ), will influence public sector knowledge workers' intention to share tacit knowledge. However; while example-oriented leadership behaviour was significant ( $p < .05$ ) the study found that it will negatively ( $\beta = -.60$ ) influence public sector knowledge workers' intention to share tacit knowledge. An analysis of their tacit knowledge sharing behaviour (TKSB) showed that only one relationship was significant, and the relationship was positive, that is:  $\text{TKSB} \leftarrow \text{KN}$  ( $\beta = .50, p < .05$ ). Two other paths were significant but the relationship was found to be negative. They are:  $\text{TKSB} \leftarrow \text{L\_RO}$  ( $\beta = -.37, p < .05$ ) and  $\text{TKSB} \leftarrow \text{R\_T}$  ( $\beta = -.45, p < .05$ ).

The results of knowledge workers' in the private sector showed that: knowledge network ( $\beta = .32, p < .05$ ), leaders' relations-oriented behaviour ( $\beta = .57, p < .05$ ), and access to tangible resources ( $\beta = .38, p < .01$ ) and intangible resources ( $\beta = .17, p < .10$ ), will positively moderate their intention to share tacit knowledge. On the other hand, it was found that this

group of knowledge worker's negatively ( $\beta = -.45, p < .10$ ) moderated the relationship between leaders' example-oriented behaviour and knowledge worker's intention to share tacit knowledge.

The study also found that private sector knowledge workers' positively moderated the influence of adequate intangible resources on tacit knowledge sharing behaviour ( $\beta = .66, p < .01$ ).

Table 4.32: Sector moderated path estimates

Structural path		Public Sector		Private Sector	
		SRW	<i>p</i>	SRW	<i>p</i>
TKSB	← I2STK	-.04	ns	.24	ns
I2STK	← KN	.45	***	.32	**
TKSB	← KN	.50	**	.00	ns
I2STK	← L_TO	.51	**	.01	ns
TKSB	← L_TO	-.03	ns	.12	ns
I2STK	← L_RO	.14	ns	.57	**
TKSB	← L_RO	-.37	**	-.36	ns
I2STK	← L_EO	-.60	**	-.45	*
TKSB	← L_EO	.55	ns	.43	ns
I2STK	← R_T	-.12	ns	.38	***
TKSB	← R_T	-.45	**	-.17	ns
I2STK	← R_I	.62	**	.17	*
TKSB	← R_I	.48	ns	.66	***

\*  $p < .10$       \*\*  $p < .05$       \*\*\*  $p < .01$       *ns* – not significant

SRW – Standardised regression weight

Industry type is essentially a sub-set of sector. Wherein sector as a moderator was examined using the public and private sectors attributes, industry type was grouped by public services (153 respondents), manufacturing (98 respondents), and commercial

services (170 respondents). Relevant goodness-of-fit indices for the configural and constrained models have been exhibited in Table 4.33.

The measurement model (Model-2) was assessed first by constraining all factor loadings. These constraints increased the  $\chi^2$  value from 2201.49 to 2257.28, gaining 42 degrees of freedom (*df*) (Table 4.34). The  $\chi^2$  difference of 55.80 with 42 *df* was statistically significant at  $p < .10$ , which while not at the expected level of  $<.05$  was accepted as more restrictive constraints improved the significance level satisfactorily.

A more restrictive model (Model-3) was established by constraining the structural regression weights, and assessed. In comparison with the configural model (model 1), the  $\chi^2$  value increased from 2201.49 to 2317.95 and gained 74 *df* (Table 4.33). The  $\chi^2$  difference of 116.46 with 74 *df* was statistically significant at  $p < .05$ , which suggested that Model-3 was noninvariant.

The final test of model invariance was conducted using Model-4, in which the prior constraints established in Model-2 and Model-3 were retained and additionally all structural covariances were constrained. In comparison with the configural model (Model-1), the  $\chi^2$  value increased from 2201.49 to 2409.37 and gained 116 *df* (Table 4.34). The  $\chi^2$  difference of 207.88 with 116 *df* was statistically significant at  $p < .05$ , which suggested that Model-4 was also noninvariant.

Table 4.33: Goodness-of-fit indices for multi-group invariance test for industry type

	Model-1	Model-2	Model-3	Model-4
Constraints	-	MW	MW, SW	MW, SW, SC
$\chi^2$	2201.49	2257.28	2317.95	2409.37
$Df$	1293	1335	1367	1409
$\chi^2/df$	1.70	1.69	1.70	1.71
$p$	< .001	< .001	< .001	< .001
CFI	.90	.90	.90	.90
TLI	.89	.89	.89	.89
RMSEA (90% CI)	.041 (.038, .044)	.041 (.038, .044)	.041 (.038, .044)	.041 (.038, .044)
SRMR	.07	.07	.07	.08

Table 4.34: Results of  $\chi^2$  difference test for industry type

	Model-1	Model-2	Model-3	Model-4
Constraints	-	MW	MW, SW	MW, SW, SC
$\Delta\chi^2$	-	55.80	116.46	207.88
$\Delta df$	-	42	74	116
$p$	-	< .10	< .001	< .001

Model fit was also assessed to determine whether the four models (that is: Model-1, Model-2, Model-3, and Model-4) were able to fit the data reasonably well (Table 4.33). The  $\chi^2/df$  (normed chi-square) of all the four models were < 2.0; and CFI of all four models were >.90. While the TLI of all four models were not exactly >.90 as per the cut-off value established earlier in this study, the value of .89 was considered acceptable. RMSEA of all four models were .041 and SRMR were  $\leq$  .08. All these indices, when examined along the cut-off values ( $\chi^2/df \leq 2.0$ ; CFI > .90; TLI > .90; RMSEA < .07; and SRMR  $\leq$  .08) used in this study, suggested that these four models were acceptable as they fitted the data adequately.

The study suggests that the four models adequately fitted the data, and the factorial invariance tests suggested that the responses from knowledge workers were noninvariant. There was sufficient evidence to infer that hypothesis H10 was supported.

Having ascertained that Industry Type is a moderator, this study then examined the path estimates to identify the direction and strength of noninvariance between the three industry types, that is: public services, manufacturing, and commercial services (Table 4.35). The structural paths of six relationships for public services and commercial services, and seven for the manufacturing industry types were not significant.

The path estimates for the public services industry type was the same as that of the public sector group in the moderator analysis by sector. Details had already been described above.

Only three path estimates for the manufacturing industry type (MIT) were found to be significant. The results showed that MIT will positively moderate the relationship between task-oriented leadership behaviour ( $\beta = .60, p < .10$ ), tangible resources ( $\beta = .37, p < .05$ ), and intangible resources ( $\beta = .44, p < .05$ ); and knowledge workers' intention to share tacit knowledge.

Commercial services industry type (CSIT) positively moderated the relationship between knowledge workers' intention to share tacit knowledge and the following factors: knowledge network ( $\beta = .51, p < .01$ ); relations-oriented leadership behaviour ( $\beta = .98, p < .05$ ); and tangible resources ( $\beta = .35, p < .01$ ). However CSIT negatively moderated the relationship between task-oriented leadership behaviour and knowledge workers' intention to share tacit knowledge ( $\beta = -.70, p < .05$ ).

The study also found that CSIT positively moderated example-oriented leadership behaviour ( $\beta = .66, p < .10$ ) and intangible resources ( $\beta = .58, p < .01$ ) on knowledge workers' tacit knowledge sharing behaviour. The same moderator, in contrast, was found to negatively moderate the relationship between tangible resources and tacit knowledge sharing behaviour ( $\beta = -.38, p < .10$ ).

Table 4.35: Industry Type moderated path estimates

Structural path			Public Services		Manufacturing		Commercial Services	
			SRW	<i>p</i>	SRW	<i>p</i>	SRW	<i>p</i>
TKSB	←	I2STK	-.04	ns	-.34	ns	.61	ns
I2STK	←	KN	.45	***	-.03	ns	.51	***
TKSB	←	KN	.50	**	.18	ns	-.25	ns
I2STK	←	L_TO	.51	**	.60	*	-.70	**
TKSB	←	L_TO	-.03	ns	.37	ns	.44	ns
I2STK	←	L_RO	.14	ns	.62	ns	.98	**
TKSB	←	L_RO	-.37	**	-.07	ns	-.87	ns
I2STK	←	L_EO	-.60	**	-.15	ns	-.16	ns
TKSB	←	L_EO	.55	ns	-.27	ns	.66	*
I2STK	←	R_T	-.12	ns	.37	**	.35	***
TKSB	←	R_T	-.45	**	.06	ns	-.38	*
I2STK	←	R_I	.62	**	.44	**	.13	ns
TKSB	←	R_I	.48	ns	.10	ns	.58	***

\*  $p < .10$       \*\*  $p < .05$       \*\*\*  $p < .01$       *ns* – not significant

SRW – Standardised regression weight

In summary, the study found that both, sector and industry types, have a moderating influence on knowledge workers tacit knowledge sharing intention and behaviour.

Discussions will follow in the next chapter.

## **Organisational culture**

In this study, hypothesis H10 proposed that, organisational culture (OC), will moderate the influence of the exogenous variables on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour. Organisations were assessed as: clan, adhocracy, market, or hierarchical. While these culture types are distinct, it is not uncommon for organisations to display dominance in two or more these culture types (Cameron & Quinn, 2006). In this study, three clusters emerged. The first was a combination of the clan and hierarchy (C&H) culture types (173 organisations). The next was a combination of clan, market, and hierarchy (C&M&H) culture types (176 organisations). The third segment had a combination of market and hierarchy (M&H) culture types (72 organisations). Factorial invariance tests and path estimates were then analysed based on these three groups. Relevant goodness-of-fit indices for the configural and constrained models have been exhibited in Table 4.36.

The measurement model (Model-2) was assessed first by constraining all factor loadings. These constraints increased the  $\chi^2$  value from 2212.48 to 2264.35, gaining 42 degrees of freedom (*df*) (Table 4.37). The  $\chi^2$  difference of 51.88 with 42 *df* was statistically significant at  $p < .10$ , which while not at the expected level of  $<.05$  was accepted as more restrictive constraints improved the significance level satisfactorily.

A more restrictive model (Model-3) was established by constraining the structural regression weights, and assessed. In comparison with the configural model (model 1), the  $\chi^2$  value increased from 2212.48 to 2313.07 and gained 74 *df* (Table 4.37). The  $\chi^2$  difference

of 116.46 with 74 *df* was statistically significant at  $p < .05$ , which suggested that Model-3 was noninvariant.

The final test of model invariance was conducted using Model-4, in which the prior constraints established in Model-2 and Model-3 were retained and additionally all structural covariances were constrained. In comparison with the configural model (Model-1), the  $\chi^2$  value increased from 2212.48 to 2416.08 and gained 116 *df* (Table 4.37). The  $\chi^2$  difference of 203.60 with 116 *df* was statistically significant at  $p < .05$ , which suggested that Model-4 was also noninvariant.

Table 4.36: Goodness-of-fit indices for multi-group invariance test for OC

	Model-1	Model-2	Model-3	Model-4
Constraints	-	MW	MW, SW	MW, SW, SC
$\chi^2$	2212.48	2264.35	2313.07	2416.08
<i>Df</i>	1293	1335	1367	1409
$\chi^2/df$	1.71	1.70	1.69	1.71
<i>p</i>	< .001	< .001	< .001	< .001
CFI	.90	.90	.90	.90
TLI	.88	.89	.89	.88
RMSEA (90% CI)	.041 (.038, .044)	.041 (.038, .044)	.041 (.038, .044)	.041 (.038, .044)
SRMR	.07	.07	.07	.08

Table 4.37: Results of  $\chi^2$  difference test for OC

	Model-1	Model-2	Model-3	Model-4
Constraints	-	MW	MW, SW	MW, SW, SC
$\Delta\chi^2$	-	51.88	100.59	203.60
$\Delta df$	-	42	74	116
<i>p</i>	-	< .10	< .001	< .001

Model fit was also assessed to determine whether the four models (that is: Model-1, Model-2, Model-3, and Model-4) were able to fit the data reasonably well (Table 4.36). The  $\chi^2/df$



(normed chi-square) of all the four models were  $< 2.0$ ; and CFI of all four models were  $>.90$ . While the TLI of all four models were not exactly  $>.90$  as per the cut-off value established earlier in this study, the values of .88 and .89 were considered acceptable. RMSEA of all four models were .041 and SRMR were  $\leq .08$ . All these indices, when examined along the cut-off values ( $\chi^2/df \leq 2.0$ ; CFI  $> .90$ ; TLI  $> .90$ ; RMSEA  $< .07$ ; and SRMR  $\leq .08$ ) used in this study, suggested that these four models were acceptable as they fitted the data adequately.

The study showed that the four models adequately fitted the data, and the factorial invariance tests for OC suggested that the responses from knowledge workers from organisations with differing culture type were noninvariant. There was sufficient justification to infer that hypothesis H11 was supported.

Having ascertained that OC is a moderator, this study then examined the path estimates to identify the direction and strength of noninvariance between the three OC combinatorial culture types, which are: C&H, C&M&H, and M&H (Table 4.38). The structural paths of five relationships for C&H, eight for the C&M&H, and eleven for M&H, were found to be not significant.

Eight path estimates for the C&H culture type were significant (Table 4.38). The results showed that C&H will moderate the relationship between: knowledge network ( $\beta = .26, p < .10$ ), task-oriented leadership behaviour ( $\beta = .41, p < .05$ ), intangible resources ( $\beta = .50, p < .05$ ) and example-oriented leadership behaviour ( $\beta = -.43, p < .10$ ); and knowledge workers' intention to share tacit knowledge. C&H was also seen to moderate the

relationship between knowledge network ( $\beta = .32, p < .01$ ), example-oriented leadership behaviour ( $\beta = .44, p < .05$ ), intangible resources ( $\beta = .34, p < .05$ ) and relations-oriented leadership behaviour ( $\beta = -.41, p < .05$ ); and knowledge workers' tacit knowledge sharing behaviour.

Five path estimates for the C&M&H culture type were significant (Table 4.38). The results showed that C&M&H will moderate the relationship between: knowledge network ( $\beta = .50, p < .01$ ), relations-oriented leadership behaviour ( $\beta = .40, p < .10$ ), tangible resources ( $\beta = .25, p < .05$ ); and knowledge workers' intention to share tacit knowledge. C&M&H was also seen to moderate the relationship between tangible resources ( $\beta = -.28, p < .05$ ) and intangible resources ( $\beta = .60, p < .01$ ); and knowledge workers' tacit knowledge sharing behaviour.

Three path estimates for the M&H culture type were significant (Table 4.38). The results showed that M&H will moderate the relationship between tangible resources ( $\beta = .64, p < .05$ ); and knowledge workers' intention to share tacit knowledge. M&H was also found to moderate the relationship between intangible resources ( $\beta = .79, p < .01$ ) and knowledge workers' tacit knowledge sharing behaviour.

Table 4.38: OC moderated path estimates

Structural path			C&H		C&M&H		M&H	
			SRW	<i>p</i>	SRW	<i>p</i>	SRW	<i>p</i>
TKSB	←	I2STK	.19	ns	.29	ns	.12	ns
I2STK	←	KN	.26	*	.50	***	.10	ns
TKSB	←	KN	.32	***	-.05	ns	.24	ns
I2STK	←	L_TO	.41	**	.03	ns	.40	ns
TKSB	←	L_TO	.09	ns	.09	ns	.07	ns
I2STK	←	L_RO	-.03	ns	.40	*	.03	ns
TKSB	←	L_RO	-.41	**	-.25	ns	-.53	ns
I2STK	←	L_EO	-.43	*	-.17	ns	-.60	ns
TKSB	←	L_EO	.44	**	.41	ns	.39	ns
I2STK	←	R_T	.03	ns	.25	**	.64	**
TKSB	←	R_T	-.23	ns	-.28	**	-.19	ns
I2STK	←	R_I	.50	**	.08	ns	.32	ns
TKSB	←	R_I	.34	*	.60	***	.79	***

\*  $p < .10$       \*\*  $p < .05$       \*\*\*  $p < .01$       *ns* – not significant

SRW – Standardised regression weight

In summary, the results show that in organisations where clan culture is among the dominant cultures, knowledge workers will be more likely to share tacit knowledge. However in contrast, the market culture was seen to have negative influence on tacit knowledge sharing.

### Religiosity

The study re-iterates that the term *Syariah* influence means organisations which were largely managed in line with the *Syariah* compliance guidelines; and “No *Syariah* influence” means organisations in which management practices were not found to be influenced by as such. These attributes were described in more detail in chapter 3.

In this study, hypothesis H11 proposed that, Religiosity will moderate the relationship of the exogenous variables and endogenous variables, which are: knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour. Religiosity was equated with *Syariah* influence in this study. 308 knowledge workers in the study were found to be employed in organisations which were influenced by the *Syariah*, and 113 knowledge workers were categorised as under the employ of organisations in which the influence of the *Syariah* on management practices could not be detected. Factorial invariance tests and path estimates were then analysed based on these two groups. Relevant goodness-of-fit indices for the configural and constrained models have been exhibited in Table 4.39.

The measurement model (Model-2) was assessed first by constraining all factor loadings. These constraints increased the  $\chi^2$  value from 1556.25 to 1581.85, gaining 21 degrees of freedom (*df*) (Table 4.40). The  $\chi^2$  difference of 25.61 with 21 *df* was statistically not significant. However of interest to this part of the research was the structural model and as such Model-3 and Model-4 were examined accordingly.

A more restrictive model (Model-3) was established by constraining the structural regression weights, and assessed. In comparison with the configural model (model 1), the  $\chi^2$  value increased from 1556.25 to 1606.40 and gained 37 *df* (Table 4.40). The  $\chi^2$  difference of 50.15 with 37 *df* was statistically significant at  $p < .10$ , which suggested that Model-3 was noninvariant.

The final test of model invariance was conducted using Model-4, in which the prior constraints established in Model-2 and Model-3 were retained and additionally all structural covariances were constrained. In comparison with the configural model (Model-1), the  $\chi^2$  value increased from 1556.25 to 1655.16 and gained 58 *df* (Table 4.40). The  $\chi^2$  difference of 98.91 with 58 *df* was statistically significant at  $p < .05$ , which suggested that Model-4 was also noninvariant.

Table 4.39: Goodness-of-fit indices for multi-group invariance test - *Syariah* influence

	Model-1	Model-2	Model-3	Model-4
Constraints	-	MW	MW, SW	MW, SW, SC
$\chi^2$	1556.25	1581.85	1606.40	1655.16
<i>Df</i>	862	883	899	920
$\chi^2/df$	1.80	1.79	1.79	1.80
<i>p</i>	< .001	< .001	< .001	< .001
CFI	.92	.92	.92	.92
TLI	.91	.91	.91	.91
RMSEA (90% CI)	.044 (.040, .047)	.043 (.040, .047)	.043 (.040, .047)	.044 (.040, .047)
SRMR	.05	.05	.05	.06

Table 4.40: Results of  $\chi^2$  difference test for *Syariah* influence

	Model-1	Model-2	Model-3	Model-4
Constraints	-	MW	MW, SW	MW, SW, SC
$\Delta\chi^2$	-	25.61	50.15	98.91
$\Delta df$	-	21	37	58
<i>p</i>	-	<i>ns</i>	< .10	< .001

ns – not significant

Model fit was also assessed to determine whether the four models (that is: Model-1, Model-2, Model-3, and Model-4) were able to fit the data reasonably well (Table 4.39). The  $\chi^2/df$  (normed chi-square) of all the four models were < 2.0; CFI of all four models were >.92; TLI of all four models were >.90; RMSEA of all four models were <.044 and SRMR were

$\leq .08$ . All these indices, when examined along the cut-off values ( $\chi^2/df \leq 2.0$ ; CFI  $> .90$ ; TLI  $> .90$ ; RMSEA  $< .07$ ; and SRMR  $\leq .08$ ) used in this study, suggested that these four models were acceptable as they fitted the data adequately.

The study suggests that the four models adequately fitted the data, and the factorial invariance tests for *Syariah* influence suggested that the responses from knowledge workers were noninvariant. There was sufficient justification to infer that hypothesis H12 was supported.

Having ascertained that *Syariah* influence is a moderator, this study then examined the path estimates to identify the direction and strength of noninvariance between groups (Table 4.41). The structural paths of three relationships for *syariah* influence, and eight for non-religious were found to be not significant.

Six path estimates with *Syariah* influence as a moderator were significant (Table 4.41). The results showed that *Syariah* influence will moderate the relationship between: knowledge networks ( $\beta = .35, p < .01$ ), task-oriented leadership behaviour ( $\beta = .47, p < .01$ ), and example-oriented leadership behaviour ( $\beta = -.57, p < .01$ ); and knowledge workers' intention to share tacit knowledge. *Syariah* influence was also seen to moderate the relationship between knowledge networks ( $\beta = .20, p < .05$ ), relations-oriented leadership behaviour ( $\beta = -.40, p < .01$ ), example-oriented leadership behaviour ( $\beta = .64, p < .01$ ); and knowledge workers' tacit knowledge sharing behaviour.

Only one path estimate with no *Syariah* influence as a moderator was significant (Table 4.41). The results show that no *Syariah* influence will only moderate the relationship between knowledge networks ( $\beta = .40, p < .01$ ) and knowledge workers' intention to share tacit knowledge.

Table 4.41: *Syariah* influence moderated path estimates

Structural path			<i>Syariah</i> influence		No <i>Syariah</i> influence	
			SRW	<i>p</i>	SRW	<i>p</i>
I2STK	←	KN	.35	***	.40	***
TKSB	←	KN	.20	**	.16	ns
I2STK	←	L_TO	.47	***	-.06	ns
TKSB	←	L_TO	-.06	ns	.10	ns
I2STK	←	L_RO	.24	ns	.32	ns
TKSB	←	L_RO	-.40	***	-.22	ns
I2STK	←	L_EO	-.57	***	-.36	ns
TKSB	←	L_EO	.64	***	.20	ns

\*  $p < .10$

\*\*  $p < .05$

\*\*\*  $p < .01$

ns – not significant

SRW – Standardised regression weight

#### **4.12. Conclusion**

Chapter 4 largely reported the results of data analysis from the data collected in this study. Preliminaries, such as data examination and reporting data and response related attributes, were dispensed with at the outset before more advanced investigations were conducted. Structural equation modelling was used extensively in analysing the data and the results were systematically presented as a base to draw further meaning henceforth.

In the next chapter, that is chapter 5, the results reported herein will be synthesised and discussed in line with the theories underpinning this research. Hypothesised relationships will be explained based on the results of the various tests employed, and where findings emerged but were not premised *a priori*, the study will provide reasonable arguments in support, where possible.



# CHAPTER 5

## DISCUSSION

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*“Knowledge is invariably a matter of degree:  
you cannot put your finger even upon the  
simplest datum and say ‘this we know’.”*

- T.S. Eliot cited in Brazeal (2006, p. 255)

## **5.1. Introduction**

In chapter 4, the empirical results to test the hypotheses outlined in the thesis was presented. Data was largely analysed using multivariate statistical analysis and SEM (described in chapter 3). The chapter commenced with an assessment of the response rates and respondents profile, followed by an analysis of missing data, outliers and normality. Subsequently exploratory factors analysis was performed and the items which lacked sufficient correlational strength or were spurious were removed. Test for common methods variance was also done before further analyses were conducted. Once the preliminaries completed, the study moved on to structural equation modelling to examine the goodness-of-fit of the data with the model. While the initial model was not able to fit the data adequately, the final model which was acceptable was derived after a series of re-specification cycles. Chapter 4 then went on to test the hypotheses and finally the direction and strength of moderators which the study hypothesised will influence relationships between the exogenous factors and the endogenous variables.

While Chapter 4 reported the results as they were, Chapter 5 is largely a meaningful synthesis of such information in the context of this research. The chapter commences with a preamble which will essentially re-visit the context of this study. This will be followed by a detailed discussion of the findings of this study in relation to the study's research questions and hypotheses. Aside from findings which resonate with the hypotheses, others which diverged will also be described and meaning drawn from these observations. The final section will discuss the effect of moderators on the relationship between the exogenous factors and endogenous variables examined in this study.

## **5.2. Discussion: A Preamble**

This discussion chapter essentially aims to relate the findings of this study to concepts, theories, and prior studies. Some parts of the discussion were firmly grounded on existing theories. Some parts may be considered productive speculation. The main purpose however was not forgotten, that is: to contribute to the body of knowledge in the area of tacit knowledge sharing in organisations.

The study found that all the factors examined had a significant role in influencing knowledge workers intention to share tacit knowledge and their consequent behaviour. However some findings were contrary to suggestions in literature. For example, extant literature has suggested that individuals will not share tacit knowledge if they are coerced (e.g. Davenport & Prusak, 2000; Janowicz-Panjaitan & Noorderhaven, 2009). While this may be valid in a particular culture setting, this study suggests that it cannot be generalised. In this study, it was found that some knowledge workers will share tacit knowledge when instructed and the leaders are involved, that is: when the leaders are example-oriented.

The dearth of prior empirical studies in the area of tacit knowledge sharing made comparative conversations difficult. Furthermore very few studies had collectively examined all the factors which were investigated in this study, even in other areas of research. Discussions were therefore crafted assiduously under these conditions.

### **5.3. Discussion: Hypotheses**

The study had expanded the research questions into hypotheses and these had been described in prior chapters. There were basically three groups of hypotheses. The first group was about the relationship between the exogenous and endogenous factors, the second group was about the relationship between the two endogenous factors, and the final group was about the effects of the moderators on the relationship between the exogenous and endogenous factors. A detailed discussion of these hypotheses, the relevant results, and the study's interpretation, follows.

#### **i. Group 1: Influence of exogenous factors on endogenous factors**

**H2a: Knowledge networks in organisations will positively influence the knowledge worker's intention to share tacit knowledge**

**H2b: Knowledge networks will positively influence tacit knowledge sharing behaviour in knowledge workers in organisations**

Both H2a and H2b were supported in this study. These observations were consistent with the social network theory (Cross, Parker, Prusak, et al., 2003; M. T. Hansen, 2002; Rivera et al., 2010), which suggests that people will generally gravitate and form groups for various reasons; the social identity theory (Tajfel, 1974), which infers that individuals have an inherent need to belong to social groups; and the social exchange theory (Homans, 1958) which informs that people generally develop relationships with others in anticipation of reciprocal exchanges.

While there are abundant literature on the concept of social networks in organisations (e.g. Borgatti, Mehra, Brass, & Labianca, 2009; McDermott & Archibald, 2010; Rost, 2011), limited studies had examined knowledge networks in the context of knowledge sharing

(e.g. M. T. Hansen, 2002; He et al., 2009; Levin & Cross, 2004; Nirmala & Vemuri, 2009), and fewer studies had drilled deeper into the synergy between knowledge networks, and tacit knowledge sharing in particular. Among them, Chatti (2012) presented a conceptual paper which focussed on personal knowledge networks. Chatti's study had examined only one factor, which may be insufficient to explain variations in tacit knowledge sharing. Joia and Lemos (2010) empirically examined what they termed as "relationship network" in the context of tacit knowledge sharing, however they had subsumed this factor together with two others (which are: hierarchy and power) within a broader organisational structure construct. Furthermore they investigated formal networks, instead of informal networks which largely define knowledge networks. Foos, Schum, and Rothenberg (2006) observed that trust is a critical factor in tacit knowledge sharing, and is one of the main foundations of the concept of knowledge networks in this study (described in chapter two). They explored inter-organisational tacit knowledge sharing expectations between product development partners, which is far removed from the factors which were examined in, and the intra-organisational focus of, this study.

In chapter 2, the study discussed that among the reasons underlying the formation of knowledge networks are, people's affinity with others who are compatible and have abilities which complement their own, the element of trust, and anticipation of reciprocal exchanges (Rivera et al., 2010). These key factors which contribute toward the formation of knowledge networks appear to be highly conducive for tacit knowledge sharing, which cannot be forced on individuals (Janowicz-Panjaitan & Noorderhaven, 2009) and requires their active participation (Nonaka & Takeuchi, 1995).

Knowledge networks are informal organisations and managers have little or no control over their formation and operations. Traditional management practices rarely leverage on the informal organisation (Cross, Parker, Prusak, et al., 2003). It would not be surprising if some managers are even unaware of the existence of such networks in their organisations. The findings herein would help to fortify the notion that knowledge networks contribute significantly toward knowledge workers intention and behaviour toward tacit knowledge sharing.

It is not surprising that both H2a and H2b were supported, in this study. While this connection may be axiomatic, limited empirical evidence can be found in extant literature; however this gap was addressed in this study.

**H3a: Task-oriented leadership behaviour in organisations will positively influence the knowledge worker's intention to share tacit knowledge.**

The study found that task-oriented leadership behaviour will positively influence knowledge worker's intention to share tacit knowledge. However this hypothesis (H3a) and the concurring finding are essentially counterintuitive as it is common for literature on tacit knowledge sharing to suggest that such sharing may only take place when individuals are not coerced to do so (e.g. Davenport & Prusak, 2000; Janowicz-Panjaitan & Noorderhaven, 2009). In practice, task-oriented leadership behaviour is associated with instructions, monitoring, and the control of subordinates (H. Wang et al., 2011; Yukl, 2008) which, if viewed in isolation, should have led to a view contrary to that of this study, *vis-à-vis* hypothesis H3a.

Limited studies had examined leadership as an influencing factor in tacit knowledge sharing in organisations. One such study was by Z. Li et al. (2010), in which they examined leadership in the context of authorising power and its influence on intention to share tacit knowledge. However their hypothesis was not supported. In another study, Martins and Meyer (2012) investigated the role of leadership in knowledge retention. In their study the concept of leadership was very broad and largely defined by the manager's trustworthiness and emotional intelligence. By and large the attributes these studies examined were inadequate for a complex construct such as leadership behaviour.

In chapter 2, the study had explained that it is taking a contrarian view from that of other studies in this regard, because of the element of national culture, particularly power distance (Hofstede et al., 2010) in this case. There is a paucity of research in the area of tacit knowledge sharing, which had configured and examined: task-oriented leaders and power distance, like how this study had done.

**H3b: Task-oriented leadership behaviour will positively influence tacit knowledge sharing behaviour among knowledge workers in organisations.**

The test of this hypothesis was not significant. This finding suggests that the notion that task-oriented leadership behaviour does not influence tacit knowledge sharing behaviour among knowledge workers cannot be rejected. This is contrary to the finding of hypothesis H3a in which the study found that intention to share was positively influenced.

Viewed in isolation, this finding suggests that the TPB does not hold in this case as intention did not lead to behaviour. Furthermore, it also supports the theory that individuals cannot be coerced to share tacit knowledge. In reality, organisational factors do not operate

in isolation. There is a complex set of dynamics involved with myriad other factors of which some were examined in this study. Examined together, this finding may tell a different story, which may be more meaningful and useful. This finding will be discussed in tandem with other factors in the section describing Group 2, below.

**H4a: Relations-oriented leadership behaviour in organisations will positively influence the knowledge worker's intention to share tacit knowledge.**

The test of this hypothesis was both positive and significant as hypothesised. This finding resonates with leadership behaviour theories which suggest that relations-oriented leaders will significantly influence the performance of subordinates (Bass, 1990; Nonaka & Takeuchi, 2011; Walumbwa et al., 2010; Yukl, 2008) and is consistent with findings in other empirical studies which broadly examined relations-oriented leadership behaviour and positive behavioural outcomes in subordinates (e.g. Srivastava et al., 2006; H. Wang et al., 2011).

However, this study infers that there is a dearth of literature on empirical research which had examined the relations-oriented leadership behaviour and its influence on tacit knowledge sharing in organisations. The study found that other findings related to leadership behaviour may not agree with this finding. Therefore, as explained above, it would be premature to discuss this finding in isolation at this point, and will be discussed in a more holistic context in the section describing Group 2, below.



**H4b: Relations-oriented leadership behaviour will positively influence tacit knowledge sharing behaviour among knowledge workers in organisations.**

The test of this hypothesis was significant as hypothesised; however the study suggests that knowledge workers' tacit knowledge sharing behaviour will be negatively influenced. Essentially this means that they hoard such knowledge when leaders display relations-oriented leadership behaviour. The result is in direct contrast to the test for intention in H4a, above.

This finding is in contrast to other studies which had examined relations-oriented leadership behaviour and follower behaviour. For example, Walumbwa et al. (2010) in their study encapsulated the concept of relations-oriented leadership under a broader construct termed: "authentic leadership". They inferred that leaders' relations-orientation will positively influence behaviour in the organisation. In another study, H. Wang et al. (2011) demonstrated that leaders' relations-oriented behaviour will positively influence employee attitude, which in turn was positively associated with firm performance.

The study re-iterates that there is some similarity between the findings of both task-oriented and relations-oriented leadership on tacit knowledge sharing behaviour. While in both cases, the study found that knowledge workers intention to share was positive, such intentions did not translate into behaviour as expected. Power distance was cited in H3b (above) as a possible explanation. The same reason may also be extended to explain the result of H4b. However in this case, the study found that the influence was negative, which suggests that there were further ramifications of power distance on tacit knowledge sharing behaviour when leaders were relations-oriented as opposed to being task-oriented.

Hofstede et al. (2010, p. 61) postulated that employees in a high power-distance culture are “less likely to prefer a consultative boss”, and leaders who try to be consultative are often viewed with suspicion. Suspicion is the antithesis of trust (Lewicki, Mcallister, & Bies, 1998); and tacit knowledge sharing is largely predicated on trust (Foos et al., 2006; Holste & Fields, 2010). Tacit knowledge by definition is such that the knowledge worker may elect not to share it, with minimal fear, and if exposed, may always fall back on the time-worn excuse: “I forgot”. These factors viewed together, may explain why knowledge workers in this study responded that relations-oriented leadership behaviour will have a negative influence on their tacit knowledge sharing behaviour.

**H5a: Example-oriented leadership behaviour in organisations will positively influence the knowledge worker’s intention to share tacit knowledge.**

This test was significant as hypothesised; however the study also found that knowledge workers’ intention to share tacit knowledge will be negatively influenced. This finding suggests that knowledge workers may not intentionally share tacit knowledge even when their leaders display such behaviour.

Prior studies had suggested that, examples set by leaders, will influence the behaviour of subordinates. Hardy et al. (2010) demonstrated that leaders as role models, positively influenced the attitude of followers. In another study, Viitala (2004) observed that leaders as role models have a positive influence on knowledge management activities in organisations. Further support for example-oriented leadership and its positive influence on knowledge sharing can be found in anecdotes on the success of Buckman Laboratories, which was described in chapter 2 (Buckman, 2004).

Yaffe and Kark (2011, p. 816) demonstrated that, followers will only be positively influenced to emulate leaders, if they see the leaders as “highly worthy role models”. Brown, Treviño, and Harrison (2005, p. 130) suggested that in order for leaders to be influential, they must be seen to be “attractive, credible and legitimate role models”. However, as this study had observed, example-oriented leadership has a negative influence on knowledge workers’ intention to share tacit knowledge, which is contrary to literature on example-oriented leadership.

Perhaps this phenomenon may have a few possible reasons. The first is again in the context of power distance. Hofstede et al. (2010) also postulated that in high power distance cultures, superiors are generally deemed to have a higher status than subordinates. Managers who engage in a participative management style are often viewed with some suspicion, and “likely to be seen as weak and incompetent” in high power distance cultures (Newman & Nollen, 1996).

Another possible explanation for this phenomenon is that the respondents in this study were all knowledge workers. In most organisations in the new economy, specialised expertise is no longer exclusively the domain of leaders; it is more likely to be dispersed throughout the hierarchy (Bukowitz & Williams, 1999; Davenport, 2005). Essentially this infers that knowledge workers may have equal or greater working knowledge than their leaders. In this setting, the respondents in this study may not have been too impressed with their leaders as role-models in tacit knowledge sharing.

In summary, synthesis of literature about power distance, suggest that in cultures where such distance is high, the intention of superiors may be viewed with suspicion, when their behaviour does not fit the expectation of the subordinate. Example-orientation is far removed from the description of what a leader in a high power distance culture would display. This coupled with the issue of credibility and expert-knowledge, which were described above may have influenced the knowledge workers intention, negatively.

**H5b: Example-oriented leadership behaviour will positively influence tacit knowledge sharing behaviour among knowledge workers in organisations.**

The test of this hypothesis was both positive and significant as hypothesised. In H5a, above the study showed that example-oriented leadership had a negative influence on knowledge workers intention to share tacit knowledge; however in this hypothesis the reverse was observed. Tacit knowledge sharing behaviour was positively influenced.

The study suggests that the concept of power distance also relates to this finding. However the argument is in contrast with the one which was offered in H5a. In a high power distance culture, subordinates are subservient to superiors, and in cultures in which collectivism is dominant, individuals conform to group-norms in the organisation. Leaders when they set examples would naturally expect subordinates to emulate them. This expectation may have influenced the behaviour of the knowledge workers, which explains why tacit knowledge sharing behaviour was found to be positively influenced by example-oriented leadership, while intention to share tacit knowledge was negative.

Augmenting the notion of power distance is the concept of collectivism (Hofstede et al., 2010, p. 103). Collectivism in the workplace is associated with group-interest

overshadowing individual-interest, and group behaviour subjugating individual ideals. Malaysia was among the countries in which collectivism prevails over individualism (Hofstede et al., 2010).

Therefore this study suggests that when knowledge workers, in a high power distance culture, witness a work-related example established by their leaders, they will also exhibit a similar behaviour irrespective of whether or not there is intention. The study further infers that this behaviour will manifest collectively throughout the organisation and not as random occurrences.

**H6a: Providing adequate tangible resources to knowledge workers will positively influence their intention to share tacit knowledge.**

The test of this hypothesis was both positive and significant as hypothesised. The results suggest that adequate tangible resources to knowledge workers will positively influence their intention to share tacit knowledge.

There is adequate theoretical support for this finding. Some prior studies had examined the influence of resources on individuals' intention, and expectation. For example: Venkatesh et al. (2008) observed significantly high correlation ( $> .70$ ) for the test of the construct, facilitating conditions; which was measured by: "I have the necessary resources to use the system". They inferred that adequate system resources (facilitating conditions) will lead to use. Z. Li et al. (2010) in their study demonstrated that resource adequacy and intention to share tacit knowledge were positively correlated. However in their study, resource, was a

single construct, but in contrast, this study distinguished tangible resources and intangible resources, and examined them separately.

This finding suggests that managers should provide adequate tangible resources in order to positively influence knowledge workers intention to share tacit knowledge. However the study suggests that such tangible resources must be appropriate for the purpose of tacit knowledge sharing as otherwise behaviour may not manifest as was found in the next hypothesis (H6b). Intention essentially is at the cognitive level. Therefore the efficacy of a tangible resource may not be a critical factor at this juncture, which may account for the contrast in the finding of H6a and H6b.

**H6b: Providing adequate tangible resources will positively influence tacit knowledge sharing behaviour among knowledge workers in organisations.**

While this hypothesis was significant, the study found that tangible resources had a negative influence on knowledge workers' tacit knowledge sharing behaviour. This was in contrast to what was hypothesised, that is: the influence will be positive.

The finding has theoretical support from Venkatesh et al. (2008). They posited that inadequate resources will lower an individual's behavioural expectation. They also argued that acknowledging the existence of resources alone is not enough for behaviour to manifest. How well the individual perceives the usefulness of the resource, matters to a great extent. This study leveraged on this premise and the discussion follows.

“*Ba*”, which is “shared space for emerging relationships”, is an important aspect to stimulate tacit knowledge sharing in the workplace (Nonaka & Konno, 1998, p. 40). Within the concept of *Ba*, physical space is an attribute, and the inadequacy of such space will be an impediment to tacit knowledge sharing.

Studies have often cited technology as an important tangible resource (e.g. Salanova et al., 2005), particularly information technology (e.g. Edwards, Shaw, & Collier, 2005; M. M. Mohamed, Stankosky, & Mohamed, 2009; Reychav & Weisberg, 2009). However studies had also demonstrated that information systems not be accepted, unless the user is convinced of its information, content, and service quality (DeLone & McLean, 2003).

Against the backdrop of these arguments, it does not come as a surprise that the study shows that tangible resources negatively influence tacit knowledge sharing behaviour. Tangible resources which are not appropriate for tacit knowledge sharing may have a negative impact on knowledge workers behaviour. For example, if a group of knowledge workers were about to engage in discussions in which experiences and expertise will be shared, but the information system to capture and disseminate such knowledge was unstable and this frustrates the knowledge workers. Although the resource was available and the knowledge workers intention to share was not compromised, the resource was deficient and impeded their behaviour. Another instance is: the place made available for a discussion in which tacit knowledge will be shared, is above a factory floor and noise from the machines in the factory disrupts the discussion. While the space was made available, it was not appropriate for the purpose.

Literature often suggests that tacit knowledge sharing is not generally practiced in organisations due to the various barriers and difficulties associated with it. Following this argument it would, by no stretch of the imagination, allow this study to infer that tangible resources in most organisations may not be appropriate or optimised for tacit knowledge sharing. In this regard it comes as no surprise that this study found tangible resources negatively influencing tacit knowledge sharing behaviour among knowledge workers.

**H7a: Providing adequate intangible resources to knowledge workers will positively influence their intention to share tacit knowledge.**

**H7b: Providing adequate intangible resources will positively influence tacit knowledge sharing behaviour among knowledge workers in organisations.**

Both H7a and H7b were supported in this study. Notwithstanding suggestions in literature that studies may have to discern between tangible and intangible resources (e.g. Mårtensson, 2000), there is a dearth of empirical studies which had adopted this suggestion. Where tangible resources are physical in nature, intangible resources are largely about human-relations, skills, competence, and emotions. Among some of the intangible resources usually associated with the work place, some are: cooperation of other people (Ajzen & Madden, 1986), autonomy, social support, opportunities to learn, feedback (Schaufeli et al., 2009), and coaching, and team climate (Xanthopoulou et al., 2009).

The study demonstrates that intangible resources are among the most significant factors in facilitating tacit knowledge sharing among knowledge workers. This factor not only positively influenced intention to share, but also tacit knowledge sharing behaviour, and



counts, together with knowledge network, as the only two factors in this study to be significant and positive in both aspects of the investigation.

Perhaps this phenomenon can be explained in more detail in conjunction with some of the attributes of intangible resources which were suggested in literature. For instance, opportunities to learn may encourage the knowledge worker to share tacit knowledge in anticipation of job promotion opportunities which may accompany such learning opportunities. Another reason could be altruism. Individuals when given the chance to expand their knowledge may be driven to repay the opportunity, by sharing what they know with others.

Coaching is a well-recognised tacit knowledge sharing practice. Given the opportunity to coach, a knowledge worker may feel honoured of such recognition and share tacit knowledge freely. A higher form of coaching is apprenticeship, which is widely recognised as a tacit knowledge sharing practice (Nonaka & Takeuchi, 1995).

Feedback is also an important intangible resource for tacit knowledge sharing as organisations have collective memory in which knowledge, defining the organisation is held collectively in the minds of its people in varying degrees and intensities (Alavi & Leidner, 2001; Rowlinson, Booth, Clark, Delahaye, & Procter, 2010). Frequent feedback means that there will be more avenues for this memory to circulate in the organisation.

**ii. Group 2: Influence of one endogenous factor on another**

**H1: Knowledge workers' intention to share tacit knowledge will positively influence tacit knowledge sharing behaviour.**

Test of this hypothesis was both positive and significant as hypothesised. This hypothesis was predicated on the theory of planned behaviour (TPB; Ajzen, 1991), which states that an individual's intention toward a given behaviour is often actualised. The support for H1 is consistent with the TPB and other empirical studies (e.g. Bock et al., 2005; Martin et al., 2010; Richetin et al., 2011). While extant literature is abound with empirical studies in support of the theory that the individual's intention leads to behaviour, very few had examined and provided empirical evidence of this phenomenon in the area of tacit knowledge sharing. Some researchers, like Z. Li et al. (2010) explored influencing factors on tacit knowledge sharing; however they stopped short of examining the relationship between intention and behaviour, which this study investigated.

**iii. Group 3: The effect of moderators**

**H8: Gender, will moderate the influence of the exogenous variables on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour.**

The study examined and found that gender moderates the relationship between the factors examined in this study and their influence on knowledge workers intention to share tacit knowledge and tacit knowledge sharing behaviour. This finding is consistent with prior research on gender differences (e.g. Eagly et al., 1995; Eagly & Steffen, 1986; Lin, 2006; Roth et al., 2012). For example; Eagly et al. (1995) demonstrated that the various leadership roles will impact the effectiveness of men and women, differently; and Lin (2006) reported that gender moderates the relationship of workplace ties and knowledge

sharing. However these studies differed from the current study in a number of areas, including: the theoretical model and constructs, and structural relationships.

The study found that female knowledge workers were more inclined to share tacit knowledge through knowledge networks compared to their male counterparts. While the study observed that both male and female knowledge workers intention to share tacit knowledge was influenced by knowledge networks, the degree of the influence on female knowledge workers was significantly more than that on males. In the case of male knowledge workers, such intentions were not translated into behaviour, however females clearly displayed tacit knowledge sharing behaviour through knowledge networks. Studies have shown that males and females, socialise in the workplace and develop trust differently (Bevelander & Page, 2011); however men are generally more competitive which makes them less intimate (Timberlake, 2005). Assimilating these suggestions and the findings herein, the study suggests that female knowledge workers may have greater trust in their colleagues than males. The study also infers that as males may be more competitive, they may not be as inclined as females to share tacit knowledge with their colleagues. Trust and competitiveness are essentially at two ends of the spectrum, especially in tacit knowledge sharing. Knowledge networks, like all informal networks, are largely predicated on trust. This may explain the gender variances found in this study in relation to knowledge networks.

The study suggests that task-oriented leadership behaviour will neither influence the intention nor the behaviour of male knowledge workers to share tacit knowledge. While female knowledge workers also exhibited similar behaviour in response to this type of

leadership; their intention however was influenced. Instructions, directions, and commands from leaders to share tacit knowledge appear to have very little effect on knowledge workers. This observation is consistent with literature which alluded that people will only share tacit knowledge on their own volition and not if they are coerced (Davenport, 2005; Nonaka & Takeuchi, 1995). Relations-oriented leadership style appears to positively influence the intention of male knowledge workers and it also negatively influenced the behaviour of their female counterparts. This observation suggests that in a high power distance culture, managers who are relatively friendly may be viewed with suspicion. With example-oriented leadership style, the data suggests that male knowledge workers will develop negative intention to share tacit knowledge but will not display this behaviour; however females were seen not to develop the intention but their tacit knowledge sharing behaviour was very strongly influenced. Studies on aggressive behaviour indicate that males are more aggressive than females (Eagly & Steffen, 1986; Hyde, 1984). In this regard, females more than males may conform to directions from leaders, especially in relation to activities where the subordinate's cooperation will be required, and non-conformance cannot be detected easily. Tacit knowledge sharing will fit this description.

The final factors which were examined in relation to the moderating effect of gender were tangible and intangible resources. The study demonstrates that both male and female knowledge workers intention to share tacit knowledge will be influenced by adequate tangible resources. Gender's moderating effect on the influence of tangible resources on knowledge workers tacit knowledge sharing behaviour was largely questionable. The study was not able to reject the hypothesis that male knowledge workers will not moderate the influence of tangible resources on tacit knowledge sharing behaviour. Their female

counterparts on the other hand exhibited negative influence. This means that they will withhold tacit knowledge given adequate tangible resources. What this study also shows, in the case of tacit knowledge sharing, is that both male and female knowledge workers' intention will not lead to behaviour, with respect to tangible resources.

Male knowledge workers intention to share tacit knowledge was influenced by intangible resources; however the study suggests that females did not display the same intention. In contrast, both male and female knowledge workers reported that intangible resources will positively influence their tacit knowledge sharing behaviour.

In summary, this study reiterates that gender moderates the relationship of the examined organisational factors on knowledge workers tacit knowledge sharing behaviour. However closer examination gives a clearer perspective of the differences between the genders. For instance, female knowledge workers may be more likely to share tacit knowledge through knowledge networks than their male counterparts. Perhaps females are not as competitive as males and may be willing to share tacit knowledge with people whom they trust.

In relation to leadership behaviour, other factors such as power distance, differences in demeanour and temperament of males and females, and the unique characteristics of tacit knowledge, will have to be synthesised in order to catalyse tacit knowledge sharing in the organisation. For instance, leaders may act as role models with female knowledge workers; however this will not work with the males. Male knowledge workers reported that they value intangible resources. All these differences open up opportunities for this study to make theoretical and practical contributions to the body of knowledge. The theoretical and

practical implications of these findings will be discussed in the section describing Group 2, below.

**H9: Industry sector and Industry type will moderate the influence of the exogenous variables on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour.**

Industry sector and industry type were found to moderate the influence of the relationship between the factors examined in this study and their influence on knowledge workers intention to share tacit knowledge and tacit knowledge sharing behaviour. In industry sector, the study examined noninvariance between the public sector and the private sector, and in industry type similar investigation was carried out between three industry types, that is: public services, manufacturing, and commercial services.

The findings associated with this hypothesis were consistent with literature. For example, (Bower, 1977) argued that the public and corporate sectors differ a great deal in the way they operate, are managed, and their purpose. In a recent study Andersen (2010) demonstrated that there is significant differences between leadership behaviour in the public and private sectors. Industry type, a sub-classification of industry sector, is also often examined in studies related to organisations. While literature suggests that industry type will moderate relationships between organisational factors (e.g. Richard et al., 2009; Zhou & Li, 2012) ), some studies were unable to reject the notion that it did not (e.g. Park & Shaw, 2013). Studies had also suggested that industry type may moderate the relationship between knowledge sharing criterion and predictor variables (e.g. H.-F. Lin, 2007; Teng & Song, 2011).

The study found that in the public sector, knowledge networks were clearly instrumental in manifesting knowledge workers' intention and behaviour toward tacit knowledge sharing; and in contrast, their private sector counterparts reported that only intention will manifest and not behaviour. Further investigation by industry type in the private sector showed that knowledge networks in the manufacturing sector neither created intention nor behaviour in knowledge workers toward tacit knowledge sharing. Intention however was observed in the commercial services sector; however this did not manifest in behaviour.

The study suggests that task-oriented leadership behaviour will only influence the tacit knowledge sharing intention of public sector knowledge workers. The same intention was observed in the manufacturing sector; however knowledge workers in the commercial services sector reported that their intention will be adverse. In all sectors, task-oriented leadership behaviour was not seen to influence knowledge workers tacit knowledge sharing behaviour. Relations-oriented leadership behaviour was only significant in the commercial services sector in influencing knowledge workers intention to share tacit knowledge. Tacit knowledge sharing behaviour, however only manifested in knowledge workers in the public sector albeit this effect was negative, which essentially meant that these workers suggested that they will withhold tacit knowledge when their leaders display relations-oriented behaviour. Example-oriented leadership behaviour similarly did not make any significant contribution to both knowledge workers intention and behaviour toward tacit knowledge sharing. Knowledge workers in the public sector indicated that their intention will be adverse and so did their counterparts in the private sector. In relation to behaviour, only knowledge workers in the commercial services sector showed they example-oriented leadership behaviour will influence them to share tacit knowledge.

Industry sector and industry types were highly significant moderators of the influence of tangible resources on knowledge workers intention and behaviour toward tacit knowledge sharing. As this finding is quite consistent with observations in other moderators examined in this study and the overall model, the deficiency may be attributed more to the factor, which is tangible resources, instead of the moderators. While the study found that adequate tangible resources significantly influenced knowledge workers intention to share tacit knowledge in the private sector and both the industry types within this sector; it had no effect in the public sector. In relation to tacit knowledge sharing behaviour, the study that tangible resources had no effect in the manufacturing sector and also the private sectors as a whole; however it negatively influenced tacit knowledge sharing behaviour in the public sector and the commercial services sector.

Intangible resources significantly influenced knowledge workers' intention to share tacit knowledge in both the public and private sectors, and within the private sector, the manufacturing sector largely contributed toward supporting this hypothesis. However the study suggests that intention does not manifest in the commercial services sector. It was found that in the public sector, the study could not reject the notion that intangible resources will not influence tacit knowledge sharing behaviour. However the results clearly showed that intangible resources will influence tacit knowledge sharing behaviour in the private sector, as this was evident in both the manufacturing and commercial services.

The study suggests that these findings may not be random occurrences, but consequences of the overall purpose, structure, and culture in the various sectors, examined. Private sector organisations are mainly concerned with their own revenue, profit, market share, and other



performance imperatives. Sustained competitive advantage is often critical for the survival of the organisation. Meritocracy will largely define recruitment and job promotion of employees in the workplace. Under these conditions, sharing knowledge may be the last thing knowledge workers in the private sector may have in mind as it may reduce their competitive advantage. The public sector, on the other hand, offers non-profit and regulatory services, and is generally driven by long-term policies in favour of security and development of the country. These organisations do not compete with each other like in the public sector. Seniority largely prevails in the public sector with regard to job promotions. Against this backdrop, sharing tacit knowledge may not be as unfavourable to knowledge workers in the public sector, compared to their counterparts in the private sector. This was evident in this study, as in the public sector, knowledge networks positively influenced knowledge workers intention and behaviour in tacit knowledge sharing; however in the private sector, such behaviour did not manifest.

The manufacturing sector is often associated with more rigid processes and procedures, compared to the commercial services sector. Industrial equipment also takes a central role in the production process in the manufacturing sector, compared to the commercial services sector which may predominantly be dependent on people. Against these factors, it was not surprising that knowledge workers in the commercial services sector were more likely to develop the intention and behaviour toward tacit knowledge sharing supported by leaders who are more involved with them in the process, compared to knowledge workers in the manufacturing sector.

In summary, this study found that sector and industry type moderate the relationship between organisational factors and tacit knowledge sharing intention and behaviour among knowledge workers. Public sector knowledge workers in general were more inclined toward tacit knowledge sharing through knowledge networks than knowledge workers in the private sector. The study inferred that this view resonates with the type of dominant organisational culture in these sectors. The study also found that knowledge workers in the commercial services sector are more favourable to tacit knowledge sharing with the direct involvement of their leaders in such activities, compared to those in the manufacturing sector. Intangible resources had a greater impact on knowledge workers in the private sector than those in the public sector. Knowledge workers in the commercial services sector appear to value intangible resources highly. All these differences open up opportunities for this study to make theoretical and practical contributions to the body of knowledge. The theoretical and practical implications of these findings will be discussed in the section describing Group 2, below.

**H10: Organisational culture type will moderate the influence of the exogenous variables on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour.**

The study provided sufficient support for this hypothesis. Data was examined using the OCAI (explained in chapter 2) to determine which culture types, among the four (that is: clan, adhocracy, market, and hierarchy) were dominant in the respective organisations which participated in this study. In chapter 4, it was reported that three distinct combinations of dominant culture types emerged, which were: (i) clan and hierarchy (“C&H”); (ii) clan, market, and hierarchy (“C&M&H”); and (iii) market and hierarchy (“M&H”).

This finding resonates with prior studies which suggested that organisational culture (OC) will influence knowledge sharing activities (e.g. Al-Alawi et al., 2007; Barachini, 2009; McDermott & O'Dell, 2001; Rivera-Vazquez et al., 2009; Román-Velázquez, 2005; Roman et al., 2004; Suppiah & Sandhu, 2011). Limited studies had particularly focused on OC and tacit knowledge sharing, and one such study by Suppiah and Sandhu (2011) was a small scale study which only examined a single factor (that is: OC), unlike this study which examined twelve factors. Furthermore some of the limitations and recommendations for future research cited by them were addressed in this study.

A general assessment of the influence of the culture types indicate that the market culture may be a barrier to tacit knowledge sharing among knowledge workers. Clan culture, in contrast, was seen to facilitate tacit knowledge sharing. The hierarchy culture may at best have a neutral influence; however insufficient information was available for informed reasoning. These suggestions were made at a broad level by examining the strength, direction, and significance of the relationships which were examined. “C&H” had six positive relationships; “C&M&H” had four positive relationships; and “M&H” had only two positive relationships (Table 4.38).

It is apparent that when market culture was among the dominant cultures, positive and significant relationship reduced and non-significant relationships increased. The other finding is that when clan culture is not dominant, there was a reduction in positive and significant relationships and increased non-significant relationships. These findings suggest that clan culture type will positively moderate the relationship between organisational factors examined in this study and tacit knowledge sharing among knowledge workers in

organisations. In contrast, market culture type reduced positive and significant relationships, indicating that it had a detrimental effect on tacit knowledge sharing in organisations.

Another perspective which may support the above argument that market culture type may have undesirable influence on tacit knowledge sharing intention and behaviour, may be explained by examining the sector and industry type of the organisations in tandem with the this culture type. The market culture type is associated with achieving results, which in turn is often associated with competition. In a competitive situation knowledge is often equated with power and people will generally be reluctant to share, on the notion that it may erode their competitive advantage (Haldin-Herrgard, 2000; C.-P. Lin, 2007). Under such conditions the element of trust may subjugate to the self-serving needs of an individual (Jensen & Meckling, 1976; Schoorman, Mayer, & Davis, 2007); however, trust is imperative in tacit knowledge sharing (Holste & Fields, 2010; C.-P. Lin, 2007). These raised pertinent issues, and the study then examined OC, and in particular, the market culture type, in relation to the sector and industry types. In chapter 4, it was reported that only 20% of organisations in the public sector had the market culture as one of the dominant culture types. In the other 80%, market culture was not dominant. The private sector's market culture dominance was the inverse of the public sector; 79% of organisations had a dominant market culture and 21% did not. In the discussion about hypothesis H9 above, the study had demonstrated that knowledge workers in the public sector were more inclined toward tacit knowledge sharing in their knowledge networks than those in the private sector. Deducing from these observations, the study provides further

support that the market culture type will have adverse influence on tacit knowledge sharing in organisations.

A dominant mix of “C&H” cultures has a positive influence on knowledge networks relationship with tacit knowledge sharing intention and behaviour of knowledge workers. Knowledge networks are essentially communities in an informal setting and the dominance of a clan culture and the finding herein is consistent with theories of both these concepts, suggesting that this finding is not surprising. The influence of the hierarchy culture in the context of knowledge networks can be discounted to a certain degree on account that the hierarchy culture is typically associated with a formal structure rather than an informal structure as in the case of knowledge networks. A dominant “C&M&H” culture mix only had a positive influence on knowledge networks and intention to share tacit knowledge. The study could not reject the notion that the “M&H” culture type did not influence tacit knowledge sharing intention and behaviour. These findings offer sufficient support for the suggestion above that the clan culture will positively influence tacit knowledge sharing intention and behaviour and the study found that this can be achieved through knowledge networks. In contrast, the market culture type was not able to leverage on knowledge networks to influence tacit knowledge sharing.

Findings related to all three leadership behaviour constructs were quite consistent with prior findings in this study about this factor. Task-oriented leadership behaviour typically offered very poor support for tacit knowledge sharing, as only one relationship was significant, that is: the influence of “C&H” on task-oriented leadership behaviour on knowledge workers intention to share tacit knowledge. “C&M&H” was found to influence the relationship

between relations-oriented leadership behaviour and knowledge workers intention to share tacit knowledge; however “C&H” negatively influenced behaviour. These were the only two significant findings about relations-oriented leadership behaviour and tacit knowledge sharing. As for example-oriented leadership behaviour, the study found that only “C&H” was significant. Intention to share tacit knowledge was negatively influenced, while tacit knowledge sharing behaviour was positively influenced. Prior suggestions related to power distance and collectivism may explain the variations observed in the leadership behaviour factors.

The examination of the influence of tangible resources on knowledge workers tacit knowledge sharing intention and behaviour shows that intention was positively influenced when OC is either “C&M&H” or “M&H” and behaviour was negatively influenced in organisations with “C&M&H” culture. These observations are consistent with others related to tangible resources, therefore prior suggestions in this study that such tangible resources may not be appropriate for tacit knowledge sharing, holds.

To a large extent, the findings related to intangible resources were consistent with prior findings in this study. While only the “C&H” culture type saw significant and positive relationship between intangible resources and intention to share tacit knowledge, the study found positive and significant relationship between intangible resources and tacit knowledge sharing behaviour in all three culture types (“C&H”, “C&M&H, and “M&H”).

In summary the study suggests that organisational culture will moderate the influence of organisational factors examined in this study on tacit knowledge sharing intention and behaviour in organisations. The study infers that in organisations which have a dominant

clan culture tacit knowledge sharing will be more prevalent than organisations in which the market culture is dominant.

**H11: Religiosity will moderate the influence of knowledge networks and leadership behaviour on knowledge workers intention to share tacit knowledge and their tacit knowledge sharing behaviour.**

Factorial invariance tests showed that religiosity moderated the influence of the factors examined in this study on knowledge workers tacit knowledge sharing intention and behaviour. Religiosity was examined using Syariah influence on management practices in organisations, which was explained in detail in chapter 2.

This finding is consistent with other studies which had examined religiosity in relation to prosocial behaviour of individuals. For example Ahmed (2009) in an experimental study demonstrated that religiosity will influence prosocial behaviour. Galen (2012, p. 899) suggested that “priming or contextual reminders of religiosity have a prosocial effect”, on people. Informal mentoring by religious leaders was also found to correlate with educational attainment in a study by Erickson and Phillips (2012). While a large number of studies had examined religiosity in the context of prosocial behaviour, empirical research on the effect of religiosity on tacit knowledge sharing intention and behaviour, is scarce.

The study found that in organisations in which there is Syariah influence, knowledge networks were clearly instrumental in influencing knowledge workers’ intention and behaviour toward tacit knowledge sharing; however in contrast, in organisations which had

no Syariah influence, the study found that only knowledge workers intention will manifest and not behaviour.

In organisations which had no Syariah influence, the study was unable to reject the notion that all three leadership behaviours (that is: task-oriented, relationship-oriented, and example-oriented) did not influence knowledge workers tacit knowledge sharing intention and behaviour. This meant that knowledge workers in these organisations perceived that their leaders, irrespective of their behaviour style, were of no significance to these workers tacit knowledge sharing intention or behaviour. In contrast, the study found that in organisations which were influenced by the Syariah, task-oriented leadership behaviour will influence intention to share tacit knowledge, and relations-oriented leadership behaviour will negatively influence tacit knowledge sharing behaviour. Example-oriented leadership behaviour will also negatively influence intention; however this same leadership behaviour will positively influence tacit knowledge sharing behaviour. These findings related to leadership behaviour, resonated with findings in prior moderators.

The study did not examine the moderating influence of religiosity on the relationship between tangible and intangible resources on knowledge workers' tacit knowledge sharing intention and behaviour. The study was largely concerned with the prosocial elements associated with religiosity and in this; tangible and intangible resources had no relevance. Premised on this argument, one may suggest that leadership behaviour may also fall within this category and as such need not be examined. This study had its reasons, and among them were: (i) the esteem in which religious leaders are often held and the respect followers have for their wisdom and knowledge (McCullough & Willoughby, 2009). In Islam, edicts



of religious leaders are accepted as commands and obeyed without question (Afridi & Khan, 2007; Ansari, 2001). The question in relation to this study was: *would such faith in religious leaders also extend to organisational leaders in the context of tacit knowledge sharing intention and behaviour?* The study did not detect any surprising results in support of this line of investigation, which meant that religiosity will not provide leaders added advantage in influencing the behaviour of their subordinates.

#### **5.4. Conclusion**

This chapter primarily synthesised, the results which emerged using the analytical procedures which were determined in chapter 3, and theories which underpinned this study. Such synthesis, grounded on the research philosophy of interpretivism (described in chapter 2) provided sufficient grounds for productive speculation.

The next chapter, that is: chapter 6, will describe the theoretical and practical implications of the insights discussed in this chapter.

# CHAPTER 6

## IMPLICATIONS

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*“Knowledge is power, which is why people who had it in the past often tried to make a secret of it. In post-capitalism, power comes from transmitting information to make it productive, not from hiding it.”*

- P.F. Drucker (1998, p. 185)

## **6.1. Introduction**

In chapter 5 the results of this study which were outlined in chapter 4, were interpreted *vis-à-vis* the theoretical framework, and the hypotheses proposed in chapter 2. While some of the findings were consistent with theories and other prior studies, the results from this thesis showed contrasting findings. These findings were then contextually examined and discussed.

A brief re-visit of the background of this study: In the new economy it is imperative for nations and organisations to be more information and knowledge intensive to enhance their competitiveness. Knowledge as an organisational resource is gaining increased attention, and so is the difficulty of operationalising tacit knowledge in organisations. The volume and value of tacit knowledge to organisations is acknowledged in literature (e.g. Davenport & Prusak, 2000; Reychav & Weisberg, 2010); however there is limited empirical research in this area (Goffin & Koners, 2011).

Recent developments in research in tacit knowledge sharing show that there is increased attention to organisational factors and activities, such as: knowledge networks (Chatti, 2012; Joia & Lemos, 2010; Panahi, Watson, & Partridge, 2013); work teams (Ryan & O'Connor, 2009; Venkitachalam & Busch, 2012); organisational culture (Suppiah & Sandhu, 2011); narratives and story-telling (Goffin & Koners, 2011; Whyte & Classen, 2012); leadership (Z. Li et al., 2010; Martins & Meyer, 2012); and resources (Z. Li et al., 2010). This trend supports the view that there is growing attention, in research, in support of the notion that organisational factors and tacit knowledge sharing are associated.

This study examined the influence of organisational factors (that is: knowledge networks, leadership behaviour, and resources) on tacit knowledge sharing in organisations. The data collected for this study came from 421 respondents, which was analysed and reported in chapter 4.

In this chapter, the study will discuss the implications of the findings in relation to theory and practice. The chapter is organised as follows: In the next section, a summary of the salient findings of this research will be discussed, followed by a highlight of a few notable theoretical implications. Subsequently the study will describe the practical implications of this study from the policy and operational perspectives. The final section will present a few concluding statement in relation to this chapter.

## **6.2. Summary of findings**

The study found significant evidence that knowledge networks will positively influence knowledge workers tacit knowledge sharing behaviour. Leadership behaviour, examined at a disaggregated level of: task-orientation, relations-orientation, and example-orientation; gave contrasting results. A significant association this study infers is that: leaders task-orientation and example-orientation will positively influence knowledge workers tacit knowledge sharing intention and behaviour. This finding is in contrast with suggestions in literature that individuals cannot be coerced to share tacit knowledge (e.g. Davenport, 2005; Janowicz-Panjaitan & Noorderhaven, 2009). Perhaps the phenomena evidenced in this study can be explained by the influence of national culture, particularly: power distance (Hofstede et al., 2010). The study also found that intangible resources will positively influence intention and behaviour. In contrast, tangible resource, was found to negatively influence behaviour,

which differed from evidence in literature (e.g. Z. Li et al., 2010). This observation and rationale were explained in chapter 5, and will also be discussed, below.

Further analysis suggested that: gender, organisational culture, sector and industry types, and religiosity, will moderate the influence of knowledge networks, leadership behaviour, and resources on knowledge workers tacit knowledge sharing intention and behaviour. The implications of these findings will be discussed below.

### **6.3. Theoretical implications**

Nonaka and Takeuchi (2011, p. 60) postulated that the “scientific, deductive, theory-first approach” often “seeks answers that are universal and predictive”, independent of context. In the social sciences, most phenomena are “context dependent and analysing them is meaningless unless you consider people’s goals, values, and interests along with the power relationships among them”

This study adopted the decomposed context-specific approach, suggested by Hong et al. (2006) in developing its theoretical framework. The findings provide adequate justification for this approach and the theoretical implications are discussed below.

#### **a) A new theoretical model: A disaggregated framework.**

While few other studies had examined the influence of organisational factors on tacit knowledge sharing (e.g. Z. Li et al., 2010; Martins & Meyer, 2012; Yang & Farn, 2009); to the best of the knowledge of the author of this study, none had constructed a theoretical model similar to that of this study. In this respect, the study makes two main contributions.

First, the theoretical model developed in this research was premised on the notion that tacit knowledge sharing is not a common practice in organisations and is not easily operationalised (Ambrosini, 2001; Nonaka & Takeuchi, 1995). These and other barriers associated with the subject, suggested that tacit knowledge sharing is a complex issue and may not be easily explained by a single dimension. However it is not uncommon for empirical research to investigate tacit knowledge sharing on the influence of a single organisational factor (e.g. Bélanger & Allport, 2008; Chatti, 2012; Ryan & O'Connor, 2009; Yang & Farn, 2009). In this study, the theoretical construct of organisational factors took a multi-dimensional approach. This is the major theoretical contribution of this thesis.

The study found at a holistic level, that knowledge workers intention to share tacit knowledge will lead to behaviour. This resonated with the TPB (Ajzen, 1991), which asserted that intention will generally lead to behaviour. However analysis at the individual factor level, suggested contradicting evidence of this. These results showed that intention to share tacit knowledge did not mediate the effect of four of the six factors examined, on tacit knowledge sharing behaviour (chapter 4: Table 4.26). This finding suggests that the dynamics of individual factors and that of the constructs collectively differ in the way tacit knowledge sharing is influenced. This further supports the approach to develop a multi-dimensional model, in this study.

The second contribution of this study's theoretical model is that it is a decomposed context-specific model. It is not unusual for studies to examine certain factors at a more aggregate level; however in such studies, the risk of one or more sub-factors masking out the effect of other sub-factors, cannot be discounted. In this study the following factors were

disaggregated and examined: leadership behaviour and resources. Leadership behaviour was disaggregated as task-oriented, relations-oriented, and example-oriented leadership behaviour; and resources as tangible and intangible resources.

The study found evidence to suggest that there are sufficient variations in the disaggregated factors to support the study's approach. For example: the absolute value of the standardised correlation coefficient between intangible resources (.56) and tacit knowledge sharing behaviour was double that of tangible resources (-.28) and tacit knowledge sharing behaviour (chapter 4: Table 4.25). This would have cancelled out the negative influence of tangible resources, if both tangible and intangible resources had been amalgamated as one construct; and any conclusions may be inaccurate.

In summary the theoretical contribution of this research is twofold. First, the proposed framework is multi-dimensional, and the factors collectively are able to explain variations in tacit knowledge sharing behaviour, satisfactorily. Second, conceptualising the factors in a more disaggregated way reflects the complex relationship between the key factors and tacit knowledge sharing behaviour, which is different from those found in the literature. Disaggregation further contextualised the theoretical framework. For example: leadership behaviour was disaggregated as task-orientation, relations-orientation, and example-orientation; and the study examined variations in the empirical results, in the context of national culture (e.g. power distance). The resource construct was decomposed as tangible and intangible resources in this study, and variations in the empirical results demonstrate that these constructs were context specific.

This study suggests that researchers should be cautious about examining variables at an aggregate level as the results may not withstand more rigorous scrutiny.

**b) The genesis of tacit knowledge: Link between ancient and contemporary theories.**

While this study does not pretend that this is a major theoretical contribution, it provides a historical perspective of the origins of the concept of tacit knowledge. Contemporary literature in knowledge management attribute the concept of tacit knowledge to Michael Polanyi (e.g. Janowicz-Panjaitan & Noorderhaven, 2009; Nonaka & Takeuchi, 1995; Whyte & Classen, 2012). While Polanyi's contribution toward articulating and popularising scholarly inquiries in the area of tacit knowledge in recent times is duly acknowledged, this study posits that the concept of tacit knowledge has been widely acknowledged by early philosophers.

This study traced the trajectory of thoughts related to the concept of tacit knowledge back to its roots, through the works of philosophers like, *Immanuel Kant*, *Aristotle*, *Plato*, and *Socrates*; through to ancient philosophies, embedded in the: *Vedas* and the *Upanishads*, the *Dao and Confucian* schools, and the *Holy Qur'ān* (discussed in chapter 2); and found traces of the concept in various contexts in these literature.

**6.4. Practical implications - policy and operational**

Tacit knowledge is critical for organisational competitiveness and sustainability; however organisations grapple with developing strategies and programmes to foster tacit knowledge sharing. The empirical results from this study provide valuable insights on key drivers and the type of strategies that can be put in place to encourage tacit knowledge sharing.



The findings of this study will offer managers some suggestions which may allow them to unlock economic value from such knowledge. For example, Chevron reduced corporate operating costs by, USD Two Billion, after implementing an organisational learning programme premised primarily on knowledge sharing (Derr, 2006).

#### **6.4.1. Policy implications**

Organisations may establish or revise existing policies which will facilitate tacit knowledge sharing. Some examples are, those related to confidentiality, recruitment, and incentives.

**Confidentiality:** Knowledge workers are likely to be cautious about sharing knowledge which they deem as sensitive (Abrams, Cross, Lesser, & Levin, 2003); and often concerns about security and confidentiality leads to “self-imposed censorship” (Ardichvili, Page, & Wentling, 2003, p. 70).

The study found that knowledge networks will positively influence tacit knowledge sharing intention and behaviour. Knowledge networks are essentially informal organisations and the composition of member of these networks may be far removed from the formal organisational structure. The dilemma members may face will be: what type of knowledge can be shared and what cannot. Loyalty to their respective departments, or maybe fear of punishment, may stand in the way of sharing knowledge, if the employees are unsure of what kind of knowledge will not be deemed as confidential, and can be shared.

Perhaps managers may devise a knowledge classification scheme, which will capture the degree of confidentiality. For example: in a study about knowledge sharing in the public

sector in Malaysia, knowledge was classified as: open, confidential, secret, and top secret (Syed Ikhsan & Rowland, 2004b). While the authors did not define what each of these classifications meant; they showed that classifying knowledge according to the degree of confidentiality is being practiced.

This study suggests that managers start by developing a taxonomy which will broadly classify knowledge in the organisation by degree of confidentiality, which is by way of explicit guidelines. However, the tacit part of confidentiality policy may include the element of discretion. Knowledge workers may practice self-censorship, especially about confidential information which can impact corporate performance or image.

Knowledge workers may then be guided about the type of knowledge which they can share freely and the type which they will have to be cautious about.

**Recruitment:** The study found that female knowledge workers are more inclined to share tacit knowledge through knowledge networks, compared to males. Prior studies which had examined increased recruitment of females have observed positive changes in organisations. For example, Torchia, Calabrò, and Huse (2011) found that an increase in women directors was correlated to an increase in innovation in Norwegian companies. The study suggested that a critical mass has the potential to influence organisational behaviour: “to enable them to interact and exercise influence on working styles, processes and tasks” (Torchia et al., 2011, p. 312). This finding suggests that, male knowledge workers may similarly be influenced to share tacit knowledge through knowledge networks, when there is a critical number of female knowledge workers.

The organisation may therefore increase the recruitment of female knowledge workers, in organisations in which there the ratio of females to males is small, in order to promote tacit knowledge sharing as a normative behaviour in the organisation.

**Incentives:** The study was unable to find sufficient evidence to suggest that knowledge workers in organisations with a dominant market culture will not share tacit knowledge (chapter 4: Table 4.38). This was not surprising given Cameron & Quinn's (2006) definition that such organisations will be externally focused, and obsessed with results. Such characteristics mean that, in the context of tacit knowledge sharing, unambiguous and measurable targets linked to job performance measures may be more effective than suggestions and instructions.

The study suggests that organisations with a market culture may include tacit knowledge sharing as a key performance indicator (KPI). Prior studies have demonstrated that KPI is an effective mechanism for influencing the behaviour of employees (e.g. M. Wang, Vogel, & Ran, 2011). For example: Gupta & Govindarajan (2000) in a case study, observed that employees in Nucor Steel, which became one of the largest steel producers in the United States, were awarded performance bonuses at a group instead of at an individual level. The authors remarked that employees were motivated to share knowledge with their colleagues in order to improve group performance.

The connection between incentives and motivation to share knowledge was aptly described by Kenneth Derr, a former chairman of the board of Chevron Corporation. The corporation had a success sharing bonus programme. Derr commented: "of course, sharing rewards isn't

managing knowledge – it just gives everyone another good reason to do it” (Derr, 2006, p. 189).

#### **6.4.2. Operational implications**

In this section the operational implications of the findings of this study is discussed. The dialogue is structured by the factors which were examined, that is: each of the exogenous factors followed by the moderating factors, for illustration purposes only. In the workplace, some of these factors are highly inter-dependent. For example: developing knowledge networks through teams, including cross-functional teams, and social proximity, may require appropriate task-oriented and example-oriented leadership behaviour, and adequate resources, such as: information technology, and appropriate environment for personal interactions. The study suggests that managers implement holistic, instead of piecemeal, strategies to foster tacit knowledge sharing.

#### **Knowledge networks**

The study demonstrated that knowledge networks significantly influence knowledge workers tacit knowledge sharing intention and behaviour. This will therefore be an important area for organisations to leverage on. However; knowledge networks are essentially informal organisations and there is little that managers can do to organise, supervise, direct, influence, and otherwise undertake the myriad other managerial activities which they generally would in a managing a formal organisation. New management competencies may therefore be necessary.

Managers may get people who are compatible and have complementary skills to work together. Trust, is usually at the epicentre of self-directed teams (Mayer, Davis, &

Schoorman, 1995), and is also among the main factors underpinning the formation of knowledge networks. Developing teams of knowledge workers as an indirect path toward the development and proliferation of knowledge networks in the organisation may have to be given serious consideration. Managers may also be advised to review and reorganise these teams on a regular basis in order to bring in fresh ideas, and to provide a path for others to be accepted into the knowledge network.

Cross-functional teams should also be formed where necessary as workplace issues are getting more complex and a multi-disciplinary approach may be necessary to resolve some of them. This may mean that knowledge workers from others sections or departments would be co-opted into the teams. Aside from the benefits which accompany knowledge from other discipline, this would be one way to facilitate knowledge flow between entities in a formal structure. In the formal organisation it is quite common for knowledge silos to form in accordance with the structures therein (Bundred, 2006; M. Mohamed, Stankosky, & Murray, 2004; Turner & Makhija, 2006) and cross functional teams will help to break down these barriers aside from catalysing the formation of knowledge networks in the organisation.

The next dimension which managers may look at is: proximity. Studies in knowledge flows have demonstrated that spatial and social proximity will result in more effective knowledge flows (e.g. Agrawal, Kapur, & McHale, 2008). Liben-Nowell and Kleinberg (2007), in resonance, posited that people are more likely to collaborate under conditions of social proximity. Perhaps the findings in a study on communications will provide further support for the proximity perspective. T. J. Allen (1970) found in his study that the probability of

people communicating with others is inversely correlated to the distance which separates them. For example, the study demonstrated that at a separation distance close to zero, the probability of communication will be approximately 25%; however at a distance of 20 feet (approximately six meters) the probability drops to approximately 16%; and at around 120 feet (36.5 meters) the probability of communication between the parties drops very close to zero. This underlines the importance of proximity to generate interactions between individuals, which is among the main factors catalysing tacit knowledge sharing (e.g. Davenport & Prusak, 2000; Yi, 2009).

Organisations may therefore provide facilitating conditions for such proximity to take place. For example, managers may adopt the flexible office concept (Steiner, 2005) in which workspace may be assigned by clustering knowledge workers in order to optimise personal interactions. For example; a novice may be given a workspace close to an expert. The anecdote (Appendix 5.1) about Trish and Carlos narrated by Stewart (2002, p. 114) is adduced in support of this suggestion.

The findings in this study suggest that knowledge networks significantly influence tacit knowledge sharing. Managers, therefore, cannot ignore knowledge networks for this purpose. New managerial competencies may also be required to identify existing knowledge networks and to facilitate the formation of new networks. Competencies such as knowledge network analysis, which involves identifying hubs and nodes within the network and maximising the flow and velocity of knowledge through these links instead of relying solely on the formal organisational structure.

## **Leadership behaviour**

Three leadership styles were examined, which were: task-orientation, relations-orientation, and example-orientation. It was not surprising that elements of national culture had an overarching influence on the behaviour of knowledge workers in relation to leadership styles. This is an important finding; otherwise organisations in Malaysia which may often adopt systems, processes, and best practices, from other cultures, with unreasonable optimism may not be able to replicate the outcomes in those countries. This may often lead to disappointments, time and monetary loss, loss of confidence, error in attributing the problem, to name a few.

While prior literature suggests that people cannot be coerced to share tacit knowledge, this study showed that instructing and hoping that tacit knowledge will be shared may not manifest in behaviour. However the empirical findings of this study showed that knowledge workers will share tacit knowledge when their leaders provide clear instructions and act as role models.

These empirical findings offer valuable insights on strategic initiatives organisations may undertake to encourage tacit knowledge sharing among knowledge workers; which can be done by aligning and improving existing managers' skills and competences, and also by ensuring that new managers are versatile and will lead by example. This study suggests three essential skills and competencies are critical for leaders to be a catalyst for fostering tacit knowledge sharing. First managers will be required to be expand their repertory of leadership styles and be able to switch from one style to another, according to the demands of the situation; which Goleman (2000) suggests will require a variety of emotional intelligence competencies. Second, managers will be required to create shared contexts.

Greater understanding and meaning will emerge when organisational members are provided opportunities to interact and learn from each other in both, formal and informal settings (Nonaka & Takeuchi, 2011). Third, managers must be articulate and be able to communicate their knowledge cogently. Nonaka and Takeuchi (2011, p. 64) called this: “communicate the essence”. They suggested the use of metaphors and stories in which managers may share their tacit knowledge with subordinates. Knowledge workers may then learn and use these techniques which have been effective in explicating tacit knowledge.

For example: Adamson, Pine, Steenhoven, and Kroupa (2006, p. 39) narrate the case of San Juan Regional Medical Centre which was facing financial problems, and staff morale was at its lowest. The leaders decided on an experience strategy which changed the business model. Focus shifted from: patients experience to employee experience; largely predicated on the notion that the employees customised experience will translate into more personalised experience for patients. However; the strategy hit a snag as it was too abstract and not clearly understood by the employees. The “what” had come across, but the “why” got muddled up. The organisation then developed a metaphor, which they titled: “Raiders of the Lost Ark”, to communicate the essence of the strategy. This was an adventure story in which the art of personalised healthcare was lost, and the players were there to find it. Eventually more than 70% of employees voluntarily participated in many of the programmes which were established, and the authors observed: “scepticism, fear, and apathy were replaced with understanding, excitement, and a sense of partnership”.



## **Resources**

The importance of appropriate and adequate resources in job performance had been described in chapter 2 and thereon. This section is concerned with how the findings of the study relate to knowledge workers' tacit knowledge sharing intention and behaviour; and what are the practical implications of these findings.

Tangible and intangible resources were examined as two different factors, instead of as a composite factor. The study found that they had differing influence on knowledge workers, which supports this approach. Tangible resources, the study found, will negatively influence tacit knowledge sharing behaviour. This means that knowledge workers will hoard tacit knowledge given tangible resources. This is in contrast to findings in other studies (e.g. Salanova et al., 2005; Venkatesh et al., 2008); however in these studies, a single construct consisting both tangible and intangible resources were examined, which this study suggests lack sufficient granularity.

Managers may recognise that tacit knowledge sharing, if at all, is being practiced in organisations, may be accidental or embedded in organisational procedures, processes, and systems. For example, training, coaching, mentoring, and apprenticeship may contribute toward tacit knowledge sharing and in some organisations these are established activities. However their objectives will largely influence the outcomes in relation to tacit knowledge sharing. For example: whether the organisations deliberately structured these activities for tacit knowledge sharing, or are they simply best practices in other organisations and adopted accordingly? Or are they activities which these organisations been practicing for many years and are now part of the standard operating procedure, with minimal or no relation to tacit knowledge sharing?

Studies have suggested that tacit knowledge sharing is not common in organisations (Davenport, 2005; Davenport & Prusak, 2000; C.-P. Lin, 2007) and is difficult to operationalise. Following these arguments, this study infers that tangible resources which organisations had already acquired or are providing to knowledge workers may not be suitable for tacit knowledge sharing. Managers may have to plan, assess, and acquire tangible resources which will catalyse, and support tacit knowledge sharing activities in their respective organisations. For example, software applications may be designed for instant connectivity between knowledge workers in the organisation and repositories may capture exchanges for dissemination to others and for future reference. Mobile applications may also be very useful to negate spatial barriers to communication between knowledge workers. Managers may also provide special discussion rooms for tacit knowledge sharing. The design, ambience, and accessibility of such rooms will have to conducive for tacit knowledge sharing, which for instance may have square or rectangular tables which seats between four to six knowledge workers. While these are some suggestions, managers will have to understand the intricacies related to tacit knowledge sharing and engage knowledge workers in acquiring tangible resources for them to share their knowledge.

While tangible resource is a necessary condition, it is not sufficient to facilitate tacit knowledge sharing. In contrast, the findings suggest that intangible resources are a necessary and sufficient condition for encouraging tacit knowledge sharing. This study found that intangible resources will influence knowledge workers tacit knowledge sharing intention and behaviour. Some of the intangible resources which were examined in this study were adequate and competent technical support, constructive feedback from managers and workmates, opportunities to develop new skills and competences, free and easy access

to experts, and be allowed to work with minimal supervision. Knowledge workers, the study found, value these intangible resources highly and this study found that this will positively influence their tacit knowledge sharing intention and behaviour.

In summary, this study reiterates that if organisations provided appropriate tangible resources for tacit knowledge sharing and enhance intangible resources, knowledge workers will be influenced to share tacit knowledge within the organisation.

### **Organisational culture**

The study found that variations in tacit knowledge sharing can be explained by the organisational culture type. Clan culture was clearly more conducive for tacit knowledge sharing compared to market culture (chapter 4: Table 4.38). Organisational culture (OC) is complex; it is often the outcome of myriad factors, like: business strategy, leadership style, influence of national culture, market structures, and so on. This study does not suggest organisations should change their overall OC to one that is conducive for tacit knowledge sharing, for example changing the OC from a dominant market culture to a dominant clan culture. That would be myopic and may bring about unintended consequences. However, this study suggests that organisations in which the OC is not conducive for tacit knowledge sharing, like those with a dominant market culture, managers may make some strategic changes to encourage a culture of tacit knowledge sharing among employees.

Culture change is not easy (M. Smith, 2003); however studies have shown that this can be achieved successfully (Shook, 2010). For example: New United Motor Manufacturing Inc. (NUMMI), a joint venture between Toyota and General Motors, managed to transform a

“once dysfunctional disaster – GM’s Fremont, California plant” into a model establishment with the same workforce (Shook, 2010, p. 63). Among the key findings of the NUMMI experience are: (i) organisations should focus on employee behaviour rather than how they think; as “it’s easier to act your way to a new thinking than to think your way into a new acting”, resonating Schein’s (2004) argument that to change culture, leaders will have to change people’s behaviour; and (ii) provide people the means to complete their jobs successfully, which resonates with this study’s selection of resources (tangible and intangible) as a key organisational factor for tacit knowledge sharing.

Based on the findings of this study and suggestions in literature for culture change, managers may do the following: First, the OC must be diagnosed rigorously for the enterprise as a whole, and also for the departments as separate entities. Studies have observed similarities and also differences between the organisation as whole and work-units (Roman et al., 2004, p. e.g. ). Once this is done, then programmes to facilitate tacit knowledge sharing will have to be introduced accordingly. For example, in a clan culture, people may be more inclined to participate in communities of practice and share tacit knowledge in their knowledge networks; however in a market culture organisation: key performance indicators, and rewards and incentives, may be more effective. Tacit knowledge sharing programmes must be appropriate for the culture type as “one size will not fit all”.

## **Sector and industry type**

The study found that knowledge workers in the public sector are more likely to share tacit knowledge compared to their counterparts in the private sector. Literature suggests that public sector organisations are largely concerned with regulatory and non-commercial public services; and the private sector is concerned with commercial activities and profit for its shareholders (Lachman, 1985; Perry & Rainey, 1988). Perhaps the non-competitive environment in which the public sector functions, may be more conducive for tacit knowledge sharing, compared to the competitive climate in which private sector organisations operate in. The intensity of competition may consequentially heighten the need for secrecy and confidentiality, which will have an impact on tacit knowledge sharing.

Private sector organisations may encourage tacit knowledge sharing by, first establishing policies on confidentiality (discussed above), which will inform knowledge workers about the degree of confidentiality of the various types of knowledge in the organisation. Managers may also recognise the importance of knowledge networks in fostering tacit knowledge sharing by facilitating the formation of these networks through team-building activities, forming cross-functional teams, and social proximity. These suggestions were discussed in more detail in the sections on confidentiality and knowledge networks, above.

There are many corporations which had successfully implemented knowledge sharing practices and the benefits were effective. Chevron Corporation's operating cost reduction of USD Two Billion (Derr, 2006), and Nucor Steel's growth into one of the largest steel producers in the USA (Gupta & Govindarajan, 2000), discussed above, offer insights into the benefits of implements knowledge driven strategies in the private sector. Another such

case is that of Outokumpu, a Helsinki based mining company, which demonstrated that the positive impact of tacit knowledge sharing is not just confined to “high-tech” firms, but also benefits “established industries” (Kluge et al., 2001, p. 108). Outokumpu had 12,000 employees in 17 plants across 11 countries. Locating the right persons in the organisation to share their tacit knowledge was a challenge. The company performed a knowledge audit and established a repository of subject matter experts, which was made available throughout the organisation. This was an ongoing activity. The result: knowledge flow was enhanced. Outokumpu developed a “flash smelting process, which currently is “used to manufacture half of the world’s primary copper” (Kluge et al., 2001, p. 109).

In relation to industry types, the study found that knowledge workers in commercial services are more likely to share tacit knowledge than their counterparts in manufacturing. This observation was discussed in chapter 5. Perhaps the process-driven framework of the manufacturing sector may be more focused on explicit knowledge, which will typically define routine manufacturing processes unambiguously. Such processes will not change unless new or improved processes are introduced. Aside from areas such as: research and development, the focus on standards and the manufacturing process, which are essentially explicit knowledge, may have subsumed the desire and need to acquire new knowledge rapidly, in the manufacturing sector. This may be a barrier to tacit knowledge sharing, which this study infers from its findings.

Now that there is adequate evidence that tacit knowledge sharing is not prolific in the manufacturing sector, perhaps managers may shift some attention to this aspect and adopt some of the suggestions which this study had made above, in the sections on policy

implications, and operational implications in: knowledge networks, leadership behaviour, and resources.

Managers may also classify the jobs subordinates perform according to the task requirements postulated by Charles Perrow (Liker & Meier, 2007, p. 90). Tasks may be classified as: technician work, routine work, craft work, and non-routine work. Technician work can be decomposed into clear tasks and taught “in a structured way”; routine work can be taught relatively easily and is repetitive; craft work is highly skilled work based on accumulated experiences over a long period of time; and non-routine work involves “spontaneous thinking, and reasoning, and decision making” (Liker & Meier, 2007, pp. 91-93). While technician and routine work are more about explicit knowledge; craft and non-routine work will largely involve tacit knowledge. Managers may focus on developing the skills and competencies of subordinates in the areas of craft and non-routine work by implementing tacit knowledge sharing programmes such as apprenticeship, coaching, and mentoring (Nonaka & Takeuchi, 1995). Liker and Meier (2007) reported that Toyota Motors uses this approach to skill enhancement widely in their manufacturing plants.

Manufacturing firms may improve organisational performance by giving adequate attention to tacit knowledge sharing. For example: John Deere’s manufacturing plant in Mannheim, Germany, which produces more than 50% of Germany’s total annual tractor production, implemented a knowledge management programme, which the study inferred, included extensive tacit knowledge sharing activities. These efforts improved profitability and “spurred impressive gains in overall production”; and it was reported that “error-free products” rose from 30% to 72% (Kluge et al., 2001, pp. 48-49).

In summary, tacit knowledge sharing is more apparent and widespread in the public sector and less in the private sector; and more in the commercial services industry type than firms involved in manufacturing. However the need to move up the innovation value chain amidst challenges to sustain competitive advantage in this knowledge-driven economy has made tacit knowledge sharing necessary for all organisations, irrespective of sector or industry type.

### **Religiosity**

Prior studies have suggested that religiosity will influence prosocial behaviour in individuals (e.g. Ahmed, 2009; Galen, 2012; McCullough & Willoughby, 2009). Prosociality relates to the individual's positive views and actions about assisting others. Sharing tacit knowledge has contextual relevance to prosocial behaviour.

This study examined religiosity using *Syariah* influence as proxy (discussed in chapter 3). Followers of the Islamic faith believe that all commandments in the Holy *Qur'ān* are irrefutable and mandatory (Afridi & Khan, 2007; Ansari, 2001). The Holy *Qur'ān* commands that the acquisition and sharing of knowledge is an imperative. Details of this discussion can be found in chapter 2: Islamic philosophy.

Prominence given to knowledge and knowledge sharing is not confined to Islam, only. Most religions offer similar edicts. For example: in Christian theology, the Biblical Book of Proverbs suggests that “The mind of the prudent acquires knowledge and the ear of the wise seeks knowledge (*Proverb 18:15*)” (Tinsley, 2002, p. 31). In *Hebrew 13:16*, Christians are encouraged to do good and make sacrifices, not only material sacrifices but also ethical



action; “for such sacrifices are pleasing to god” (Daly, 1978, p. 100). In Hinduism, acquiring and sharing *jnana* (knowledge) is “essential to the attainment of *moksha* (spiritual liberalization)”. *Moksha* is described as the unification of the *atman* (self) and *brahman* (ultimate reality) in the *Upanishads* (Saha, 2007, p. 486); and loosely translated, *Moksha* may be “equated with the cessation of rebirth”; which is the ultimate goal in Hinduism (Sharma, 2000, p. 116).

The study found that religiosity will influence tacit knowledge sharing behaviour, in organisations. Managers may encourage religiosity within the organisation by establishing initiatives, like: creating awareness among employees that religion encourages knowledge sharing. Perhaps religious leaders and teachers may be invited to give talks about the subject; however ethical considerations are paramount as otherwise the initiative may degenerate into exploiting religion; and setting up inter-faith centres in the organisation to support religious discourse among employees of different religions. This may help harmonise relationships and also provide platforms to establish greater trust among people of different religions. Tacit knowledge sharing is predicated on trust (Holste & Fields, 2010).

Organisations may also embark on international best practices, in areas such as: food production and handling, global warming, human rights, and assistance for the under-privileged. These initiatives can be linked to religious practices. For example: in Malaysia, *Halal* certification is mandatory for food (production and handling) meant for the consumption of Muslims. These best practices will not only benefit the systems and processes in organisations, but also will amplify religiosity in the context of organisational

practices. This will foster prosocial behaviour in the organisation, which will positively influence tacit knowledge sharing.

## **6.5. Conclusion**

In this chapter the theoretical and practical implications of this study were discussed. While the study acknowledges that it had made contributions to theory, the practical implications may be arguably more substantial, especially in light of the difficulties managers face in the work place in relation to tacit knowledge sharing and the changing landscape in the global economy.

The next chapter (that is: chapter 7) will conclude the submissions in this thesis. Therein, the study will briefly summarise the salient points in prior chapters, discuss some of the limitations of this research, and provide directions for future research.

# **CHAPTER 7**

## **CONCLUSION**

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*“Individual knowledge, essential as it is, isn’t enough for success; its true value emerges only when it can be taken up and used as needed by a whole organization.”*

- Buckman (2004, p. x)

## **7.1. Introduction**

This is the final chapter, and it essentially rounds-up discussions related to this research. The chapter commences with a section which provides a summary of this thesis. This is followed by a section which will summarise the extent to which the aims of this study were met. Subsequently the limitations of the study will be described, followed by some directions for future research. The thesis will then be brought to an end, with some concluding statements.

## **7.2. Summary of thesis**

In this section, a few salient points from each chapter in this thesis have been outlined in the form of an executive summary.

Chapter 1: This chapter provides meaning for this research. Knowledge is at the epicentre of the knowledge-driven economy, and can no longer be taken for granted. Tacit knowledge, which cannot be managed like other organisational resources, must be shared in order for organisations to extract value from it. The chapter identified relevant research problems, articulated the research objectives which cascaded into research questions, in order provide a clear sense of purpose for this study.

Chapter 2: Literatures relevant to this study were reviewed. During the course of literature review, the study found that the concept of tacit knowledge has been around since the age of the early philosophers. In line with the objectives of this study, particular attention to theories explaining human behaviour was reviewed. The TPB resonated with this study's direction of inquiry and was adopted to model its theoretical framework. After synthesising

relevant literature, the study defined the theoretical model and hypotheses to guide the research.

Chapter 3: This chapter was mainly concerned with the research design and methodology. After evaluating some of the more widely cited sampling methods, the study selected the probability sampling method in which respondents, both the organisations and knowledge workers, were selected at random to minimise bias. The chapter also described in sufficient depth the analytical procedures which were used in this study, and the reference values which the study used to examine the results.

Chapter 4: The data was analysed with the aid of the analytical procedures described in chapter 3. In this chapter data was analysed using SEM and reported accordingly. Model fit was assessed based on the goodness-of-fit reference values which were determined in chapter 3. Multi-group analysis was also performed to assess the extent of the effect of the moderating variables modelled in this study.

Chapter 5: Essentially the results generated in chapter 4 were interpreted rationally. Observations were theoretically justified, where possible; and explained logically with inferences from examples in some instances. Observations which were in contrast to theory, like the TPB in the instance of leadership behaviour, were articulated cogently.

Chapter 6: key theoretical contributions and practical implications of the findings of this study were articulated. The study was able to justify its stand in disaggregating and examining factors such as, leadership behaviour and resources, into theoretically justifiable

sub-factors. The variations which were observed would be very much more meaningful in the operational environment which is often starved of effective models.

### **7.3. To what extent were the objectives of this study met?**

In this section, the study re-visits the research objectives outlined in chapter 1, and provides an assessment in relation to the findings herein:

*RO1: To identify key organisational factors which will influence knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour.*

This objective was met. The study not only identified three organisational factors, that is: leadership behaviour, knowledge networks, and resources; it also disaggregated with theoretical justification the constructs of leadership behaviour into: task-orientation, relations orientation (Yukl, 2008), and example-orientation (Yaffe & Kark, 2011); and resources into: tangible and intangible (Mårtensson, 2000). The variations which were found (chapter 4: Table 4.25) provide adequate justification for this approach. The details of these findings were discussed in chapter 5, and the implications in chapter 6.

*RO2: To examine the impact of moderating factors on the influence of key organisational factors on knowledge workers' intention to share tacit knowledge and tacit knowledge sharing behaviour.*

This objective was met. The study found that the moderators examined in this study were factorially noninvariant, which means that there were variations in their respective attributes. The study found that female knowledge workers were more

inclined to share tacit knowledge through knowledge networks, compared to their male counterparts. Clan organisational culture is conducive to tacit knowledge sharing; however in contrast, the study demonstrates that, in market organisational cultures, tacit knowledge sharing may not be a priority. Religiosity was another moderator which was examined, and the study suggests that the influence of religion on management practices may remove some of the inhibitions knowledge workers may have about sharing tacit knowledge. Details of these findings were discussed in chapter 5, and the implications in chapter 6.

*RO3: To examine if knowledge workers' intention to share tacit knowledge will influence tacit knowledge sharing behaviour.*

This objective was met. The study found that at the holistic level knowledge workers intention to share tacit knowledge will positively influence tacit knowledge sharing behaviour. However; the study was unable to find adequate evidence to suggest that the same influence will prevail for each of the exogenous factors examined. Details of these findings were discussed in chapter 5, and the implications in chapter 6.

#### **7.4. Limitations of this study and directions for future research**

The study was able to demonstrate that the organisational factors which were examined will influence knowledge workers tacit knowledge sharing intention and behaviour. While this study makes important contributions to the literature, it has a number of limitations and they are outlined below.

The sample for this study was selected from organisations in the KL/KV region, which is the hub of economic activities in Malaysia. Organisations in this region are more likely to be larger than that of other regions in Malaysia, in terms of size of workforce, and business activities. Knowledge workers in the KL/KV region may have access to more sophisticated technologies and knowledgeable subject matter experts, than their counterparts in other regions. All these suggest that the findings of this study may not be generalised for Malaysia. Future research may extend the sampling frame to include other regions in Malaysia. The results may be different for firms located in urban and rural areas in Malaysia. Future studies should control for firms located in rural and urban areas within Malaysia so that key factors that impact tacit knowledge sharing in these localities are identified and appropriate strategies can be implemented to enhance tacit knowledge sharing. This will enable firms in the different locations to move up the innovation value chain and become a high income firm.

This study was premised on a cross-sectional design, in which data was collected at a single point in time. The attributes of the factors examined in this study may change over time. For example, the leaders may be replaced or their leadership styles may change. Knowledge networks have an organic nature and will constantly evolve depending on the relationship between the players. Future research may consider the longitudinal approach to data collection in order to mitigate the limitations of the cross-sectional design.

In this study, knowledge networks was a single dimensional construct, largely predicated on the element of trust between knowledge workers, while the other two factors, that is:



leadership behaviour and resources, were multi-dimensional. Knowledge networks may be examined in detail using a multi-dimensional approach in future research.

Notwithstanding the above limitations, the study suggests that valuable knowledge has been generated in this area of research in the literature. The study contributes to theory by providing greater understanding of the factors which influence tacit knowledge sharing in organisations in a developing country. The study also contributes to practice by identifying key strategies that can enhance tacit knowledge sharing in an organisational setting. The suggestions for future research will further enrich the findings herein for the benefit of the research community, organisations, society at large, and nations.

#### **7.5. Concluding statements**

In a knowledge-driven economy, economic growth and wealth generation is largely defined by the creation and application of knowledge. Knowledge sharing, especially tacit knowledge, in this new economy, is a critical component of an organisations bid to sustain competitive advantage. While there are barriers in fostering tacit knowledge sharing, this research has shown that individuals, given the right enabling conditions, will share knowledge. This study aspired to identify organisational factors which will positively influence tacit knowledge sharing behaviour to contribute to the body of knowledge. This aim was achieved. Key factors identified to foster tacit knowledge sharing will not only contribute to the body of knowledge, but also to inform organisations and policy-makers on the type of strategies that will enhance tacit knowledge sharing.

In summary, the global economic landscape is evolving at a fast pace. Organisations that aim to be at the frontier of competition are the ones that should not only be able to create new knowledge, but also share and disseminate knowledge rapidly. This research provides new insights on organisational factors influencing tacit knowledge sharing, and lessons from the Malaysian case may be valuable for other developing countries aspiring to become a knowledge driven economy.

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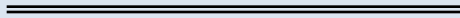


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# **APPENDICES**



## Appendix 3.1: Human ethics certificate of approval



**MONASH** University

Monash University Human Research Ethics Committee (MUHREC)  
Research Office

### Human Ethics Certificate of Approval

**Date:** 3 February 2012  
**Project Number:** CF12/0032 – 2012000009  
**Project Title:** Influence of selected organisational factors on tacit knowledge sharing behaviour  
**Chief Investigator:** Dr Manjit Singh Sandhu  
**Approved:** From: 3 February 2012 To: 3 February 2017

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#### Terms of approval

1. The Chief investigator is responsible for ensuring that permission letters are obtained, if relevant, and a copy forwarded to MUHREC before any data collection can occur at the specified organisation. Failure to provide permission letters to MUHREC before data collection commences is in breach of the National Statement on Ethical Conduct in Human Research and the Australian Code for the Responsible Conduct of Research.
2. Approval is only valid whilst you hold a position at Monash University.
3. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval and to ensure the project is conducted as approved by MUHREC.
4. You should notify MUHREC immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
5. The Explanatory Statement must be on Monash University letterhead and the Monash University complaints clause must contain your project number.
6. **Amendments to the approved project (including changes in personnel):** Requires the submission of a Request for Amendment form to MUHREC and must not begin without written approval from MUHREC. Substantial variations may require a new application.
7. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
8. **Annual reports:** Continued approval of this project is dependent on the submission of an Annual Report. This is determined by the date of your letter of approval.
9. **Final report:** A Final Report should be provided at the conclusion of the project. MUHREC should be notified if the project is discontinued before the expected date of completion.
10. **Monitoring:** Projects may be subject to an audit or any other form of monitoring by MUHREC at any time.
11. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.



Professor Ben Canny  
Chair, MUHREC

cc: Prof Mahendhiran Nair, Mr Visvalingam N Suppiah

Postal – Monash University, Vic 3800, Australia  
Building 3E, Room 111, Clayton Campus, Wellington Road, Clayton  
Facsimile +61 3 9905 3831  
[www.monash.edu/research/ethics/human/index/html](http://www.monash.edu/research/ethics/human/index/html)  
ABN 12 377 614 012 CRICOS Provider #00008C

## Appendix 3.2: Explanatory statement

1 June 2012

### Explanatory Statement

#### “The Influence of Selected Organisational Factors on Tacit Knowledge Sharing Behaviour”

My name is Visvalingam N. Suppiah and I am conducting a research on *The Influence of Selected Organisational Factors on Tacit Knowledge Sharing Behaviour*, with Dr. Manjit Singh Sandhu a senior lecturer in the Department of Management, School of Business, Monash University and Professor Mahendhiran Nair, the Head of School, School of Business; toward a Doctorate of Philosophy (PhD) at Monash University (“the University”).

Most scholars and management practitioners agree that knowledge is the one and only distinct resource in an organisation and critical in sustaining competitive advantage. However; managing knowledge, of which knowledge sharing is an important component, is generally taken for granted, left to chance, or ignored completely, due to various reasons. Knowledge is broadly categorised as explicit (codified knowledge stored in databases, books, and other documents), and tacit (knowledge embedded in the minds of individuals).

The aim of this research is to understand the varying influences of selected organisational factors such as organisational culture, knowledge networks, leadership behaviour, and resources, on tacit knowledge sharing behaviour in organisations in Malaysia. The findings of this research is expected to contribute to a better understanding of these organisational factors and their influence on employees behaviour in relation to sharing tacit knowledge.

The organisation (“the Organisation”) in which you are employed has been selected to participate in this research, as a large proportion of employees is engaged in the creation, distribution and application of knowledge (“knowledge workers”). We have obtained written consent from the management of the Organisation for this study to be conducted.

The study would involve the filling up of a questionnaire that should take no more than 30 to 45 minutes. Fifteen (15) knowledge workers shall be selected at random. The questionnaire is expected to be distributed and returned within two (2) working days.

A token of appreciation will be given to all those participating in this study.

Being in this study is voluntary and you are under no obligation to consent to participate. You may withdraw at any point in time, prior to the submission of the questionnaire (first part) or completion of interview (second part). Please be assured that all data collected and related findings shall be treated as confidential, unless disclosure has to be made pursuant to or under compulsion of a valid order of a court of law or under the requirement of law.

The Organisation would be identified anonymously as ‘Case #’; where # would be number, between 1 and 40. There would be no mention of the name of the Organisation in any of the documentation that would be produced as a result of this study. Storage of the data collected will adhere to the University regulations and kept on the University premises in a locked cupboard/filing cabinet for 5 years. A report of the study may be submitted for publication, but the Organisation or individual participants will not be identified in any such report.

If you would like to be informed of the research findings, please contact Visvalingam, N. Suppiah at, telephone number: +6019-3350205, or at email address: [REDACTED]

<i>If you would like to contact the researchers about any aspect of this study, please contact the Chief Investigator:</i>	<i>If you have a complaint concerning the manner in which this research (Project number: CF 12/0032 – 2012000009) is being conducted, please contact:</i>
Dr. Manjit Singh Sandhu Senior Lecturer, School of Business Monash University Jalan Lagoon Selatan 46150 Bandar Sunway Selangor Darul Ehsan Malaysia [REDACTED] [REDACTED] [REDACTED]	Ms. Joyce Tang Head of Planning and Research Management Monash University Jalan Lagoon Selatan 46150 Bandar Sunway Selangor Darul Ehsan Malaysia [REDACTED] [REDACTED] [REDACTED]

Thank you.

Visvalingam, N. Suppiah

Appendix 3.3: Questionnaire



MONASH University

Survey Questionnaire

Dear Sir/Madam,

You have been selected, with the consent of your organisation, to participate in this survey because you have a high degree of expertise, education, and/or experience and your job primarily revolves around the creation, distribution and/or application of knowledge, and you also contribute toward innovation and growth in your organisation.

Please respond to the questions below to the best of your ability. There are no right or wrong answers. The survey is conducted on conditions of anonymity; you need not identify yourself. Your participation is important as the findings of this survey may assist organisations improve management practices.

Thank you for your time and effort.

## SECTION 1

Please tick one answer in each question in Section 1. All questions in Section 1 are about you.

1	Age (next birthday)	<sup>1</sup> <input type="checkbox"/> Less than 21	<sup>2</sup> <input type="checkbox"/> 21 to 30	<sup>3</sup> <input type="checkbox"/> 31 to 40	<sup>4</sup> <input type="checkbox"/> 41 to 50	<sup>5</sup> <input type="checkbox"/> Greater than 50
2	Gender	<sup>1</sup> <input type="checkbox"/> Male	<sup>2</sup> <input type="checkbox"/> Female			
3	Religion	<sup>1</sup> <input type="checkbox"/> Islam	<sup>2</sup> <input type="checkbox"/> Christian	<sup>3</sup> <input type="checkbox"/> Buddhist	<sup>4</sup> <input type="checkbox"/> Hindu	<sup>5</sup> <input type="checkbox"/> Others
4	Race	<sup>1</sup> <input type="checkbox"/> Malay	<sup>2</sup> <input type="checkbox"/> Chinese	<sup>3</sup> <input type="checkbox"/> Indian	<sup>4</sup> <input type="checkbox"/> Others	
5	Highest education level	<sup>1</sup> <input type="checkbox"/> SPM/STPM or equivalent	<sup>2</sup> <input type="checkbox"/> Diploma/Degree or equivalent	<sup>3</sup> <input type="checkbox"/> Masters/Doctorate		
6	Position	<sup>1</sup> <input type="checkbox"/> Executive	<sup>2</sup> <input type="checkbox"/> Mid Management	<sup>3</sup> <input type="checkbox"/> Top Management	<sup>4</sup> <input type="checkbox"/> Others: (please specify) _____	
7	Job orientation (please select the one which best describes your role in your workplace)	Please tick <u>one</u> only: <sup>1</sup> <input type="checkbox"/> Internal (e.g. Accounts, Audit, Corporate, IT, Legal, etc.) <sup>2</sup> <input type="checkbox"/> External (e.g. Customer service/relations, Marketing, Sales, etc.) <sup>3</sup> <input type="checkbox"/> Product/service (e.g. Production, Quality assurance, R&D, etc.) <sup>4</sup> <input type="checkbox"/> Others (please specify) : _____				
8	Work experience (years)	<sup>1</sup> <input type="checkbox"/> Less than 1	<sup>2</sup> <input type="checkbox"/> 1 to less than 6	<sup>3</sup> <input type="checkbox"/> 6 to less than 10	<sup>4</sup> <input type="checkbox"/> 10 to 20	<sup>5</sup> <input type="checkbox"/> Greater than 20



## SECTION 2

Please circle only one answer for each question in this section to indicate the extent of your agreement or disagreement with the statement.

1 Strongly disagree    2 Disagree    3 Somewhat disagree    4 Undecided    5 Somewhat agree    6 Agree    7 Strongly agree

B001	The organization defines success on the basis of having the most unique or newest products. It is a product leader and innovator.	1	2	3	4	5	6	7
B002	The management style in the organization is characterized by security of employment, conformity, predictability, and stability in relationships.	1	2	3	4	5	6	7
B003	The organization is very results-oriented. A major concern is with getting the job done. People are very competitive and achievement-oriented.	1	2	3	4	5	6	7
B004	The glue that holds the organization together is loyalty and mutual trust. Commitment to this organization runs high.	1	2	3	4	5	6	7
B005	The leadership in the organization is generally considered to exemplify (serve as example) entrepreneurship, innovation, or risk taking.	1	2	3	4	5	6	7
B006	The management style in the organization is characterized by individual risk taking, innovation, freedom, and uniqueness.	1	2	3	4	5	6	7
F001	The organization defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is key.	1	2	3	4	5	6	7
F002	The organization is very controlled and structured place. Formal procedures generally govern what people do.	1	2	3	4	5	6	7
F003	The organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.	1	2	3	4	5	6	7
F004	The organization emphasizes human development. High trust, openness, and participation persist.	1	2	3	4	5	6	7
K001	The glue that holds the organization together is formal rules and policies. Maintaining a smooth running organization is important.	1	2	3	4	5	6	7
K002	The leadership in the organization is generally considered to exemplify (serve as example) mentoring, facilitating, or nurturing.	1	2	3	4	5	6	7
K003	The organization emphasizes permanence and stability. Efficiency, control, and smooth operations are important.	1	2	3	4	5	6	7
K004	The glue that holds the organization together is the emphasis on achievement and goal accomplishment.	1	2	3	4	5	6	7
K005	The leadership in the organization is generally considered to exemplify (serve as example) a no-nonsense, aggressive, results-oriented focus.	1	2	3	4	5	6	7
K006	The organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling, and low-cost production are critical.	1	2	3	4	5	6	7
K007	The management style in the organization is characterized by teamwork, consensus, and participation.	1	2	3	4	5	6	7

1 Strongly disagree    2 Disagree    3 Somewhat disagree    4 Undecided    5 Somewhat agree    6 Agree    7 Strongly agree

K008	The organization emphasizes competitive actions and achievement. Hitting stretch targets and winning in the marketplace are dominant.	1	2	3	4	5	6	7
D001	The glue that holds the organization together is commitment to innovation and development. There is an emphasis on being on the cutting edge.	1	2	3	4	5	6	7
D002	The management style in the organization is characterized by hard-driving competitiveness, high demands, and achievement.	1	2	3	4	5	6	7
D003	The organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.	1	2	3	4	5	6	7
D004	The organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.	1	2	3	4	5	6	7
D005	The organization is a very personal place. It is like an extended family. People seem to share a lot of themselves.	1	2	3	4	5	6	7
D006	The leadership in the organization is generally considered to exemplify (serve as example) coordinating, organizing, or smooth-running efficiency.	1	2	3	4	5	6	7

*Community of Practice (CoP) is an informal group of practitioners who share a concern or a passion for something they do, and learn how to do better as they interact regularly.*

E001	Typically I seek knowledge from someone I am close with, in my workplace.	1	2	3	4	5	6	7
E002	My manager communicates actively with subordinates.	1	2	3	4	5	6	7
E003	There is a shared sense of purpose in most things that we do in my organisation.	1	2	3	4	5	6	7
E004	I believe that colleagues whom I have close working relationships are, in general, trustworthy.	1	2	3	4	5	6	7
E005	My manager is a good role model for me to follow.	1	2	3	4	5	6	7
E006	In my organisation, we are often left on our own with little or no coaching, mentoring, and managerial support.	1	2	3	4	5	6	7
E007	I believe that my colleagues freely share their knowledge with others who are close to them.	1	2	3	4	5	6	7
E008	My manager offers a clear perspective on work related matters.	1	2	3	4	5	6	7
E009	My organisation regularly maintains all work related equipment in order for them to be in good working condition at all times.	1	2	3	4	5	6	7
E010	My organisation provides moral and financial support for employees to further their studies.	1	2	3	4	5	6	7
H001	I find that those who are close to me in my organisation, share knowledge more readily with me compared to those with whom I do not have a close relationship.	1	2	3	4	5	6	7
H002	My CEO strongly advocates knowledge sharing among employees in my organisation.	1	2	3	4	5	6	7
H003	The CoP encourages the sharing of, knowledge and experiences, among members.	1	2	3	4	5	6	7

1 Strongly disagree      2 Disagree      3 Somewhat disagree      4 Undecided      5 Somewhat agree      6 Agree      7 Strongly agree

H004	My manager organises, directs and supervises the work of my group members effectively.	1	2	3	4	5	6	7
H005	I do not face insurmountable barriers when I wish to share knowledge in my workplace.	1	2	3	4	5	6	7
H006	In my organisation, mentoring is not commonly practiced.	1	2	3	4	5	6	7
H007	I feel that sharing my knowledge with others will not be disadvantageous to me in relation to my career.	1	2	3	4	5	6	7
H004	My manager organises, directs and supervises the work of my group members effectively.	1	2	3	4	5	6	7
Q001	I do not feel that it is a loss to me when I share knowledge with my colleagues.	1	2	3	4	5	6	7
Q002	My manager helps to make subordinates feel comfortable in the workplace.	1	2	3	4	5	6	7
Q003	In my workplace, we often do not have sufficient equipment to perform our jobs effectively.	1	2	3	4	5	6	7
Q004	The views of my colleagues are important to me and, in general, I would do what they think I should do in the area of sharing my knowledge.	1	2	3	4	5	6	7
Q005	My organisation provides adequate equipment and other resources for me to perform my job responsibilities.	1	2	3	4	5	6	7
Q006	There are no CoP's in my organisation that I am aware of.	1	2	3	4	5	6	7
Q007	My manager often unites my colleagues and me and pools together our knowledge and experiences in achieving our goals and objectives.	1	2	3	4	5	6	7
Q008	I receive regular constructive feedback from my colleagues and superiors.	1	2	3	4	5	6	7
Q009	Mentoring in my organisation has been effective in the sharing of tacit knowledge (that is: knowledge embedded in the minds of the mentor).	1	2	3	4	5	6	7
L001	The closeness of my working relationship is an important factor in the extent of knowledge that I would share with another person.	1	2	3	4	5	6	7
L002	My manager often shows me how to do things instead of just instructing.	1	2	3	4	5	6	7
L003	My manager creatively uses stories, examples, and anecdotes to convey ideas to subordinates, which makes the understanding of what is expected from us clear from the beginning.	1	2	3	4	5	6	7
L004	I have access to adequate resources to share knowledge in my workplace.	1	2	3	4	5	6	7
L005	When I share knowledge with my colleagues I feel proud that I am contributing to the success of my organisation.	1	2	3	4	5	6	7
L006	Experienced and knowledgeable people in my organisation mentor others voluntarily (that is: without being instructed to do so by the management).	1	2	3	4	5	6	7
L007	My manager, in general, will not ask subordinates to perform tasks which the manager (himself or herself) is unable or unwilling to perform.	1	2	3	4	5	6	7
J001	In my organisation various learning opportunities, including coaching and mentoring, exist for employees to improve their knowledge, skills, and competence.	1	2	3	4	5	6	7

1 Strongly disagree    2 Disagree    3 Somewhat disagree    4 Undecided    5 Somewhat agree    6 Agree    7 Strongly agree

J002	My immediate superior is supportive of my participation in CoPs.	1	2	3	4	5	6	7
J003	People in my organisation do not share knowledge freely with their colleagues.	1	2	3	4	5	6	7
J004	My manager treats subordinates fairly.	1	2	3	4	5	6	7
J005	CoP membership is open to all (including individuals from other organisations) practitioners.	1	2	3	4	5	6	7
J006	Given the resources and opportunities that I have in my workplace, it is easy for me to share knowledge.	1	2	3	4	5	6	7
J007	My manager often takes the lead in undertaking new tasks that eventually subordinates perform as part of their job function.	1	2	3	4	5	6	7
J008	Sharing knowledge with my colleagues is usually an enjoyable experience for me.	1	2	3	4	5	6	7
X001	Mentors in my organisation have assisted me complete assignments/tasks that otherwise would have been difficult to complete.	1	2	3	4	5	6	7
X002	Employees in my organisation are given ample opportunities to develop new skills, competences, and promotional prospects.	1	2	3	4	5	6	7
X003	My manager often creates a shared purpose in my workplace, which encourages my colleagues and me to achieve our goals.	1	2	3	4	5	6	7
X004	I would, in general, follow the instructions of my CEO in sharing my knowledge with others.	1	2	3	4	5	6	7
X005	My manager establishes performance standards for my group members.	1	2	3	4	5	6	7
X006	My manager often consults subordinates on work related matters.	1	2	3	4	5	6	7
X007	The equipment made available to me by my organisation allows me to perform my job effectively and efficiently.	1	2	3	4	5	6	7
X008	I have adequate knowledge to operate the various technology tools made available to me by my organisation.	1	2	3	4	5	6	7
X009	CoP members meet to seek and share experiences and practices in areas related to our jobs.	1	2	3	4	5	6	7
X010	I share knowledge only with those in my organisation with whom I have a close working relationship.	1	2	3	4	5	6	7
X011	My manager often does not get involved with operations and hardly establishes standards for job performance.	1	2	3	4	5	6	7
M001	The seniors in my organisation share their knowledge freely with my colleagues and me.	1	2	3	4	5	6	7
M002	My manager develops a plan of action for the people reporting to him/her.	1	2	3	4	5	6	7
M003	Mentors have shared their personal experiences with me as an alternative perspective to my job related problems.	1	2	3	4	5	6	7
M004	In my organisation, the process of requesting and supplying resources is, simple, effective, and efficient.	1	2	3	4	5	6	7
M005	Sharing knowledge is valuable as it is beneficial to my colleagues and my organisation.	1	2	3	4	5	6	7
M006	I often receive positive responses from my manager and colleagues when I approach them for assistance in work related matters.	1	2	3	4	5	6	7

1 Strongly disagree      2 Disagree      3 Somewhat disagree      4 Undecided      5 Somewhat agree      6 Agree      7 Strongly agree

M007	I am able to overcome barriers in sharing my knowledge, quite effortlessly.	1	2	3	4	5	6	7
M008	My manager does not take all the credit for new ideas and ensures that the contributor is recognised accordingly.	1	2	3	4	5	6	7
P001	There is sustained interest by members in the activities of CoPs in my organisation.	1	2	3	4	5	6	7
P002	My CEO supports the sharing of non-confidential knowledge with people in other organisations for mutual benefit.	1	2	3	4	5	6	7
P003	My manager does not offer clear directions for subordinates on job related matters.	1	2	3	4	5	6	7
P004	My organisation facilitates access to experts relevant to my profession.	1	2	3	4	5	6	7
P005	Mentoring is recognised as an important and desired activity in my organisation.	1	2	3	4	5	6	7
P006	My manager displays good values and ethics which motivate the work performance of subordinates.	1	2	3	4	5	6	7
P007	I feel that I can share knowledge in my workplace whenever I want to.	1	2	3	4	5	6	7
S001	I have sufficient access to technical support in my organisation.	1	2	3	4	5	6	7
S002	I believe that people will not misuse the knowledge that is shared with them.	1	2	3	4	5	6	7
S003	My manager encourages subordinates to share knowledge with others in my organisation.	1	2	3	4	5	6	7
S004	I share my knowledge even with those whom I am not close with.	1	2	3	4	5	6	7
S005	My manager shows concern for the well-being of subordinates.	1	2	3	4	5	6	7
S006	There is adequate space and facilities in my workplace for meetings, discussions, and other forms of formal and informal interaction with my colleagues.	1	2	3	4	5	6	7
S007	There is a formal mentoring programme in my organisation, in which mentors freely share their knowledge and experiences.	1	2	3	4	5	6	7
S008	I feel good about sharing knowledge with my colleagues.	1	2	3	4	5	6	7
S009	My manager often sets a good example for subordinates.	1	2	3	4	5	6	7
S010	In general, I would conform to the instructions of my manager in sharing my knowledge and experience.	1	2	3	4	5	6	7
S011	CoP members meet to seek and share success and failure stories in areas related to our jobs.	1	2	3	4	5	6	7
S012	If I do not trust someone, I generally do not develop a close relationship and share knowledge with the person.	1	2	3	4	5	6	7
V001	My manager encourages subordinates to think creatively and is often supportive of new ideas.	1	2	3	4	5	6	7
V002	My manager allows me to work independently and make decisions relevant to my job.	1	2	3	4	5	6	7
V003	I voluntarily share knowledge with others if I believe that it would benefit my organisation.	1	2	3	4	5	6	7
V004	I interact frequently with those whom I have a close working relationship in my organisation.	1	2	3	4	5	6	7
V005	My manager is friendly with his subordinates.	1	2	3	4	5	6	7

1 Strongly disagree    2 Disagree    3 Somewhat disagree    4 Undecided    5 Somewhat agree    6 Agree    7 Strongly agree

V006	In my organisation, CoP members understand and appreciate the benefit of CoPs.	1	2	3	4	5	6	7
V007	I share knowledge with my colleagues even if I do not believe that they are trustworthy.	1	2	3	4	5	6	7
V008	My manager encourages my group members to do high-quality work.	1	2	3	4	5	6	7
V009	My manager often spares sufficient time to listen to my problems.	1	2	3	4	5	6	7
V010	My manager delegates work to subordinates to develop their potential.	1	2	3	4	5	6	7
T001	My intention to share knowledge is often obstructed by events beyond my control.	1	2	3	4	5	6	7
T002	My colleagues, in general, share knowledge regularly in my workplace.	1	2	3	4	5	6	7
T003	I do not like to share knowledge with others because it brings no benefit to me.	1	2	3	4	5	6	7
T004	My immediate superiors are supportive of mentoring in my organisation.	1	2	3	4	5	6	7
T005	I find that I have a close working relationship with people whom I have frequent direct (e.g. face-to-face) contact and indirect (email, facebook, telephone, etc.) contact.	1	2	3	4	5	6	7
T006	My manager often provides problem-solving suggestions in our work related problems.	1	2	3	4	5	6	7
T007	My Manager, in general, is detached from the problems faced by subordinates and often offers very minimal or no assistance.	1	2	3	4	5	6	7
Y001	In my workplace, I would largely work according to the expectations of my seniors in sharing my knowledge.	1	2	3	4	5	6	7
Y002	My manager has the capability to perform most of the tasks that my group members perform.	1	2	3	4	5	6	7
Y003	My organisation regularly upgrades my computer equipment and software.	1	2	3	4	5	6	7

Thank you for participating

### Appendix 3.4 – Questionnaire items cross-reference

This is the original sequence of the items in the questionnaire. The items in the questionnaire were scrambled to mitigate common methods bias.

Code 1 – denotes the codes used in the thesis.

Code 2 – code listed in the questionnaire.

Code 1	Code 2	Item
B1	D005	The organization is a very personal place. It is like an extended family. People seem to share a lot of themselves.
B2	F003	The organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.
B3	B003	The organization is very results-oriented. A major concern is with getting the job done. People are very competitive and achievement-oriented.
B4	F002	The organization is very controlled and structured place. Formal procedures generally govern what people do.
C1	K002	The leadership in the organization is generally considered to exemplify (serve as example) mentoring, facilitating, or nurturing.
C2	B005	The leadership in the organization is generally considered to exemplify (serve as example) entrepreneurship, innovation, or risk taking.
C3	K005	The leadership in the organization is generally considered to exemplify (serve as example) a no-nonsense, aggressive, results-oriented focus.
C4	D006	The leadership in the organization is generally considered to exemplify (serve as example) coordinating, organizing, or smooth-running efficiency.
D1	K007	The management style in the organization is characterized by teamwork, consensus, and participation.
D2	B006	The management style in the organization is characterized by individual risk taking, innovation, freedom, and uniqueness.
D3	D002	The management style in the organization is characterized by hard-driving competitiveness, high demands, and achievement.
D4	B002	The management style in the organization is characterized by security of employment, conformity, predictability, and stability in relationships.
E1	B004	The glue that holds the organization together is loyalty and mutual trust. Commitment to this organization runs high.
E2	D001	The glue that holds the organization together is commitment to innovation and development. There is an emphasis on being on the cutting edge.

Code 1	Code 2	Item
E3	K004	The glue that holds the organization together is the emphasis on achievement and goal accomplishment.
E4	K001	The glue that holds the organization together is formal rules and policies. Maintaining a smooth running organization is important.
F1	F004	The organization emphasizes human development. High trust, openness, and participation persist.
F2	D004	The organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.
F3	K008	The organization emphasizes competitive actions and achievement. Hitting stretch targets and winning in the marketplace are dominant.
F4	K003	The organization emphasizes permanence and stability. Efficiency, control, and smooth operations are important.
G1	D003	The organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.
G2	B001	The organization defines success on the basis of having the most unique or newest products. It is a product leader and innovator.
G3	F001	The organization defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is key.
G4	K006	The organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling, and low-cost production are critical.
I1	S007	There is a formal mentoring programme in my organisation, in which mentors freely share their knowledge and experiences.
I2	L006	Experienced and knowledgeable people in my organisation mentor others voluntarily (that is: without being instructed to do so by the management).
I3	X001	Mentors in my organisation have assisted me complete assignments/tasks that otherwise would have been difficult to complete.
I4	H006	In my organisation, mentoring is not commonly practiced.
I5	M003	Mentors have shared their personal experiences with me as an alternative perspective to my job related problems.
I6	Q009	Mentoring in my organisation has been effective in the sharing of tacit knowledge (that is: knowledge embedded in the minds of the mentor).
I7	T004	My immediate superiors are supportive of mentoring in my organisation.
I8	P005	Mentoring is recognised as an important and desired activity in my organisation.



Code 1	Code 2	Item
J1	X009	CoP members meet to seek and share experiences and practices in areas related to our jobs.
J2	Q006	There are no CoP's in my organisation that I am aware of.
J3	S011	CoP members meet to seek and share success and failure stories in areas related to our jobs.
J4	H003	The CoP encourages the sharing of, knowledge and experiences, among members.
J5	J005	CoP membership is open to all (including individuals from other organisations) practitioners.
J6	P001	There is sustained interest by members in the activities of CoPs in my organisation.
J7	V006	In my organisation, CoP members understand and appreciate the benefit of CoPs.
J8	J002	My immediate superior is supportive of my participation in CoPs.
L1	S008	I feel good about sharing knowledge with my colleagues.
L2	J008	Sharing knowledge with my colleagues is usually an enjoyable experience for me.
L3	M005	Sharing knowledge is valuable as it is beneficial to my colleagues and my organisation.
L4	Q001	I do not feel that it is a loss to me when I share knowledge with my colleagues.
L5	V003	I voluntarily share knowledge with others if I believe that it would benefit my organisation.
L6	L005	When I share knowledge with my colleagues I feel proud that I am contributing to the success of my organisation.
L7	T003	I do not like to share knowledge with others because it brings no benefit to me.
M1	H002	My CEO strongly advocates knowledge sharing among employees in my organisation.
M2	P002	My CEO supports the sharing of non-confidential knowledge with people in other organisations for mutual benefit.
M3	S003	My manager encourages subordinates to share knowledge with others in my organisation.
M4	J003	People in my organisation do not share knowledge freely with their colleagues.
M5	M001	The seniors in my organisation share their knowledge freely with my colleagues and me.

Code 1	Code 2	Item
M6	T002	My colleagues, in general, share knowledge regularly in my workplace.
M7	X004	I would, in general, follow the instructions of my CEO in sharing my knowledge with others.
M8	S010	In general, I would conform to the instructions of my manager in sharing my knowledge and experience.
M9	Y001	In my workplace, I would largely work according to the expectations of my seniors in sharing my knowledge.
M10	Q004	The views of my colleagues are important to me and, in general, I would do what they think I should do in the area of sharing my knowledge.
N1	P007	I feel that I can share knowledge in my workplace whenever I want to.
N2	L004	I have access to adequate resources to share knowledge in my workplace.
N3	X008	I have adequate knowledge to operate the various technology tools made available to me by my organisation.
N4	J006	Given the resources and opportunities that I have in my workplace, it is easy for me to share knowledge.
N5	T001	My intention to share knowledge is often obstructed by events beyond my control.
N6	H005	I do not face insurmountable barriers when I wish to share knowledge in my workplace.
N7	M007	I am able to overcome barriers in sharing my knowledge, quite effortlessly.
O1	X010	I share knowledge only with those in my organisation with whom I have a close working relationship.
O2	V004	I interact frequently with those whom I have a close working relationship in my organisation.
O3	L001	The closeness of my working relationship is an important factor in the extent of knowledge that I would share with another person.
O4	S004	I share my knowledge even with those whom I am not close with.
O5	E001	Typically I seek knowledge from someone I am close with, in my workplace.
O6	H001	I find that those who are close to me in my organisation, share knowledge more readily with me compared to those with whom I do not have a close relationship.
O7	T005	I find that I have a close working relationship with people whom I have frequent direct (e.g. face-to-face) contact and indirect (email, facebook, telephone, etc.) contact.

Code 1	Code 2	Item
P1	E004	I believe that colleagues whom I have close working relationships are, in general, trustworthy.
P2	V007	I share knowledge with my colleagues even if I do not believe that they are trustworthy.
P3	E007	I believe that my colleagues freely share their knowledge with others who are close to them.
P4	S002	I believe that people will not misuse the knowledge that is shared with them.
P5	S012	If I do not trust someone, I generally do not develop a close relationship and share knowledge with the person.
P6	H007	I feel that sharing my knowledge with others will not be disadvantageous to me in relation to my career.
R1	L003	My manager creatively uses stories, examples, and anecdotes to convey ideas to subordinates, which makes the understanding of what is expected from us clear from the beginning.
R2	X005	My manager establishes performance standards for my group members.
R3	T006	My manager often provides problem-solving suggestions in our work related problems.
R4	E008	My manager offers a clear perspective on work related matters.
R5	M002	My manager develops a plan of action for the people reporting to him/her.
R6	V008	My manager encourages my group members to do high-quality work.
R7	P003	My manager does not offer clear directions for subordinates on job related matters.
R8	H004	My manager organises, directs and supervises the work of my group members effectively.
S1	V005	My manager is friendly with his subordinates.
S2	Q002	My manager helps to make subordinates feel comfortable in the workplace.
S3	X006	My manager often consults subordinates on work related matters.
S4	X003	My manager often creates a shared purpose in my workplace, which encourages my colleagues and me to achieve our goals.
S5	J004	My manager treats subordinates fairly.
S6	E002	My manager communicates actively with subordinates.

Code 1	Code 2	Item
S7	V001	My manager encourages subordinates to think creatively and is often supportive of new ideas.
S8	M008	My manager does not take all the credit for new ideas and ensures that the contributor is recognised accordingly.
S9	S005	My manager shows concern for the well-being of subordinates.
S10	Q007	My manager often unites my colleagues and me and pools together our knowledge and experiences in achieving our goals and objectives.
S11	T007	My Manager, in general, is detached from the problems faced by subordinates and often offers very minimal or no assistance.
S12	V010	My manager delegates work to subordinates to develop their potential.
T1	E005	My manager is a good role model for me to follow.
T2	S009	My manager often sets a good example for subordinates.
T3	X011	My manager often does not get involved with operations and hardly establishes standards for job performance.
T4	L002	My manager often shows me how to do things instead of just instructing.
T5	P006	My manager displays good values and ethics which motivate the work performance of subordinates.
T6	Y002	My manager has the capability to perform most of the tasks that my group members perform.
T7	J007	My manager often takes the lead in undertaking new tasks that eventually subordinates perform as part of their job function.
T8	L007	My manager, in general, will not ask subordinates to perform tasks which the manager (himself or herself) is unable or unwilling to perform.
U1	Q005	My organisation provides adequate equipment and other resources for me to perform my job responsibilities.
U2	S006	There is adequate space and facilities in my workplace for meetings, discussions, and other forms of formal and informal interaction with my colleagues.
U3	Q003	In my workplace, we often do not have sufficient equipment to perform our jobs effectively.
U4	X007	The equipment made available to me by my organisation allows me to perform my job effectively and efficiently.
U5	M004	In my organisation, the process of requesting and supplying resources is, simple, effective, and efficient.

Code 1	Code 2	Item
U6	E009	My organisation regularly maintains all work related equipment in order for them to be in good working condition at all times.
U7	Y003	My organisation regularly upgrades my computer equipment and software.
V1	S001	I have sufficient access to technical support in my organisation.
V2	Q008	I receive regular constructive feedback from my colleagues and superiors.
V3	X002	Employees in my organisation are given ample opportunities to develop new skills, competences, and promotional prospects.
V4	E010	My organisation provides moral and financial support for employees to further their studies.
V5	J001	In my organisation various learning opportunities, including coaching and mentoring, exist for employees to improve their knowledge, skills, and competence.
V6	P004	My organisation facilitates access to experts relevant to my profession.
V7	V002	My manager allows me to work independently and make decisions relevant to my job.
V8	E006	In my organisation, we are often left on our own with little or no coaching, mentoring, and managerial support.
V9	M006	I often receive positive responses from my manager and colleagues when I approach them for assistance in work related matters.
V10	E003	There is a shared sense of purpose in most things that we do in my organisation.
V11	V009	My manager often spares sufficient time to listen to my problems.

## Appendix 4.1 – Tests of Normality

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
I1	.193	421	.000	.925	421	.000
I2	.220	421	.000	.919	421	.000
I3	.222	421	.000	.901	421	.000
I4	.144	421	.000	.936	421	.000
I5	.209	421	.000	.916	421	.000
I6	.212	421	.000	.916	421	.000
I7	.195	421	.000	.911	421	.000
I8	.197	421	.000	.899	421	.000
J1	.212	421	.000	.923	421	.000
J2	.155	421	.000	.934	421	.000
J3	.237	421	.000	.910	421	.000
J4	.206	421	.000	.909	421	.000
J5	.238	421	.000	.911	421	.000
J6	.269	421	.000	.888	421	.000
J7	.260	421	.000	.885	421	.000
J8	.270	421	.000	.867	421	.000
L1	.277	421	.000	.838	421	.000
L2	.273	421	.000	.848	421	.000
L3	.279	421	.000	.835	421	.000
L4	.302	421	.000	.763	421	.000
L5	.294	421	.000	.825	421	.000
L6	.274	421	.000	.844	421	.000
L7	.282	421	.000	.772	421	.000
M1	.260	421	.000	.876	421	.000
M2	.193	421	.000	.900	421	.000
M3	.273	421	.000	.846	421	.000
M4	.147	421	.000	.943	421	.000
M5	.214	421	.000	.907	421	.000
M6	.218	421	.000	.885	421	.000
M7	.241	421	.000	.877	421	.000
M8	.273	421	.000	.845	421	.000
M9	.248	421	.000	.870	421	.000
M10	.234	421	.000	.873	421	.000
N1	.238	421	.000	.856	421	.000
N2	.240	421	.000	.879	421	.000
N3	.226	421	.000	.883	421	.000
N4	.224	421	.000	.866	421	.000

N5	.162	421	.000	.939	421	.000
N6	.248	421	.000	.871	421	.000
N7	.232	421	.000	.888	421	.000
O1	.204	421	.000	.921	421	.000
O2	.268	421	.000	.831	421	.000
O3	.228	421	.000	.863	421	.000
O4	.270	421	.000	.879	421	.000
O5	.239	421	.000	.850	421	.000
O6	.229	421	.000	.870	421	.000
O7	.265	421	.000	.863	421	.000
P1	.261	421	.000	.867	421	.000
P2	.192	421	.000	.934	421	.000
P3	.214	421	.000	.891	421	.000
P4	.193	421	.000	.923	421	.000
P5	.238	421	.000	.890	421	.000
P6	.236	421	.000	.836	421	.000
R1	.242	421	.000	.888	421	.000
R2	.216	421	.000	.878	421	.000
R3	.237	421	.000	.842	421	.000
R4	.241	421	.000	.845	421	.000
R5	.250	421	.000	.858	421	.000
R6	.280	421	.000	.822	421	.000
R7	.174	421	.000	.928	421	.000
R8	.253	421	.000	.860	421	.000
S1	.267	421	.000	.835	421	.000
S2	.223	421	.000	.854	421	.000
S3	.246	421	.000	.844	421	.000
S4	.259	421	.000	.831	421	.000
S5	.249	421	.000	.866	421	.000
S6	.256	421	.000	.848	421	.000
S7	.261	421	.000	.851	421	.000
S8	.213	421	.000	.894	421	.000
S9	.277	421	.000	.835	421	.000
S10	.235	421	.000	.859	421	.000
S11	.170	421	.000	.925	421	.000
S12	.240	421	.000	.825	421	.000
T1	.233	421	.000	.862	421	.000
T2	.243	421	.000	.860	421	.000
T3	.188	421	.000	.922	421	.000
T4	.247	421	.000	.898	421	.000
T5	.230	421	.000	.858	421	.000

T6	.233	421	.000	.882	421	.000
T7	.262	421	.000	.875	421	.000
T8	.158	421	.000	.935	421	.000
U1	.241	421	.000	.856	421	.000
U2	.260	421	.000	.833	421	.000
U3	.194	421	.000	.909	421	.000
U4	.240	421	.000	.843	421	.000
U5	.243	421	.000	.902	421	.000
U6	.264	421	.000	.845	421	.000
U7	.237	421	.000	.898	421	.000
V1	.249	421	.000	.877	421	.000
V2	.261	421	.000	.877	421	.000
V3	.247	421	.000	.866	421	.000
V4	.204	421	.000	.900	421	.000
V5	.255	421	.000	.866	421	.000
V6	.224	421	.000	.904	421	.000
V7	.240	421	.000	.864	421	.000
V8	.188	421	.000	.931	421	.000
V9	.269	421	.000	.829	421	.000
V10	.233	421	.000	.840	421	.000
V11	.227	421	.000	.873	421	.000

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a. Lilliefors Significance Correction



Appendix 4.2 – Assessment of normality

Variable	min	max	skew	c.r.	kurtosis	c.r.
P4	1	7	-0.389	-3.259	-0.161	-0.675
P3	2	7	-0.647	-5.423	0.339	1.421
L4	1	7	-1.9	-15.912	5.549	23.24
L2	2	7	-0.878	-7.359	1.3	5.447
L1	3	7	-0.854	-7.157	0.999	4.183
M9	2	7	-0.774	-6.485	0.606	2.539
M8	2	7	-1.075	-9.008	1.569	6.573
M10	1	7	-0.903	-7.566	1.092	4.575
N2	1	7	-0.922	-7.727	1.253	5.246
N3	1	7	-0.829	-6.942	0.59	2.472
N4	1	7	-0.939	-7.864	1.403	5.875
J4	1	7	-0.473	-3.961	0.327	1.368
J6	1	7	-0.352	-2.946	0.669	2.804
J7	1	7	-0.151	-1.267	0.599	2.507
S3	1	7	-1.22	-10.218	2.308	9.666
S6	1	7	-1.249	-10.464	2.268	9.499
S9	1	7	-1.308	-10.958	2.568	10.756
T1	1	7	-1.128	-9.445	1.549	6.487
T2	1	7	-1.117	-9.356	1.466	6.139
T5	1	7	-1.122	-9.403	1.761	7.377
I3	1	7	-0.716	-5.997	0.015	0.061
I5	1	7	-0.66	-5.527	0.061	0.254
I6	1	7	-0.652	-5.458	0.063	0.262
U4	1	7	-1.204	-10.082	2.224	9.315
U2	1	7	-1.333	-11.164	2.519	10.55
U1	1	7	-1.1	-9.218	1.582	6.627
V6	1	7	-0.675	-5.651	0.335	1.403
V5	1	7	-1.012	-8.478	1.468	6.15
V3	1	7	-1.09	-9.127	1.742	7.295
R5	1	7	-1.076	-9.015	1.107	4.638
R4	1	7	-1.212	-10.151	2.337	9.79
R3	1	7	-1.247	-10.442	2.554	10.696
Multivariate					465.015	102.27

## Appendix 4.2 – Exploratory Factor Analysis

### Tacit knowledge sharing behaviour

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.93
	Approx. Chi-Square	4971.02
Bartlett's Test of Sphericity	df	120
	Sig.	.000

Factor	Total Variance Explained					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.144	50.900	50.900	7.806	48.789	48.789
2	2.078	12.990	63.890	1.749	10.932	59.721
3	1.013	6.330	70.221	.462	2.888	62.609
4	.746	4.661	74.882			
5	.617	3.859	78.741			
6	.547	3.420	82.161			
7	.499	3.118	85.279			
8	.410	2.561	87.840			
9	.376	2.350	90.189			
10	.367	2.294	92.483			
11	.282	1.764	94.247			
12	.254	1.585	95.831			
13	.211	1.321	97.152			
14	.180	1.124	98.276			
15	.164	1.026	99.303			
16	.112	.697	100.000			

Pattern Matrix <sup>a</sup>			
	Factor		
	1	2	3
I1	.027	.497	.219
I2	.050	.557	.215
I3	-.042	.835	.028
I4	-.084	.160	.700
I5	.064	.860	-.138
I6	-.009	.943	-.084
I7	.010	.720	.009
I8	.039	.670	.107
J1	.690	.173	-.024
J2	.170	-.039	.382
J3	.754	.172	-.077
J4	.899	.014	-.063
J5	.781	.043	-.061
J6	.845	.003	.030
J7	.926	-.104	.098
J8	.835	-.116	.125

Intention to share tacit knowledge

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.89
	Approx. Chi-Square	4829.01
Bartlett's Test of Sphericity	df	276
	Sig.	.000

Factor	Total Variance Explained					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.888	32.865	32.865	7.454	31.057	31.057
2	2.300	9.585	42.450	1.850	7.709	38.766
3	1.872	7.798	50.248	1.378	5.741	44.507
4	1.415	5.898	56.146	.948	3.950	48.457
5	1.288	5.367	61.513	.810	3.373	51.830
6	.996	4.149	65.662			
7	.945	3.940	69.602			
8	.878	3.659	73.261			
9	.657	2.738	75.999			
10	.617	2.572	78.571			
11	.548	2.283	80.853			
12	.518	2.160	83.013			
13	.494	2.057	85.070			
14	.490	2.040	87.110			
15	.435	1.814	88.924			
16	.398	1.658	90.582			
17	.374	1.556	92.139			
18	.357	1.487	93.625			
19	.321	1.337	94.962			
20	.293	1.219	96.181			
21	.279	1.164	97.345			
22	.246	1.026	98.371			
23	.225	.938	99.309			
24	.166	.691	100.000			

Pattern Matrix <sup>a</sup>					
	Factor				
	1	2	3	4	5
L1	.883	.066	-.035	-.038	-.067
L2	.846	.082	-.018	.022	-.082
L3	.809	-.031	.032	.050	.066
L4	.692	-.119	.035	.056	.093
L5	.638	.023	-.026	.234	.023
L6	.707	.074	-.006	.031	-.070
L7	.495	-.047	.024	-.304	.454
M1	.156	-.192	.097	.704	-.030
M2	.011	-.044	-.039	.775	-.114
M3	.109	.017	-.025	.571	-.001
M4	-.007	.027	.035	-.051	.764
M5	-.171	.311	-.019	.458	.225
M6	-.055	.251	.045	.346	.302
M7	.090	.050	.568	.004	-.058
M8	-.025	-.125	.941	.006	.050
M9	.006	.059	.754	.011	-.077
M10	-.068	.234	.453	-.009	-.091
N1	.130	.420	.105	.155	-.014
N2	.055	.741	-.044	.050	-.103
N3	.047	.782	.026	-.187	-.118
N4	.062	.768	-.047	-.012	.008
N5	-.021	-.031	-.167	.070	.437
N6	-.024	.509	-.012	.002	.132
N7	-.068	.629	.084	-.058	.065

Extraction Method: Principal Axis Factoring.  
 Rotation Method: Promax with Kaiser Normalization.<sup>a</sup>  
 a. Rotation converged in 6 iterations.

Knowledge networks

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KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.76
Bartlett's Test of Sphericity	Approx. Chi-Square	1174.42
	df	78
	Sig.	.000

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Factor	Total Variance Explained					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.390	26.076	26.076	2.811	21.622	21.622
2	2.005	15.424	41.500	1.383	10.641	32.263
3	1.163	8.948	50.448	.514	3.955	36.218
4	.977	7.515	57.963			
5	.894	6.876	64.839			
6	.790	6.076	70.914			
7	.728	5.601	76.515			
8	.694	5.336	81.852			
9	.595	4.577	86.429			
10	.563	4.333	90.762			
11	.432	3.320	94.082			
12	.391	3.008	97.091			
13	.378	2.909	100.000			

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Pattern Matrix <sup>a</sup>			
	Factor		
	1	2	3
O1	-.150	-.068	.605
O2	.292	.097	.345
O3	.187	.033	.512
O4	-.091	-.493	.240
O5	.535	-.038	.136
O6	.366	-.161	.397
O7	.786	-.096	-.108
P1	.738	.123	-.145
P2	.255	-.624	-.100
P3	.162	.577	.127
P4	.054	.694	.018
P5	-.086	.144	.351
P6	.119	.231	.116

## Leadership behaviour

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.96
	Approx. Chi-Square	9441.77
Bartlett's Test of Sphericity	df	378
	Sig.	.000

Factor	Total Variance Explained					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.263	50.941	50.941	13.935	49.769	49.769
2	1.866	6.664	57.605	1.416	5.056	54.825
3	1.530	5.465	63.070	1.175	4.197	59.022
4	1.194	4.264	67.334	.781	2.788	61.810
5	.914	3.265	70.599			
6	.812	2.900	73.500			
7	.717	2.561	76.061			
8	.636	2.273	78.334			
9	.562	2.006	80.340			
10	.487	1.739	82.078			
11	.479	1.710	83.788			
12	.453	1.618	85.406			
13	.420	1.500	86.906			
14	.402	1.437	88.343			
15	.368	1.313	89.656			
16	.352	1.256	90.911			
17	.318	1.135	92.046			
18	.305	1.090	93.136			
19	.268	.955	94.092			
20	.260	.929	95.021			
21	.234	.834	95.855			
22	.229	.817	96.672			
23	.205	.732	97.404			
24	.168	.601	98.005			
25	.158	.565	98.570			
26	.142	.509	99.078			
27	.140	.500	99.579			
28	.118	.421	100.000			



Pattern Matrix <sup>a</sup>				
	Factor			
	1	2	3	4
R1	-.032	.757	-.028	-.048
R2	-.055	.835	-.159	.020
R3	-.067	.768	.145	.033
R4	.010	.895	.029	-.041
R5	.153	.606	.073	-.022
R6	.153	.665	-.123	.065
R7	-.060	.148	.026	.538
R8	.025	.629	.204	.008
S1	.890	-.115	-.061	.082
S2	.887	-.107	.038	-.005
S3	.713	.016	.068	.088
S4	.662	.167	.040	.050
S5	.870	-.083	.052	-.017
S6	.831	.097	-.022	-.022
S7	.553	.241	.062	.032
S8	.363	-.120	.198	-.122
S9	.976	.002	-.122	-.032
S10	.698	.231	-.027	-.035
S11	.102	-.135	-.116	.888
S12	.713	.169	-.038	-.085
T1	.043	-.042	.787	.035
T2	.008	-.011	.815	-.071
T3	-.101	.061	.017	.769
T4	-.144	-.007	.804	.054
T5	.204	.033	.633	.104
T6	.376	.278	.280	.029
T7	.350	.058	.494	.043
T8	.122	-.032	.375	-.272

Resources

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.92
	Approx. Chi-Square	3451.10
Bartlett's Test of Sphericity	df	153
	Sig.	.000

Factor	Total Variance Explained					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.273	40.403	40.403	6.818	37.878	37.878
2	1.590	8.832	49.235	1.128	6.266	44.144
3	1.432	7.956	57.191	.961	5.341	49.484
4	1.108	6.155	63.346	.624	3.467	52.951
5	.837	4.652	67.998			
6	.652	3.621	71.619			
7	.607	3.372	74.991			
8	.575	3.196	78.187			
9	.564	3.133	81.320			
10	.488	2.711	84.031			
11	.444	2.469	86.500			
12	.421	2.339	88.840			
13	.401	2.226	91.065			
14	.394	2.189	93.254			
15	.343	1.903	95.157			
16	.322	1.791	96.948			
17	.293	1.627	98.575			
18	.257	1.425	100.000			

Pattern Matrix <sup>a</sup>				
	Factor			
	1	2	3	4
U1	.446	.241	-.107	.228
U2	.361	.043	.013	.355
U3	-.039	-.158	-.055	.878
U4	.559	.098	-.104	.344
U5	.855	-.020	-.037	-.071
U6	.693	.009	.086	-.019
U7	.816	-.172	.187	-.144
V1	.797	-.060	.009	-.078
V2	.294	.348	.185	-.064
V3	.033	.124	.559	.128
V4	.111	-.107	.653	-.057
V5	-.100	.023	.804	.109
V6	.190	.068	.614	-.038
V7	-.130	.691	.049	-.036
V8	-.181	.014	.205	.564
V9	-.033	.817	-.023	-.005
V10	.024	.656	.084	-.010
V11	-.011	.807	-.096	-.104

## Appendix 4.4 – Inter-item Correlation Matrix

### Tacit knowledge sharing behaviour

	I1	I2	I3	I4R	I5	I6	I7	I8	J1	J2	J3	J4	J5	J6	J7	J8
I1	1.000															
I2	.536	1.000														
I3	.538	.683	1.000													
I4	.443	.441	.439	1.000												
I5	.436	.515	.693	.364	1.000											
I6	.549	.607	.704	.428	.772	1.000										
I7	.444	.484	.592	.389	.626	.659	1.000									
I8	.570	.538	.560	.426	.600	.668	.602	1.000								
J1	.379	.440	.475	.277	.508	.480	.378	.456	1.000							
J2	.170	.259	.213	.356	.262	.242	.204	.244	.306	1.000						
J3	.398	.419	.476	.259	.506	.490	.386	.469	.801	.280	1.000					
J4	.345	.391	.394	.261	.444	.459	.395	.395	.716	.246	.767	1.000				
J5	.373	.372	.364	.228	.397	.419	.348	.385	.576	.161	.623	.746	1.000			
J6	.364	.450	.424	.275	.434	.482	.398	.423	.617	.226	.660	.724	.704	1.000		
J7	.369	.403	.396	.281	.446	.463	.380	.429	.659	.302	.689	.744	.692	.863	1.000	
J8	.313	.392	.345	.266	.421	.363	.405	.377	.611	.303	.629	.700	.618	.715	.800	1.000

## Intention to share tacit knowledge

	L1	L2	L3	L4	L5	L6	L7	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	N1	N2	N3	N4	N5	N6	N7
L1	1.000																							
L2	.812	1.000																						
L3	.717	.747	1.000																					
L4	.581	.553	.666	1.000																				
L5	.599	.632	.648	.572	1.000																			
L6	.642	.634	.574	.521	.626	1.000																		
L7	.391	.373	.420	.337	.317	.290	1.000																	
M1	.335	.365	.412	.376	.422	.352	.109	1.000																
M2	.251	.312	.293	.201	.337	.266	.009	.566	1.000															
M3	.318	.317	.329	.265	.442	.273	.120	.450	.452	1.000														
M4	.143	.141	.236	.213	.190	.131	.419	.156	.050	.146	1.000													
M5	.233	.265	.272	.180	.311	.197	.008	.338	.351	.353	.289	1.000												
M6	.294	.371	.333	.253	.364	.246	.114	.342	.317	.336	.367	.647	1.000											
M7	.286	.333	.323	.265	.268	.336	.119	.350	.220	.186	.028	.200	.245	1.000										
M8	.287	.311	.359	.315	.364	.275	.137	.361	.239	.272	.105	.197	.253	.572	1.000									
M9	.335	.350	.337	.248	.323	.310	.071	.328	.262	.253	.055	.252	.265	.485	.670	1.000								
M10	.228	.246	.193	.106	.169	.179	.048	.161	.235	.204	.001	.197	.215	.277	.422	.465	1.000							
N1	.411	.415	.399	.261	.454	.336	.127	.331	.302	.398	.147	.414	.354	.280	.333	.333	.400	1.000						
N2	.336	.352	.320	.191	.349	.298	.106	.298	.320	.352	.094	.409	.318	.215	.252	.304	.293	.508	1.000					
N3	.254	.277	.267	.169	.243	.225	.074	.208	.173	.212	.078	.244	.293	.279	.205	.271	.216	.336	.563	1.000				
N4	.309	.347	.328	.238	.373	.355	.152	.302	.316	.333	.168	.382	.400	.301	.221	.303	.248	.425	.612	.643	1.000			
N5	.014	-.029	.050	.058	.069	.014	.271	.051	.081	.077	.291	.090	.098	-.084	-.071	-.114	-.086	.010	.007	-.110	.087	1.000		
N6	.178	.218	.218	.217	.253	.251	.085	.165	.255	.177	.163	.299	.300	.154	.178	.166	.170	.355	.300	.286	.375	.109	1.000	
N7	.248	.260	.202	.160	.269	.240	.040	.167	.230	.187	.121	.357	.310	.240	.234	.264	.284	.397	.431	.347	.391	.077	.554	1.000

## Knowledge network

	O1	O2	O3	O4	O5	O6	O7	P1	P2	P3	P4	P5	P6
O1	1.000												
O2	.212	1.000											
O3	.291	.367	1.000										
O4	.235	-.115	.069	1.000									
O5	.128	.309	.380	-.105	1.000								
O6	.272	.304	.367	.084	.381	1.000							
O7	.091	.309	.246	-.133	.406	.346	1.000						
P1	-.008	.325	.262	-.174	.342	.255	.537	1.000					
P2	-.011	.018	-.052	.395	.014	.050	-.050	-.084	1.000				
P3	.007	.267	.228	-.278	.252	.150	.235	.432	-.256	1.000			
P4	-.074	.147	.084	-.294	.190	-.010	.198	.368	-.338	.551	1.000		
P5	.137	.213	.137	.047	.051	.206	.068	.084	-.043	.111	.125	1.000	
P6	-.020	.260	.131	-.136	.132	.157	.146	.212	-.135	.166	.218	.118	1.000

## Leadership behaviour

	R1	R2	R3	R4	R5	R6	R7	R8	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	T1	T2	T3	T4	T5	T6	T7	T8
R1	1.000																											
R2	.513	1.000																										
R3	.594	.544	1.000																									
R4	.609	.588	.811	1.000																								
R5	.503	.496	.627	.712	1.000																							
R6	.461	.512	.596	.683	.567	1.000																						
R7	.245	.263	.298	.341	.304	.270	1.000																					
R8	.594	.499	.689	.707	.670	.555	.316	1.000																				
S1	.383	.320	.504	.498	.478	.489	.268	.477	1.000																			
S2	.459	.296	.509	.550	.536	.492	.237	.554	.792	1.000																		
S3	.447	.410	.577	.578	.557	.518	.302	.567	.711	.750	1.000																	
S4	.489	.506	.583	.643	.615	.538	.297	.636	.683	.704	.813	1.000																
S5	.361	.379	.521	.587	.546	.437	.288	.526	.623	.655	.639	.671	1.000															
S6	.449	.479	.583	.638	.600	.506	.301	.607	.653	.693	.719	.771	.790	1.000														
S7	.457	.452	.632	.659	.579	.599	.302	.592	.607	.638	.648	.643	.663	.730	1.000													
S8	.151	.136	.208	.250	.190	.224	.066	.213	.220	.289	.262	.259	.352	.306	.291	1.000												
S9	.429	.395	.533	.603	.542	.496	.284	.540	.681	.704	.668	.688	.756	.780	.696	.373	1.000											
S10	.475	.488	.577	.647	.615	.556	.270	.620	.615	.640	.627	.718	.732	.766	.731	.328	.739	1.000										
S11	.164	.173	.251	.222	.218	.258	.485	.208	.333	.281	.342	.298	.253	.263	.277	.021	.292	.244	1.000									
S12	.404	.451	.506	.549	.542	.539	.236	.533	.598	.599	.570	.634	.661	.664	.634	.281	.708	.709	.212	1.000								
T1	.522	.495	.693	.708	.655	.534	.331	.692	.584	.616	.648	.711	.678	.717	.713	.301	.698	.703	.277	.698	1.000							
T2	.460	.450	.614	.644	.618	.495	.301	.628	.583	.619	.602	.687	.664	.686	.684	.282	.645	.694	.261	.602	.804	1.000						
T3	.162	.276	.305	.278	.257	.342	.457	.296	.267	.219	.289	.343	.261	.308	.313	.037	.252	.323	.616	.212	.300	.304	1.000					
T4	.355	.313	.487	.462	.400	.314	.237	.509	.352	.393	.434	.444	.373	.412	.434	.298	.339	.390	.120	.351	.523	.532	.209	1.000				
T5	.504	.420	.620	.655	.583	.532	.312	.617	.554	.638	.646	.648	.623	.619	.650	.302	.595	.629	.286	.597	.761	.767	.303	.625	1.000			
T6	.396	.339	.559	.555	.512	.421	.219	.540	.480	.485	.509	.534	.527	.535	.533	.215	.492	.539	.168	.459	.600	.638	.255	.550	.694	1.000		
T7	.363	.338	.520	.527	.483	.404	.185	.546	.362	.465	.487	.517	.466	.510	.513	.265	.451	.509	.103	.473	.558	.618	.186	.541	.604	.677	1.000	
T8	.125	.100	.181	.226	.245	.157	.017	.188	.185	.191	.219	.226	.193	.238	.175	.125	.186	.200	-.132	.213	.204	.286	-.094	.213	.227	.255	.351	1.000

## Resources

	U1	U2	U3	U4	U5	U6	U7	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
U1	1.000																	
U2	.516	1.000																
U3	.332	.359	1.000															
U4	.646	.613	.428	1.000														
U5	.477	.422	.237	.574	1.000													
U6	.469	.435	.233	.561	.608	1.000												
U7	.393	.353	.170	.444	.580	.585	1.000											
V1	.433	.405	.206	.487	.562	.483	.627	1.000										
V2	.439	.367	.145	.430	.438	.447	.441	.424	1.000									
V3	.356	.389	.229	.382	.396	.424	.440	.379	.493	1.000								
V4	.266	.240	.044	.284	.286	.409	.356	.313	.336	.440	1.000							
V5	.360	.346	.136	.412	.369	.373	.377	.308	.415	.543	.518	1.000						
V6	.402	.364	.133	.422	.465	.442	.500	.427	.495	.547	.459	.640	1.000					
V7	.286	.267	.100	.323	.218	.266	.150	.180	.331	.376	.258	.308	.292	1.000				
V8	.260	.278	.457	.283	.158	.214	.200	.197	.242	.306	.145	.268	.232	.128	1.000			
V9	.398	.317	.213	.425	.340	.366	.312	.265	.441	.414	.233	.394	.424	.524	.217	1.000		
V10	.423	.353	.165	.366	.347	.435	.304	.284	.503	.413	.269	.422	.428	.427	.259	.559	1.000	
V11	.375	.214	.078	.300	.265	.240	.220	.317	.409	.336	.161	.291	.346	.426	.247	.542	.485	1.000



Appendix 4.5 – Descriptive Statistics

Item Code	N	Minimum	Maximum	Mean	Std. Deviation
I1	421	1	7	4.66	1.471
I2	421	1	7	4.74	1.342
I3	421	1	7	4.85	1.284
I4	421	1	7	4.18	1.771
I5	421	1	7	4.67	1.344
I6	421	1	7	4.63	1.330
I7	421	1	7	5.13	1.220
I8	421	1	7	4.99	1.305
J1	421	1	7	4.39	1.326
J2	421	1	7	3.52	1.610
J3	421	1	7	4.30	1.294
J4	421	1	7	4.49	1.225
J5	421	1	7	4.31	1.243
J6	421	1	7	4.16	1.179
J7	421	1	7	4.25	1.190
J8	421	1	7	4.40	1.221
L1	421	3	7	5.93	.881
L2	421	2	7	5.87	.909
L3	421	2	7	5.97	.856
L4	421	1	7	5.93	1.068
L5	421	1	7	5.83	.962
L6	421	2	7	5.75	1.044
L7	421	1	7	5.80	1.482
M1	421	1	7	5.49	1.196
M2	421	1	7	4.97	1.324
M3	421	1	7	5.52	.972
M4	421	1	7	4.57	1.502
M5	421	1	7	5.14	1.169
M6	421	2	7	5.33	1.007
M7	421	1	7	5.32	1.159
M8	421	2	7	5.46	1.016
M9	421	2	7	5.36	.989
M10	421	1	7	5.23	1.077
N1	421	1	7	5.45	1.065
N2	421	1	7	5.19	1.127
N3	421	1	7	5.15	1.125
N4	421	1	7	5.35	1.039
N5	421	1	7	4.02	1.493
N6	421	1	7	5.15	1.060

N7	421	1	7	5.07	.971
O1	421	1	7	4.24	1.618
O2	421	1	7	5.56	1.030
O3	421	1	7	5.36	1.137
O4	421	1	7	3.13	1.237
O5	421	1	7	5.41	1.125
O6	421	1	7	5.44	1.111
O7	421	1	7	5.53	.993
P1	421	1	7	5.52	.965
P2	421	1	7	3.77	1.395
P3	421	2	7	5.20	1.036
P4	421	1	7	4.94	1.152
P5	421	1	7	4.86	1.366
P6	421	1	7	5.26	1.281
R1	421	1	7	5.06	1.223
R2	421	1	7	5.20	1.058
R3	421	1	7	5.33	1.095
R4	421	1	7	5.27	1.083
R5	421	1	7	5.08	1.188
R6	421	1	7	5.67	1.036
R7	421	1	7	4.55	1.577
R8	421	1	7	5.09	1.178
S1	421	1	7	5.62	.989
S2	421	1	7	5.39	1.128
S3	421	1	7	5.41	1.082
S4	421	1	7	5.38	1.114
S5	421	1	7	5.29	1.171
S6	421	1	7	5.44	1.146
S7	421	1	7	5.49	1.101
S8	421	1	7	4.75	1.509
S9	421	1	7	5.44	1.109
S10	421	1	7	5.31	1.168
S11	421	1	7	4.75	1.592
S12	421	1	7	5.33	1.071
T1	421	1	7	5.25	1.204
T2	421	1	7	5.30	1.181
T3	421	1	7	4.73	1.505
T4	421	1	7	4.82	1.263
T5	421	1	7	5.27	1.120
T6	421	1	7	5.07	1.270
T7	421	1	7	4.99	1.213
T8	421	1	7	4.40	1.395

U1	421	1	7	5.22	1.111
U2	421	1	7	5.52	1.137
U3	421	1	7	4.81	1.611
U4	421	1	7	5.39	1.078
U5	421	1	7	4.81	1.347
U6	421	1	7	5.14	1.157
U7	421	1	7	4.78	1.403
V1	421	1	7	5.11	1.240
V2	421	1	7	5.02	1.085
V3	421	1	7	5.13	1.162
V4	421	1	7	4.90	1.409
V5	421	1	7	5.19	1.136
V6	421	1	7	4.90	1.151
V7	421	1	7	5.43	1.002
V8	421	1	7	4.39	1.596
V9	421	1	7	5.39	.993
V10	421	1	7	5.33	.997
V11	421	1	7	5.18	1.253

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Appendix 4.6 – Initial model: Factor loadings, AVE and CR

Observed variable		Latent Factor	Factor loading ( <i>l</i> )	<i>l</i> <sup>2</sup>	AVE	CR
I1	←	Ment	.64	.41	.60	.91
I2	←	Ment	.72	.52		
I3	←	Ment	.82	.67		
I5	←	Ment	.82	.67		
I6	←	Ment	.88	.77		
I7	←	Ment	.75	.56		
I8	←	Ment	.76	.57		
	←					
J1	←	COP	.78	.61	.70	.94
J3	←	COP	.82	.67		
J4	←	COP	.87	.75		
J5	←	COP	.79	.62		
J6	←	COP	.88	.77		
J7	←	COP	.90	.82		
J8	←	COP	.82	.67		
	←					
L1	←	A2B	.87	.75	.64	.91
L2	←	A2B	.88	.78		
L3	←	A2B	.85	.72		
L4	←	A2B	.69	.48		
L5	←	A2B	.75	.56		
L6	←	A2B	.73	.54		
	←					
M1	←	PN	.61	.37	.34	.81
M2	←	PN	.55	.30		
M3	←	PN	.54	.29		
M5	←	PN	.50	.25		
M7	←	PN	.58	.33		
M8	←	PN	.68	.46		
M9	←	PN	.69	.48		
M10	←	PN	.51	.26		
	←					
N1	←	PBC	.64	.41		
N2	←	PBC	.77	.59		
N3	←	PBC	.68	.47		
N4	←	PBC	.78	.60		
N6	←	PBC	.51	.26		
N7	←	PBC	.58	.34		

Observed variable		Latent Factor	Factor loading ( <i>l</i> )	<i>l</i> <sup>2</sup>	AVE	CR
O3	←	KN	.37	.14	.33	.74
O5	←	KN	.50	.25		
O7	←	KN	.63	.39		
P1	←	KN	.75	.56		
P3	←	KN	.59	.35		
P4	←	KN	.52	.27		
	←					
R1	←	L_TO	.68	.47	.61	.91
R2	←	L_TO	.65	.42		
R3	←	L_TO	.86	.73		
R4	←	L_TO	.91	.83		
R5	←	L_TO	.78	.61		
R6	←	L_TO	.72	.52		
R8	←	L_TO	.81	.66		
	←					
S1	←	L_RO	.78	.61	.69	.96
S2	←	L_RO	.81	.66		
S3	←	L_RO	.82	.68		
S4	←	L_RO	.85	.73		
S5	←	L_RO	.84	.70		
S6	←	L_RO	.89	.78		
S7	←	L_RO	.81	.66		
S9	←	L_RO	.86	.73		
S10	←	L_RO	.85	.72		
S12	←	L_RO	.78	.61		
	←					
T1	←	L_EO	.90	.81	.64	.90
T2	←	L_EO	.88	.78		
T4	←	L_EO	.63	.39		
T5	←	L_EO	.86	.75		
T7	←	L_EO	.68	.46		
	←					
U1	←	R_T	.69	.47	.54	.85
U4	←	R_T	.76	.58		
U5	←	R_T	.76	.57		
U6	←	R_T	.77	.59		
U7	←	R_T	.69	.47		

Observed variable		Latent Factor	Factor loading ( <i>l</i> )	$l^2$	AVE	CR
V1	←	R_I	.55	.31	.40	.85
V3	←	R_I	.68	.47		
V4	←	R_I	.62	.38		
V5	←	R_I	.69	.48		
V6	←	R_I	.51	.26		
V7	←	R_I	.67	.45		
V9	←	R_I	.71	.50		
V10	←	R_I	.54	.30		
V11	←	R_I	.65	.42		

Appendix 4.7 – Final model: Inter-construct squared correlations

1. Inter-construct correlation and squared correlation – KN

Latent factor		Latent factor	r	$r^2$
KN	↔	L_EO	.27	.07
KN	↔	L_RO	.31	.09
KN	↔	L_TO	.40	.16
KN	↔	R_I	.41	.16
KN	↔	R_T	.40	.16

2. Inter-construct correlation and squared correlation – L\_EO

Latent factor		Latent factor	r	$r^2$
L_EO	↔	KN	.27	.07
L_EO	↔	L_RO	.87	.75
L_EO	↔	L_TO	.84	.71
L_EO	↔	R_I	.54	.30
L_EO	↔	R_T	.46	.21

3. Inter-construct correlation and squared correlation – L\_RO

Latent factor		Latent factor	r	$r^2$
L_RO	↔	KN	.31	.09
L_RO	↔	L_EO	.87	.75
L_RO	↔	L_TO	.78	.61
L_RO	↔	R_I	.54	.29
L_RO	↔	R_T	.49	.24

4. Inter-construct correlation and squared correlation – L\_TO

Latent factor		Latent factor	r	r <sup>2</sup>
L_TO	↔	KN	.40	.16
L_TO	↔	L_EO	.84	.71
L_TO	↔	L_RO	.78	.61
L_TO	↔	R_I	.53	.28
L_TO	↔	R_T	.45	.20

5. Inter-construct correlation and squared correlation – R\_I

Latent factor		Latent factor	r	r <sup>2</sup>
R_I	↔	KN	.41	.16
R_I	↔	L_EO	.54	.30
R_I	↔	L_RO	.54	.29
R_I	↔	L_TO	.53	.28
R_I	↔	R_T	.64	.41

6. Inter-construct correlation and squared correlation – R\_T

Latent factor		Latent factor	r	r <sup>2</sup>
R_T	↔	KN	.40	.16
R_T	↔	L_EO	.46	.21
R_T	↔	L_RO	.49	.24
R_T	↔	L_TO	.45	.20
R_T	↔	R_I	.64	.41



Appendix 4.8 – Final model fit indices: AMOS output

**CMIN**

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	97	789.481	431	0	1.832
Saturated model	528	0	0		
Independence model	32	9090.065	496	0	18.327

**Baseline Comparisons**

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0.913	0.9	0.959	0.952	0.958
Saturated model	1		1		1
Independence model	0	0	0	0	0

**RMSEA**

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.045	0.04	0.049	0.969
Independence model	0.203	0.199	0.207	0

## **Appendix 5.1 – The Xerox experience (extracted from (Stewart, 2002, pp. 114-115)**

Jack Whalen, a sociologist, works at Xerox's Palo Alto Research Center. A few years ago, he was brevetted to the Institute for Research on Learning, a nonprofit group Xerox supported, and spent a couple of years studying how people, computers, and expert-system software interacted in a customer-service call center in Lewishville, Texas, north of Dallas.

The software (in this case, Inference Corp.'s CasePoint) was supposed to help employees tell customers how to fix problems with copiers – paper jams, faded copies, and the like. When the call-centre operator typed words spoken by a customer – “jam,” for example – the software would search its memory bank of diagnoses and solutions; as the customer continued to speak – “document feeder....noise” – the search would narrow, in theory till the right problem and right solution appeared. Xerox was after greater productivity, of course: faster, better answers in less time, costing less money. Trouble was, employees weren't using the new software. Management's diagnosis: they needed an incentive to change. Confident CasePoint would prove to be more productive than what it was replacing, the company held a month long contest in which employees earned points (which translated into cash) each time they solved a customer problem, by whatever means. The winner by a country mile was an eight-year veteran named Carlos, with more than 900 points. Carlos wasn't a big favourite among managers – “He's a cowboy,” said one – but his victory was no surprise. Carlos really knew his stuff, and everybody, including Carlos knew it. He almost never used the software.

The runner-up was a shock. Trish had been with the company just four months and had no previous experience with copying equipment. Her six hundred points more than doubled the score of the third-place finisher, and she didn't even have the new software, only an older, less sophisticated system. She had a secret weapon: She sat right across from Carlos. She overheard him when he talked: a single mother highly motivated, she apprenticed herself to him and persuaded him to show her the innards of copiers during lunch breaks; she asked other colleagues for their tips, too, and built up a personal collection of manuals and handwritten notes about how to fix problems.

The case of Carlos and Trish says a lot about knowledge management. The point isn't to diss the software; CasePoint has many fans and documented triumphs. We English majors relish stories about the limitations of technology – it's just an enabler, after all – but not the least of its virtues is that it scales. Sure, Trish learned better from Carlos than anyone did from CasePoint, but how many people can sit next to him?