# KNOWLEDGE COLLABORATION IN THE EGO-CENTERED NETWORKS OF PROFESSIONALS: THE ROLE OF RECIPROCITY, INTERPERSONAL TRUST, AND TRANSACTIVE MEMORY SYSTEM

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# ABSTRACT

Prior research has shown that professionals maintain a network of contacts in their relevant professions and knowledge domains for information and knowledge collaboration. Where these networks are built around individuals and are informal in nature rather than arranged by organisations, they can be considered examples of ego-centered (personal) knowledge networks (EGKNs). The role of informal networks (or EGKNs) of professionals is very important in knowledge-intensive sectors, where the access to relevant information and the ability to coordinate and combine expertise from diverse sources can make substantial difference to the performance of individuals and organisations. Research in knowledge management (KM) has yet to fully grasp the role of informal networks in individual learning and organisational performance. This thesis highlights the importance of EGKNs of professionals and investigates the process of knowledge coordination and collaboration through EGKNs, in the absence of formal structures and organisational mechanisms.

Based on theories of social exchange, social capital, and transactive memory systems (TMS), a model is proposed to explain how informal knowledge cooperation develops in the EGKNs of professionals. A large-scale survey of professionals in New Zealand was carried out to empirically validate the model. Structural equation modelling (SEM) is the main statistical technique for testing the model and hypotheses associated with the model. The results indicate that EGKNs are structured by TMS that help to develop information and knowledge collaboration among socially connected individuals. This structure is based on network members' understanding of the knowledge held by other members and the transactive processes to coordinate and integrate knowledge of network members.

This study contributes to theory building in the area of social (informal) networks, KM, and TMS. A key contribution of this research is to offer a robust model to explain how informal knowledge collaboration is developed among socially connected individuals. The study provides a novel perspective by identifying the development of TMS in the EGKNs of professionals, where task interdependence and goal congruence cannot be assumed to exist. In addition, this study links social exchange theory and the relational dimension of social capital with TMS to explain the process of informal knowledge collaboration among socially connected individuals.

*Keywords:* Knowledge management, ego-centered networks, social exchange, social capital, transactive memory systems

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During the process of my PhD, I was also involved in the activities of New Zealand Knowledge Management (NZKM) network. The network comprises of professionals in a variety of business and industry sectors in New Zealand who have interest in information and knowledge management. It was a great learning experience to participate in the discussion sessions; sharing and implementing ideas to promote knowledge management practices in New Zealand. Thanks to the members of the NZKM network who provided valuable input and completed my survey questionnaire. Their contribution is highly appreciated in completing this research.

# PUBLICATIONS AND AWARDS

1) Knowledge Sharing in Ego-centered Knowledge Networks of Professionals: Role of Transactive Memory Systems, Trust, and Reciprocity. Paper presented at the ICICKM 2011, Bangkok, Thailand.
2) Understanding the Role of Ego-centered Knowledge Networks in Problem Solving and Individual Performance. Paper presented at the 13th European Conference on Knowledge Management - ECKM 2012, Universidad Politécnica de Cartagena, Spain. *This paper received the best PhD paper award in the conference.*
3) What Managers Think of Informal Networks and Knowledge Sharing by Means of Personal Networking? *World Academy of Science, Engineering and Technology, 39*(72), 187-191.
4) Employing individuals' social capital to create value in the public sector organisations. In Y. Al-Bastaki, & A. Shajera (Eds), *Building a Competitive Public Sector with Knowledge Management Strategy* (pp. 272-293). IGI global.
5) Potential Enablers of Knowledge Collaboration in Ego-centered Networks of Professionals. *Knowledge Management: An International Journal, Vol. 12 (1), 71-82*. *This paper was selected in the top ten papers of the Journal for the year 2012.*
6) Organisational Learning and Problem Solving through Cross-firm Networking of Professionals. Paper presented at the ICICKM 2013 10th International Conference on Intellectual Capital, Knowledge Management and Organisational Learning, Washington, DC, USA.

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF BOXES

# LIST OF FIGURES

# LIST OF APPENDICES

# LIST OF ABBREVIATIONS

| | | |
|---|---|---|
| AVE | - | Average variance extracted |
| CFA | - | Confirmatory factor analysis |
| CFI | - | Comparative fit index |
| CoP | - | Community of practice |
| EFA | - | Exploratory factor analysis |
| EGKN | - | Ego-centered knowledge network |
| ENoP | - | Electronic network of practice |
| e.g. | - | Exempli Gratia (for example) |
| i.e. | - | Id Est (that is) |
| KM | - | Knowledge management |
| IM | - | Information management |
| NZKM | - | New Zealand Knowledge Management |
| PKN | - | Personal knowledge network |
| R&D | - | Research and development |
| RQ | - | Research question |
| RMSEA | - | Root mean square error of approximation |
| SEM | - | Structural equation modelling |
| SCT | - | Social capital theory |
| SET | - | Social exchange theory |
| TLI | - | Tucker-Lewis index |
| TMS | - | Transactive memory system |

# CHAPTER ONE

## SYNOPSIS OF THE THESIS

### 1.1. Background of the Study

Organisations provide various opportunities for their employees to access a variety of knowledge resources to help them in their day-to-day work. With respect to non-routine work and those associated with the search for innovative solutions to novel problems, internal knowledge sources alone may not provide all the required knowledge. In today's ever-changing and competitive world, it is difficult for organisations to retain and/or provide all relevant and up-to-date knowledge to deal with continuously emerging problems and meet the demand of customer focused solutions. Previously developed solutions and the organisational knowledge base that created them may not be able to solve many of the non-routine problems facing knowledge workers of today. This is because organisational knowledge sources (e.g. databases, routines, immediate colleagues) often contain routine or outdated knowledge and many new ideas come from outside the organisation (Levin & Cross, 2004; Teigland & Wasko, 2003).

Professional colleagues facing similar challenges in different work settings often hold firsthand knowledge and can provide ready-made solutions to the problems. From the perspective of individual employees, time and effort can be saved by utilising outside experience alongside that exists within their own organisation. In view of this, today's knowledge workers' routine work practices are not limited to their own particular workplaces as they frequently cross organisational boundaries to share and discuss task-related know-how with professional colleagues in their relevant disciplines and knowledge areas (Benner, 2003; Teigland & Wasko, 2003; 2009).

Knowledge workers use various channels for information and knowledge collaboration with colleagues while performing knowledge-intensive tasks. Some of these are prescribed by organisations (i.e. formal channels) while others are arranged by employees through their personal means. Formal channels are structures provided by organisations to capture and share knowledge of individual employees. Examples of formal channels include knowledge management systems, work groups, functional teams, project management structures, joint ventures, and strategic alliances. Informal channels develop organically and bring together individuals who hold mutual interests and intend to resolve problems through collaboration and knowledge sharing. Informal channels include communities of practice, electronic networks of practice, and social (personal) networks of employees. The focus of this research is on the use and significance of informal channels (i.e. personal networks) in coordinating and collaborating knowledge from diverse sources.

Networking research has highlighted informal (personal) networks of knowledge workers as an important means of acquiring new ideas and problem solutions (Allen, Andrew, & Phil, 2007; Bouty, 2000; Dahl & Pedersen, 2004a). Networking and knowledge sharing through informal contacts is a common practice in the work of scientific and technical communities. It had been shown, for example, that the sharing of technical information through informal networks of employees resulted in design improvements of blast furnaces in the 19$^{th}$ century (Allen, 1983). Similarly, von Hippel (1987) and Schrader (1991) documented the optimisation of production processes in the US mini-mill steel industry as a result of information sharing through personal (informal) contacts between engineers of competing and non-competing firms. These researchers identified informal personal contacts of individuals as crucial sources for the transfer of work-specific information and knowledge.

The internet and advanced communication technology help knowledge workers to interact with other knowledge experts irrespective of their current work structures and organisational boundaries. While solving problems, today's knowledge workers are potentially able to discuss their problem situations with colleagues within and outside of their formal work organisations. Rather than inventing solutions from scratch, knowledge workers may try to build solutions through the combination and re-combination of the existing knowledge. The search for expertise and the quest for performance drive knowledge workers to collaborate with other knowledge workers across organisations and formal structures. In view of this, social relationships and organisational boundaries are the key emerging themes in the contemporary knowledge management research. This research is based on these themes with a view to investigate the process of informal knowledge collaboration among socially connected professionals.

## 1.2. Problem Statement

Individuals interact with a range of people (both within and outside their work organisations) to discuss and share ideas for solving problems while performing knowledge tasks. Such interactions can either be prescribed by the organisations and/or developed through the personal initiatives of knowledge workers. These interactions form the basis of informal (personal) relationships between individuals, known as ego-centered networks of professionals (Cross, Nohria, & Parker, 2002; Cross, Parker, Prusak, & Borgatti, 2001). Ego-centered (personal) networks are now identified as an important means of information and knowledge transfer, although the process of knowledge coordination through such networks is not clearly understood. Little is known about how individuals coordinate and integrate knowledge in the absence of

formal structures (such as work groups or teams), and organisational mechanisms (such as, common goals, hierarchy, and rules).

## 1.3. Theoretical Foundation of the Study

While organisations provide structures to share information and knowledge, the decisions to share with whom, when, and to what extent are based largely on the discretion of individuals. Individuals may have positive intentions to share information or knowledge, but they make such decisions on the basis of certain rational assumptions (Davenport & Prusak, 1998). For instance, people do costs and benefits analysis before making a decision about what to share and with whom to share (Hall, 2001; Molm, 2001; Schrader, 1991). In view of this, researchers argue that knowledge collaboration in informal networks depends on a number of preconditions: willingness to share (Borgatti & Cross, 2003; Chiu, Hsu, & Wang, 2006; Reagans & McEvily, 2003), risk tolerance (e.g. misappropriation) (Cross et al., 2001; Hansen, 1999; Schrader, 1995), and the ability to identify (i.e. who knows what) and coordinate with diverse sources of knowledge (Brandon & Hollingshead, 2004; Lewis, Lange, & Gillis, 2005).

Theories of social exchange, social capital, and transactive memory systems (TMS) help to explain the process of informal knowledge exchange among socially connected individuals. These theories provide insights into why individuals create and maintain informal knowledge sharing relationships by managing the issues involved in such knowledge collaborations. Social exchange theory (SET) highlights the role of reciprocity (i.e. receiving and returning favours) in creating mutual dependence among socially connected individuals (Blau, 1964; Constant, Kiesler, & Sproull, 1994). Social capital theory (SCT) helps to explain the basic structure (e.g. nature of ties and trustworthiness) needed to develop resource sharing relationships (Inkpen & Tsang, 2005; Levin & Cross, 2004; Nahapiet & Ghoshal, 1998). TMS theory helps to

understand how individuals manage the task of coordinating and integrating knowledge from diverse sources (Brandon & Hollingshead, 2004; Jarvenpaa & Majchrzak, 2008).

This study establishes links between SET, dimensions of social capital, and TMS to explain the process of informal knowledge sharing among networked individuals. Although researchers have highlighted the role of social capital in informal knowledge collaboration, there is no clarity as to how individuals use social capital to form useful knowledge collaboration. Among different theoretical perspectives addressing the issue of coordinating and combining diverse information, TMS has gained a lot of attention from organisation and knowledge management researchers. It has been studied as a system of combing expertise of group members, who are supposed to work together to perform organisational tasks. TMS facilitates knowledge collaboration by keeping a record of areas of expertise of others, enabling trust in the competence of a knowledge source, and developing ability to coordinate information and expertise from diverse sources of knowledge (Brandon & Hollingshead, 2004; Lewis, Lange, & Gillis, 2005; Wegner, 1987).

TMS research has tended to focus on the coordination and combination of distributed information among organisational groups and teams, keeping in view the assumption of joint problem solving and task interdependence. However, few studies have specifically looked at the use of TMS in coordinating and integrating distributed information among socially connected groups of individuals. For instance, Jarvenpaa and Majchrzak (2008) apply TMS theory to help interpret ad-hoc knowledge collaboration in the ego-centered networks of security professionals who are pursuing the common objective of protecting the *National* security. Their study is limited to the context of information sharing among inter-organisational groups of security professionals intending to achieve a common goal. The present study suggests the

application of TMS in explaining the process of informal knowledge cooperation among loosely coupled groups of individuals, who do not pursue common goals and objectives. This is a novel contribution of this thesis.

## 1.4. Definitions of Key Terms/Constructs used in the Study

The definitions of the key concepts/constructs used in this study are presented in this section. Construct or the latent factor/variable is an abstract term used in the litertature to define concepts that are not directly measureable.

Table 1.1 *Definitions of Key Terms/Constructs used in the Study*

| Sr. | Key Terms/ Constructs | Definition | Source |
|---|---|---|---|
| 1. | Informal contact | An informal contact is a person who works in similar profession or knowledge domain with whom the knowledge worker's current relationship is primarily a social relationship. | Self-developed |
| 2. | Ego-centered networks | Informal personal contacts developed by a professional, for the purpose of sharing work-related knowledge (on ad-hoc basis), to improve problem solving and task performance. | Cross, Parker, Prusak, and Borgatti (2001) |
| 3. | Ego-centered Knowledge Networks (EGKNs) | Networks of professionals who are connected through social means in order to mutually coordinate work-related information and knowledge for problem solving and task performance | Self-developed |
| 4. | External information sharing | The sharing of technical information on a work-related topic, in the form of reports or data, with the informal contacts (EGKN members) who are not part of the formal work organisation. | Teigland and Wasko (2003) |

| Sr. | Key Terms/ Constructs | Definition | Source |
|---|---|---|---|
| 5. | Internal information sharing | The sharing of technical information on a work-related topic, in the form of reports or data, with the informal contacts (EGKN members) who are working inside the organisation. | Teigland and Wasko (2003) |
| 6. | Norms of reciprocity | Individuals' belief that their current knowledge sharing with the EGKN members will be reciprocated. | Chiu, Hsu, and Wang (2006) & Kankanhalli, Tan, Wei (2005) |
| 7. | Interpersonal trust | Individuals' expectations about the attitude and behaviour of their EGKNs members that they will always behave according to their expectations and take care of their interests (Tsai & Ghoshal, 1998). | Mayer, Davis, and Schoorman (1995), & Zaheer, McEvily, and Perrone (1998) |
| 8. | TMS | An individual's perception about the knowledge specialisation of the EGKN members, reliance on the competence of the knowledge source, and the coordination ability to acquire work-specific (specialised) knowledge from the EGKN members. | Lewis (2003) and Wegner (1987) |

## 1.5. Research Questions

The demand for non-redundant and specific knowledge for problem solving encourages knowledge workers to collaborate and share knowledge outside their work organisations (Jarvenpaa & Majchrzak, 2008; Teigland & Wasko, 2003). Previous research into knowledge sharing networks provides some insights into the characteristics of informal relations between scientific and technical employees (Allen, Andrew, & Phil, 2007). Employees working in knowledge intensive professions (such as biotechnology, R&D, technology development) tend to build knowledge sharing ties with colleagues and use them for assistance and advice for problem solutions and

innovative ideas. In view of this, this thesis defines an ego-centered knowledge network (EGKN) of a professional as *informal personal contacts developed by a professional, for the purpose of sharing work-related knowledge (on ad-hoc basis), to improve problem solving and task performance.*

Relations with others are not sufficient for the actors to be able to benefit from a relationship (Borgatti & Cross, 2003). Little is known about how knowledge workers use their personal connections to develop effective knowledge collaborations. Therefore, this study intends to answer the broader research question: *How do people connect and collaborate to share knowledge and what sustains ad-hoc knowledge collaboration among socially connected individuals (i.e. EGKN) in the absence of organisational structures and control mechanisms.* The specific research questions investigated in this study are as follows:

*RQ1. What contributes to the development of EGKNs of professionals other than formal structures and organisational work processes?*

*RQ2. What enables and sustains informal knowledge collaboration among professionals connected through an EGKN?*

*RQ3. Where TMS-like structures exist in the EGKN of a professional, how they affect the job performance of an individual?*

## 1.6. Aim of the Study and Research Objectives

Managers and leaders of organisations interested in expanding the knowledge-base of their organisation need to understand the informal knowledge sharing activities of individuals (Teigland & Wasko, 2003). They need to consider informal (personal) knowledge sharing networks of employees, both internal and across a firm's legal

boundaries, as important sources of knowledge. With the identification and integration of relevant theories and concepts from the literature, this study aims to develop a model linking various concepts to conceptualise the process of informal knowledge collaboration among socially connected individuals. The purpose is to provide understanding about how individuals collaborate to share knowledge in the absence of formal structures and prescribed channels of communication. Thus, this study seeks to achieve following objectives:

1. Understand the formation of EGKNs other than prescribed communication channels of an organisation.

2. Investigate the process of ad-hoc (informal) knowledge collaboration in the EGKNs of professionals.

## 1.7. Summary of the Research Methodology

This study focuses on five major components: external information sharing, internal information sharing, norms of reciprocity, interpersonal trust, and TMS. The study proposes that external and internal informal information sharing together with norms of reciprocity and interpersonal trust develop TMS in an EGKN of a professional. Such TMS allows informal knowledge cooperation among socially connected individuals by providing knowledge coordination and integration abilities. To measure the constructs and the hypotheses developed in this study, measurement items were mainly developed by adopting and altering scales used in the past studies. Where necessary, new items were developed based on the logic derived from the literature.

Informal information sharing (both external and internal) practices were measured through the scale developed by Teigland and Wasko (2003). Norms of reciprocity were measure with the items adapted from the studies of Chiu et al. (2006),

and Kankanhalli et al. (2005). To measure interpersonal trust, items were adapted from Zaheer et al. (1998). To measure TMS, items were developed from Lewis (2003) scale, which measured TMSs through three components: specialisation (people know about each other's expertise and who in a network has specialised knowledge that can help to perform one's task), competence trust (trust in other members' knowledge and expertise while using it in one's own task) and coordination (ability to acquire work-specific knowledge).

Structural equation model (SEM) is used as the main technique for data analysis. SEM is an appropriate tool to test models involving multiple constructs each represented by several manifest variables (Byrne, 2012). SEM is a useful technique to identify and measure strengths of relationships between constructs. Researchers recommend to use the two-phased approach in SEM (Anderson & Gerbing, 1988; Byrne, 2010; Hair, Black, Babin, & Anderson, 2010). The first stage requires the testing the measurement model (i.e. how well the theoretical model fits with the collected data). The second stage tests the hypothetical assumptions associated with the model and the strengths of the relationships.

To test the research model and to further cross-validate the results, two datasets are established. These datasets contain responses of individuals gathered through a questionnaire survey across various industry sectors and occupations in New Zealand. The first dataset includes the responses of the New Zealand Knowledge Management (NZKM) network. The second dataset includes the responses of professionals selected from the Kompass business directory of the New Zealand companies. Chapter 5 provides the details of the overall research design and the analysis strategy.

## 1.8. Major Contributions of the Study

The research ideas presented in this thesis help understand how knowledge workers make use of their personal connections and collaborate to share work-specific knowledge across organisational boundaries and formal (prescribed) channels of communication. The study extends the findings of Jarvenpaa and Majchrzak's (2008) study that identify the role of TMS in information and knowledge cooperation among professionals by means of their EGKNs. The study not only confirms the findings of Jarvenpaa and Majchrzak (2008), regarding development of TMS in the absence of task interdependence and joint problem solving, but also indicates that work-specific knowledge can be coordinated and combined through TMS based structures in the EGKNs of professionals who are not working for common goals and objectives. The study contributes to the literature on informal knowledge sharing and TMS, as follows:

- Theoretically, it provides new insights into the process of informal knowledge collaboration among socially connected individuals through the manifestation of network TMS.
- Empirically, it adds to the limited studies conducted with regards to informal knowledge sharing and network TMS, thereby allowing future research to build upon the results of this study.
- Practically, it attempts to improve the understanding about the role and significance of personal knowledge networks of individuals among organisational members especially at the level of managers and executives. This increase in understanding may bring some managerial support to employees who are engaged in informal knowledge sharing outside their work organisations.

## 1.9. Structure of the Thesis

This section indicates the overall structure of the thesis and briefly outlines the contents of each chapter.

Table 1.2 *Structure of the Thesis*

| Chapter Number | Description of the Chapter |
|---|---|
| Chapter 2 | This chapter provides a discussion on information and knowledge and develops the argument that some forms of knowledge can effectively be transferred through interactions between individuals. The chapter distinguishes between formal and informal means of knowledge sharing and highlights the role of informal networks of professionals in the sharing and transfer of work-specific knowledge. Evidence from the literature is gathered to emphasise the importance of informal networks and information sharing through personal connections of knowledge workers. The chapter concludes that information sharing in various informal networks leads to the development of ego-centric knowledge networks of professionals, called EGKNs. |
| Chapter 3 | This chapter outlines the theoretical foundation of the study. The chapter highlights the theories of social capital, social exchange, and TMS to explain the process of informal knowledge cooperation in the EGKNs of professionals. It highlights that social exchange and social capital theories develop the context for knowledge cooperation in the absence of formal structures and organisational mechanisms. It also discusses the role of TMS in coordinating and integrating task-related expertise in EGKNs of professionals. |

| Chapter Number | Description of the Chapter |
|---|---|
| Chapter 4 | This chapter presents the research model to conceptualise the process of informal knowledge cooperation in the EGKNs of professionals. It represents the links between theories of social capital, social exchange, and TMS development in the form of a model and hypotheses of the study. The model suggests that such structures develop and sustain informal knowledge collaboration among socially connected individuals for problem solving and task performances. The chapter also provides discussion on the operationalisation of constructs involved in the study. |
| Chapter 5 | The chapter explains the research methodology to collect and analyse data. It discusses survey design and administration approaches and the statistical techniques used for model testing and theory verification. It describes the use of the SEM approach to test the measurement model and the structural model in order to verify theories and underlying structure of the research model. |
| Chapter 6 | The chapter outlines phase one of the study which includes data collection and testing of the research model. This chapter presents the results of the exploratory factor analysis and model testing on the first dataset (NZKM). It also presents descriptive statistics and results of the measurement model testing and structural model testing. It uses the SEM approach (as specified in Chapter 5) to test the model and associated hypotheses. The summary of results of the hypotheses testing is also presented. |

| Chapter Number | Description of the Chapter |
|---|---|
| Chapter 7 | This chapter presents phase two of the study which involves data collection and analysis through an independent sample (Kompass dataset). This part is conducted to cross-validate the findings and the results of model testing and hypotheses analyses. It uses a similar approach (as specified in Chapter 5) to cross-validate the model and associated hypotheses. Descriptive analysis and a summary of the findings are presented. Moreover, the findings from the two samples are compared to highlight the similarities and the differences. |
| Chapter 8 | This chapter discusses and interprets the findings of the study in relation to the established literature and theory and the aims and objectives of the study. The discussion evaluates various assumptions and links that are drawn from the literature and are provided in the form of a conceptual model and hypotheses. These assumptions and links are assessed through the results of this study. The chapter also highlights the contribution of the study in informal networking, knowledge management, and the TMS literature. A section on limitations of the study is also presented. Finally, implications for practice and further research stimulated by this study are provided. |

# CHAPTER TWO

## UNDERSTANDING KNOWLEDGE SHARING IN INFORMAL NETWORKS

The purpose of this chapter (and the next chapter) is to provide a review of the literature on the role and significance of informal (personal) networks and relevant theories to explain the process of informal knowledge collaboration among socially connected individuals. This literature review consists of two parts (divided over two chapters). The present chapter defines theories of informal information sharing practices and consolidates evidence to highlight the role and significance of informal networks of individuals. Chapter Three highlights theories of social exchange, social capital, and TMS to discuss knowledge collaboration among socially connected individuals. It highlights TMS as a structure that supports coordination and combination of diverse expertise from various sources to improve task performance. Figure 2.1 provides a roadmap of the discussion covered in these two chapters.

The key search terms for the literature review include: information sharing, knowledge sharing, social exchange, social capital, social networking, informal networking, informal information trading, trust, reciprocity, transactive memory, and transactive memory systems (TMS). The literature is searched in four main areas: information management (IM), knowledge management (KM), organisational science (OS), and social science (SS).

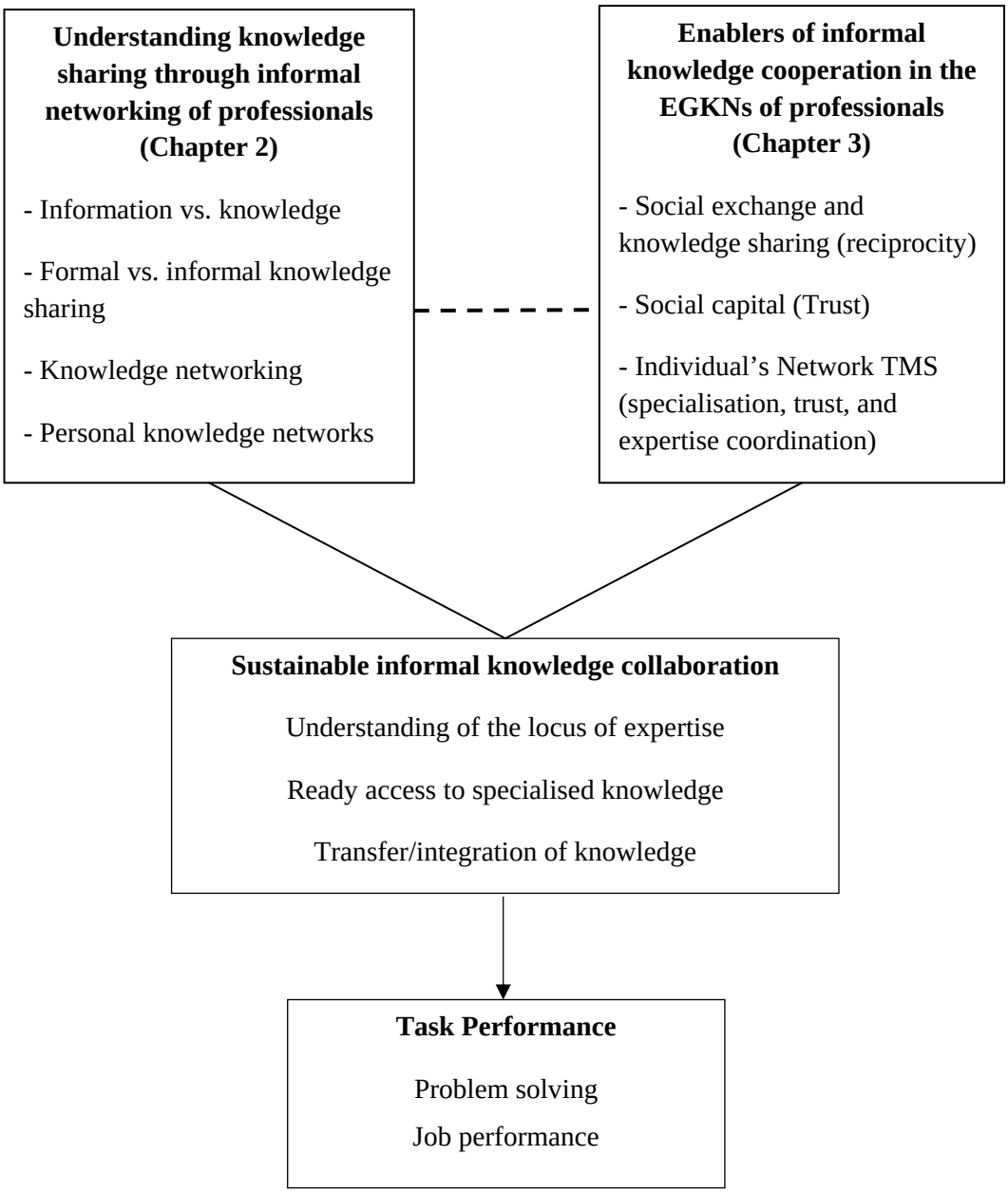


*Figure 2.1.* Overview of the literature.

This chapter starts with the discussion to differentiate between information and knowledge and highlights the tacit (personal) view of knowledge to build the argument that some forms of knowledge can be effectively transferred through personal interactions between knowledge workers. It discusses various approaches for information and knowledge management and draws attention to the network approach of knowledge management. The chapter highlights the formal and informal means of

information and knowledge sharing and contends that informal channels are effective ways of sharing specific information and knowledge between individuals. It emphasises the role and significance of informal (personal) networks in the diffusion and transfer of knowledge and consolidates evidence on informal information sharing between professionals from various industry sectors and technology clusters. The chapter also highlights the role of communities of practice and electronic networks in the development of EGKNs of professionals.

## 2.1. Information vs. Knowledge

Information and knowledge have been used interchangeably throughout the KM literature despite indication by some researchers that distinguishing information from knowledge is important to understand the larger role of KM other than information processing and management (Alavi & Leidner, 2001). The confusion between information and knowledge is also evident in the TMS literature. Although the majority of the TMS literature (discussed in section 3.3) deals with the coordination and processing of distributed information, researchers also highlight the use of TMS in coordinating and integrating knowledge without clearly differentiating knowledge from information. Based on the fact that the precise definitions of knowledge and information do not exist and many authors have used the terms interchangeably when discussing KM and TMS, this thesis does not attempt to provide a precise differential and may use the terms without strictly implying information and knowledge as separate entities in the context discussed. Nonetheless, this thesis has tried to differentiate information and knowledge to develop the argument that human (tacit) form of knowledge can be effectively transferred through informal (personal) means.

A distinction sometimes made is that knowledge resides in a cognitive system (i.e. the brain), while information may exist outside the cognitive system (Alavi &

Leidner, 2001; Stenmark, 2001; Zack, 1999). A cognitive system exists in the minds of humans and is capable of doing the tasks of knowing and transferring learning into some useful actions. Cognitive systems have the capacity to produce knowledge from information and vice versa (Stenmark, 2001; von Hippel, 1994). The role of the cognitive system in developing knowledge is evident from the fact that knowledge contains both meaningful experiences and the beliefs of a person. Davenport and Prusak (1998, p. 5) explain knowledge as "a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information". This suggests that information and knowledge are mutually constituted i.e. information can be converted to knowledge once it is processed by the cognitive system (i.e. human brain) and knowledge becomes information once it is explicitly expressed (Alavi & Leidner, 2001). However, knowledge may comprise of actionable information together with the experiences and insights of an individual (Wiig, 1999).

According to Zack (1999, p. 45), knowledge is what "we come to believe and value on the basis of the meaningfully organised accumulation of information (messages) through experience, communication, or inference". Davenport and Prusak (1998) suggest that knowledge may develop from information but it is something being driven from the actions and real-life experiences of an individual. Thus, knowledge may also be developed from an understanding of the patterns that emerge in information. In view of this, knowledge can be seen as a value-added product of information that contains personal experiences and insights. For the purpose of this thesis, the distinction between information and knowledge is defined as: information is data arranged in a meaningful way to help decision making (Alavi & Leidner, 2001), whereas, knowledge is defined as 'justified true beliefs' (Polanyi, 1966).

Table 2.1 *Information vs. Knowledge*

| **Information** | **Knowledge** | **Authors** |
|---|---|---|
| Interpretation of facts | Justified beliefs | (Alavi & Leidner, 2001) & (Polanyi, 1966) |
| Interpretation developed from the organisation of data | Experiences and insights based on detailed contextual information | (Davenport & Prusak, 1998) |
| Portraying understanding of a situation or a condition | Beliefs, judgments, and know-how about a situation or a condition | (Wiig, 1999) |
| Answering who, where, when or what questions | Answering why and how questions | (Quigley & Debons, 1999) |
| Data stored in computers and internet servers | Information processed in the minds of humans | (Alavi & Leidner, 2001) |
| Meaningful interpretation of messages | Beliefs developed from the orientation of messages | (Nonaka & Takeuchi, 1995) |
| Information without context may be useless | Knowledge is the contextualised understanding of information | (Boisot & Canals, 2004) |
| Information is processed data in a context | Knowledge is authenticated information that is actionable | (Rowley, 2007), and (Stenmark, 2001) |
| What can easily be codified and transferred through digital means is information | Experiences and skills of an individual that are difficult to codify and transfer through explicit means | (Alavi & Leidner, 2001), and (Nonaka, Nishiguchi, & Krogh, 2000) |

Table 2.1 provides some other perspectives on information and knowledge as described by many authors. Though these views add more clarity to draw the line between information and knowledge, it is still hard to distinguish knowledge from information in absolute and practical terms. The purpose of highlighting the difference

here is to develop support for the argument that interpersonal interactions are effective means of knowledge transfer between humans.

As we move further into the knowledge economy where information and knowledge are increasingly becoming the sources of competitive advantage for an organisation, there is a crucial need to pay attention to the effective ways of managing information and knowledge possessed by employees (Cross et al., 2001). It may be interesting to think how effective management and coordination of human knowledge could improve the productivity and performance of knowledge workers. The various approaches for information and knowledge management are discussed in section 2.3.

## 2.2. Forms of Knowledge

Another important dichotomy in the KM literature is the explicit or tacit knowledge which stems from the work of Polanyi (1966). Tacit knowledge comprises of insights and experiences "that an individual or organisation actor uses to interpret situations and to generate activities, behaviour, and solutions; no matter whether these experiences are rational or used intentionally" (Maier, 2007, p. 76). Tacit knowledge enables problem solving through sense-making and applying one's experience and worldview (Wiig, 2003).

Polanyi (1966, p. 7) argues that "explicit knowledge must rely on being tacitly understood and applied. Hence all knowledge is either tacit or rooted in tacit knowledge". Polanyi (1966) does not regard tacit and explicit knowledge as opposite, separate, and mutually exclusive, but as mutually complementary entities. In other words, knowledge is neither completely and fully tacit nor completely and fully explicit, but exists alongside a continuum (Baumard, 1999), as shown in Figure 2.2.

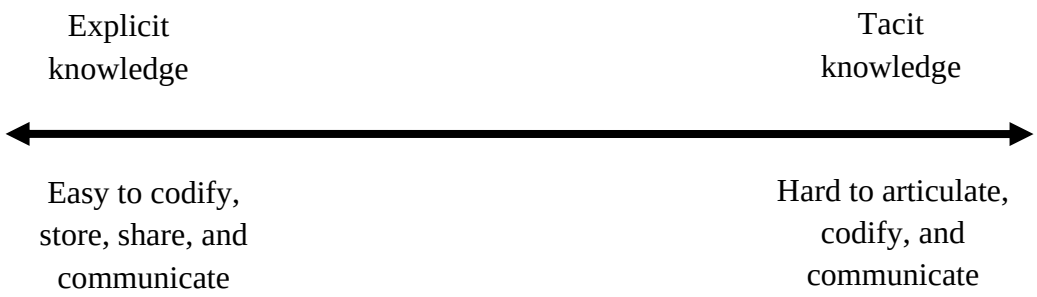


*Figure 2.2.* Tacit vs. explicit knowledge (Baumard, 1999).

There are many different interpretations of information and explicit/tacit knowledge distinction exists. In this thesis, the major distinction made is between information and tacit knowledge rather than information and all other forms of knowledge. This more limited comparison is taken because explicit knowledge can be stored and transferred through similar means of communicating information (i.e. documents and repositories), which means it can be hard to distinguish from information. On the other hand, tacit knowledge held by individuals is hard to detach from the holder of the knowledge and therefore tends to rely on direct face-to-face interaction to be shared effectively. This suggests that interactions between knowledge workers and their willingness to share knowledge are important in transmitting some specialised knowledge. Since information (or explicit knowledge) is something that can be stored and transferred through digital or impersonal means, explicit knowledge and information are considered in this thesis at one side of the continuum (see Figure 2.2) and tacit knowledge on the other side. Moreover, the tacit view of knowledge is largely emphasised in this thesis while discussing the process of knowledge coordination and integration in the EGKNs of professionals.

Knowledge transfer requires interaction between knowledge seekers and knowledge providers. Information and explicit knowledge can be stored and transferred through repositories. However, tacit knowledge is located in the minds of humans and

can be effectively transferred through participation in a knowledge sharing context. The next section discusses the codification and personalisation approaches to information and knowledge management and highlights the importance of social (personal) interaction in the management of human knowledge.

## 2.3. Approaches to Information and Knowledge Management

The information and knowledge distinction highlights two different approaches to information and knowledge management: codification and personalisation (Balconi, Pozzali, & Viale, 2007; Hansen, Nohria, & Tierney, 1999; Smedlund, 2008). These approaches provide structures to effectively manage and transfer information and knowledge. For instance, the codification approach provides ways to deal with the information and explicit knowledge and store them in the forms of documents, policies, and procedures. The personalisation approach, on the other hand, emphasises the role of human and personal interaction between individuals for the effective management and transfer of tacit knowledge. Networks that link people with each other for the transfer of information and knowledge are central to the personalisation approach (Reagans & McEvily, 2003), both in the form of communities and networks of practice. Communities of practice and networks of practice are discussed in section 2.9.

Codification refers to the conversion of knowledge into a digital format that can be stored and transferred simply by means of technology. The codification strategy is based on the use of information technology to codify information and explicit knowledge and store it in a location so that organisational members can access and reuse it (Hinds & Pfeffer, 2003). With this approach, knowledge is made "available to members of the organisation via databases and data warehouses" (Desouza & Evaristo, 2004, p. 87). An example of the codification approach is a customer database that stores information about customers' behaviour, buying patterns, and their preferences.

Codification approach emphasises on the reuse of knowledge (e.g. experiences, best practices) through storing information in the form of documents and repositories. Consequently, designing database systems for classification, storage, and retrieval of information are the main activities involved in implementing such KM strategies.

The personalisation approach, on the other hand, refers to the process of creating and transferring tacit knowledge (Stenmark, 2001; Szulanski, 2000). This view takes into account the human (personal) view of knowledge and recognises interactions between humans as a crucial means of knowledge creation and transfer. It therefore considers the transfer of tacit knowledge through dialogue and face-to-face communication (Hinds & Pfeffer, 2003). A focus on personalisation strategies for knowledge sharing requires the understanding of the social structures that can provide context for knowledge sharing (Blankenship & Ruona, 2009). This suggests that organisations should be aware of the formal and informal structures that can support or inhibit knowledge sharing among individuals.

## 2.4. Knowledge Management in an Organisational Context

Herbert (1991) proposed that organisations had a capacity to learn by: (1) developing systems and procedures that incorporate knowledge, (2) hiring people that introduce new knowledge, and (3) discovering new ways of doing things by going through their work routines. Through such mechanisms, Herbert (1991) views organisational learning as being the aggregated insight of organisational employees, some of which get transferred into work practices. Many other researchers agree with Herbert's views and contend that the learning ability of an organisation depends upon the learning and behaviour of its members (Argyris, 1999; Senge, 1990; Wang & Ahmed, 2003). Senge (1990, p. 3) defines a learning organisation as the one where "people continuously expand their capacity to create the results they truly desire, where

new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together". Grant (1996b) argues that the competitive success of a firm depends on its ability to effectively capture and utilize the knowledge of employees. Thus, the process of individual learning through knowledge creation and acquisition activities is crucial to the learning and competitive success of an organisation.

A firm exists to capture and utilise the knowledge of its members to develop innovative products and services (Conner, 1996; Grant, 1996b; Kogut & Zander, 1992). Nonetheless, knowledge is created and possessed by individuals, and the firm provides structures and mechanisms to capture and utilise the knowledge of individuals (Grant, 1996a, 1996b). The interplay between individual knowledge and organisational learning is also highlighted in the work of other researchers (for example, Nonaka & Takeuchi, 1995; Nonaka, Toyama, & Konno, 2000). According to these researchers, individual knowledge is the basis for organisational knowledge creation and the role of an organisation is to provide opportunities to its individual members to create and apply knowledge (Nonaka & Takeuchi, 1995). It may be interesting to learn how knowledge is created and managed in organisations and what the role of individuals is in the overall process of organisational knowledge creation and management.

Nonaka and Takeuchi (1995) developed a four staged spiral model, Socialisation, Externalisation, Combination, and Internalisation (SECI), to highlight the process of knowledge creation and management in an organisational context. They argue that knowledge is created and expanded through the interplay between tacit and explicit knowledge. Their model highlights the role and importance of individuals in knowledge creation and transfer activities during the four stages of knowledge conversion as is shown in Figure 2.3.

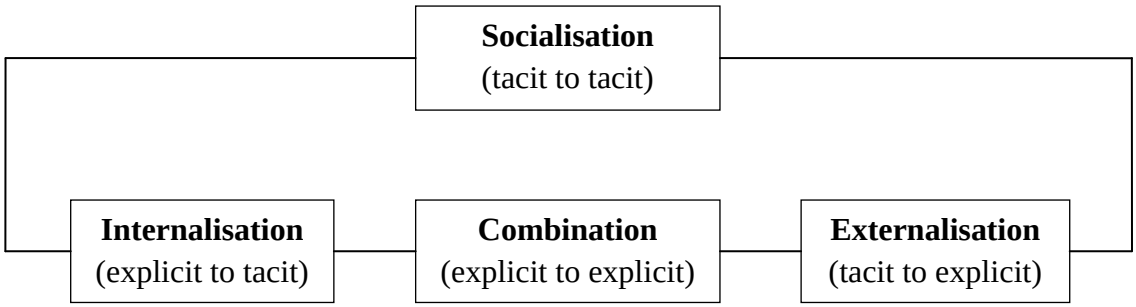


*Figure 2.3.* SECI model (Nonaka & Takeuchi, 1995).

Nonaka and Takeuchi (1995) describe socialisation as a process where tacit knowledge can be transferred from one person to another through face-to-face interaction, observation, and practice. Externalisation, on the other hand, is a process of converting the tacit knowledge of an individual (e.g. ideas, beliefs, and cognition) into readily understandable form, such as policies, procedures, and operational manuals. Once knowledge becomes explicit, it can be shared through a process called combination. Combination allows transfer of explicit knowledge via documents, emails, and databases. The internalisation process helps the transfer of explicit knowledge into an individual's tacit knowledge (Nonaka & Takeuchi, 1995).

The SECI model has been used to conceptualise knowledge creation in organisations through the conversion of knowledge, starting at the level of an individual, moving on to the group level and finally to the organisational level. The four SECI modes as mentioned in figure 2.3 are embedded in a shared space or context, the so-called 'Ba' (Nonaka & Konno, 1998). According to Nonaka and Konno "Ba is a shared space that serves as a foundation for knowledge creation" (1998, p. 40). In other words, Nonaka and Konno (1998) argue that knowledge is created through the activities of individuals who are confined to a shared space (i.e. 'Ba'). Thus, 'Ba' is a concept used to define a platform where individuals may interact to create and share knowledge.

It can be an organisation, a network, a community practice, or a social group that provides some context for interaction between individual for the purpose of knowledge creation and sharing.

Nonaka and Takeuchi (1995) see knowledge as a process rather than an object and argue that organisational knowledge is created through combining knowledge of the organisational members. When (tacit) knowledge of an individual cannot be made explicit, it cannot easily be leveraged by an organisation. There needs to be some specific ways to manage and transfer knowledge of individuals that otherwise cannot be made explicit and captured through routine work processes. In view of this, the SECI model and the concept of 'Ba' (i.e. shared space where individuals can interact to share knowledge) can be used to describe the creation and transfer of (tacit) knowledge between humans. This interactive perspective of the SECI model and 'Ba' suggests that knowledge sharing is an essential process of knowledge creation and that knowledge is created through interactions between humans in a shared context.

Thus, knowledge creation requires that individuals share their knowledge through social interactions through dialogue and discussion using the prescribed structures and mechanisms provided by the organisation. Nonetheless, not all knowledge collaboration between professionals is developed through formal structures and organisational mechanisms. Individuals may not get all current and relevant knowledge from organisational sources, and the prescribed channels of an organisation are sometimes not effective in coordinating the desired knowledge for solving a particular problem situation. Individuals can also develop knowledge through personal interactions in their own shared space that goes beyond their current work spaces and prescribed organisational structures. Thus, the extended shared spaces may exist in the

form of informal (personal) networks of individuals, and are comprised of members from many different organisations and work contexts.

The next section discusses the formal and informal means of knowledge management and highlights the role of informal networks in the management and transfer of work-specific knowledge between individuals.

## 2.5. Formal vs. Informal Knowledge Management

Grant's (1996a) knowledge-based theory of the firm highlights the need for integration and management of organisational knowledge. In view of this, KM was seen as a system to capture and share organisational knowledge in the form of information repositories and learning documents (Alavi & Leidner, 2001). More recent trends in KM focus on the connectivity and interactions between individuals since more valuable knowledge exists in the minds of individuals and/or is created by their activities (Davenport, 2005; Ichijo & Nonaka, 2007; Kaše, Paauwe, & Zupan, 2009). Networking and communication between knowledge workers provide opportunities for knowledge and transfer (Fleming & Frenken, 2007; Lee & Cole, 2003; Levin & Cross, 2004).

Collaboration between knowledge workers improves the understanding of problem situations and helps in developing innovative solutions (von Hippel & von Krogh, 2003). Many studies explain that these collaborations and knowledge sharing can be through formal and informal means (Allen et al., 2007; Cummings & Cross, 2003; Yongsuk & Jarvenpaa, 2008). Formal means are organisational structures, that is, functional teams, joint ventures, and knowledge management systems that encourage and expect employees to share knowledge. Informal means include communities of practice, virtual communities of practice, and informal (personal) knowledge networks of employees that develop through personal interactions.

Formal workplace learning may happen through joint working in organisational structures (e.g., formal training, apprenticeship), whereas informal learning occurs through self-study, peer mentoring, sharing knowledge with friends and colleagues. The means of interaction and communication in informal networks are much different from that of formal organisational structures (Allen et al., 2007; Cross & Parker, 2004; Cross et al., 2001). Formal knowledge sharing works through structures and prescribed communication channels of an organisation. On the other hand, informal knowledge sharing is emergent, spontaneous, and voluntary, and therefore does not follow an organisation's formal rules and structures.

In formal work practices, organisations provide various mechanisms for knowledge sharing, such as working groups, project teams, formal meetings, trainings, workshops, and so on. KM systems and collaboration tools are available to share the knowledge possessed by employees (Alavi & Leidner, 2001). These formal mechanisms provide means to interact and communicate with other individuals and groups and share knowledge with each other (Lawson, Petersen, Cousins, & Handfield, 2009). However, the question arises: Do formal structures provide an adequate environment to build interpersonal trust and knowledge exchange relationships among individuals?

Studies have indicated a critical disconnection between knowledge sources arranged and provided by an organisation and the actual knowledge sharing channels used by employees (Cross et al., 2002; Cross & Parker, 2004; Cross et al., 2001). While formal structures do facilitate information and knowledge collaboration among individuals, the decisions to share what, with whom, when and to what extent are made by the employees (Bouty, 2000; Cross et al., 2002; Cross et al., 2001). The need for knowledge to resolve complex problem situations requires organisational members to collaborate and share knowledge irrespective of the formal structures and organisational

boundaries (Chow & Chan, 2008; Davenport, Eccles, & Prusak, 1998). This implies that organisational members involved in informal knowledge sharing seek different sets of expertise, perspectives, and problem-solving capabilities outside their prescribed work structures and formal boundaries of the organisation (Cummings, 2004).

Organisations are realising that they need flexible structures through which organisational members are able to interact freely and share tacit knowledge (Aramburu & Sáenz, 2007). Researchers argue that employees' networks of relationships provide informal structures to share knowledge (Cross et al., 2001; Kogut & Zander, 1992; Nonaka, Toyama, & Konno, 2000). Informal (personal) networks of individuals provide opportunities for interactions and knowledge collaboration, allowing people who have similar work conditions to learn from each other's experiences (Reagans & McEvily, 2003). As we move further into the knowledge economy where knowledge creation and innovation are increasingly central to organisational effectiveness, KM researchers argue that instead of managing knowledge through explicit means, the focus of KM should be on the informal (personal) ways that people use to seek out knowledge and solve problems in organisations (Cross et al., 2001).

## 2.6. Personal Knowledge Management

KM researchers emphasise the importance of organisational knowledge to achieve the competitive success of a firm (Grant, 1996b; Ichijo & Nonaka, 2007; Nonaka, Toyama, & Nagata, 2000). They agree on the role of individuals in the creation of organisational knowledge. However, there is not enough understanding about how individuals actually create their own shared space (i.e. 'Ba') to create and share knowledge. Wiig (2003) suggests that organisational knowledge creation depends on how individual knowledge workers utilise given information and knowledge sources to solve problems and generate new knowledge. In view of this, KM researchers argue that

understanding knowledge creation at the level of individuals is crucial for organisations to leverage their knowledge assets and intellectual capital (Davenport & Prusak, 2000; Nonaka, Toyama, & Nagata, 2000). Organisations can effectively create new knowledge by managing and utilising the knowledge of their employees and providing them 'Ba' to create knowledge (Nonaka, Toyama, & Konno, 2000). Nonetheless, individuals may also develop their own shared spaces by using various organisational sources and extra-organisational channels (including personal relationships), while solving various routine and non-routine problems.

Over time, individuals in an organisation experience different situations, face problems, find solutions, and develop unique skills and expertise. This knowledge remains in the heads of individuals, helps them in their daily work, and becomes part of organisational memory (Tuomi, 1999). This view is presented by Polanyi (1966) in his book titled 'Personal Knowledge' and is further supported by Simon (1991, p. 125); who says that "all learning takes place inside individual human heads". Learning takes place through solving routine and non-routine problems (Billett, 2001; Davenport, 2005). Billet (2001) identifies routine problems as ones that have a pre-defined pattern of solutions and can be resolved by applying explicit knowledge. Non-routine or novel problems, on the other hand, require sense-making and the application of tacit knowledge (e.g., personal judgment) (Billett, 2001). Solving novel problems requires the creation of new knowledge and the acquisition of knowledge from diverse sources. These sources of knowledge may exist beyond organisational structures and the prescribed channels of an organisation.

The creation and transfer of knowledge among humans can be understood through a sociological approach to knowledge. This approach considers knowledge as distributed cognition among groups of individuals and created through interactions

between individuals (Zander & Kogut, 1995). Keeping in view that individual learning and problem solving have paramount importance in organisational knowledge management, it is important for organisations to understand the knowledge creation and sharing activities of individuals for resolving non-routine situations and complex problems at work. Burt (2000) argues that social embeddedness and informal networks connect firms and individuals to the diverse pools of knowledge. A networking approach thus highlights the importance of relationship building in the management and transfer of knowledge between individuals for problem solving (Uzzi, 1999).

Problem solving in today's challenging work environment requires knowledge workers to work in collaborative ways through a closer interaction with knowledge sources (Wright, 2005). In search of knowledge and problem solutions, knowledge workers collaborate to share knowledge with colleagues both within and outside the organisational boundaries and build on the knowledge they already possess. They develop contacts to seek and share knowledge with peers both within and across organisational boundaries with whom they share common interests and have long-term interpersonal relationships. This can be seen in the case of professional networks and communities of practice where people with mutual interests interact and create knowledge through discussions (Lave & Wenger, 1991). The role of professional communities and knowledge networks in the creation and transfer of knowledge is discussed in the subsequent sections.

Knowledge networking is crucial in organisational contexts where complex knowledge tasks require the combination and application of diverse knowledge (Davenport, 2005). Organisational and KM researchers acknowledge the importance of personal networks of individuals in knowledge creation and organisational effectiveness (Alavi & Leidner, 2001; Nahapiet & Ghoshal, 1998). Evidence suggests that (informal)

personal connections and informal interactions between technical employees help in the creation and dissemination of knowledge between firms (Fleming & Frenken, 2007; Lee & Cole, 2003; Levin & Cross, 2004; Teigland & Wasko, 2003; von Hippel & von Krogh, 2003). These studies highlight the importance of informal (personal) contacts in knowledge transfer between individuals.

The social ties of individuals are useful channels for knowledge transfer between firms. The next section presents some studies to highlight the role of cross-firm informal (personal) networks of professionals in the diffusion and transfer of knowledge between firms. These studies show that combining knowledge from diverse sources can benefit individuals as well as organisations. These studies further describe how the valuable knowledge is shared through interpersonal relationships. Experience, contact with former colleagues, trust, and norms of reciprocity are the main factors explaining the sharing of valuable knowledge between socially connected individuals.

## 2.7. Evidence of Informal Networking and Information Sharing

The literature provides sufficient (but fragmented) evidence to highlight the role and significance of informal networks in information and knowledge sharing among individuals. Dalum (1995, p. 104) highlights that “the informal (personal) networks have been of significant importance. Below the level of top management, there are intensive informal links between employees, even from firms who are competitors”. Informal contacts were also highlighted by Kreiner and Schultz (1993), who performed a small study on knowledge sharing in the Danish R&D biotechnology industry. Based on 16 interviews of researchers and research directors in university and industry, Kreiner and Schultz (1993) found that individuals liberally shared information that was even of a confidential nature with others in their personal networks. Macdonald and Williams (1993) conducted a survey of 125 individuals working in the science and

engineering sectors. They found that individuals who were ‘gatekeepers’ (as explained in Box 2.1) within their organisations were more likely to engage in external information sharing. These individuals shared information with others with whom they had a personal relationship.

Box 2.1 *Technological Gatekeepers: Definition and Role*

> Literature has established a strong role of technological gatekeepers in learning and innovation process. Allen and Cohen (1969) defined gatekeepers as individuals who were better acquainted with technological developments and maintained a greater degree of contacts with internal and external sources of information. Allen (1977) observed that gatekeepers acquire information about the latest scientific and technological developments and had the ability to disseminate it to the relevant parts of the organisation. The term ‘technological gatekeepers’, therefore, referred to the concept of the ‘gate’ through which information and technological developments flows into the organisation (Whelan, Teigland, Donnellan, & Golden, 2010).

Liebeskind, Oliver, Zucker, and Brewer (1996) found that external collaboration in publications by individuals was not governed by formal contracts or agreements between their firms. Rather, informal networks allowed individuals to acquire information and resources with ease and speed, without entering into formalities. Continuing the work on informal information exchange, Bouty (2000) investigated the knowledge exchange decisions of thirty eight R&D supervisors and researchers in France through a case study approach. In this study, the decisions regarding with whom to exchange resources (such as information) were examined in informal relationships. First, in contrast to some of the previous studies, she found that individuals only exchanged information that they did not consider to be confidential. Second, individuals exchanged information with people with whom they were mutually acquainted and were not direct competitors.

Box 2.1 highlights the role of gatekeepers in learning and development of scientific and technical communities. The power of knowledge workers in the labour

market is largely built on their ability to solve problems and deal with rapidly changing technology (Benner, 2003). Knowledge workers are constantly being market tested for the relevance of their skills and the ability to resolve complex organisational problems (Davenport, 2005). The dramatic pace of innovation in *Silicon Valley* was attributed to the rapid and open diffusion of knowledge through the efforts of individual knowledge workers (Saxenian, 1994). Informal networking in the *Silicon Valley* was mainly developed through professional associations, which had grown rapidly in the 1990s amongst high-level entrepreneurs, engineers, programmers, and people in a range of more mid-level occupations. Saxenian (1994) explained the phenomenon as:

> Silicon Valley is remarkable in the extent to which shared practices are rooted not in a single firm or workplace, but spread within a broader technical community in the region as a whole. Many workers in the technology cluster are identified with the pursuit of technological knowledge, or with their particular skill, craft, or occupation, rather than their current work site or product. The cross-firm social interactions allowed people with similar interests and experiences to come together in various users' groups and hobbyists' clubs. (p. 28)

Thus, knowledge workers, in order to remain competitive, strive for knowledge and develop skills and expertise by being a part of various communities and networks. According to Maskell (1998), the creation of informal information sharing relationships takes time, starting from the exchange of general information to the reciprocal trade of work-specific know-how. Reciprocal exchanges make a relationship stable and develop a climate of trust in which more useful information sharing occurs. Lissoni (2001) takes Maskell's viewpoint of sharing useful information in informal contacts and claims that "

diffusion of tacit knowledge requires the pre-existence of a community of people, rich in social links and endowed with a common cultural background" (p.1480). Lissoni (2001) further argues that such communities emerge through long acquaintance and shared cultural background, and help each other through personal rather than inter-organisational arrangements. See Box 2.2 for details of the Lissoni (2001) study.

Box 2.2 *Knowledge Flows through Epistemic Communities by Lissoni (2001)*

Lissoni (2001) conducted a study in the Brescia (Italy) mechanical industry cluster to investigate the transfer of technical knowledge between firms through social contacts of engineers. Using survey data from 200 engineers from different firms in the cluster, he found that more than 50% of engineers had social contacts with engineers in other firms. Out of these, 15% of the engineers have had technical discussions with their social contacts (i.e. engineers) in other firms. Only a limited number of engineers (i.e. 4.5%) had exchanged specific information on project matters with their social contacts. Based on the results of the study, Lissoni (2001) concluded that knowledge circulate within a few smaller communities through networks of contacts, centered around individuals. These individual centered communities were based on mutual trust and reputation and emerged as knowledge diffusion and creation places; allowing engineers to share technical knowledge freely.

The informal information sharing studies have indicated that informal networks of individuals can play an important role in learning and information transfer across organisational boundaries. It appears that employees even share useful information through informal means that are not approved of or prescribed by the management (Schrader, 1991). This may be due to the reason that knowledge workers need to be aware of the latest thinking and development in their areas of work. Further to the work of Lissoni (see Box 2.2), many other researchers argue that technical employees develop informal networks to get access to creative ideas and new ways of doing things (Cummings, 2004; Teigland & Wasko, 2003). In a study conducted by Teigland (2000,

as cited in Teigland & Wasko, 2003), one programmer reported his informal information sharing behaviour in the following manner:

> But most importantly, I have my network from the internet. I've been in this for four years so really there is a core clique of people who know each other and who trade secrets with each other. We pass over the nondisclosure agreements of different companies all the time and trade company secrets. (p. 265)

Informal information sharing is not restricted to non-competing firms, but may also (or particularly) occur between rival firms under specific conditions (Hamel, Doz, & Prahalad, 1989; Sattler, Schrader, & Lüthje, 2003; von Hippel, 1987). It is reasonable to assume that many useful contacts are found in competing firms, because they use similar machineries and equipment, or produce similar goods (Schrader, 1991). The next section discusses how competing and non-competing firms allow their employees to share valuable (firm-specific) information across firms in specific circumstances. These studies have shown that informal information trading (through employees' personal networks) develops under the condition of technological uncertainty and the desire for collective innovation among firms.

### 2.7.1. Informal Information Trading

Many researchers claim that high value information (including proprietary information) is also shared in informal networks of professionals (Allen, 1983; Appleyard, 1996; Lundvall, 1992; Saxenian, 1994; Schrader, 1991; von Hippel & von Krogh, 2003). These studies indicate that social ties and cross-firm connections of professionals work as useful channels of information and information transfer across

organisations, when there is a high degree of market uncertainty and firms are willing to minimise risk through collective innovation.

von Hippel (1987) was the first person to document the trading of useful firm-specific information among technical employees in competing mini-mill firms of the US steel industry. He observed that employees frequently shared valuable know-how about production processes, even with direct competitors, with the support and approval of top management (von Hippel, 1987). The details of the von Hippel study are provided in the inset Box 2.3.

Box 2.3 *von Hippel (1987) Analysis of Informal Know-How Trading*

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| von Hippel (1987, p. 291) defined know-how trading as the "extensive exchange of proprietary know-how by informal networks". He interviewed plant managers and other managers in eleven firms in the US steel mini-mill industry regarding their informal know-how trading practices. von Hippel found that out of the eleven firms only one did not routinely trade any proprietary know-how and this firm was considered to be an outlier in terms of know-how trading by some of the other firms. The participants of the study reported that "they were not giving know-how for free, rather they were consciously trading information whose value they recognized" (p. 295). von Hippel also found some evidence of informal information trading in other US industries, such as aerospace and waferboard manufacturing mills. |

Extending the work of von Hippel (see Box 2.3), Schrader (1991) also found abundant evidence of informal information sharing in the steel industry of USA. Schrader found that employees of the directly competing and non-competing firms frequently shared firm specific know-how to get similar information in return. See Box 2.4 for details about Schrader's study. Schrader (1991) explained that employees made their decisions to trade information based on the economic costs to the firm.

While explaining the process for informal information trading (see Box 2.4), Schrader (1991) summarised that the information transfer decision of the individuals were based on the: 1) nature of competition between firms, 2) difficulty of accessing

information from alternative sources, and 3) perceived value of information. While roughly 29% of the transfers were between competing firms, Schrader found that individuals did not trade information if their employing firms were directly competing. However, 72% of the respondents indicated that their chances of receiving information would increase after the provision of information. Schrader concluded that "it is the incremental change in the likelihood of receiving information that was economically beneficial to the firm and was important in determining the benefit to a transfer" (Schrader, 1991, pp. 165-166).

Box 2.4 *Schrader (1991) Views on Informal Information Trading*

Schrader (1991) surveyed 294 middle-level technical managers in 127 firms in US specialty steel and mini-mill industry. The study found out that "employees frequently gave technical information or advice to colleagues in other firms, including direct competitors" (p. 153). Schrader described the process as when an employee in the production process faced technical problems and was unable to resolve it; the person activated his personal network and called a colleague in another competing firm, who was using similar production equipment. The colleague in the other firm provided the information by making a careful analysis of the relative disadvantage to his firm through provisioning of the requested information.

In another study, Appleyard (1996) investigated the informal information sharing patterns in the semiconductor industry. In a survey of 134 respondents from a non-random sample, Appleyard found that colleagues in other companies were the most important sources of external technical information. Due to uncertainty in the semiconductor industry (e.g. the useful life of a new technology), the employees of competing firms shared technical information on a frequent basis. Appleyard (1996) concluded that uncertainty in the market developed a context for informal information collaboration among professional colleagues.

Further work on informal information trading by Teigland and Wasko (2003) found significant evidence of informal information trading between employees of

various technology firms. They concluded that sharing of valuable firm-specific information through informal contacts of employees improved the performance of the firms. Dahl and Pederson's (2004b) study suggested that engineers who had social and personal relations with engineers in other firms had higher chances of acquiring knowledge from these contacts. Dahl and Pederson (2004b) regarded informal information trading between employees of different firms as important channels for knowledge diffusion and better performance of firms in the technology cluster.

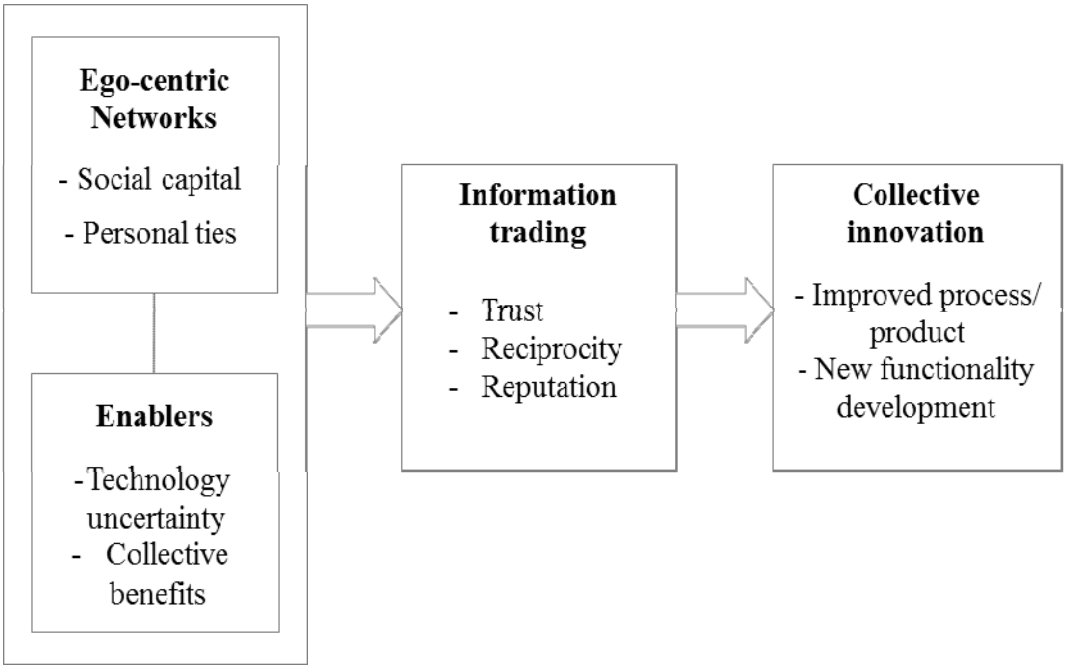


*Figure 2.4.* Informal information/know-how trading.

Figure 2.4 summarises the process of informal information/know-how trading. The crux of the informal information trading research is that information is diffused through social (personal) networks of individuals. These information exchanges between individuals are done in specific contexts for a variety of reasons. Technological uncertainty and collective innovation develop a context for informal information collaboration among individuals (Schrader, 1991; von Hippel, 1987). Technology companies as well as technical workers in these companies understand that their power

in the rapidly changing market is largely dependent upon their ability to deal with market uncertainty and keep abreast with the new technology. Moreover, the information sharing relationships between individuals are built on trust, reciprocity, and reputation.

The information flows through informal information trading between technical employees of competing and non-competing firms are considered positive in the informal information sharing literature. One may broaden this understanding by also including the exchange of business know-how by managerial personnel. For instance, "information regarding valuable business opportunities, new patent applications, distribution channels (of unfamiliar regional markets), or knowledge of appropriate support programs have a great potential to contribute significantly to the competitive position of a firm" (Schwartz & Hornych, 2010, p. 7). However, some researchers point out the downsides of such informal information transfers between firms (Mansfield, 1985, Schrader, 1991).

Mansfield (1985, p. 219) labels diffusion of technical information via informal channels as "leakage of information" and argues that this might be one of the reasons many firms are facing difficulty in appropriating the benefits of their innovations. Schrader (1991) suggests that firms should evaluate whether the transfer is a trade or leakage, that is, whether transfer of firm-specific information through informal information trading can cause benefit or harm to them. Schrader, however, does not specify objective measures to make such evaluations. In an extension of their own work, von Hippel and Schrader (1996) studied the possibility of putting in place a structure for informal information sharing between firms and investigated the likelihood of managing know-how trading. The details of their study are presented in Box 2.5.

Box 2.5 *Managing Informal Information Trading (von Hippel & Schrader, 1996)*

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| von Hippel and Schrader (1996) investigated the possibility of managing the process of informal information trading in order to minimise potential losses to the firms whose employees were engaged in such practices. They interviewed designated information trading experts (oil scouts) in the oil exploration industry to further develop an understanding of the issues involved in informal information trading between competing firms. von Hippel and Schrader (1996) observed that there were 'specified trading norms' in the oil exploration industry to guard against the misappropriation and misuse of the information. Moreover, only senior managers (i.e. who were capable of evaluating the proprietary value of information) were legitimated to decide whether to trade information of particular high (competitive) value. In conclusion, von Hippel and Schrader found that oil scouts continued to trade information (of high value) with colleagues in rival firms, without the approval of the management. |

von Hippel and Schrader's (1996) evidence of managed information trading (see Box 2.5) through *oil scouts* in the oil exploration industry suggested that the attempt to manage informal means of information sharing was not a good idea. They found that the appointment of oil scouts by the firms to informally trade geological information was ineffective. Since oil scouts were only trained finders of information and they did not use the information themselves, they were unable to understand the contents of the information and thus, were not effective in their actions. It can be argued that the idea of managing informal information is not good and the decision to share knowledge should be left to the persons who are the actual producers or consumers of the information.

Firms may have substitutable information or knowledge, and they may arrive at the solution sooner or later. If the receiving firm or individual can easily develop similar know-how in-house, or if the same information is available from other sources, disseminating information may not create disadvantage for the transferring firm (Schrader, 1991). Instead, it will help to develop robust knowledge sharing relationships between information trading partners. One can suggest that firms may leave the decision of sharing information and knowledge to their employees and trust that they will

consider the interest of the firm when sharing information and knowledge. Putting too many constraints in place (as evident in Box 2.5 that management structures were introduced) and trying to protect information within boundaries may have negative repercussions. Schrader (1991) summarised this information sharing and protection tension as:

> Firms that make their boundaries impenetrable to informal information transfer, however, may prevent not only leakage of information, but also its acquisition. Opening a firm's boundaries to allow information trading can create economic benefits, though entailing the risk that employees exchange information against the firm's interests. However, it is advantageous if employees are aware of when to exchange and when to hide information and if they act accordingly. (p. 169)

The informal information trading studies indicate that professionals' information and know-how sharing relationships are based on personal choices, rather than being prescribed by the organisations. Such relationships can be described as social or informal networks (Cross & Cummings, 2004; Hansen, 2002; Reagans & McEvily, 2003). The next section investigates the role of informal networks in information and knowledge sharing among individuals. It explains how such networks provide a platform for advancing individual and collective knowledge (Nonaka & Konno, 1998) and form the basis for the development of EGKNs.

### 2.7.2. Informal Networks and Knowledge Sharing

The fluid nature of knowledge and the fact that knowledge cannot be constrained within boundaries and structures emphasise the need for knowledge sharing irrespective of the formalities, hierarchies, structures, and organisational boundaries. This suggests

that formal structures may not accurately reflect the true working relationships between individuals and thus may not be able to fully exploit the knowledge sharing potential between individuals. Recent trends in KM highlight that the creation and integration of knowledge can no longer be confined within the formal boundaries of the organisations. Increasingly, informal networks of employees (that span organisational boundaries and formal structures) are at the forefront of knowledge creation, problem solving, and innovation. However, the question exists: How do socially connected individuals collaborate and share work-specific knowledge in the absence of organisational structures and control mechanisms?

Informal networks exist in many forms both within and outside organisations providing opportunities for individuals to create their own 'Ba' for advancing individual and collective knowledge. However, people do not automatically share their knowledge in informal networks (Reagans & McEvily, 2003). Szulanski (2000) found that one of the reasons for knowledge being sticky (i.e. resides in the cognitive system of individuals) was that knowledge sources were not motivated to share their knowledge. Knowledge sharing occurs to the extent that individuals believe their knowledge is valuable and it is in their best interest to share (Wasko & Faraj, 2005). Researchers agree that the decision to share information should be made by the knowledge workers as they are the ones who know better what to share, what not to share, and with whom to share (Davenport, 2005).

The examples of these informal networks include social networks (e.g. Facebook, Linkedin, Myspace), communities of practice (Lave & Wenger, 1991), networks of practice (Brown & Duguid, 2001), and virtual professional communities (Chiu et al., 2006; Kankanhalli et al., 2005). Understanding the process of knowledge sharing in these networks may help to understand how individuals make choices

regarding what, when, and with whom to share. Some researchers argue that individuals participate in professional communities and networks of practice with the expectation to develop a good reputation and strengthen their social ties (Chen & Huang, 2007; Chiu et al., 2006; Wasko & Faraj, 2005). Nonetheless, there may be several other reasons for participation in such communities and networks. The next section provides a review of the knowledge sharing process in communities of practice and professional networks to develop the basis for explaining the mechanism of informal knowledge cooperation in the EGKNs of professionals.

#### 2.7.2.1. Knowledge Sharing in Communities of Practice (CoP)

People having common interests and need to learn in specific areas of knowledge develop their own learning space (i.e. 'Ba'). Lave and Wenger (1991) describe such learning space as a community of practice (CoP). In a CoP, people informally gather for joint sense-making and problem solving through sharing of experience and knowledge (Lave & Wenger, 1991; Wenger, 1998). Joint sense-making and experience sharing develop shared understanding among members of a CoP (Wenger & Snyder, 2000, p. 139). The shared understanding about problems and solutions help CoP members to work more effectively in their jobs (Lave & Wenger, 1991). Moreover, through engaging in shared practices and collective problem solving members of a CoP build strong interpersonal ties (Lave & Wenger, 1991; Wenger, 1998). These stronger interpersonal ties may lead to the development of personal knowledge sharing relationships among individuals, known as ego-centered networks (Cummings & Cross, 2003).

CoPs allow exchange of knowledge between individuals through social relationships and face-to-face meetings. In view of this, many CoPs are likely to operate within organisations and local settings. Nonetheless, members may not get all the

required information and knowledge to solve problems merely through organisational sources from co-located colleagues (Teigland & Wasko, 2003). They acquire new ideas and information through their external network connections, which they bring into the discussions of their local (within organisation) CoPs (Teigland & Wasko, 2009). The new ideas and know-how acquired from outside the organisation result in innovative solutions and performance improvement (Teigland & Wasko, 2003; 2009). Individuals who participate in internal knowledge sharing networks (i.e. CoPs) may also connect with the professional networks and external sources of knowledge. In this way, CoPs extend across organisational and geographic boundaries and allow people to learn through engagement in social practice across the globe (Wenger, 1998).

#### 2.7.2.2. Knowledge Sharing in Electronic Networks of Practice (ENoP)

In applying CoP framework to cross-firm learning processes, Brown and Duguid (2001) introduced the term networks of practice (NoP) which was further developed by others as electronic networks of practice (ENoP) or online communities (Chiu et al., 2006; Kankanhalli et al., 2005; Wasko, Faraj, & Teigland, 2004). In this thesis, the term ENoP is used to refer to all sorts of computer-mediated information and knowledge sharing networks. ENoPs are similar to traditional CoPs in the sense that they provide social space where individuals working on similar tasks may collaborate and share knowledge. However, there are some considerable differences. Interactions in CoPs are typically face-to-face, whereas ENoPs provide a virtual interface and online forums for interactions. In most CoPs, members belong to the same workplace and the network size is small. In ENoPs, participation can be huge and members belong to different

workplaces and geographical regions. ENoPs are not limited by size constraints, and membership is typically voluntary and open, unlike CoPs.

Through ENoPs, people in common professions with similar work practices share information and know-how across organisations. The unique characteristic of such ENoPs is to connect hundreds of geographically dispersed individuals. They can share information regardless of their demographic characteristics and organisational affiliations. Knowledge within ENoPs can be considered to be more of a public good since all interactions between members are generally visible to all members (Wasko & Faraj, 2005). Individuals may benefit from these networks by gaining access to the new information, expertise, and ideas that are often not available inside their organisations. Nevertheless, individuals voluntarily participate in ENoPs and share less valuable information with others (Wasko et al., 2004). In view of this, ENoPs allow less personal familiarity as personal information is limited to what an individual wishes to voluntarily disclose, and thus individuals develop weak ties after initial participation in these networks. Relationships grow with the passage of time and initial weak ties are converted into stronger ones, resulting in a more valuable information exchange.

Nonetheless, valued knowledge sharing relationships in ENoPs develop and are sustained over time through reciprocal exchanges of information (Wasko et al., 2004). When members no longer engage in generalised exchange and focus on reciprocal exchanges of specialised knowledge with selected members, ENoPs help to form a closed group of known individuals (Wasko et al., 2004). Although some researchers do not favour such closed groups and claim that knowledge becomes redundant in tightly knit groups (for example, Burt, 2004; Granovetter, 1973), Lissoni (2001) observe that effective knowledge sharing occurs in small communities where individuals connect

with each other through interpersonal ties, trust, and reputation. These small groups can be referred to ego-centered knowledge networks (EGKNs) of professionals.

#### 2.7.2.3. Ego-centered (Personal) Knowledge Networks

Knowledge cannot flow in informal networks unless knowledge seekers and knowledge providers are willing to collaborate and share their knowledge. Even if the receiver is willing to help, the source (transmitter) may not gain any benefit from the relationship if the receiver is not to offer any substantial advantage (Schrader, 1991). This suggests that for successful information collaboration both the source and the receiver must be willing to share and have something to offer in return of the received favour. This leads to the concept of EGKN, which is developed through long-term social capital that can provide structures to cooperate for information and knowledge sharing.

EGKNs are based on trust, norms, and reputation; provide opportunities for seeking, arranging, and integrating specialised knowledge for problem solving and performance. Through participation in CoPs and other professional networks, knowledge workers establish personal ties with people with whom they need to collaborate for a detailed discussion on problem solutions (Wasko et al., 2004). EGKNs share characteristics of CoPs and ENoPs as they allow individuals to share information and knowledge for problem solving. Unlike ENoPs where there is no direct reciprocity or obligation, EGKNs are structured through norms of reciprocity, that is, “either through increasing the beneficiary’s obligation to reciprocate or through receiving the beneficiary’s esteem or both” (Constant, Kiesler, & Sproull, 1996, p. 121). Nonetheless, EGKNs are interpersonal closed networks. In this thesis, these closed interpersonal networks are termed as ego-centered knowledge networks (EGKNs). This thesis defines *EGKNs as networks of professionals who are connected through social means in order*

*to mutually coordinate work-related information and knowledge for problem solving and task performance.*

EGKNs are developed around individuals from a variety of professions and knowledge domains who are connected to share specialised know-how and expertise to solve each other's work-related problems. Figure 2.5 shows that EGKNs are developed through interconnected knowledgeable individuals from different communities and networks. Unlike many CoPs, an ego-centered network is not restricted to an organisation and uses information and communication technologies to develop a wider communication network. Moreover, EGKNs are different from ENoPs in the sense that they center around an individual and not for a specific set of practices (Cummings & Cross, 2003). Though people in ENoPs share a common repertoire of concepts and discourses rooted in practice, they lack the intensity of social interaction and trust, which are essential for useful knowledge sharing.

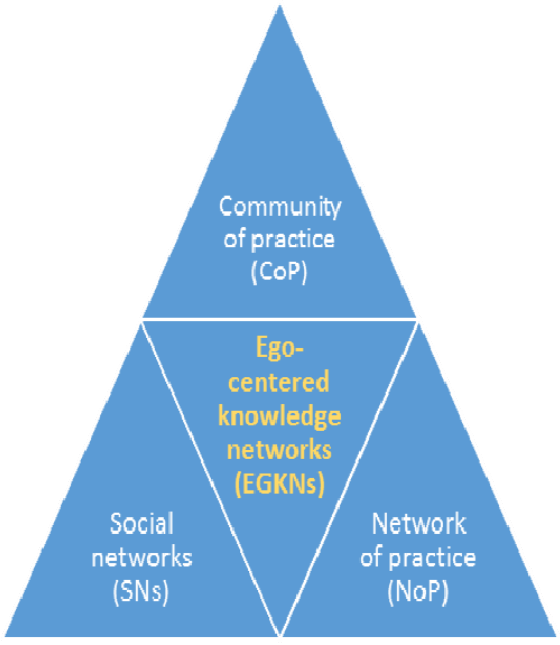


*Figure 2.5.* Ego-centered knowledge networks of professionals (EGKNs).

Formal channels may not truly reflect the working relationships between individuals, and therefore, they are not likely to encourage the informal exchange of knowledge between individuals (Allen et al., 2007). Social and personal networks of individuals provide opportunities for integration of diverse expertise beyond prescribed structures and formal boundaries of the organisation (Fleming, & Frenken, 2007; Kogut & Zander, 1992; Kreiner & Schultz, 1993). EGKNs have the ability to serve as vital conduits of knowledge flows (Jarvenpaa & Majchrzak, 2008; Teigland & Wasko, 2003). In view of this, EGKNs can be multi-disciplinary and include ties within the same organisation or may exist elsewhere in a variety of occupations and work contexts. Moreover, EGKNs allow individuals to develop ties across organisational and geographical boundaries and improve their ability to innovate (Cross & Parker, 2004).

Gaining access to a specialist's advice for problem solving can not only save time and cost but also improves performance. However, internalising pieces of external knowledge is not straightforward. A certain level of *absorptive capacity* is required (Cohen & Levinthal, 1990). Cohen & Levinthal (1990, p. 128) define absorptive capacity as "the ability of a firm to recognise the value of new, external information, assimilate it, and apply it to commercial ends". Since, individuals are central to organisational knowledge creation (Nonaka & Takeuchi, 1995; Grant, 1996), they can play an important role in building absorptive capacity of a firm by integrating external knowledge into the existing knowledge base of the firm.

Informal knowledge sharing research highlights two important qualifiers to determine the extent to which an individual is willing to participate in informal networks. First, participation in informal networks for knowledge sharing requires a high level of skills and understanding (i.e. absorptive capacity) to take advantage of the external knowledge (Cohen & Levinthal, 1990; Dahl & Pedersen, 2004a; Reagans &

McEvily, 2003). Second social relationships are important to share knowledge more useful knowledge is share in closed network that are based on interpersonal relationships.

## 2.8. Conclusion

This chapter highlights the difference between information and knowledge and argues that human (tacit) knowledge can be effectively shared through informal (personal) means. It consolidates evidence on how informal (personal) contacts of professionals provide access to technical know-how that can enhance collective learning and work performance. A review of the literature on informal networking and information trading studies suggests that individuals consciously trade information and advice for collective gains. Information trading studies highlight that inter-organisational information sharing develops through informal cooperation among individuals under the conditions of technology uncertainty and the desire for collective gains. These studies, however, do not imply how informal knowledge collaboration develop and sustain in the absence of preconditions, such as uncertainty or the desire for collective innovation among firms.

The literature review also indicates that the demand for non-redundant and specialist knowledge encourages knowledge workers to collaborate and share knowledge beyond the prescribed structures and organisational mechanisms. One of the examples of such informal knowledge cooperation is the existence of EGKNs of professionals. EGKNs develop through informal information sharing and participation of the individuals in communities of practice and professional networks. While the chapter answers RQ1 and highlights the role and significance of EGKNs in sharing work-specific knowledge beyond structures and prescribed channels of organisations, the process of knowledge coordination and integration in the EGKNs of professionals is

unclear. The next chapter highlights theories and the relevant literature to uncover the process of knowledge coordination and integration among loosely coupled groups of individual in the absence of organisational structures and formal control mechanisms.

# CHAPTER THREE

## SOCIAL EXCHANGE, SOCIAL CAPITAL, AND TMS

The previous chapter has highlighted the role of informal (personal) networks in the diffusion and transfer of knowledge among individuals. It has explained how EGKNs of knowledge workers are developed through prior contacts and/or participation in communities of practice and electronic and professional networks. To further investigate the process of informal knowledge cooperation in EGKNs, this chapter discusses theories of social learning, social capital, and transactive memory system (TMS). It highlights that social exchange and social capital theories develop the context for knowledge cooperation in the absence of organisational structures and other pre-conditions (such as uncertainty). It also investigates the application of TMS theory in the EGKNs of professionals for providing structures to coordinate and integrate knowledge in the absence of organisational control mechanisms.

Researchers argue that knowledge collaboration in informal networks depends on: willingness (whether the person is willing to collaborate for knowledge sharing) (Borgatti & Cross, 2003; Chiu et al., 2006; Reagans & McEvily, 2003), management of risks involved in sharing knowledge (Cross et al., 2001; Hansen, 1999; Schrader, 1995), and the ability to identify (i.e. who knows what) and integrate diverse expertise (i.e. knowledge coordination) (Brandon & Hollingshead, 2004, p. 633; Lewis, Lange, & Gillis, 2005). This proposes the application of social exchange theory (Blau, 1964) to explain mutual dependence, of social capital theory (Coleman, 1988; Nahapiet & Ghoshal, 1998) to manage fears of misuse, and of TMS theory (Wegner, 1987; Wegner, Giuliano, & Hertel, 1985) to provide mechanisms for coordination and integration of diverse expertise.

## 3.1. Social Exchange Theory and Informal Knowledge Sharing

Social exchange theory (SET) helps to understand informal exchange relationships between individuals. Social exchange occurs when a person gives favour to another person, and the former is motivated to return the favour (Blau, 1964; Constant et al., 1994; Cropanzano & Mitchell, 2005). Blau (1964) explains the social exchange process as:

> When people are thrown together, and before common norms or goals or role expectations have crystallized among them, the advantages to be gained from entering into exchange relations furnish incentives for social interaction, and the exchange processes serve as mechanisms for regulating social interaction, thus fostering the development of a network of social relations and a rudimentary group structure. (p. 90)

This quote indicates that people create groups or network structures through social exchanges and develop norms of exchanges based on expectations of benefits. SET assumes that people make rational decisions regarding their relationships by comparing alternatives and perceived costs and benefits. SET thus defines a framework through which individuals develop and maintain social relationships in order to get mutual benefits. It can help individuals to share resources including knowledge.

Researchers have used SET to study the behaviour of individuals regarding information and knowledge sharing (Constant et al., 1994; Jarvenpaa & Staples, 2000; Molm, 2001). For instance, Constant et al. (1994) used SET to understand the attitudes and behaviours of employees about information and knowledge sharing in organisations. They found that information sharing create feelings of obligation and expectations on both sides. Information seeker may feel an obligation to return the

favour and knowledge provider expect to get similar help in future. Constant et al. (1994) work was extended by Jarvenpaa and Staples (2000), who used SET with contextual aspects (such as information culture and task interdependence) and technology factors (such as use of electronic media) to determine individuals' behaviours towards information and knowledge sharing in organisations.

Jarvenpaa and Staples (2000) not only acknowledged the role of SET in exploring the determinants of information sharing but also indicated that "Constant et al. theory is an important piece of work that has yet to receive the attention that it deserves in the information and knowledge management literature" (p. 148). They suggested that SET has a broader application to understand the social context and information culture that affect information sharing behaviours of individuals (Jarvenpaa & Staples, 2000). After Jarvenpaa and Staples's study, many other researchers used SET to understand the knowledge-sharing behaviour of individuals in social and electronic networks (for example, Hall, 2003; Kankanhalli et al., 2005; Shore, Coyle-Shapiro, Xiao-Ping, & Tetrick, 2009; Tiwana & Bush, 2001). These researchers argue that knowledge sharing has a cost and people expect something in return in order to further develop and sustain exchange relationships.

In a social exchange, both the receiver and the transmitter assume costs. For instance, receiver may incur obligation cost, while the transmitter (source) incurs the cost of the actual resource transferred. Therefore, it is reasonable to think that one may expect benefits out of the social exchange transaction (Kankanhalli et al., 2005; Molm, 2001). The decision of a source to share knowledge can be based on estimated cost and profit. It the expected benefits (rewards) are higher than the costs people are likely to engage in a social exchange (Molm, 2001). However, not all knowledge sharing transactions are made on this principle. People do share knowledge for benevolence,

reputation, identity, and other intrinsic or extrinsic motivators, such as monetary reward, recognition, and status (Ardichvili, 2008; Bartol & Srivastava, 2002; Bock, Zmud, Kim, & Lee, 2005; Hsu, Ju, Yen, & Chang, 2007).

Nonetheless, social exchanges create feelings of obligations and general expectations of return. In the absence of any reward or recognition structure, the norms of reciprocation develop between people or in groups of people after a couple of social exchanges (Cropanzano & Mitchell, 2005). In other words, social exchanges are glued with expectations of return. The obligations and expectations in social exchanges keeping people together for collective benefits (Blau, 1964).

### 3.1.1. Role of Reciprocity in Social Exchange

Social exchange works on the principle of incurring and discharging obligations. When a person does another a favour (by making a social transaction, for example, helping in a work-related matter) an obligation occur on the receiving person (Blau, 1964). Exchange relations evolve if the receiving person discharge this obligation and provide similar help to the giving person (Molm, 2003). Obligation cost is a negative outcome that a person may perceive after receiving help from peers. Molm (2003) refers to this cost, that is seeking knowledge from others entails the need to repay back in the future, as obligation that needs to be returned in future. This is expected in a social exchange that individuals must release their debts or discharge their obligations in order to continue receiving help in future (Blau, 1964; Constant et al., 1994; Cropanzano & Mitchell, 2005). Therefore, reciprocity turns out to be a central concept in a social exchange relationship.

Reciprocity is important to maintain a give and take relationship as people expect favours to be returned (Zhang & Epley, 2009). It also plays a crucial role in building information and knowledge sharing relationships among individuals by

eliminating feeling of distrust and misappropriation (Kankanhalli et al., 2005; Wasko & Faraj, 2005). Norms of reciprocity create an enabling environment in which the actors feel strong obligation to reciprocate the favour (Zhang & Epley, 2009). Molm (2001) identifies three specific exchange structures based on reciprocity: (1) direct reciprocity, (2) generalised reciprocity; and (3) productive reciprocity.

In generalised reciprocity, as in the case of ENoPs (Wasko & Faraj, 2005), there is indirect reciprocity, that is, actors helping each other without expecting return directly from the person they helped. For example, if 'A' helped 'B' and 'B' helped 'C', and then 'C' would help 'A' instead of 'A' expecting return from 'B' or 'B' would expect a return from 'C' (Molm, 2001). Direct reciprocity involves two actors who are mutually dependent. In productive reciprocity, both parties must participate in making a joint decision. Direct reciprocity creates mutual dependence among interacting individuals since the actions by one leads to a response by the other. Productive reciprocity occurs "where both actors must participate in order to benefit, for example in co-authoring a book" (Molm, 2001, p. 261). In EGKNs, there is a direct or productive reciprocity between sharing partners as people expect to receive help from those they provided favour.

### 3.1.2. SET and Interdependence

Blau (1964) argued that social exchange is distinct from economic exchange due to its unspecified nature and value of obligation. In an economic exchange the value and timing of return is specified before initiating a social transaction. Social exchange relationships, on the other hand, are vague and complex. The value of exchange is not negotiated in advance and a person gives a favour without knowing how and when the other party will reciprocate (Molm, 2003). Describing the social exchange process, Cropanzano and Mitchell (2005, p. 876) state that "the process begins when at least one

participant makes a move, and if the other reciprocates, new rounds of exchange initiate". The relationship develops gradually through an initial act of benevolence and perceptions of fair exchange and reciprocity (Molm, 2003). Thus, SET provides a framework in which behaviour of an individual is contingent on the action of others (Blau, 1964).

SET has broader application in predicting and explaining interpersonal relationships and exchange behaviours of individuals (Hall, 2003). It explains how interdependence is developed among socially connected individuals through exchange relationships. Interdependence refers to the extent to which individuals rely on one another as sources of unique benefits (Molm, 2003). The interdependence of individuals creates a context in which collaboration can be achieved through coordination and combination of distributed resources. In view of this SET can help to explain the underlying framework of knowledge sharing between socially connected individuals. SET assumes that mutual dependence through reciprocal exchanges builds stronger interpersonal relationships and develops the feelings of trust among interacting parties (Molm, 2003).

### 3.1.3. The Ego-centric Social Exchange Process

In social exchange, the initiator of a transaction bears the risk that the return may either not happen at all or the true value of the favour may not be reciprocated. This vagueness in the social exchange process is highlighted by the fact that the provider does not have the means to control the value of exchange relationships. The value of the favour has to be left on the discretion of the receiver. In view of this, social exchanges are prone to risk and uncertainty as the initiator of a social exchange process does not know whether the exchange relationship will sustain or it brings expected benefits. Thus, the risk factor affects the willingness of an actor to engage in social transactions

(Molm, Takahashi, & Peterson, 2000). In view of this, frequent reciprocal exchanges strengthen the social bonds between individuals and eliminate fears of misuse (Shore, Coyle-Shapiro, Xiao-Ping, & Tetrick, 2009).

Many economic exchanges develop through ongoing relationships of trust and commitment, indicating a broader application of the social exchange relationships (Shore et al., 2009). This suggests that long-term social exchange relationships facilitate the exchange of other valuable resources (this may also include knowledge). In summary, social exchange creates obligations, norms of reciprocity, and long-term social relationships between the giver and the receiver (Shore et al., 2009). Nonetheless, social exchange develops over time when both parties develop norms to reciprocate favours. Norms of reciprocation, in turn, develop interpersonal relationships between exchange partners through feelings of trustworthiness and commitment.

Researchers argue that long-term exchange relationships require repeated occurrences of resource exchanges and social bonds between interacting parties (Blau, 1964; Cropanzano & Mitchell, 2005). Since the social exchange creates social bond through mutual dependence, “social capital is created and sustained through social exchange” (Nahapiet & Ghoshal, 1998, p. 41). Social capital has its significance in minimising risk and protecting social exchanges from misappropriation and misuse.

## 3.2. The Role of Social Capital in Informal Knowledge Collaboration

Social capital is a key concept in understanding sharing of resources between socially connected individuals (Inkpen & Tsang, 2005; McFadyen & Cannella, 2004; Nahapiet & Ghoshal, 1998). Social capital is “the aggregate of resources embedded within, available through, and derived from the network of relationships possessed by an individual or a social unit” (Inkpen & Tsang, 2005, p. 151). Mcfadyen and Cannella (2004) highlight that structure of social ties provides access to the resources, while the

closeness in relationships allows actual usage (or sharing) of the resources. This suggests that social capital has many distinguished features to facilitate the acquisition and sharing of resources.

Social capital and informal knowledge sharing are interrelated because social capital provides necessary condition of trust and mutual dependence to affect the ability of an individual to access and use jointly held resources. Social capital can contribute to develop a relationship of trust, reduce opportunistic behaviour, and increase the value of exchange (Coleman, 1988, 1990; Granovetter, 2005). Social capital is developed through investment of time and attention in social relationships (Coleman, 1988; Sobel, 2002). However, in contrast to other types of capital (i.e. human capital or physical capital), social capital has some specific features. For instance, the social capital results from a relationship of at least two individuals, who cannot realise the benefits of social capital independently of each other.

The literature presents three dimensions of social capital (Inkpen & Tsang, 2005; Nahapiet & Ghoshal, 1998): (a) structural dimension; (b) cognitive dimension; and (c) relational dimension. The structural dimension provides a general pattern of relationships between actors and defines the configuration of ties (i.e. who is connected with whom). The cognitive dimension represents shared understanding achieved through shared goals and values. The relational dimension represents the degree of trust and trustworthiness between socially connected individuals.

Social capital researchers argue that all the three dimensions of social capital contribute to the development of resource sharing structure among socially connected individuals (Inkpen & Tsang, 2005; Nahapiet & Ghoshal, 1998; Tsai & Ghoshal, 1998). For instance, the structural dimension provides an explanation about how members of a network are connected (i.e. who is connected with whom). The cognitive dimension

provides an understanding of shared culture and interpretations of ideas using common language. The relational dimension of social capital highlights the role of trust and trustworthiness in the formation of knowledge sharing relationship among socially connected professionals. Key points from the literature on the contribution of all the three dimensions of social capital in knowledge sharing are provided in the Table 3.1. The roles of different dimensions of social capital in informal knowledge cooperation among individuals are explained in the upcoming sub-sections.

Table 3.1 *The Literature Discussing Various Dimensions of Social Capital*

| **Authors** | **Structural dimension** | **Cognitive dimension** | **Relational dimension** | **Nature of research** |
|---|---|---|---|---|
| (Coleman, 1988) | Network structure | Social norms, information channels | Obligations, expectations, and trust | Social capital in the creation of human capital |
| (Burt, 1997; 2000) | Network structure | - | - | The value of social capital |
| (Tsai & Ghoshal, 1998) | Social networks | Shared vision | Trust and trustworthiness | The role of social networks in value creation |
| (Nahapiet & Ghoshal, 1998) | Network ties, network configurations | Shared goals and language | Trust, expectations | Social capital and organisational advantage |
| (Inkpen & Tsang, 2005) | Network ties, network configurations | Shared goals, shared culture | Trust and trustworthiness | Social capital and knowledge transfer |
| (Wasko et al., 2004) | Network centrality | identification | Loyalty, norms | Knowledge sharing in ENoPs |
| (Chow & Chan, 2008) | Social network | Shared goals | Social trust | Organisational knowledge sharing |
| (Chiu et al., 2006) | Social interaction ties | Common goals and language | Trust, norms, identification | Knowledge sharing in ENoPs |
| (McFadyen & Cannella, 2004) | Network structure | - | Strength of interpersonal ties | Knowledge creation through social capital |

### 3.2.1. Structural Dimension of Social Capital and Knowledge Sharing

The structural dimension of social capital indicates the structure of relationships among the network members (Nahapiet & Ghoshal, 1998). It involves patterns of relationships between the network members, such as, network ties that deal with the specific ways the actors are connected. When two actors interact, this forms a tie between them, which is a measure of either a weak or a strong relationship. The strength of tie determines how actors get opportunities for resource sharing (Burt, 2000). Tie strength is defined as a "combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and reciprocal services" (Granovetter, 1973, p. 1361). Thus, a higher frequency of personal interactions and reciprocal exchanges represents a stronger relationship (Peltokorpi, 2008). Strong ties can provide reciprocal transfer of knowledge in both directions (Marsden & Campbell, 1984). Further, strong ties are easily accessible, reliable, and reduce uncertainty to share useful knowledge (Granovetter, 1983; Krackhardt, 1992; Hansen, 1999).

Nahapiet and Ghoshal (1998) observe that stronger ties develop among network members with the passage of time but such ties restrict members to accept new ideas and diverse opinions. Gulati (2007) confirms this view and indicates that people in closed networks hold strong ties but such networks may contain redundant information. This view is in agreement with the Granovetter's (1973) weak ties theory, which emphasises the role of weak ties in seeking new information. This is because weak ties can connect individuals in many different networks and organisations and can provide them access to resources outside a limited circle. Other researchers also claim that weak ties are important channels for obtaining fresh ideas. This is because people, who are densely connected and meet frequently (as being part of a firm), may possess redundant

knowledge (Constant, Kiesler, & Sproull, 1996; Teigland & Wasko, 2003; Wasko et al., 2004).

Nonetheless, studies examining the significance of informal networks highlight that both strong and weak ties are important (Burt, 2000; 2004; Granovetter, 1973; 1983; Gulati, 2007; Hansen, 1999; Krackhardt, 1992). The combination of weak and strong ties leads to efficient knowledge sharing among interacting actors (Hansen, 1999). Weak ties can help to search useful knowledge, whereas strong ties help in the transfer of complex knowledge (Hansen, 1999). EGKNs evolve around individuals and contain diversity in relationships (i.e. both strong and weak ties). Tie diversity in EGKN is likely to provide the focal individual with complementary resources, access to new information, and means to transfer useful knowledge for problem solving and task performance.

### 3.2.2. Cognitive Dimension of Social Capital and Knowledge Sharing

Cognitive social capital refers to the development of cognitive elements (e.g. shared meaning, representations, and logical interpretations), which allow communication to occur between individuals. Informal information sharing (as discussed in section 2.7) confirms that creativity occurs by combining information from diverse sources. However, the incoming information needs to be processed in cognitive systems (e.g. human brain) in order to be meaningful. This relates to shared understanding and the fact that effective knowledge sharing could occur, if an external piece of information seamlessly integrate with the already understood concepts of the underlying cognitive system (Inkpen & Tsang, 2005). In view of this, shared understanding is the degree of understanding that evolves between dyads within a

network to link pieces of information in order to create knowledge (Gulati, 2007). This can promote mutual understanding of the value that can be created through cooperation and exchange of ideas and resources in a network.

The cognitive dimension also represents the shared goals and common understanding of the rules and values between the network members (Nahapiet & Ghoshal, 1998). Shared goals enable group members to work together in order to accomplish joint tasks. Members of an organisation usually work towards a common goal set by management, although they may also have to fulfill certain personal goals related to their own compatibility in the knowledge market. In the case of EGKN, where members often belong to different organisations, shared understanding of the work contexts may be difficult to achieve. However, the members of EGKN develop a shared understanding as to how should they interact and what value can be created through cooperation and knowledge sharing. They know each other's areas of expertise through communication and informal exchanges of information, and recognise that the combination of diverse knowledge can lead to joint problem solving and knowledge creation (Davenport, 2005).

Nonetheless, the cognitive dimension of social capital does not appear fully applicable in EGKNs of professionals (due to the absence of shared goals and organisational context), thus leaving room for TMS to fill this gap. TMS can develop shared understanding by integrating expertise of the EGKN members through ad-hoc knowledge collaboration. TMS is a broader concept that not only refers to a human cognitive system but also allows integration of distributed memories in many cognitive systems (i.e. human brains) (Wegner, Erber, & Raymond, 1991). Aspects of the cognitive social capital (i.e. shared understanding and distributed cognition) are covered in the TMS theory, which is explained in the section 3.3.

### 3.2.3. Relational Dimension of Social Capital and Knowledge Sharing

The relational dimension of social capital represents the depth and breadth of a person's relationships (Nahapiet & Ghoshal, 1998). The depth and breadth in social relationships indicate how well people trust in their social (personal) ties. Similarly, the quality of an exchange relationship depends upon how well the trust is developed between the interacting parties (Tsai & Ghoshal, 1998). Abrams, Cross, Lesser, & Levin (2003, p. 65) define trust as "the willingness of a party to be vulnerable against the actions of the other party in an exchange relationship, makes it less costly and assures that knowledge gained will be better practically applied". In knowledge networks, trust is gained through frequent interactions and long-term relations (Inkpen & Tsang, 2005). Inkpen and Tsang (2005) argue that frequency creates a common language and simplifies the communication, while the time dimension makes interpersonal relations more open and may decrease their (the members of the network) efforts to protect their knowledge and skills.

Within a CoP, as members interact and share their knowledge, trust increases among them. As a result, members show more willingness to share knowledge. Thus, motivations to share knowledge are argued to be the expectation of stronger knowledge sharing relationships among members (Davenport & Prusak, 2000). Trust plays a key role in knowledge sharing (Kramer & Cook, 2004). Over time, as trust develops so does the opportunities for knowledge transfer between connected individuals. However, trust takes time to build in informal knowledge exchange relationships, starting from exchanging information of limited value to more useful sharing of ideas (Kramer & Cook, 2004). When trust is high, interacting parties may be more likely to share

knowledge that is more useful or valuable to them. They also rely on the information and advice of others and use them for solving their work-related problems.

Table 3.2 *Types of Trust*

| **Type of Trust** | **Definition of Trust** | **Context of the study** |
|---|---|---|
| Benevolence | "Interest in the well-being of others... allows one to query in-depth without fear of damage to self-esteem" (Abrams et al., 2003, p. 65) | Trust in knowledge sharing networks in an organisational setting |
| Competence | Allows one to feel confident about the knowledge and expertise of the provider (Abrams et al., 2003) | Trust in organisational knowledge networks |
| Cognition | Builds on first impression rather than repeated personal interactions (McKnight, Cummings, & Chervany, 1998) | Initial trust formation in organisational relationships |
| Interpersonal | "The willingness of a party to be vulnerable to the actions of another party" (Mayer et al., 1995, p. 712) | Trust in organisational settings |
| Identification based | Parties know and appreciate each other's needs and this understanding is developed to the extent that each can effectively act for the other (Lander, Purvis, McCray, & Leigh, 2004) | Trust-building mechanisms between managers, team members, users over the course of a project |
| Reciprocation trust | Trust is created through reciprocal exchanges (Coleman, 1990) | Knowledge sharing as a social exchange process |

Researchers argue that knowledge collaboration depends on the perceptions of trust and positive feelings about the intentions and behaviours of others (Abrams et al., 2003; Mayer et al., 1995; McEvily et al., 2003). However, trust is a multi-dimensional construct and it has different types in varying contexts (Abrams et al., 2003; Kramer & Cook, 2004). It is crucial to understand the relationship between different types of trust

in relation to the knowledge sharing behaviours of individuals. While there are different forms of trust, and they may vary accordingly, they are nevertheless related to each other (Mayer, Davis, & Schoorman, 1995). Table 3.2 summarises different forms and relationships of trust in various knowledge sharing networks.

Different types of trust may evolve into other deeper types of trust. For instance, identification based trust evolves because the parties know and appreciate each other's needs and this understanding is developed to the extent that each can effectively act for the other (Lander et al., 2004). Identification trust can be transformed into interpersonal and benevolence trust (Jarvenpaa & Leidner, 1998; Kramer & Cook, 2004; Paul & McDaniel, 2004). Similarly, interpersonal trust eliminates fears of misconduct and opportunistic behaviours and can also transforms into competence-based trust to ensure the validity of the received knowledge (Abrams et al., 2003; Kramer & Cook, 2004). The competence trust is further discussed in the TMS literature in section 3.3.

Networking research has identified the role of benevolence trust in reducing perceived risks of sharing knowledge (McEvily, Perrone, & Zaheer, 2003; Tsai & Ghoshal, 1998; Zaheer et al., 1998). However, in situations of mixed motives, that is, when goals and objectives are different, benevolence cannot be assumed. The lack of benevolence creates suspicion in the intensions and motivations of others (Kramer & Cook, 2004). In these situations, people develop a situation specific cognitive assumptions about the motives and interests of others that may cause damage to one's own interests (Jarvenpaa & Majchrzak, 2008). These assumptions alert professionals for possible alternative (or harmful) motives of others regarding misappropriation (i.e. taking undue benefits of the shared knowledge) (Heiman & Nickerson, 2004) or causing harm to the reputation of the knowledge provider (Scott & Geoff, 2005).

## 3.3. Role of Distrust in Knowledge Sharing

As discussed in section 3.2.3, trust plays a key role in developing informal knowledge collaboration among socially connected individuals. Interpersonal trust refers to the extent a person rely on the intentions of others and is willing to accept the vulnerability in the act of sharing knowledge with others (Mayer et al., 1995). However, in mixed motive knowledge collaboration, people also develop negative assumptions about the behaviours and conducts of others, known as distrust (Jarvenpaa & Majchrzak, 2008). Lewicki, McAllister, and Bies (1998, p.44) argue "…distrust expectations anticipate injurious conduct" of others. People develop the feeling that others will not act according to their rational self-interests. In this way, trust and distrust may work together in a knowledge sharing relationship.

The literature suggests that trust and distrust can both work in parallel and play an important role in determining an individual's knowledge sharing behaviour. Since members of EGKN belong to different organisations and work contexts, perceptions of distrust exist. As indicated by Jarvenpaa and Majchrzak (2008, p. 260), "individuals may generally trust members of their inter-organisational ego-centered networks in terms of member competence, but distrust them in terms of their own interests". The perceptions of distrust affect the decision of knowledge sharing with colleagues. The confident negative assumptions (i.e. distrust) about the conduct of others can help to avoid disadvantageous knowledge sharing (Jarvenpaa & Majchrzak, 2008; Lewicki et al, 1998).

Jarvenpaa and Majchrzak (2008) suggest that individuals manage the concerns related to knowledge sharing with informal contacts by using the knowledge of their TMS. TMS not only provides structures to coordinate and integrate external knowledge but also helps individuals to decide (based on the know-how of other's areas of

expertise) what knowledge can be shared and with whom it can be shared (Jarvenpaa & Majchrzak, 2008). The next section discusses TMS theory and its use in the development of informal knowledge collaboration among EGKN members.

## 3.4. Transactive Memory System (TMS)

Wegner defines TMS as "a set of memory system that help individuals or groups to perform task efficiently by retrieving and combining information from interconnected individual memory systems" (1987, p. 190). TMS consists of organised information held by group members and transactive processes to coordinate and integrate information possessed by individual groups members (Wegner et al., 1991). The organised information includes information held in the memory system of each group member and the transactive processes include know-how about information held by others and the mechanisms to combine this information to complete a joint task (Liang, Moreland, & Argote, 1995; Mohammed & Dumville, 2001; Moreland & Myaskovsky, 2000). TMS considers it an extension of individuals' memory system by including memories of others as an aid to their memory systems (Ashleigh & Prichard, 2012; Jackson & Klobas, 2008; Wegner, 1987; Wegner et al., 1991). This system contains a directory of 'who knows what' and how the diverse knowledge can be combined to solve problems collectively (Hollingshead, 1998b; 2004; Hollingshead & Fraidin, 2003).

TMS has been studied in contexts where individuals need to work collaboratively and combine diverse information and knowledge to do complex tasks. While transactive memory exists in the minds of individuals, a TMS develops among group members through cooperation and integration of individual memories of each of the group members (Hollingshead & Brandon, 2003; Wegner et al., 1991). A TMS formation begins when people (assuming they have their own specialisation) learn about

self and other group members' expertise and develops ability to coordinate and combine expertise of others to perform a joint task. The TMS concept consists of three components: specialisation (expertise in some form of knowledge), credibility (trust in others' knowledge), and coordination (ability to combine diverse specialised knowledge) (Lewis, 2003; Lewis et al., 2005). The three components provide structures to support information and knowledge cooperation among people or groups who work together to accomplish complex tasks.

## 3.5. TMS and Knowledge Sharing

TMS theory was first developed to describe the cognitive division of labour between intimate couples to obtain information for solving day-to-day information related problems (Wegner et al., 1985). Wegner et al. (1991) argued that such information coordination also occurred in groups of individuals. TMS has been mainly studied in organisational groups and teams to understand how information and knowledge are coordinated and combined by individuals to perform complex tasks (Hollingshead & Brandon, 2003). In organisational work groups, TMS start working when members of the organisation learn about areas of expertise of others and accept responsibility to work in a specific area or knowledge domain, and able to coordinate and combine expertise of other group members (Hollingshead & Brandon, 2003).

TMS helps in the division of cognitive labour (specialised knowledge) and integration of knowledge from many differentiated domains. The decision to coordinate and combine information is affected by the understanding of self-expertise and perceptions about relative expertise of others to do a specific task. In TMS, individuals contribute with their knowledge and expect that others will contribute their relevant expertise in solving a problem jointly (Hollingshead, 2000; Wegner et al., 1991). This suggests that a TMS works when people who are mutually dependent on each other's

knowledge to accomplish a task. Moreover, the task is complex and people accept the responsibility to specialise in a specific domains and willing to combine their relevant expertise when needed to solve problems (Hollingshead & Brandon, 2003). TMS makes knowledge less redundant among members of a group through assigning and coordinating specialised knowledge from diverse sources (Brandon & Hollingshead, 2004; Hollingshead & Brandon, 2003).

Evidence of TMS formation has been demonstrated in dyads, works groups, and teams in organisations. Few scholars have also drawn on TMS theory to explore knowledge collaboration in inter-organisational groups of socially connected individuals, who work to achieve common objectives (Jarvenpaa & Majchrzak, 2008). The next sub-sections present a review of the literature of the development and functioning of TMS at various levels and categories, that is, between couples and dyads, organisational groups, social and inter-organisational groups of individuals.

### 3.5.1. TMS in Couples and Dyads

TMS develops when two or more people collaborate to accomplish task through coordination and combination of their individual transactive memories (Wegner, 1987). Wegner (1987, p. 189) suggested that “one person has access to information in another’s memory. This allows both people to depend on communication with each other for the enhancement of their personal memory storage”. Wegner et al. (1991) conducted a research on 59 intimate couples in a laboratory setting and found that intimate couples showed efficient use of transactive memory in storing and recalling information than pairs of strangers. However, this view of information storage and retrieval between individuals is a limited perspective of TMS. A broader view of TMS suggests that an individual relies on the knowledge of other individuals to accomplish a task (Hollingshead, 1998c).

Hollingshead (1998a, 1998c) investigated application of TMS using a sample of 49 couples and discovered that intimate couples working face-to-face performed better than intimate couples working via a computer system. She further observed in another study that individuals learned relatively more in their own area when they believed their partners hold specialisation in other specific areas and that TMS structure was most differentiated when individuals remembered different experiences and expertise (Hollingshead, 2000). This is further confirmed by Hollingshead and Brandon (2003), who argued that integration of differentiated information resulted in faster learning and problem solving. These studies provided evidence that TMS had been used to describe the integration of individual memory systems between couples and dyads. Moreover, TMS has positive performance implications among people who have long acquaintance and meet face-to-face.

### 3.5.2. TMS in Teams and Organisations

TMS works when group members collaborate and effectively use transactive memories of self and peers to do a joint task (Lewis, 2003). TMS can help to explain information sharing and coordination behaviors of individuals in groups. Group members can share and integrate non-redundant information available among different group members by allowing each group member to specialise in an area of knowledge and combine this knowledge with the specalised knowledge of others (Brandon & Hollingshead, 2004; Mohammed & Dumville, 2001). Awareness of other people expertise and their willingness to share knowledge enhance learning opportunities among team members.

TMS can offer many benefits to groups working collaboratively in joint and complex tasks. Through sharing knowledge and experiences members of a group not only learn about areas of expertise of other members but understand the value of

cooperation in getting access to the larger pool of information and knowledge to resolve complex problem situations (Hollingshead, 1998a; Wegner, 1987). Individuals do not need to specialise in many different knowledge areas rather they need to learn how relevant information and knowledge can be coordinated from diverse sources. In this way, redundancy of knowledge can be reduced and people can get access to the novel knowledge from diverse sources through transactive processes of knowledge coordination and integration (Peltokorpi, 2008). The coordination and combination of diverse expertise reduces the amount of cognitive labour (i.e. the amount of information or knowledge one need to acquire and retain for completing a task) from each individual and still allow them to access larger pool of information and knowledge across differentiated domains (Brandon & Hollingshead, 2004).

Nonetheless, TMS is based on the assumption that group members assume their individual responsibility in TMS and willing to share their relevant expertise to perform joint tasks (Hollingshead & Fraidin, 2003; Wegner, 1987; Wegner et al., 1991). Most obviously, responsibility will be assigned to the person perceived to be an 'expert' in a particular domain; however, identification of expertise and assigning or accepting responsibility for a specific knowledge domain is not a straightforward process. Assigning responsibility of a domain knowledge may be based on anything of surface characteristics (such as age, gender, company designation) to the actual know-how of the areas of expertise of an individual (Wegner et al., 1991). Moreover, even if the person is willing to accept responsibility of a specific knowledge domain, it is not necessary that the person is the real expert in that particular knowledge area (Brandon & Hollingshead, 2004).

The various issues and factors in the development and effective functioning of TMS indicate that achieving performance through TMS in organisational teams and

groups is not an easy job. This may also contend that organisational teams and formal groups may not be the ideal structures to study the development and functioning of TMS. It appears that TMS studies may have painted an overly optimistic picture by investigating it in formal groups and organisational team members. Jarvenpaa and Majchrzak (2008) argue that TMS is a concept that is worth exploring beyond organisational teams and formal structures. As modern organisations are increasingly transitory and unstable in their formal structures (Cummings & Cross, 2003), it may be the informal structures that can provide more stable basis for TMS.

### 3.5.3. TMS in Informal (Personal) Networks

TMS requires certain pre-conditions to develop and allow people to coordinate and combine information and expertise. First, there needs to be mutual dependence among group members to accomplish task. Second, group members' agree to hold responsibility for specific domains of knowledge and are willing to contribute their knowledge. Third, task in hand is complex and require coordination and integration of knowledge from differentiated domains (Hollingshead & Brandon, 2003). This suggests that TMS could work in organisational groups and teams that work together in prescribed structures of an organisation. Nonetheless, these conditions may not exist in groups of individuals who are socially connected. Anand, Manz, and Glick (1998) studied the application of TMS theory among different work groups in an organisation. Their study showed that employees in different work units maintained a 'know-who' directory by knowing each other's areas of expertise and use these directories to coordinate and integrate information and expertise (which is not available to them in their work units) from personal sources to resolve non-routine problem situations. Anand et al. (1998) study suggests that TMS can be used to describe information search and retrieval processes in social (personal) networks of individuals.

The basic idea to study TMS in social (personal) networks of individuals is that expertise is distributed among people and one can utilise differentiated expertise by having interpersonal awareness of other people knowledge provided that there exist the ability to coordinate and combine diverse knowledge (Hollingshead, 1998b). The memories of collaborative individuals aggregate to form a knowledge network (Barnier, Sutton, Harris, & Wilson, 2008). As discussed in section 3.5.1, TMS develops among individuals who have close relationship or long-time acquaintance. Similarly, people in interpersonal networks (i.e. EGKN) know each other for a longer period of time; it is likely that they know about each other's areas of expertise. Moreover, interpersonal awareness of others' knowledge helps in developing a knowledge network (Akgün et al., 2005).

The idea of knowledge coordination through interpersonal awareness of other people areas of expertise has been investigated by Jarvenpaa and Majchrzak (2008). They observed that individuals gather actionable information through their informal networks using TMS based structures. Individuals (having their own knowledge specialisation) develop know-how about relevant expertise in specific knowledge domains from their personal knowledge networks. As members know each other's areas of expertise (specialisation), they develop the ability to coordinate relevant information from their informal (personal) contacts. The level of TMS in informal (personal) networks of professionals helps them coordinate and integrate work-specific information for problem solving and collective learning (Jarvenpaa & Majchrzak, 2008).

## 3.6. Conclusion

This chapter highlights the potential enablers of informal knowledge collaboration in the EGKNs of professionals. It explores SET, social capital, and TMS

theories to explain the process of informal knowledge sharing process among socially connected individuals. While researchers have highlighted the role of social capital in knowledge sharing, there is no clarity as to how individuals use social capital to coordinate and integrate information and knowledge from diverse sources in the absence of organisational mechanisms. TMS theory has explained the transactive processes of coordination and integration of human knowledge and expertise in differentiated knowledge domains.

The ability to coordinate diverse expertise through TMS can reduce cognitive burden of individuals to acquire and hold information and expertise from differentiated domains and provide them access to the extended pools of knowledge. However, efficient TMS functioning in socially connected groups of individuals depends upon several factors. Prior studies on TMS indicate that task interdependence and shared goals are essential elements for knowledge collaboration. This suggests that people need to be interdependent and be motivated to share information and knowledge. However, interdependence and joint problem solving cannot be assumed in EGKNs of professionals. In view of this, social exchange theory provides a glue to hold people together and norms of reciprocity provide the motivation to share information and knowledge in the absence of organisational mechanisms.

Professionals take into account the mixed motives and conflicting interests of EGKN members while making informal knowledge collaboration with them. The trust in the competence of a knowledge source does not help to reduce uncertainty in acquiring and integrating knowledge from the knowledge source (Jarvenpaa & Majchrzak, 2008). Nonetheless, for effective TMS development, members not only need to trust in the competence of others but also believe in the benevolence and integrity of the knowledge source (Ashleigh & Prichard, 2012). Social capital can help

to provide conditions of trust and trustworthiness among groups of socially connected individuals.

The relational dimension of social capital (i.e. interpersonal trust) and cognitive dimension (shared understanding of the context) help professionals in eliminating fears of the misconduct and opportunistic behaviours others. The relational dimension influences the ability of professionals to acquire the right knowledge from the right person, while the cognitive dimension affects the combinative skills and help to integrate diverse information and knowledge. In addition, the structural dimension of social capital connects knowledgeable individuals together and thus influence the condition of accessibility (Nahapiet & Ghoshal, 1998). In this way, all the three dimensions of social capital are linked to provide a basic structure for informal knowledge collaboration among socially connected individuals.

The major gaps identified in the understanding of informal knowledge collaboration (in the entire literature review i.e. Chapter 2 and Chapter 3) are presented as under:

1. The difference between information and knowledge is not clear in the TMS literature. Most researchers refer to TMS as a system of combining memories of individuals for the purpose of coordinating and integrating information. There is a little understanding about how knowledge, which resides in the minds of individuals, can be combined to improve performance.
2. The enablers of informal knowledge collaboration among socially connected individuals are not well established. The review indicates that professionals participate in knowledge networks and communities of practice, but they are more likely to share useful knowledge in their closed interpersonal networks.

The process of informal knowledge collaboration in the EGKNs of professionals is not clearly understood.

3. The social capital of individuals has been overly taken as an effective mechanism for information and knowledge sharing between individuals. The links between structural, cognitive, and relational dimensions of social capital and informal knowledge sharing are not clearly mentioned in the literature. Research is scant to answer how social capital helps to coordinate and integrate knowledge of socially connected individuals.
4. TMS has been studied in dyads, organisational groups, and project teams where members combine their knowledge to perform tasks jointly. Few researchers have successfully explored the development of TMS among cross-functional teams and informal networks (or EGKNs). There is little understanding of how TMS develop and help to improve performance through coordination and integration of knowledge among socially connected individuals.

The gaps from the literature review identify following research questions:

*RQ1. What contributes to the development of EGKNs of professionals other than formal structures and organisational work processes?*

*RQ2. What enables and sustains informal knowledge collaboration among professionals connected through an EGKN?*

*RQ3. Where TMS-like structures exist in the EGKN of a professional, how do they affect an individual's job performance?*

The next chapter presents hypotheses to answer the above research questions and to fulfill following research objectives:

1. Understand the formation of EGKNs other than prescribed communication channels of an organisation.

2. Investigate the process of informal knowledge collaboration in the EGKNs of professionals.

# CHAPTER FOUR

# CONCEPTUAL MODEL, HYPOTHESES, AND MEASUREMENT

The literature review in Chapter two summarises previous work on informal networking and knowledge sharing between professionals by means of their personal contacts. The process of informal knowledge coordination and integration in the absence of formal structures and organisational mechanisms has been explained in Chapter three through relevant theories. Considering the gaps in the literature and grounding on the theories of social exchange, social capital, and TMS, this chapter presents a conceptual model to encapsulate the process of informal knowledge cooperation in the EGKNs of professionals. Links among various constructs are represented in the model through a number of hypotheses developed in this study. The chapter also outlines operationalisation of the various constructs involved in the study and lists items to measure each of these constructs.

## 4.1. The Conceptual Model

Figure 4.1 shows a model linking various constructs to conceptualise the process of informal knowledge collaboration among socially connected individuals. These constructs are related to informal information sharing, SET, social capital, and TMS. The model predicts that information sharing with EGKN members, norms of reciprocity (developed through social exchanges of information), and interpersonal trust (dimension of social capital) create TMS based structures in the EGKNs of professionals. Such TMS provides transactive processes for knowledge coordination and integration in the absence of formal structures and organisational mechanisms.

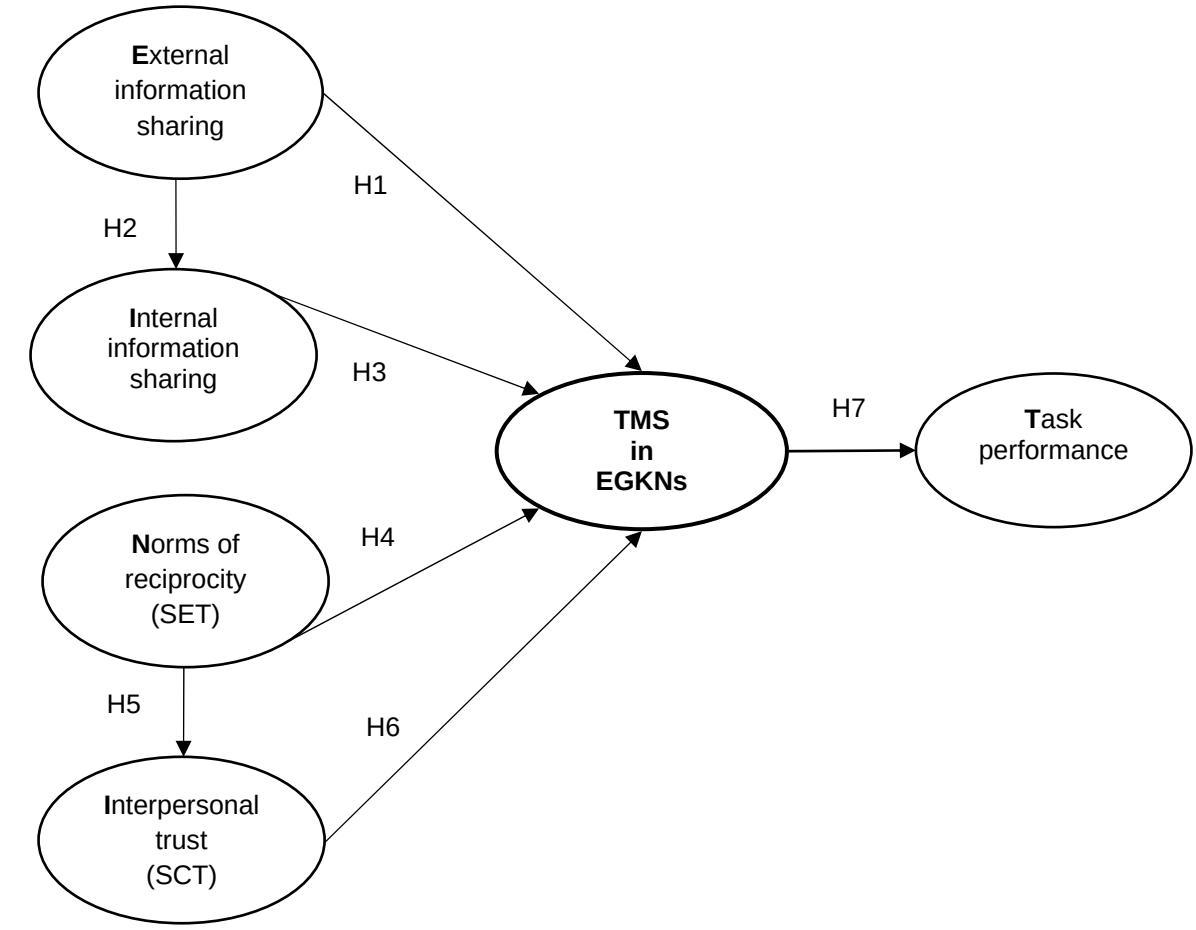


*Figure 4.1.* Conceptual model.

The subsequent sections discuss the links highlighted in the model (Figure 4.1) and formulate hypotheses of this study. Operationalisation of constructs and measurement items are also discussed at the end.

### 4.1.1. External Information Sharing and TMS Development

A general conclusion can be drawn from the literature review presented in the previous chapters that employees develop frequent contacts for informal information sharing both within and across organisational boundaries. However, individuals make choices for ad-hoc knowledge collaboration by deciding from whom they would seek potentially useful knowledge as well as with whom they would share their knowledge. These choices are primarily based upon their knowledge about the expertise of their

network members. EGKN of an individual comprises of people from diverse groups and knowledge domains. The focal individual need to know 'who knows what' in the network and who to contact to resolve a specific problem situation (Macdonald & Piekkari, 2005). Knowing about the locus of expertise (i.e. knowledge source) provides the basis for knowledge cooperation and the transactive processes of knowledge coordination and integration facilitate the transfer of information and knowledge from internal and external sources.

The TMS literature has discussed the mechanism of coordinating and integrating knowledge from diverse sources (Brandon & Hollingshead, 2004; Lewis, 2003). The TMS literature indicates that expertise utilisation through informal (personal) networking is a function of knowing self and peer expertise and the ability to coordinate and integrate knowledge. Thus, a prerequisite for expertise utilisation requires understanding of the relevant expertise in peers. People are able to know each other's knowledge and expertise if they have worked together in a joint task (e.g. in projects or joint trainings (Liang et al., 1995; Moreland & Myaskovsky, 2000). Team members know about the expertise of their colleagues (Hollingshead, 2000). Training studies show that joint trainings enable individuals to develop an understanding of group members' areas of expertise (Liang et al., 1995; Moreland & Myaskovsky, 2000). In EGKNs, there is a possibility that members have previously worked in a joint enterprise or trained together in specific areas of knowledge. Nonetheless, in the absence of joint trainings, information sharing with EGKN members helps to recognise their areas of expertise and sought out the right person for specific knowledge or advice.

Information sharing enable actors to develop perceptions of other people expertise (Rulke & Rau, 2000). Individuals keep information of other people's expertise based on their past collaborations, known as pathways or directories

(Peltokorpi, 2004). Pathways or directories link distinct sources of knowledge and keep a track of who knows what (Wegner, 1987). In organisational groups or teams, directories can be formed easily since the knowledge or expertise of many individuals are known because they accept the responsibility to work in specific domains (Wegner, 1987). Nonetheless, expert recognition is a continuous process that keeps on building over time. Professional colleagues working in competing firms face problems of similar nature during their work (Schrader, 1991). Information sharing with them keeps on building the 'know-who' directory of the individuals and improve ability of an individual to coordinate knowledge from relevant sources.

As discussed in previous chapters, the external connections of knowledge workers are instrumental to acquire innovative ideas and problem solutions. Informal information trading studies (as discussed in section 2.7.1) indicate that external information sharing helps them in identifying the locus of expertise to solve a problem and improve ability of individuals to access specialised knowledge from a variety of sources. Hence, it can be argued that external information sharing enables individuals to know about each other's knowledge and expertise and increases the level of their TMS by building their ability to coordinate and combine information and specialised knowledge from diverse sources.

*H1: External information sharing improves the level of TMS held by individuals in their EGKNs.*

### 4.1.2. Link between External and Internal Information Sharing

People working in the same organisation often possess similar or redundant knowledge (Granovetter, 1973; Teigland & Wasko, 2003). Teigland and Wasko (2003) highlighted that reliance on co-located workers for new ideas and problem solutions, resulted in lower levels of creativity. The literature review in the previous chapters

indicates that individuals develop extensive informal contacts outside their work organisations and use them to acquire latest information and ideas. Nevertheless, the knowledge coming from outside organisations through informal contacts are difficult to comprehend and to apply in organisational tasks (Teigland & Wasko, 2003). Scholars argue that organisational creativity and performance increases if external knowledge (solutions + advice) is shared within the organisation, for instance, with members of the local CoPs (Teigland & Wasko, 2003; 2009; Whelan et al., 2010). This also allows members of internal CoPs to connect with the external knowledge networks.

The linking of internal CoPs with external networks enables combination of knowledge from different places within the company's local context and foster creativity (Faraj & Wasko, 2001; Teigland & Wasko, 2009; Teigland & Wasko, 2003; Wasko & Faraj, 2005). Nonetheless, a certain level of absorptive capacity is required to process the information internally by making use of the external knowledge (Cohen & Levinthal, 1990). Cohen and Levinthal (1990, p. 128) define absorptive capacity as "the ability of a firm to recognise the value of new external information, assimilate it, and apply it to commercial ends" Thus, individuals engaging in external information sharing should have the ability to coordinate and combine existing knowledge of the firm with novel external knowledge. The literature labels such individuals, who have the ability to gather diverse expertise from external sources and integrate it into the practices and processes of the firm, as gatekeepers (see Box 2.1).

Modern knowledge workers are frequently required to keep themselves abreast of new technology and work in situation where competitive success depends upon adoption of new technology and innovative solutions. They play the role of gatekeepers as they are connected with outside world through the use of information and communication technology (Teigland & Wasko, 2003). Thus, individuals who are

engaged in external information sharing are likely to be involved in the internal knowledge creation processes by transferring their learning in informal networks inside their work organisations.

*H2: Individuals, who share information externally, transfer learning to their internal informal networks.*

### 4.1.3. Internal Information Sharing and TMS Development

Individuals working within an organisation may face similar issues and work challenges in different units or parts of the organisation (Brown & Duguid, 2001). They may exchange information and advice relatively easier than engaging with the external sources of knowledge. Internal information sharing allows flow of ideas (or knowledge) more readily as compared to the external sources of knowledge. This is because colleague in other parts of the organisation probably has already worked and resolved similar problem situation. Instead of trying to acquire the required knowledge from external sources, knowledge workers may arrange it internally and engage the person (i.e. internal knowledge source) to resolve their problem situations.

The searching and acquiring firm-specific knowledge from organisational sources (through informal contacts) can be relatively easier when compared to knowledge coordination from extra-organisational sources. Individuals are able to easily develop and maintain the 'know-who' directory and get ready access to the relevant knowledge experts. Moreover, the coordination and combination of knowledge is less complicated due to shared work context and knowledge processes. Thus, it can be suggested that internal information sharing through informal contacts helps individuals to improve their level of TMS by developing ability to coordinate and combine expertise of others.

*H3: Internal (intra-organisational) information sharing improves the level of TMS held by individuals in their EGKNs.*

### 4.1.4. Norms of Reciprocity and TMS Development

The literature review in the previous chapters has highlighted reciprocity as an important enabler for developing long-term exchange relationships. Reciprocity in social exchange relationships develops a transactional pattern of interdependent exchanges, that is, a person who gets favourable treatment fulfills obligation and returns the favour to further establish the exchange relationship (Cropanzano & Mitchell, 2005). If reciprocity is prevented permanently in social relationship, the reputation of agents suffers and the entire exchange relationship is expected to become weaker, resultantly the likelihood of transferring valuable knowledge decreases (Macdonald, 1992). Thus, norms of reciprocity create obligations to share knowledge and strengthen the exchange relationships among socially connected groups of individuals (i.e. EGKNs).

As discussed in section 3.4, one important condition for TMS development is interdependence, that is, reliance on others to complete a task. The SET literature in section 3.1 indicates that norms of reciprocity through repeated social exchanges develop interdependence among socially connected individuals. Reciprocal interdependence reduces risk in informal exchange of knowledge and encourages cooperation since a favourable action by one party leads to similar response by another party (Molm, 2001). Thus, norms of reciprocity create interdependence between network members in the absence of formal task dependence. The mutual give-and-take relationships facilitate coordination and integration of knowledge in the absence of formal organisational mechanisms. It is therefore predicted that norms of reciprocity

improve the level of TMS in EGKNs of individuals by increasing their reliance on each other for information and knowledge. So, the hypothesis states:

*H4: Norms of reciprocity increase the level of TMS held by individuals in their EGKNs.*

### 4.1.5. Link between Norms of Reciprocity and Interpersonal Trust

Exploitation or misuse of the provided information is an extreme negative feeling that may prohibit information and knowledge sharing (Empson, 2001). People are concerned with the misuse of their shared knowledge, or they do not rely on the information sharing motives of the interacting party (Riege, 2005). Knowledge sharing may incur significant cost due to the misuse of information by the receiving party (Inkpen & Tsang, 2005; Schrader, 1995). The risk is even higher in informal interorganisational information or knowledge collaborations between individuals. The literature (see section 3.2.3) highlights the role of trust in reducing fear of misconducts by others and fostering knowledge sharing relationships among individuals (McEvily et al., 2003; Zaheer et al., 1998). Morover, repeated exchanges of information establish trust among members of a network that their current act of helping others will be reciprocated, and they will get help in the time of need (Chiu et al., 2006; Wasko & Faraj, 2005).

People are willing to share their knowledge when they trust that their act of sharing will be reciprocated through similar favours (Bock et al., 2005). As discussed in section 3.2.3.1, interpersonal trust is necessary for information and knowledge sharing as it helps to overcome fears of misconduct and opportunism (Abrams et al., 2003; Levin & Cross, 2004). Moreover, in an exchange relationship, one should trust that the receiving party will reciprocate the favor (Blau, 1964). The frequency of reciprocal exchanges also increases trust in the goodwill of other party and can lead stronger

exchange relationships. Thus, trust is seen as an important factor in guiding knowledge sharing behaviours of individuals, and the vice versa. It is expected that norms of reciprocity establish interpersonal trust among interacting parties to allow them coordinate and share work-specific knowledge.

*H5: Norms of reciprocity increase the level of trust between socially connected individuals.*

### 4.1.6. Interpersonal Trust and TMS Development

EGKNs members may have different motives to share knowledge. The multiple motives of individuals affect knowledge sharing decisions of individuals (Brandon & Hollingshead, 2004; Jarvenpaa & Majchrzak, 2008; Peltokorpi, 2008). As discussed in section 3.3, professionals hold perceptions of distrust about the behaviours and knowledge sharing intentions of others in mixed motive situations of knowledge collaboration. While holding perceptions of distrust, they do not rely much on the information and knowledge received from others and also consciously decide with whom to share and what to share (Jarvenpaa & Majchrzak, 2008). The multiple motives of EGKN members affect transactive processes of knowledge coordination and integration and thus impact negatively on the development of TMS in socially connected individuals.

In conditions of distrust and mixed motive, trust can play a crucial role in developing perceptions of trustworthiness in the motives and intentions of others who are collaborating for knowledge sharing. Trust maintains a goodwill between interacting parties and can help to manage risk and uncertainities involved in informal knowledge sharing (Mayer et al., 1995; Tsai & Ghoshal, 1998). With high levels of trust, actors are likely to share valuable information and knowledge (McEvily et al., 2003; Nahapiet & Ghoshal, 1998). If individuals trust in the goodwill and motives of others, they spend

less time in evaluating and making judgements about their intentions and freely engage in collaborations with the trusted members of their networks. Conversely, in the absence of trust, people put more efforts in understanding the motives and behaviours of knowledge sources and safeguarding the risk involved in knowledge sharing. Such behaviour will increase transaction costs of knowledge sharing and affect the transactive processes of knowledge coordination and integration (McEvily et al., 2003).

The trust on the competence of others and the beliefs about positive intentions of team members help in developing transactive processes of knowledge coordination and integration in teams (Ashleigh & Prichard, 2012). While seeking knowledge from EGKN members, one need to have perceptions of trustworthiness on the competence of the source and maintains positive feelings that EGKN members will safeguard the interest of the knowledge seeker. Interpersonal trust develops the perceptions of trustworthiness on the motives and conducts of others in the absence of the ability to monitor or control behaviours of others. Hence, interpersonal trust can contribute to the development of TMS among socially connected individuals by influencing the knowledge coordination and integration processes in the absence of formal structures and organisational mechanisms.

*H6: Interpersonal trust increases the level of TMS held by individuals in their EGKNs.*

### 4.1.7. TMS in EGKNs and Performance

The literature review in Chapter two indicates that external knowledge can enhance performance and creativity of both individuals and firms. Individuals who are able to acquire relevant information and knowledge from diverse sources demonstrate superior performance (Whelan et al., 2010). When individuals need advice from peers concerning a specific type of problem situation, they arrange relevant knowledge

through their coordination and integration abilities and solve the problem (Lewis, 2003; Moreland & Myaskovsky, 2000). Thus, TMS may enhance an individual's performance through three major mechanisms:

- Know-how about the locus of expertise that can help to resolve a problem.
- Level of trust in the credibility and authenticity of the knowledge source.
- Ability to acquire expertise from diverse sources.

It is assumed in the study that the three mechanisms can also develop in the EGKNs of professionals, leading to well-coordinated and efficient knowledge collaborations among individuals. The integration of knowledge from existing sources not only allows individuals to save efforts and time; but also make them perform tasks efficiently (Hansen et al., 1999). Nevertheless, previous research on TMS found a positive relationship between TMS and group performance in co-located workers and project teams, who have tight interdependencies in performing tasks (Brandon & Hollingshead, 2004; Cross & Sproull, 2004; Lewis et al., 2005; Oshri, Van Fenema, & Kotlarsky, 2008). However, interdependence is difficult to exist in EGKNs as members belong to different organisations and work contexts, and they are not supposed to work together to achieve common organisational goals (Jarvenpaa & Majchrzak, 2008).

Drawing on the social exchange literature, this thesis suggests that social interdependence (based on norms of reciprocity) together with interpersonal trust and past experiences of information sharing provide a context for TMS development in the EGKNs of professionals. Such TMS facilitate coordination and integration of specialised knowledge from diverse sources and professionals improve their task performance.

*H7: TMS developed in EGKNs of professionals helps in problem solving and improves task performance.*

## 4.2. Operationalisation of Constructs

The conceptual model in Figure 4.1 is made up of various constructs and links drawn from the literature. This section operationalises these constructs and lists measurement items for each of these constructs. Where available, constructs are measured using validated questions from prior studies.

### 4.2.1. Measuring Informal Information Sharing

Measuring interaction between individuals is a multidimensional phenomenon that can be conceptualised and measured across a number of attributes, such as frequency, mode, openness, density, directionality, and so on. In the studies conducted as part of this thesis, interaction and knowledge exchange in EGKN have been operationalised and measured primarily in terms of frequency. The notion of frequency of interaction is an indicator of the intensity of the tie between two persons and has a long academic tradition and many studies have effectively used the frequency measure in different settings (Allen et al., 2007; Granovetter, 1973; Teigland & Wasko, 2003).

The items for measuring external and internal information sharing instances are provided in Table 4.1. Informal information sharing was measured to see its impact on the development of TMS structures in the EGKNs of individuals. Respondents were asked to recall and report frequency of their information sharing instances with their internal and external informal contacts. The responses were recorded on a five point frequency scale developed by Teigland and Wasko (2003). These measures asked respondents to report the frequency of verbal and written communication and the

sharing of data and reports with informal contacts within and outside of their work organisation.

Table 4.1 *Measure of Informal Information Sharing with Informal Contacts*

| Sr. | Items | Description of measurement | Source |
|---|---|---|---|
| ***External information sharing*** | | | |
| | EX_INF1 | This variable measures the frequency of inquiries made by the informal contacts/EGKN members who are outside the organisation | Adapted from Teigland and Wasko (2003) |
| | EX_INF2 | This measures the frequency of verbal information provision on a work-related topic to informal contacts outside the organisation | - |
| | EX_INF3 | This measures the frequency of written information provision formally on a work-related topic to informal contacts outside the organisation | - |
| | EX_INF4 | This measures the frequency of written information provision informally on a work-related topic to informal contacts outside the organisation | - |
| ***Internal information sharing*** | | | |
| | IN_INF1 | This measures the frequency of inquiries made by the informal contacts/EGKN members who are immediate colleagues | Adapted from Teigland and Wasko (2003) |
| | IN_INF2 | This measures the frequency of verbal information provision on a work-related topic to informal contacts within the organisation | - |
| | IN_INF3 | This measures the frequency of written information provision formally on a work-related topic to informal contacts within the organisation | - |
| | IN_INF4 | This measures the frequency of written information provision informally on a work-related topic to informal contacts within the organisation | - |

### 4.2.2. Measuring Norms of Reciprocity

Norms of reciprocity in this thesis are regarded as individuals' beliefs that their current knowledge sharing with EGKN members will be reciprocated. This is derived from Blau (1964), who defines it in the context of social exchanges as: "favors that create diffuse future obligations, not precisely defined ones, and the nature of the return cannot be bargained about but must be left to the discretion of the one who makes it" (p.93). Since EGKN develops around a focal individual, and the person involved has direct links with all members of the personal network, direct questions have been asked from participants to measure their perceptions of reciprocity. Table 4.2 shows items for the measurement of norms of reciprocity that have been adapted from the studies of Chiu et al. (2000), and Kankanhalli et al. (2005).

Table 4.2 *Measuring Norms of Reciprocity*

| **Items** | **Description of measurement** | **Source** |
|---|---|---|
| RCPR1 | This measures the respondents' perceptions that their current knowledge sharing with an EGKN member will increase their ability to acquire knowledge from other EGKN members; whenever he is in need of help | Adapted from Chiu et al. (2000), and Kankanhalli et al. (2005) |
| RCPR2 | This measures the respondents' perceptions whether they feel any obligation when their EGKN members ask for sharing specific knowledge | - |
| RCPR3 | This measures the respondents' expectations whether their current knowledge sharing with EGKN members will help in getting positive response on their future knowledge sharing requests | - |

The study has operationalised norms of reciprocity in EGKNs of individuals based on their perceptions and expectations. This approach is consistent with many previous studies where participants have been asked about their perception of the norms

of reciprocation involved in their information sharing relationships. Examples include Teigland and Wasko (2003), Wasko and Faraj (2005), and Lin et al. (2003).

### 4.2.3. Measuring Interpersonal Trust

In this study, interpersonal trust is defined as the belief of individuals in good intentions, behaviour of other people in their EGKNs that they will always behave according according to their expectations and interests (Tsai & Ghoshal, 1998). This is derived from Mayer's et al. (1995, p. 712) definition of trust as: "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other part". This is consistent with past studies that examined trust as a belief about the dependable and trustworthy behaviour of other person (Kramer, 1999; Mayer et al., 1995; McAllister, 1995; Zaheer et al., 1998). Items for measuring interpersonal trust are shown in table 4.3.

Table 4.3 *Measuring Interpersonal Trust*

| **Items** | **Description of measurement** | **Source** |
|---|---|---|
| Trst1 | This measures an individual's level of trust in the goodwill of EGKN members, whether they will look after interests of the respondent | Adapted from Zaheer, McEvily and Perrone (1998) |
| Trst2 | This measures the respondent's general perception of trust in the goodwill of EGKN members i.e. how much they are trustworthy to share knowledge | - |
| Trst3 | This measures the perception of the respondents about the expected behaviour of their EGKN members i.e. they will always act positively with regard to the knowledge being shared | - |

Following the past empirical research, this study has measured interpersonal trust between knowledge sharing individuals through a self-reported measure adapted from Zaheer et al. (1998). The three-item construct has been developed to measure interpersonal trust between EGKN members (see Table 4.3). Out of these three items, one item is related to measure the predictability of the behaviour of the informal contact, the other item is related measure the perception of fairness in dealing, and the last one directly assessed the level of trustworthiness among EGKN members.

### 4.2.4. Measuring TMS

As discussed in section 3.4, TMS is being used by many researchers in organisational groups and teams working on joint tasks (Hollingshead, 2000; Lewis, 2003; Moreland & Myaskovsky, 2000; Rulke & Rau, 2000). The three dimensions (specialisation, credibility, and coordination) measure TMS by evaluating specialisation of the knowledge source, credibility of the acquired knowledge, and the ability of the receiver to coordinate diverse expertise. Thus, operationalising TMS requires measuring awareness of the expertise (knowledge specialisation) of others, sense of reliability on the competence of knowledge source, and the ability to coordinate relevant task-specific expertise.

TMS measures vary in their levels of measurement and formats of analysis. The level of measurement is the level at which data are gathered. For instance, Liang and colleagues (1995) take level of TMS measurement as a ‘group’. They observe groups of participants interacting together and rate the extent of transactive memory on the basis of group interactions. Interesting research in the social networking literature has begun to measure TMS at the individual level and with items focusing on relations between particular group members. For instance, Lewis (2003) provides individual ratings of specialisation within the group and measures TMS at the ‘individual’ level.

Lewis (2003) outlined three formats that researchers used to measure TMS: recall, observation, and self-report. Early research on transactive memory in dyads tended to use a recall format (Hollingshead, 1998c; Wegner et al., 1991), in which TMS was measured on the "quantity, content, and structure of what participants remember individually and with their partners" (Lewis, 2003, p. 588). The observation format was used by Moreland and Myaskovsky (2000). They asked individuals to observe videotapes of groups and note evidence of the three dimensions of TMS, that is, knowledge specialisation within the groups (i.e. memory differentiation), knowledge trust (group members trust each other's memory), and coordination in group to complete tasks (Moreland & Myaskovsky, 2000). Many recent studies used self-report measures to operationalise TMS (for example, Jarvenpaa & Majchrzak, 2008; Lewis, 2003; Peltokorpi, 2004).

Table 4.4 *Items for Measuring TMS in EGKN*

| **Items** | **Description of measurement** | **Source** |
|---|---|---|
| TMS1 | This measures respondents' general perception about their EGKN members holding specialised knowledge related to some aspects of the their current job | Adapted from Lewis (2003) |
| TMS2 | This measures respondents' specific knowledge about the expertise of their EGKN members in specific areas that can be helpful to their jobs | - |
| TMS3 | This measures the degree of trust in the competence (specialised knowledge) of EGKN members | - |
| TMS4 | This measures the degree of the respondents' ability to coordinate knowledge from EGKN members, who are working with them in the same organisation | - |
| TMS5 | This measures the degree of the respondents' ability to coordinate knowledge of their EGKN members who work in other organisations | - |

Following the recent approach of measuring TMS, the present study has asked from respondents about the existence of TMS in their EGKNs. A five items scale was developed from Lewis's (2003) study. Lewis (2003) measured TMS through three components: specialisation (know about each other's expertise and who in the network has specialised knowledge that can help to perform one's task), competence trust (trust in other members' knowledge and expertise while using it in one's own task) and coordination (ability to coordinate specialised knowledge and expertise from within and outside the organisation). Table 4.4 shows items for measuring TMS in EGKNs of professionals.

## 4.3. Summary of the Chapter

Based on the gaps and missing links identified in the literature review (see section 3.5), this chapter presents a conceptual model and suggested links among various constructs to encapsulate the process of informal knowledge cooperation among socially connected individuals. The model has highlighted the links between informal information sharing, social exchange, social capital, and the development of TMS in the EGKNs of professionals. The model suggests that professionals share work-specific information with members of their EGKNs both within and across organisational boundaries and such information sharing, together with interpersonal trust and norms of reciprocity, contribute to the development of TMS structures in their EGKNs. The chapter proposes that informal knowledge collaboration in the EGKNs of professionals develops and sustains through a TMS based structure. Such TMS develops in the EGKNs of professionals through their external and internal informal information sharing, together with norms of reciprocity and interpersonal trust between EGKN members.

The chapter further discusses ways of operationalising constructs used by previous studies and outlines measurement scales of all the latent constructs used in this study. These constructs are operationalised by reviewing the literature and considering various approaches used by researchers in prior studies. It also indicates that most of the items that made these constructs are derived from past studies. However, where necessary, items are modified to fit the context of this study. The next chapters present how these items are used in constructing the survey questionnaire and specifically measure each of these constructs.

# CHAPTER FIVE

# RESEARCH DESIGN AND ANALYSIS STRATEGY

This chapter presents the research design and methodology to collect data and perform analysis to investigate the research questions. It first outlines the research philosophy and overall design approach of this study. Following this, the chapter discusses the strategy employed for data collection and analysis. It also discusses human research ethics issues that have been considered for this research. It further discusses survey design and administration approaches, and the statistical techniques used for model testing and theory verification.

## 5.1. Research Paradigm and Design Methods

Research design is the researcher's plan and strategy to collect and analyse data in order to systematically find answers to the research questions or problems. Research design is guided by research paradigm as it provides the basis for designing methods for data collection and analysis about the phenomenon of study. A choice of research paradigm reflects the basic set of beliefs that guide action of the researchers (Guba & Lincoln, 1994). Thus, an understanding of the research paradigms can be a crucial step in designing methods to investigate the research problem. Research paradigm includes research philosophies and research methods.

There are several research philosophies to help understand researchers' beliefs and actions (Guba & Lincoln, 1994). These include positivism, critical theory, and interpretivism. The positivism approach is used by 'theory verification' as argued by many researchers (Collis & Hussy, 2009; Creswell, 2009). Critical theory challenges existing theories and beliefs by engaging participants in the research process and

acknowledging the cultural, historical, and political context (Cohen, Manion, & Morrison, 2007; Crotty, 1998). Interpretivism approach can be used for theory development and allows multiple explanations of the phenomenon; as opposed to positivism which assumes a singular reality (Cohen et al., 2007, Denzin & Lincoln, 2008). The choice of a research philosophy is largely dependent on the researcher's assumptions about reality and the overall aim of the study.

This study followed a positivist philosophy by keeping in view the ontological assumptions of the various aspects of the study and the aim to validate a model developed on priory theory and past empirical investigations. The positivist ontology provides an objective view of the social reality (Nonaka & Peltokorpi, 2006). Positivists believe that reality can be understood independent of the beliefs and values of the researcher investigating a phenomenon (Collis & Hussey, 2009; Guba & Lincoln, 2005). Consequently, researcher's personal beliefs and values are separated from the phenomenon of interest. The primary goal of a positivist research is to "establish (or validate) relationships and to develop generalisations that contribute to theory" (Leedy & Ormrod, 2001, p. 102). Nevertheless, the goal of this research is to identify and understand knowledge collaboration structures and process through frequency of interactions between professionals, which clearly indicates an objective assessment of the reality (i.e. phenomenon of interest). The positivistic, deductive approach, followed in this study implies that the theoretical framework developed through prior theory need to be tested through empirical data.

The positivist approach involves testing of pre-conceived notions and measure reality through numerical methods (Nonaka & Peltokorpi, 2006). The idea that a hypothesis can be developed from existing scholarship and then be tested using collected data is regarded as particularly fruitful in research where large samples are

tested to make inferences about the wider population (Creswell & Plano Clark, 2009; Neuman, 2000). Prior studies, investigating links between informal networking and knowledge sharing, have used objective measures to find the occurrences of information and knowledge sharing and predicating relationships among various constructs that facilitate the process (Dahl & Pedersen, 2004a; Jarvenpaa & Majchrzak, 2008; Teigland & Wasko, 2003). In these studies, hypotheses were formed and theories were validated by using quantitative techniques for data collection and analysis.

The objectives of this study include the investigation of informal knowledge collaboration process in the EGKNs of professionals through interaction between various constructs informed by existing research evidence. Following the approach of these prior studies, the design of the present study required the use of a quantitative approach for data collection and analysis. The use of quantitative methods helped in identifying constructs relevant to the topic of the study and developed a conceptual model to explain the ongoing phenomenon. The quantitative methods adopted in this study helped to objectively measure relationships between various constructs involved in knowledge coordination and integration in order to explain the informal knowledge collaboration process in different organisations and industry sectors.

The overall research design including data analysis strategy is illustrated in Figure 5.1.

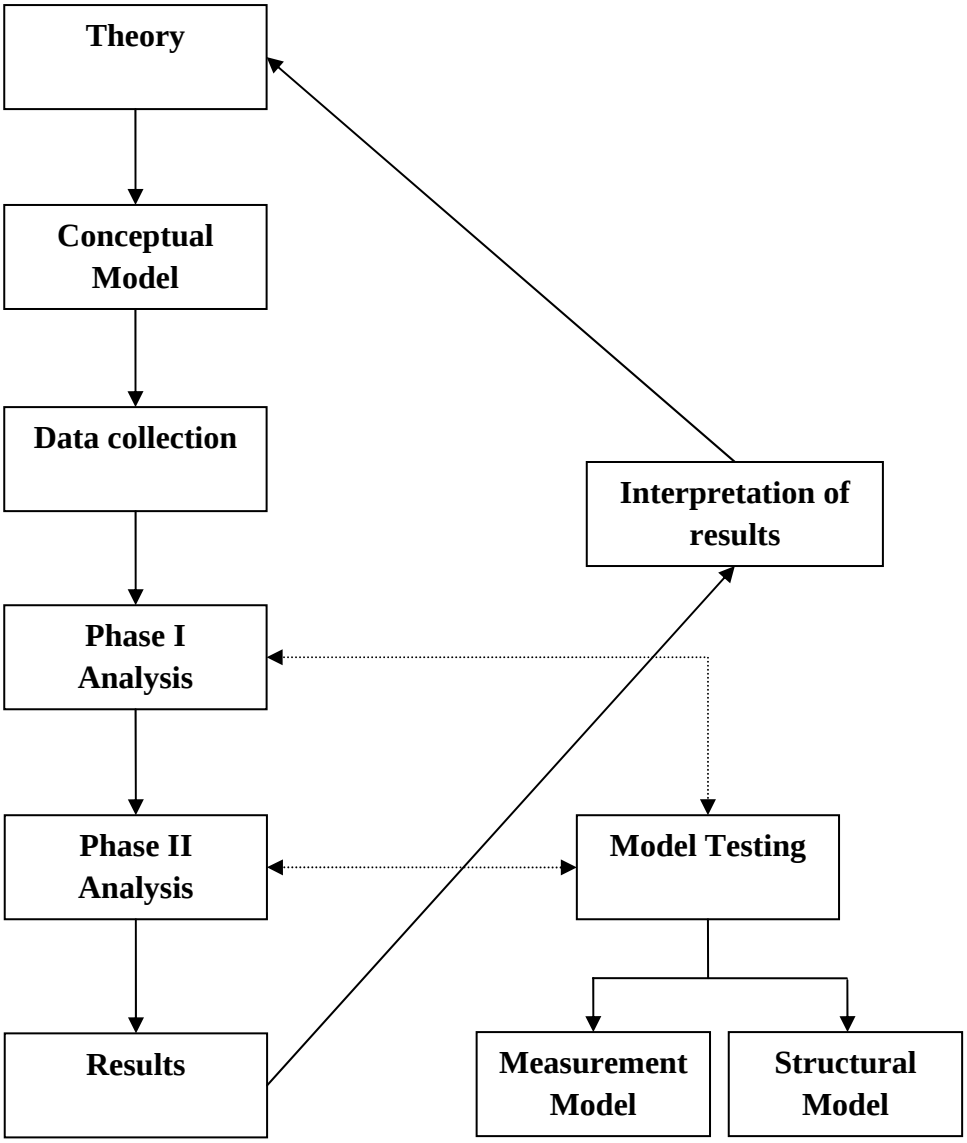


*Figure 5.1.* Research design approach.

Figure 5.1 explains the entire process of investigation used in this study. A conceptual model was developed based on the theory and the gaps identified in the literature review (see Chapter 2 and Chapter 3). To test the model and the various associated assumptions, cross-sectional data were collected (based on individuals' responses) through self-administered surveys. Patterns of behaviours were analysed using structural equation modelling (SEM) technique, using a two-stage analysis process. First, data were mapped to a measurement model by assessing the fitness of the

data with the model. Second, hypotheses were tested by developing the structural model and the results had been interpreted back to theory.

## 5.2. Data Collection Strategy

Since the objective of this study is to enhance the generalisation of the findings to a wider population, the study needs to involve large numbers of subjects. A survey methodology was selected to collect individuals' responses on their information practices with informal contacts and knowledge sharing behaviours. Survey research involves the collection of information from large samples of individuals and provides an efficient way to gather data from many people at relatively low cost, with ease and speed (depending on the survey design and administration). In this study, various assumptions were needed to be verified in a variety of professions and across industry sectors. Survey, therefore, was the method of choice for this study as it allowed a range of categories and subgroups to be sampled.

Two independent datasets were developed to test the hypothetical model and to cross-validate the findings of the study. The first dataset assembled is based on the responses of the members of New Zealand Knowledge Management (NZKM) network. This group was identified based on their obvious inter-organisational informal knowledge collaboration activities. To further validate the findings of the study and to improve robustness of the research model, a new dataset was established from the responses of the individuals selected from the Kompass business directory of New Zealand. Kompass directory contains the list of important business and industry professionals in New Zealand.

## 5.3. Model Testing Approach

This study used the SEM technique to test the research model and the hypotheses associated with the model. SEM tests predicted relationships among observed variables (i.e. indicators or measurable factors) and latent constructs (i.e. unmeasured factors) in the model. It is a powerful statistical technique that provides a "set of tools for verifying theories" (Blunch, 2012, p. 6). SEM can be used where we want to find whether a relationship exists, and, if so, to measure the strengths of the relationship in numerical form (Hair et al., 2010). In this study, the relationship between informal information sharing, interpersonal trust, and norms of reciprocity were explored to understand the process of informal knowledge collaboration between knowledge workers and to establish and test relationships between these variables while incorporating potential measurement errors.

SEM allows researchers to develop a model based on priori theories and test it against empirical data. The purpose is to confirm fitness of the model with data and measure the strength of the relationships appears in the model. In this way, SEM is a confirmatory rather than an exploratory technique. The difference between confirmatory and exploratory techniques is that exploratory analysis (e.g. EFA) do not restrict researcher to identify patterns of relationships between observed measures and unobserved variables (i.e. latent constructs) before performing the analysis. On the other hand, confirmatory techniques (like CFA) require a clear identification of the factors (i.e. latent constructs) and patterns of loadings in each of the factors. Because results obtained from exploratory analysis alone can be unreliable, using confirmatory techniques can help avoid costly mistakes (Byrne, 2006).

SEM can simultaneously examine multiplex relationships between a set of variables (Blunch, 2012). Unlike regression analysis, which allows researchers to look

at only one equation at a time, SEM is more realistic to identify and measure complex relationships between variables involved in a phenomenon. It analyses model fit and tests hypotheses using factor analysis and path analysis. The model fit measures how well the data fit into the developed measurement model. Path analysis or structural model testing measures the relationships among latent constructs provided in the model (Byrne, 2006). In other words, the path analysis is used to test the predicted links (i.e. hypotheses) represented in the conceptual model. The two-phased approach has been used and/or recommended by many researchers (Anderson & Gerbing, 1988; Hair et al., 2010).

### 5.3.1. Measurement Model Testing

SEM allows testing a model involving multiple observed variables and latent constructs as a whole. This process is completed in two phases: measurement model testing and structural model testing (i.e. path analysis). Measurement model testing is performed through confirmatory factor analysis (CFA). CFA is a form of factor analysis used in social science research. It is used to measure whether observed variables actually belong to their latent constructs (or factors). As such, it tests how well the data fit into the hypothesised measurement model (based on theory and the literature review). In other words, it confirms that the predicted relationships between the observed variables and their underlying latent constructs exist.

In this study, CFA tested the fitness of the model with the data before moving to structural model analysis (i.e. hypotheses testing). The measurement model was developed based on the conceptual model as introduced in Chapter 4 (see Figure 4.1). The fitness of the measurement model was evaluated using fit indices suggested by Hair et al. (2010) and Kline (2011). These included chi-square value, comparative fit index (CFI), goodness-of-fit (GFI), adjusted goodness-of-fit (AGFI), and root mean-

square error of approximation (RMSEA). As part of CFA, the measurement model was evaluated for its construct validity using two indicators (i.e. convergent and discriminant validity) recommended by many researchers (Byrne, 2010; Hair et al., 2010; Hu & Bentler, 1999; Kline, 2011). Construct validity defines the extent to which manifest variables (i.e. observed variables) actually measure the latent variables in the model (Hair et al., 2010; Kline, 2005).

#### 5.3.1.1. Convergent validity

Convergent validity determines the extent to which the measurement items converge into their respective latent constructs. It can be measured using the approach of Fornell and Larcker (1981). All indicator loadings should exceed .60 (and ideally .70), and average variance extracted (AVE) of each construct should be 0.50 and above (Fornell & Larcker, 1981). A higher value of AVE (> .50) indicates a sufficient degree of convergence, meaning that the measurement items are representatives of their respective latent variables (Hair et al., 2010). These criteria are applied in sections 6.5.1 and 7.4.1.

#### 5.3.1.2. Discriminant validity

Discriminant validity refers to the extent to which the items measure their own underlying constructs, rather than appearing as a part of other constructs in the model (Kline, 2011). The manifest (observed) variables of theoretically different constructs should have low correlations with each other. Therefore, it can be assessed by examining cross-loadings (i.e. items load on their own construct higher than in any other construct) for each of the items measuring the construct (Fornell & Larcker, 1981). The other criterion, followed in this research to test discriminant validity, was to

check whether the square roots of AVE should be greater than the correlation between them (Hair et al., 2010). These criteria are applied in sections 6.5.2 and 7.4.2.

### 5.3.2. Structural Model Testing

After evaluating the fitness of the model, the next step was to test the structural model. Based on the estimation results (i.e. regression weights), structural model indicates how the latent constructs are related. It describes the dependence relationships between hypothesised constructs of the model (see, Hair et al., 2010). The underlying directional relationships among external and internal information sharing, reciprocity, interpersonal trust, and TMS development in EGKNs were examined through path analysis (i.e. R-square measures the statistical significance).

The structural model was tested based on the R-square measures and statistical significance of the path coefficients. Chin (1998, p. 13) suggested that the "standardised paths should be at least .20 and ideally above .30 in order to be considered meaningful". Kline (2011) suggested that standardised path coefficients with values close to .10 or above can be interpreted as a small effect, values close to .30 should be considered as a medium effect and close or above .50 has a large effect. In business research R-square value of .20 and above for endogenous latent variables are considered good (see, Byrne, 2010; Hair et al., 2010). Endogenous refers to a variable whose value is determined by other variables in the model. This is in contrast with the exogenous variable which is determined by other variables not included in the model (Blunch, 2012). The significance level was checked against standard *p-value*, that is, $p < .05$.

## 5.4. Survey Design

In constructing the survey questionnaire, reviews of previous studies were conducted in order to find existing scales. Where possible, these scales were adopted

from the previous published studies and altered to fit the context of this study. As a result, the questionnaires were based upon a mixture of established scales from the literature and self-developed measures of constructs relevant to this study. Most questions had the pre-defined response alternatives based on five-point Likert scales. Demographics of the respondents were also collected, for example, age, education, job status, experience, and so on, were also collected. Pilot tests for the instrument were conducted with modifications made to the surveys based on the results of the pilot tests.

A 38-items (including demographics) questionnaire was created to collect data from the target group (i.e. NZKM). The survey was designed and administered through the Qualtrics software (http://www.qualtrics.com/). Qualtrics is an online survey management system (like Googledocs, SurveyGizmo) but it provides more sophistication than other survey development tools. The survey was first distributed using the email distribution features of the Qualtrics software. The web-based survey distribution was followed by the paper-based mail surveys. The paper-based survey acted as a reminder to the online surveys. A copy of the questionnaire is attached in Appendix A.

The survey instrument was pilot tested (as explained in section 5.7) and refined accordingly. All latent variables (except informal knowledge sharing) were measured on a five-point Likert scale (ranging from strongly disagree '1' to strongly agree '5'). Informal information sharing was measured by asking respondents about their occurrences of information sharing with colleagues (1 = "Never", 2= "A few times a year", 3= "Once a month", 4= "Once a week", 5= "Once a day"). Table 5.1 shows the list of variables/latent constructs used in the model along with the source from where items have been taken and altered to use in this study.

Table 5.1 *Survey Constructs and Questionnaire Items*

| Sr. | *Construct* /Items | Actual question | Modified question | Source |
|---|---|---|---|---|
| ***1. External Information Sharing*** | | | | |
| i. | EX_INF1 | "You were contacted by someone *outside* of Cap Gemini for some specific technical information". | You were contacted by someone **outside** your organisation for some specific technical information on a work-related topic. | Adapted from Teigland and Wasko (2003) |
| ii. | EX_INF2 | "You gave out some specific technical information to a person working outside of Cap Gemini". | You gave out some specific technical information on a work-related topic to one of your informal contacts **outside** your organisation. | - |
| iii. | EX_INF3 | "You sent *formal,* written communications in the form of reports or data to someone outside of Cap Gemini". | You sent ***formal***, written communications in the form of reports or data on a work-related topic to one of your informal contacts **outside** your organisation. | - |
| iv. | EX_INF4 | "You sent *informal,* written communications in the form of reports or data to someone outside of Cap Gemini". | You sent ***informal***, written communications in the form of reports or data on a work-related topic to one of your informal contacts **outside** your organisation. | - |
| ***2. Internal Information sharing*** | | | | |
| i. | IN_INF1 | "You were contacted by someone in Cap Gemini for some specific technical information". | You were contacted by one of your informal contacts **within** your organisation for some specific technical information on a work-related topic. | Adapted from Teigland and Wasko (2003) |

| | | | | |
|---|---|---|---|---|
| ii. | IN_INF2 | "You gave out some specific technical information to someone at Cap Gemini". | You gave out some specific technical information on a work-related topic to one of your informal contacts **within** your organisation. | - |
| iii. | IN_INF3 | "You sent *formal,* written communications in the form of reports or data to someone inside of Cap Gemini". | You sent ***formal***, written communications in the form of reports or data on a work-related topic to one of your informal contacts **within** your organisation. | - |
| iv. | IN_INF4 | "You sent *informal,* written communications in the form of reports or data to someone inside of Cap Gemini". | You sent ***informal***, written communications in the form of reports or data on a work-related topic to one of your informal contacts **within** your organisation. | - |
| ***3.*** | ***Norms of reciprocity*** | | | |
| i. | RCPR1 | "I know that other members in the BlueShop virtual community will help me, so it's only fair to help other members". | I know that other members will help me, so I feel obligatory to help members of my PKN. | Adapted from Chiu et al. (2006) |
| ii. | RCPR2 | "I believe that members in the BlueShop virtual community would help me if I need it". | When I share knowledge with other members, I believe that the members of my PKN would help me if I need it. | - |
| iii. | RCPR3 | "When I share my knowledge through EKRs, I believe that my queries for knowledge will be answered in future". | When I share knowledge with other members, I believe that my future request for knowledge will be answered by members of my PKN. | Adapted from Kankanhalli et al. (2005) |

***4. Interpersonal trust***

| | | | | |
|---|---|---|---|---|
| i. | TRST1 | "I have faith in my contact person to look out for my interests even when it is costly to do so". | I believe that other members of my PKN will always look out for my interests. | Adapted from Zaheer, McEvily and Perrone (1998) |
| ii. | TRST2 | "My contact person is trustworthy". | All members of my PKN are trustworthy. | - |
| iii. | TRST3 | "I know how my contact person is going to act. S/he can always be counted on to act as I expect". | I have faith that other members of my PKN would always act as I expect. | - |

**5. *TMS in EGKNs***

| | | | | |
|---|---|---|---|---|
| i. | TMS1 | "Each team member has specialised knowledge of some aspect of our project". | Some members of my PKN have specialised knowledge of some aspect of my job. | Adapted from Lewis (2003) |
| ii. | TMS2 | "I know which team members have expertise in specific areas". | I know which of my PKN members have expertise in specific areas that can be helpful to my job. | - |
| iii. | TMS3 | "I trusted that other members' knowledge about the project was credible". | I trust the knowledge that my PKN members have about my job is credible. | - |
| iv. | TMS4 | "Our team worked together in a well-coordinated fashion". | I coordinate advice from my PKN members within my organisation if it concerns aspects of my job. | - |
| v. | TMS5 | - | I coordinate advice from my PKN members working in other organisations if it concerns aspects of my job. | - |

***6. Performance***

| | | | | |
|---|---|---|---|---|
| i. | PERF1 | - | Knowledge sharing with members of my PKN will increase my problem-solving capability. | Self-developed |
| ii. | PERF2 | - | Knowledge sharing with members of my PKN will help me confirm my own understanding of my work-related topics. | - |
| iii. | PERF3 | - | Knowledge sharing with members of my PKN will help me in my job and improve my performance. | - |

## 5.5. Human Research Ethics

The research complied with the Massey University Human Ethics regulations. An information sheet was attached to the questionnaire administered to the participants of this study. The information sheet was prepared according to the *Code of Ethical Conduct for Research, Teaching, and Evaluations involving Human Participants* used in Massey University. The information sheet included the contact details of the researcher and official of the Massey University Human Ethics committee. Overall, ethical considerations were given to confidentiality and privacy of the data collected from survey participants. The data collection started after the receipt of the low risk notification from the Massey University Human Ethics Committee. The cover letter, information sheet, and the low risk notification (ethics approval) are provided in Appendix B and Appendix C, respectively.

To minimise any risk to the participants, the researcher took the following precautions. Participation in the survey was voluntary and specific personal details were not asked from the participants. The collected data was treated confidentially and used

solely, for the purpose of this study, and any publications related to this study. Individuals were assured about the privacy of their demographic details. Only aggregate responses were included in this thesis and the publications related to this study. The data obtained in both the paper-based and online versions of the survey were anonymous as no name or identification details were asked, except the optional email for the purpose of sending the summary of the outcome of this research to the interested participants.

## 5.6. Sampling (Datasets)

The first dataset (to be used for model testing) was established from members of the New Zealand knowledge management (NZKM) network. The NZKM network was chosen as a valuable resource for data collection as it provided a ready access to cross-industry professionals, who were involved in informal knowledge sharing. The NZKM network was developed in 2001 by a group of professionals engaged in informal knowledge sharing practices outside their work organisations. NZKM established local communities in the major cities of New Zealand and hold regular meetings and events for the knowledge management community.

The second dataset (for model cross-validation) was solicited from the list of professionals available in the Kompass database of the New Zealand businesses. These professionals were selected from the database based on their professions and industry characteristics. The objective was to select those professionals who worked in a knowledge-intensive profession and were likely to hold EGKNs. The questions in the survey were used to gather information about professionals who developed and maintained their ego-centered knowledge networks.

## 5.7. Pre-testing Data Collection Instrument

To establish content validity of the questionnaire, a pilot study was conducted before undertaking the main larger survey. The small-scale administration of the survey can fulfill a variety of functions, such as testing for any form of ambiguity and assessing the approximate length of time for completion (Veal, 2005). Pre-testing could also help in improving clarity, logical flow and estimating the completion rates (Cooper & Schindler, 2011). The other aim of the pilot testing was to test the reliability of the scales. Cronbach's coefficient alpha was used to assess the reliability of the scale as recommended in quantitative research (Veal, 2005).

The participants in the pilot study were executive committee members of the NZKM group and a bunch of fellow researchers. The questionnaires were distributed to 25 individuals, of which 21 fully completed the questionnaire. The pilot test participants were also asked to provide detailed feedback indicating problems in terms of the outlined criteria. Some changes to language, wording, appearance, logical consistency, and sequencing of items were performed based on the results and feedback gathered in the pre-testing. Moreover, the pilot survey also gives some confidence about the scale as values of all items were on and above 0.70. The value of the Cronbach's coefficient alpha of 0.5 is acceptable but a coefficient alpha that is greater than 0.70 is highly satisfactory (Hair et al., 2010).

## 5.8. Summary of the Chapter

The chapter discusses the overall research design, data collection strategy, and analysis plan. The nature and objective of the research support the use of quantitative approached to collect and analyses data. Survey questionnaire was developed to identify and measure the frequency of informal information sharing practices and behaviours of

individuals. The purpose of analysis was to observe bahavioural patterns from large samples of data and to generalise the findings on a bigger population. The selected research methodology was found consistent with previous work in similar types of studies in relevant disciplines.

Steps were taken to minimise the harm to the respondents before approaching to them for the purpose of data collection. These included voluntary participation, treating participants' identity private, and data as confidential. After getting approval from the Massey University Human Ethics Research Committee, data collection process started. A pilot testing was performed to refine the data collection instrument, developed from measurement items that were mainly used in the previous studies.

Quantitative data methods were identified for data collection from individuals working in various industry sectors and occupations. The target population identified in this study was professionals working in New Zealand business and industry. The survey questionnaire was both online and paper-based. First, the link of online questionnaire was forwarded through a survey management tool, which was followed by paper survey through surface mail.

A two stage data collection was performed. The first dataset was established from responses of the professionals who were part of the NZKM network. The second dataset was developed by drawing contact details of professionals from the Kompass business directory. The purpose of establishing two independent datasets was to test and re-test the assumptions and findings of this study. Both datasets were examined through a two-step (i.e. measurement model testing and path analysis) SEM technique.

# CHAPTER SIX

## MODEL TESTING USING THE NZKM DATASET

The chapter outlines Phase 1 of the study which includes data collection and testing of the research model with the NZKM data. It presents demographics of the survey participants (NZKM group), descriptive statistics, and inter-correlation as part of the preliminary data analysis. It then applies SEM technique (as outlined in section 5.3) to first test the fitness of the measurement model with the data, and then to run path analysis to test the structural model and hypotheses of the study. A summary of the model fitness test and the path analysis (structural model testing) results is also presented.

### 6.1. Missing Values, Unengaged Responses, and Test of Normality

Following the guidelines of Hair et al. (2010), cases with more than 50% values missing (other than demographics) were deleted from the dataset. Those cases were removed where the majority of the values were missing in the measured variables. The remaining cases were examined using the guidelines suggested by Graham (2012) and Little and Rubin (2002). Few missing values (in six cases) in measure variables were replaced with the mean of all nearby values by ensuring that the overall mean remained unaffected by the new values (Little & Rubin, 2002).

For checking outliers and unengaged responses, data were examined carefully using SPSS tool. Since all the variables were measured through ordinal/interval scales with 1-5 intervals, extreme value outliers did not exist. Unengaged responses are someone who responds with the exact same value in every single question. Few such

cases (two) were deleted by looking at the standard deviation and by examining the data physically.

For checking normality of data, skewness and kurtosis tests are recommended by many researchers (Kline, 2011; Hair et al., 2010). According to Kline (2011), if skewness and kurtosis for individual indicators are below 3 and 10 (see Appendix D) respectively, the data can be regarded to be close enough to multivariate normal and considered fit for the purpose of SEM analysis. Almost all of the indicators passed these criteria.

## 6.2. Demographics of the Respondents

As explained in section 5.2, a questionnaire survey was forwarded to all (500) members of the NZKM group. Out of 500 members, 194 completed responses were received, yielded a response rate of 38.8%. Survey respondents have had diverse characteristics (i.e. gender, age, industry, and occupation) as shown in Figures 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7. In all these figures, N represents the total number of respondents in each category of questions. There were almost equal numbers of male (91) and female (87) respondents. The majority (39%) of the respondents were over 50 years of age. Nearly half of the respondents (45%) hold Masters' degrees or above. More than half the numbers of respondents (53%) were working at the middle level positions in their organisations. Many of them (29%) belonged to professional, scientific, and technical service. Overall, 39% of the respondents were information and organisation professionals and related to the fields of information processing and knowledge management.

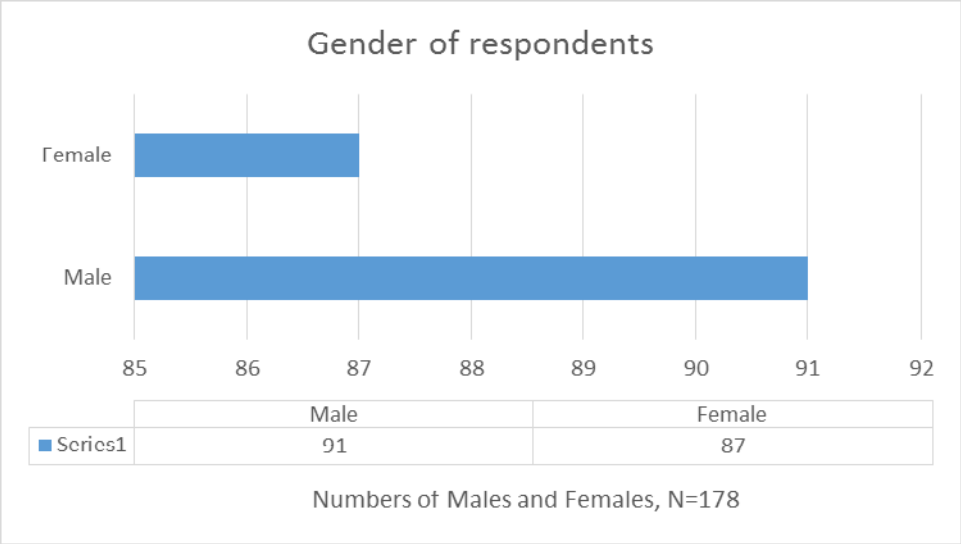


*Figure 6.1.* Gender specification.

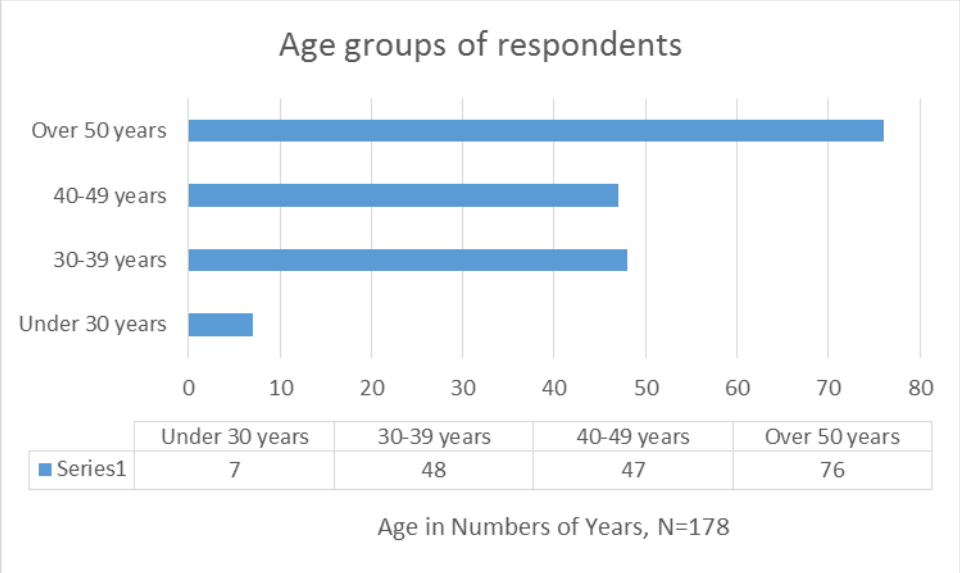


*Figure 6.2.* Age groups of respondents.

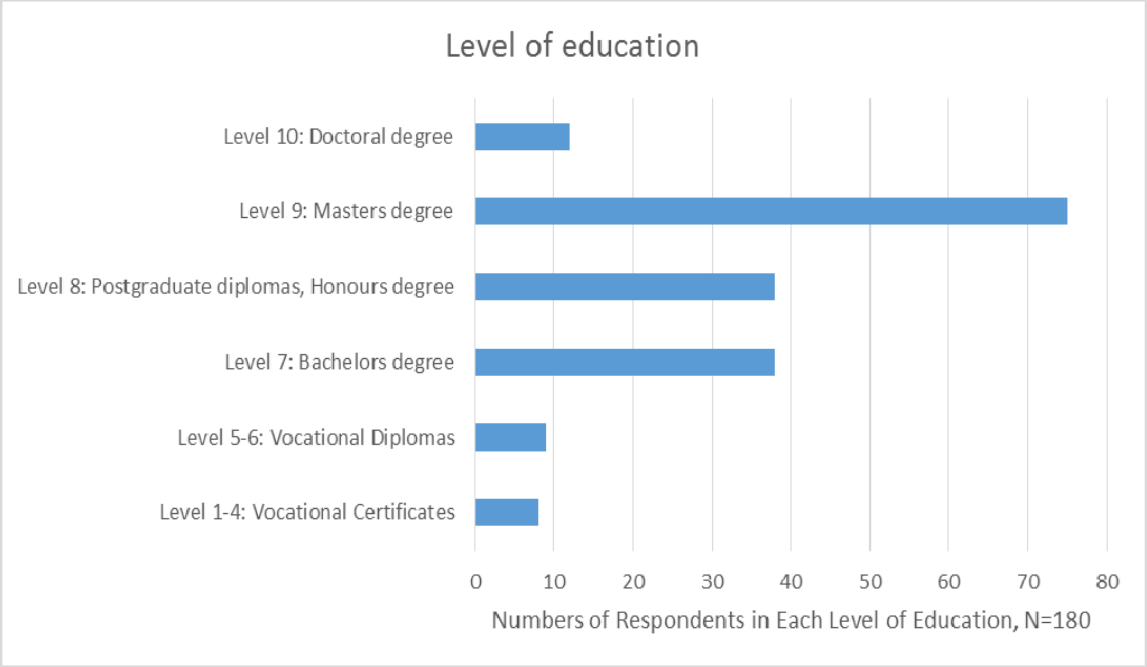


*Figure 6.3.* Level of education of the respondents.

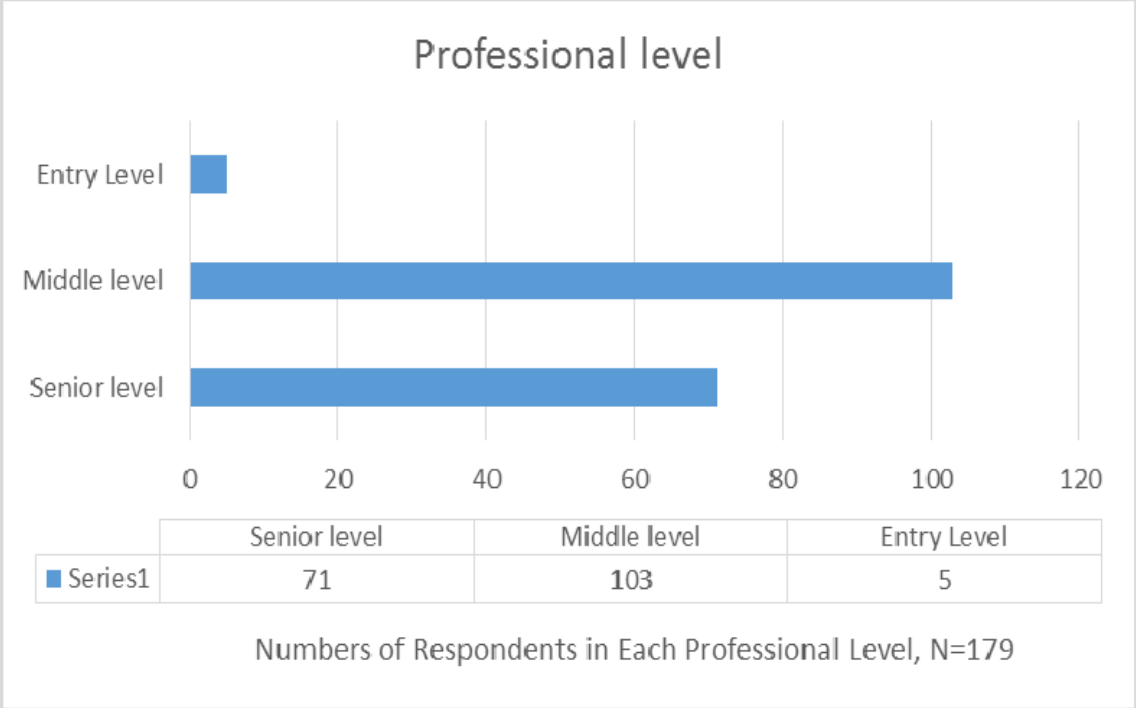


*Figure 6.4.* Professional level of the respondents.

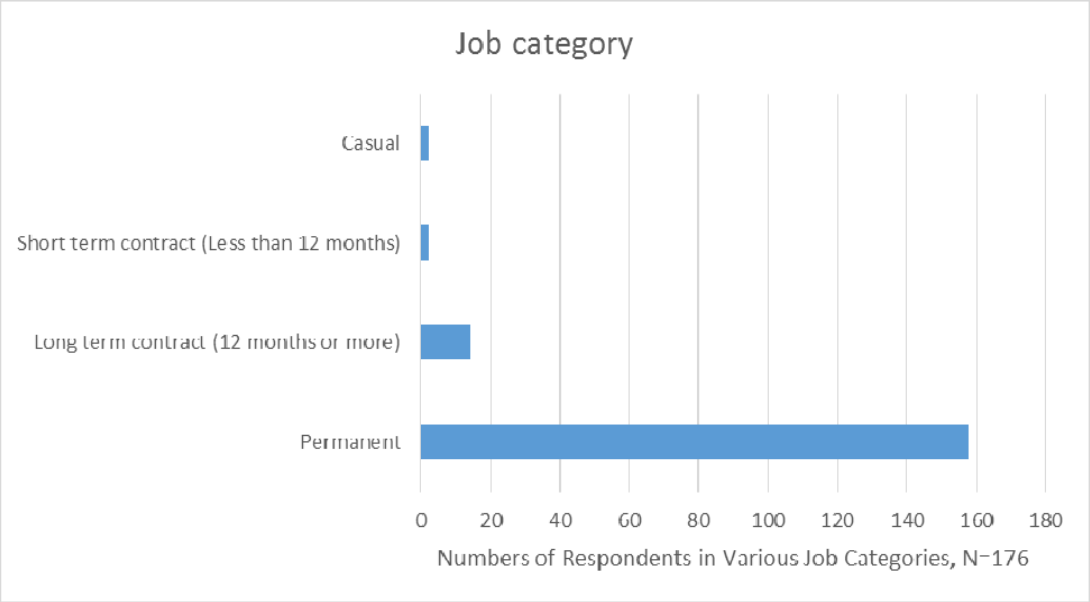


*Figure 6.5.* Job category of the respondents.

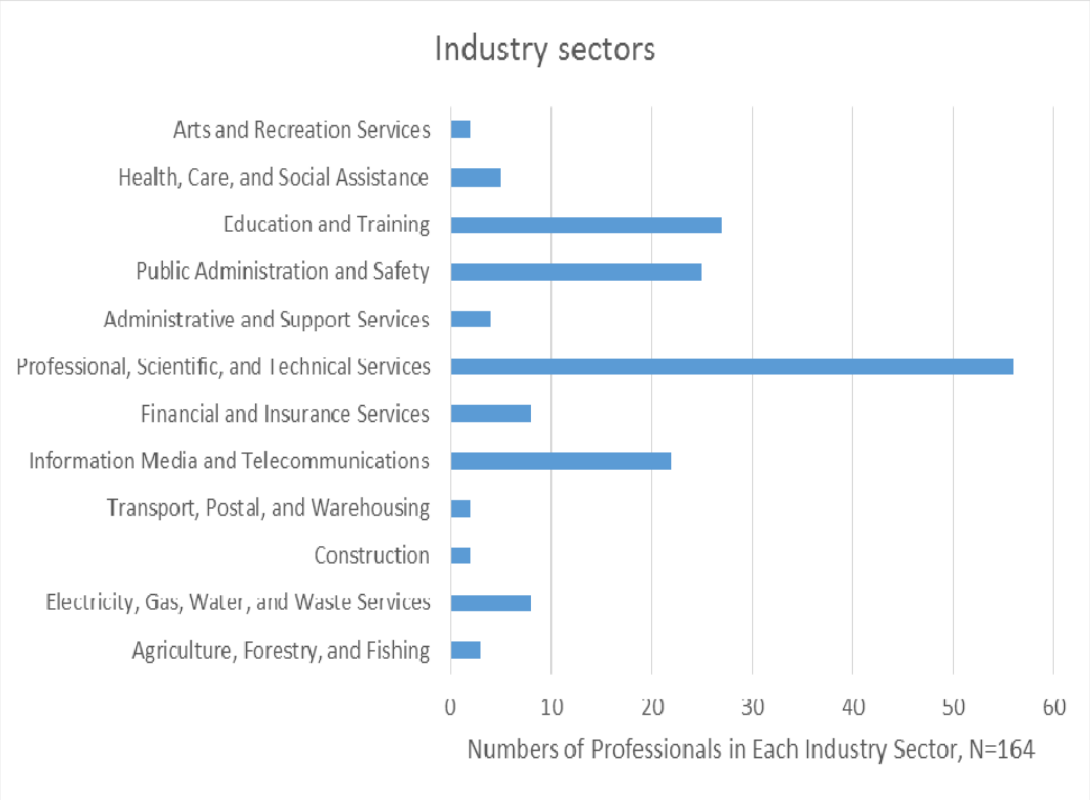


*Figure 6.6.* Industry sectors of the respondents.

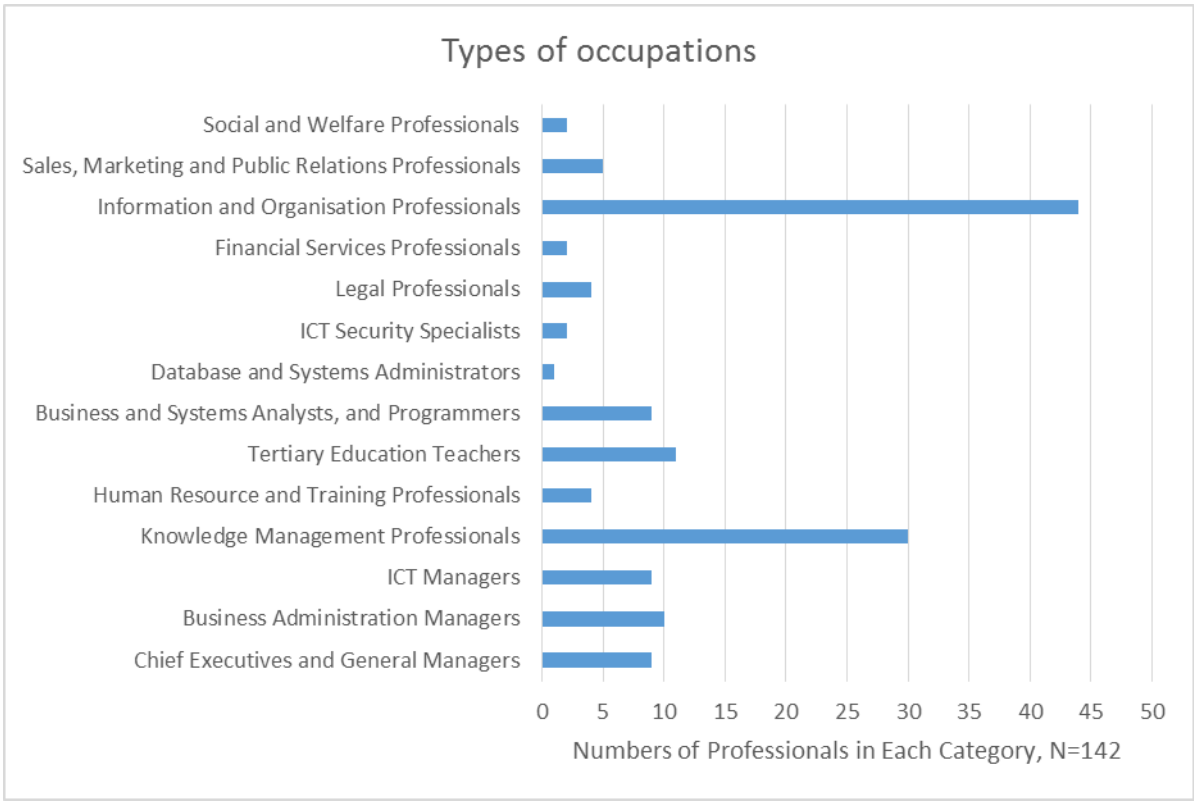


*Figure 6.7.* Types of occupations of the respondents.

## 6.3. Descriptives and Intercorrelations

In the survey, members were asked questions about their informal knowledge sharing contacts and the size of their informal knowledge networks within and outside of their work organisations. Respondents were asked if they had been involved in informal knowledge sharing on work-related topics with their informal contacts. They were asked to rate the frequency of information sharing with their informal contacts within and outside of their work organisations. The results indicate that the majority of the respondents frequently shared work-related knowledge with informal contacts both within and outside their work organisations. The responses are illustrated in figures 6.8, 6.9, 6.10, & 6.11.

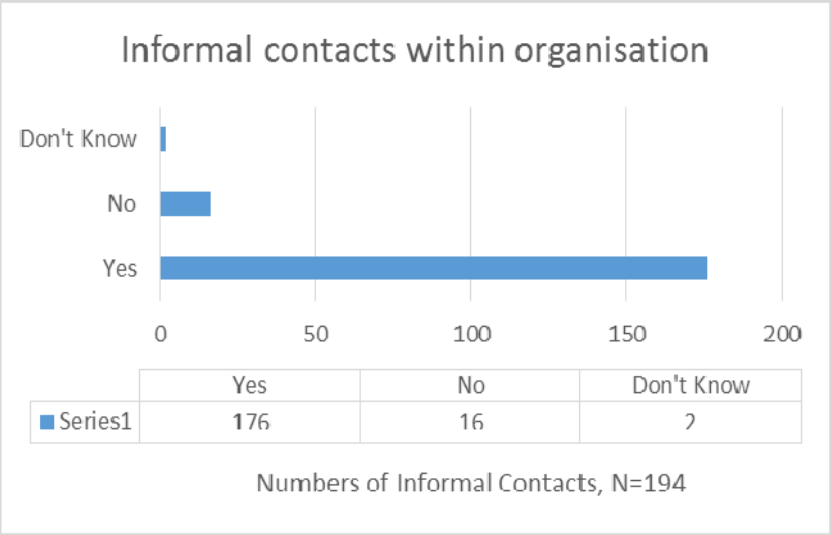


*Figure 6.8.* Informal contacts within organisation.

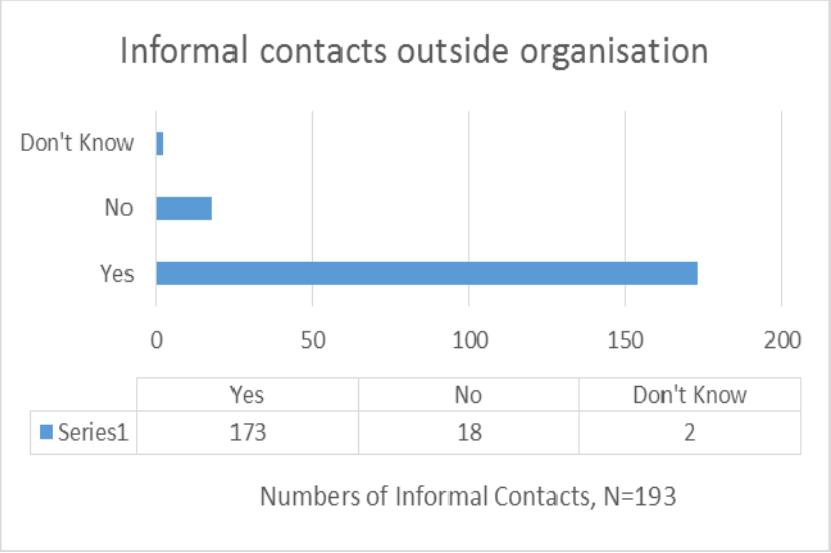


*Figure 6.9.* Informal contacts outside organisation.

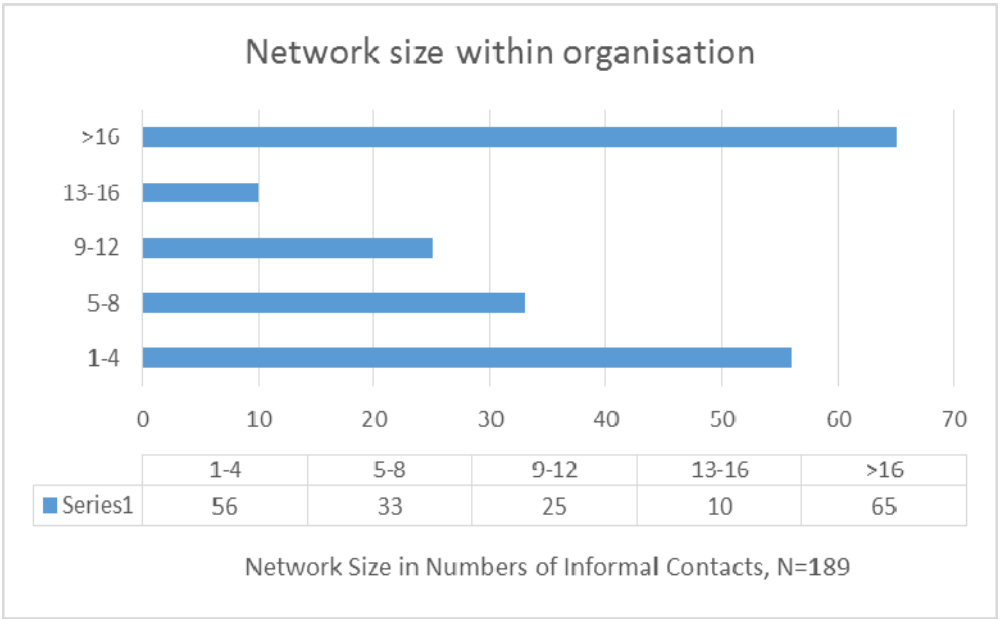


*Figure 6.10.* Network size within organisation.

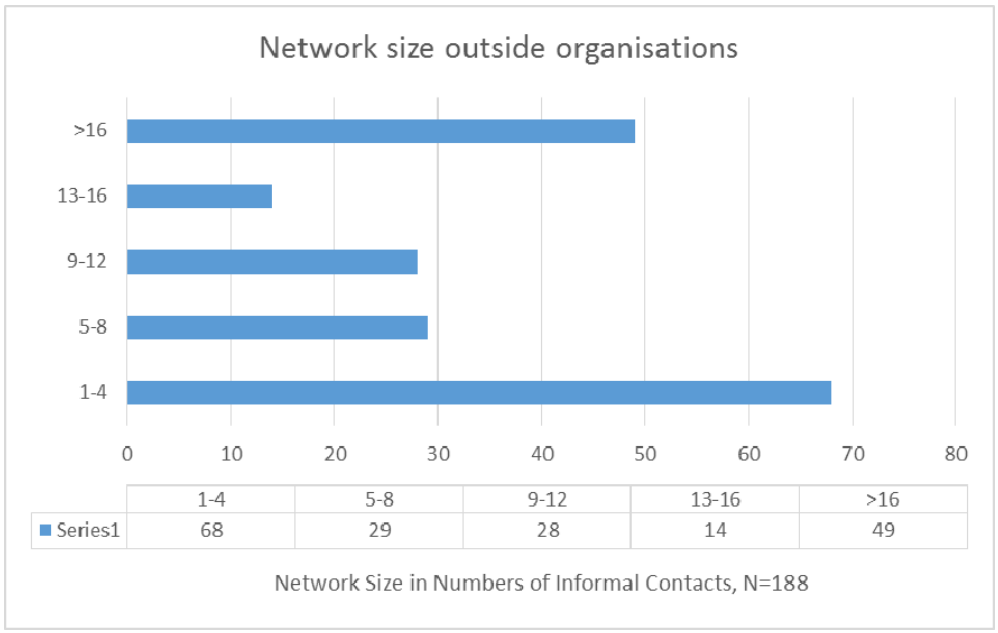


*Figure 6.11.* Network size outside organisation.

Table 6.1 presents the means scores (based on multiple items measure) and inter-correlations between items. Means were calculated on a 5-point Likert scale: *1='strongly disagree', 2='disagree', 3='neutral', 4='agree', 5='strongly agree'.* Survey responses have shown a great deal of information sharing with informal contacts within the work organisations. In addition, responses also indicate high occurrences of

information sharing with colleagues who work outside their work organisations. There is a strong correlation found between internal and external information sharing. The results show strong correlation between norms of reciprocity and trust. The results also indicate significant relationship between internal information trading, norms of reciprocity, interpersonal trust, and TMS of an individual.

Table 6.1 Descriptives and Intercorrelations, N=194

| | | **Mean** | **SD** | **1** | **2** | **3** | **4** | **5** | **6** |
|---|---|---|---|---|---|---|---|---|---|
| 1 | External information sharing (04 items) | 2.4 | .95 | 1 | .57** | .06 | -.11 | -.04 | .05 |
| 2 | Internal information sharing (04 items) | 3.3 | 1.0 | .57** | 1 | .10 | -.10 | .08 | .14* |
| 3 | Norms of reciprocity (03 items) | 3.9 | .59 | .06 | .10 | 1 | .60** | .33** | .58** |
| 4 | Interpersonal trust (03 items) | 3.6 | .63 | .11 | -.10 | .60** | 1 | .37** | .46** |
| 5 | TMS in EGKNs (05 items) | 3.9 | .65 | -.04 | .09 | .33** | .37** | 1 | .46** |
| 6 | Performance (03 items) | 4.1 | .59 | .05 | .14* | .58** | .46** | .46** | 1 |

*** Correlation is significant at the 0.01 level (2-tailed).*
** Correlation is significant at the 0.05 level (2-tailed).*

## 6.4. Exploratory Factor Analysis (EFA)

Based on the results of the pre-test of the survey questionnaire, it was decided to perform exploratory factor analysis (EFA) to see how the indicators load on their assumed factors (or latent constructs), and to explain the variance and correlations among the measurement items. Therefore, EFA was performed, using *varimax* rotation in SPSS, on the 22 measured variables (indicators) of the NZKM dataset. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's test of sphericity were also carried out (see Hair et al., 2010) to confirm the suitability of the EFA test. The KMO test determines whether component or factor analysis will be useful for the set of

variables in hand. A KMO value of 0.84 (as provided in Appendix D) is considered good for the purpose of doing EFA. In addition, Bartlett's test of sphericity determined that indicators were uncorrelated (i.e. p-value < 0.001), see Appendix D. These results indicated that  this demonstrates that EFA can be performed on the data (see Hair et al., 2010). Table 6.2 shows that resultant component matrix of the EFA test.

The EFA helped to identify whether measurement items appeared in their conceptualised factors (i.e. latent constructs). The results in Table 6.2 shows that indicators are loaded high on their respective factor, except for 'Trust' and 'Norms of Reciprocity'. Moreover, the highest cross-loadings (i.e. indicators loadings on other factors) are .358, which is under the acceptable range. According to Blunch (2012) and Hair et al. (2010), the minimum indicator loadings on a latent construct should be 0.4 (after rotation) and any indicator that is cross-loaded on any other factor up to 0.4 is also acceptable. In this study, all cross-loadings observed are more than 0.4; thus, the identified latent factors retained and included in the research model.

In Table 6.2, the items (IN_INF1...IN_INF4) represent *Internal information sharing*, (EX_INF1…EX_INF4) represent *External information sharing*, (TMS1…TMS5) represent *TMS in EGKNs* of professionals, (Trust1…Trust3) represent *Interpersonal trust*, (RCPR1…RCPR3) represent *Norms of reciprocity*, and finally (PERF1…PERF3) represent *Performance*. The EFA indicated (see Table 6.2) that items of *Norms of reciprocity* and *Interpersonal trust* were merged into a single component (or factor). While *Norms of reciprocity* and *Interpersonal trust* can be seen as highly correlated in the EFA results, they have been considered as separate constructs in past studies (Chiu et al., 2006; Kankanhalli et al., 2005). The issue of keeping these two constructs separate or merging them into a single construct was further assessed during the CFA.

Table 6.2 *Rotated Component Matrix*

| | Component | | | | |
|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** |
| IN_INF1 | | | | .856 | |
| IN_INF2 | | | | .852 | |
| IN_INF3 | | .322 | | .779 | |
| IN_INF4 | | .358 | | .725 | |
| EX_INF1 | | .797 | | .387 | |
| EX_INF2 | | .881 | | | |
| EX_INF3 | | .841 | | | |
| EX_INF4 | | .889 | | | |
| TMS1 | | | .837 | | |
| TMS2 | | | .770 | | |
| TMS3 | | | .784 | | |
| TMS4 | | | .683 | | |
| TMS5 | | | .675 | | |
| Trust1 | .729 | | | | |
| Trust2 | .762 | | | | |
| Trust3 | .766 | | | | |
| RCPR1 | .656 | | | | .316 |
| RCPR2 | .692 | | | | .319 |
| RCPR3 | .682 | | | | .366 |
| PERF1 | .316 | | | | .747 |
| PERF2 | .306 | | | | .813 |
| PERF3 | | | | | .800 |

*Extraction Method: Principal Component Analysis.*
*Rotation Method: Varimax with Kaiser Normalisation.*

## 6.5. Measurement Model Testing

The overall model fit was assessed through the guidelines provided in section 5.3.1. The research model (see Figure 4.1) was drawn using AMOS Graphics software. In Figure 6.9, manifest (measured or observable) variables are shown as boxes and the latent constructs are represented as ovals. Each manifest variable appeared with a measurement (or standard) errors (e1…e20). Covariances between latent constructs are represented by two-way connectors. The values on the single headed connectors (between latent construct and indicators) represent factor loadings. The detailed results of the covariance-based component analysis, correlations among the constructs, alpha

coefficients, reliability tests, computed variability for each construct, and inter-construct correlations are provided in Appendix E.

A summary of the model fit indices is provided in Table 6.3. The overall indices for assessing the model fit were acceptable, with chi-square value = 1.40, CFI = 0.96, GFI= 0.91, AGFI = 0.88, and RMSEA = 0.04 (Byrne, 2010; Hair et al., 2010). Figure 6.12 shows the final model with a bit of modification. These results justify the six constructs in the CFA model (see Figure 6.12) gives this study a significant measurement model. Hence, the issue raised in the EFA (see section 6.4) resolved and the use of six factors was justified.

Table 6.3 *Model fit indices of the Measurement Model*

| **Model fit indices** | **Observed value** | **Recommended value** |
|---|---|---|
| Chi-square/degree of freedom (CMIN/DF) | 1.40 | < 3.00 |
| Comparative fit index (CFI) | .96 | >.90 |
| Goodness-of-fit (GFI) | .91 | >.90 |
| Adjusted Goodness-of-fit (AGFI) | .88 | >.80 |
| Root mean square error of approximation (RMSEA) | .04 | < .08 |

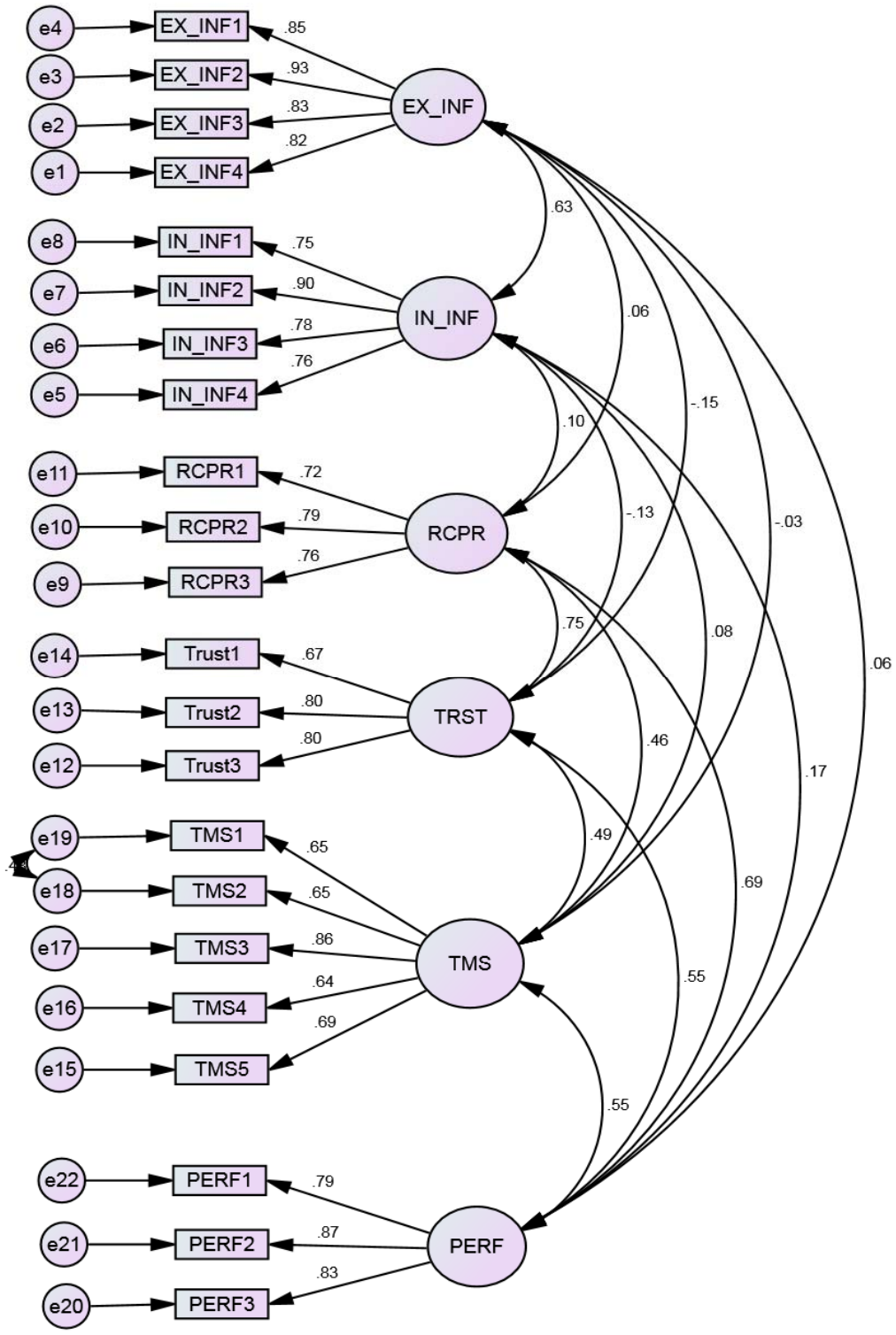


*Figure 6.12.* CFA (NZKM dataset), e1-e22 are the residuals or error variance.

The CFA results exhibit a good level of fit of the measurement model with the collected data. The measurement model was further evaluated for convergent and discriminant validity following the guidelines specified in sections 5.3.1.1 and 5.3.1.2.

### 6.5.1. Convergent Validity

The convergent validity of the model was measured through following the guidelines provided in section 5.3.1.1. Indicator loadings, construct reliability, and AVE of each construct were evaluated using guidelines of Fornell & Larcker (1981). Table 6.4 shows factor loadings for all items, composite reliability, and AVE values of the constructs. The results indicate that all factor loadings were above 0.5; AVE of each construct is equal or above 0.5; and composite reliability of all constructs exceed 0.60. Thus, the results indicate sufficient convergent validity of the research model.

Table 6.4 *Results of Convergent Validity*

| **Construct/indicators** | **Factor Loadings** | **CR** | **AVE** |
|---|---|---|---|
| *External information sharing* | | 0.92 | 0.74 |
| EX_INF1 | 0.85 | | |
| EX_INF2 | 0.93 | | |
| EX_INF3 | 0.83 | | |
| EX_INF4 | 0.82 | | |
| *Internal information sharing* | | 0.88 | 0.64 |
| IN_INF1 | 0.75 | | |
| IN_INF2 | 0.90 | | |
| IN_INF3 | 0.78 | | |
| IN_INF4 | 0.76 | | |
| *Norms of reciprocity* | | 0.80 | 0.57 |
| RCPR1 | 0.72 | | |
| RCPR2 | 0.79 | | |
| RCPR3 | 0.76 | | |
| *Interpersonal trust* | | 0.80 | 0.57 |
| Trust1 | 0.67 | | |
| Trust2 | 0.80 | | |
| Trust3 | 0.80 | | |
| *TMS in EGKNs* | | 0.83 | 0.50 |
| TMS1 | 0.65 | | |
| TMS2 | 0.65 | | |

| Construct/indicators | Factor Loadings | CR | AVE |
|---|---|---|---|
| TMS3 | 0.86 | | |
| TMS4 | 0.64 | | |
| TMS5 | 0.69 | | |
| *Performance* | | 0.87 | 0.69 |
| PERF1 | 0.79 | | |
| PERF2 | 0.87 | | |
| PERF3 | 0.83 | | |

*AVE = CR= Composite reliability, Average variance extracted*

### 6.5.2. Discriminant Validity

The discriminant validity of the model was assessed using the guidelines outlined in section 5.3.1.2. According to these guidelines, AVE for a construct should be greater than correlations between any pair of factors. As shown in Table 6.5, the AVE for each construct is greater than any of the inter-factor correlations. Overall, the measurement model demonstrated sufficient discriminant validity.

Table 6.5 *Composite Reliability, AVE, and Intercorrelations*

| | CR | AVE | TMS | EX_INF | IN_INF | RCPR | TRST | PERF |
|---|---|---|---|---|---|---|---|---|
| TMS | 0.83 | 0.50 | **0.70** | | | | | |
| EX_INF | 0.92 | 0.74 | -0.03 | **0.86** | | | | |
| IN_INF | 0.88 | 0.64 | 0.08 | 0.63 | **0.80** | | | |
| RCPR | 0.80 | 0.57 | 0.47 | 0.06 | 0.10 | **0.76** | | |
| TRST | 0.80 | 0.57 | 0.50 | -0.15 | -0.13 | 0.75 | **0.76** | |
| PERF | 0.87 | 0.69 | 0.55 | 0.06 | 0.17 | 0.69 | 0.55 | **0.83** |

CR=Composite reliability, AVE=Average variance explained, TMS=TMS in EGKNs, EX_INF=External Information Sharing, IN_INF=Internal Information Sharing, RCPR=Reciprocity, Trust=Interpersonal trust, PERR=Performance

## 6.6. Common Method Variance

The potential of common method variance (CMV) (or commonly known common method bias) was examined. CMV is a source of concern in studies using self-report measure (Spector, 2006). CMV may cause measurement error due to systematic response bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Measurement errors

can threaten the validity of the conclusions by providing a different interpretation of the relationship between observed (or manifest) variables and their respective latent construct (Podsakoff et al., 2003). Podsakoff et al. (2003) highlighted the use of various methods including Harman's single factor test, partial correlation, common latent factor based on CFA. This study included Harman's single factor test and common latent factor (CLF) based on CFA to verify whether CMV or common method bias is an issue in this research.

### 6.6.1. Harman's Single Factor Test

A study can have significant method bias if the majority (more than 50%) of the variance can be accounted for by a single factor (Harman, 1976). To find common method bias in responses, Harman's single factor method test was performed in SPSS on the NZKM response set. The results in Table 6.6 do not indicate the emergence of a single factor as no more than 26% of the items were accumulated in one factor. CMV is indicated by "the emergence of either a single factor or a general factor accounting for the majority of covariance among measures" (Podsakoff et al. 2003, p. 889). Based on the results, CMV is not seen a likely issue of concern in this study. A second test (CLF) was performed to get further assurance on the issue.

Table 6.6 *Total Variance Explained*

| **Component** | **Initial Eigenvalues** | | | **Extraction Sums of Squared Loadings** | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 5.904 | 26.834 | 26.834 | 5.904 | 26.834 | 26.834 |
| 2 | 4.882 | 22.192 | 49.026 | | | |
| 3 | 2.057 | 9.349 | 58.375 | | | |
| 4 | 1.363 | 6.195 | 64.570 | | | |
| 5 | 1.098 | 4.990 | 69.559 | | | |
| 6 | .840 | 3.819 | 73.379 | | | |
| 7 | .818 | 3.719 | 77.097 | | | |
| 8 | .617 | 2.807 | 79.904 | | | |

| | | | |
|---|---|---|---|
| 9 | .582 | 2.644 | 82.548 |
| 10 | .472 | 2.146 | 84.695 |
| 11 | .438 | 1.992 | 86.687 |
| 12 | .411 | 1.866 | 88.553 |
| 13 | .391 | 1.777 | 90.329 |
| 14 | .346 | 1.572 | 91.902 |
| 15 | .290 | 1.318 | 93.219 |
| 16 | .280 | 1.275 | 94.494 |
| 17 | .253 | 1.150 | 95.644 |
| 18 | .249 | 1.130 | 96.774 |
| 19 | .226 | 1.029 | 97.803 |
| 20 | .200 | .911 | 98.714 |
| 21 | .154 | .700 | 99.414 |
| 22 | .129 | .586 | 100.000 |

Extraction Method: Principal Component Analysis.

### 6.6.2. Common Latent Factor

The second method used to identify common method bias was the common latent factor (CLF) recommended by Podsakoff et al. (2003). This method requires measurement items (or indicators) to be loaded on their individual theoretical latent constructs as well as on a common latent factor (i.e. CLF), and the common method variance were examined by comparing results with and without using the CLF (Podsakoff et al., 2003). Results indicate that there were no significant differences between the two models (i.e. with and without CLF) (see Gaskin, 2012). The results of common method variance test are presented in Table 6.7.

Table 6.7 *Common Latent Factor, Using CFA*

| **Standardized Regression Weights: (with CLF)** | | | | **Standardized Regression Weights: (without CLF)** | | | | **Difference** |
|---|---|---|---|---|---|---|---|---|
| | | | *Estimate* | | | | *Estimate* | *Estimate* |
| EX_INF4 | <--- | EX_INF | 0.82 | EX_INF4 | <--- | EX_INF | 0.82 | 0.00 |
| EX_INF3 | <--- | EX_INF | 0.83 | EX_INF3 | <--- | EX_INF | 0.83 | 0.00 |
| EX_INF2 | <--- | EX_INF | 0.92 | EX_INF2 | <--- | EX_INF | 0.93 | 0.00 |
| EX_INF1 | <--- | EX_INF | 0.85 | EX_INF1 | <--- | EX_INF | 0.85 | 0.00 |
| IN_INF4 | <--- | IN_INF | 0.72 | IN_INF4 | <--- | IN_INF | 0.76 | 0.04 |
| IN_INF3 | <--- | IN_INF | 0.86 | IN_INF3 | <--- | IN_INF | 0.78 | -0.08 |
| IN_INF2 | <--- | IN_INF | 0.95 | IN_INF2 | <--- | IN_INF | 0.90 | -0.04 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| IN_INF1 | <--- | IN_INF | 0.71 | IN_INF1 | <--- | IN_INF | 0.75 | 0.04 |
| RCPR3 | <--- | RCPR | 0.75 | RCPR3 | <--- | RCPR | 0.76 | 0.01 |
| RCPR2 | <--- | RCPR | 0.79 | RCPR2 | <--- | RCPR | 0.79 | 0.01 |
| RCPR1 | <--- | RCPR | 0.71 | RCPR1 | <--- | RCPR | 0.72 | 0.01 |
| Trust3 | <--- | TRST | 0.79 | Trust3 | <--- | TRST | 0.80 | 0.01 |
| Trust2 | <--- | TRST | 0.80 | Trust2 | <--- | TRST | 0.80 | 0.00 |
| Trust1 | <--- | TRST | 0.68 | Trust1 | <--- | TRST | 0.67 | -0.01 |
| TMS5 | <--- | TMS | 0.69 | TMS5 | <--- | TMS | 0.69 | 0.00 |
| TMS4 | <--- | TMS | 0.64 | TMS4 | <--- | TMS | 0.64 | 0.00 |
| TMS3 | <--- | TMS | 0.87 | TMS3 | <--- | TMS | 0.86 | 0.00 |
| TMS2 | <--- | TMS | 0.65 | TMS2 | <--- | TMS | 0.65 | 0.00 |
| TMS1 | <--- | TMS | 0.65 | TMS1 | <--- | TMS | 0.65 | 0.00 |
| PERF3 | <--- | PERF | 0.83 | PERF3 | <--- | PERF | 0.83 | 0.00 |
| PERF2 | <--- | PERF | 0.87 | PERF2 | <--- | PERF | 0.87 | 0.00 |
| PERF1 | <--- | PERF | 0.79 | PERF1 | <--- | PERF | 0.79 | 0.00 |

## 6.7. Structural Model Testing

As outlined in section 5.3.2, structural model test evaluates dependence relationships between hypothesised constructs of the model by measuring the value and statistical significance of the path coefficients. Figure 6.13 shows the structural model and values of path coefficient. Appendix F provides significance values (i.e. *p-value*) and detailed results of structural model testing. The structural model (Figure 6.13) allows a pictorial view of the relationships between external and internal information sharing, norms of reciprocity, interpersonal trust, and TMS development. The SEM model confirms that internal information sharing between individuals together with norms of reciprocity and interpersonal trust lead to the development of TMS in their EGKNs, and such TMS structures improve task performance. A summary of the hypotheses results is provided in Table 6.8.

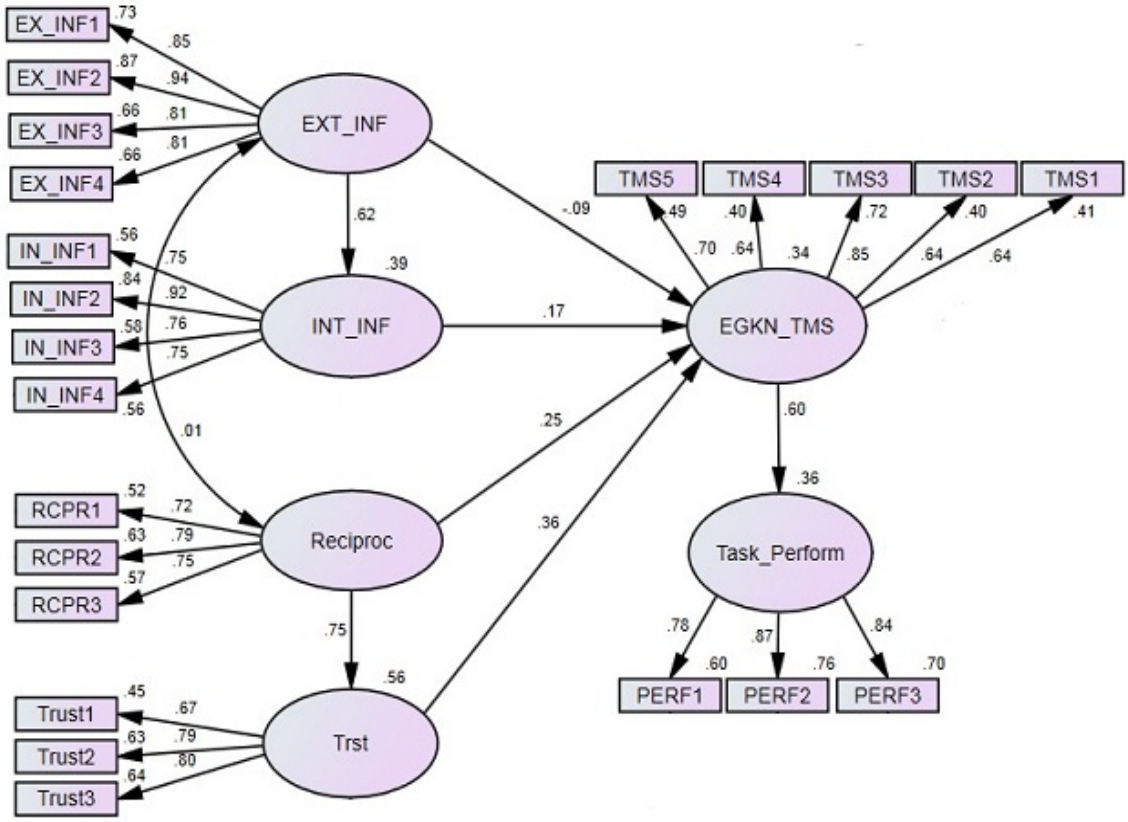


*Figure 6.13.* Structural model (NZKM dataset).

Table 6.8 *Hypotheses Results (NZKM Sample)*

| Sr. | Hypothesis | Results summary |
|---|---|---|
| H1 | *External information sharing improves the level of TMS held by individuals in their EGKNs* | The direct relationship between cross-firm informal information sharing and TMS development is not significant ($\beta$ = -0.09, $p$ ns), thus rejecting H4 |
| H2 | *Individuals who share information externally, transfer learning in their internal informal networks* | Significant relationship found ($\beta$ = 0.62, $p$ < .001), thus supporting the hypothesis |
| H3 | *Internal (intra-organisational) information sharing improves the level of TMS held by individuals in their EGKNs* | Partially supported since significance level is slightly higher than the standard *p-value* .05 ($\beta$ = 0.17, $p$ =.07) |

| Sr. | Hypothesis | Results summary |
|---|---|---|
| H4 | *Norms of reciprocity increase the level of TMS held by individuals in their EGKNs* | Partially supported since significance level is slightly higher than the standard *p-value* .05 ($\beta$ = 0.25, $p = .07$) |
| H5 | *Norms of reciprocity increase the level of trust between socially connected individuals* | The relationship between norms of reciprocity (Reciproc) and interpersonal trust (Trst) is highly significant ($\beta$ = 0.75, $p < .001$), supporting this hypothesis |
| H6 | *Interpersonal trust increases the level of TMS held by individuals in their EGKNs* | Hypothesis is supported as interpersonal trust improves the level of TMS in socially connected individuals ($\beta$ = 0.36, $p$ <.01) |
| H7 | *TMS developed in EGKNs of professionals helps in problem solving and improves task performance* | Hypothesis is well supported ($\beta$ = 0.60, $p$ < .01), confirming that TMS developed in EGKNs of professionals positively impact on individual's problem solving ability and task performance |

## 6.8. Summary of the Chapter

This chapter has discussed results of the survey and analysis performed on the NZKM dataset, which was established from the responses of the members of NZKM network. Demographics of the survey participants show that most of them were information and knowledge management professionals working at middle level positions in their organisations. The descriptive statistics revealed that the majority of the respondents used their informal contacts to share work-specific information and knowledge across their work organisations. These professionals had internal and external information and knowledge networks and most of the respondents had equal numbers of information sharing ties within and outside their work organisations.

An EFA was performed to see how the measurement items are loaded into their conceptualised constructs. After getting an adequate rotation matrix (see Table 6.2), the research model was tested using the SEM technique. It first assessed the fitness of the measurement model with the data and then run path analysis to test the hypotheses associated with the model. Findings indicated a good fit of the model with sufficient convergent and discriminant validity of the model. The structural model then tested the hypotheses associated with the model. The hypotheses results indicated a good support for the various predicted links except the link between external information sharing and TMS development in EGKNs of professionals. There is non-significant relationship between external information sharing and TMS development. There was also a partial support for the link between interpersonal trust and TMS development in EGKNs. A detailed discussion on these results is provided in Chapter 8.

# CHAPTER SEVEN

## CROSS-VALIDATIONS OF THE FINDINGS

## (USING THE KOMPASS DATASET)

This chapter provides details of phase two data collection and analysis. Phase two study was performed for cross-validations of the findings through an independent dataset. The phase two survey established a dataset from the Kompass directory of New Zealand companies. Eight hundred business and industry professionals were selected from the list of more than six thousand available contacts in the directory. An online survey, followed by the paper survey was then forwarded to the selected individuals. Out of 800 distributed surveys, 217 completed responses were received, thus yielded a response rate of 27%. The findings from the two samples were then compared to highlight the similarities and the differences in the two studies.

### 7.1. Data Cleaning and Normality Assumptions

As discussed in section 6.1, those cases were deleted where the majority (more than 50%) of the values in measured variables was missing. Some missing values (in eight cases) were imputed with the mean of all nearby values after ensuring that the overall mean remained unaffected by the new values, using the guidelines suggested by Graham (2012) and Little and Rubin (2002). Some (three) unengaged responses were observed and deleted by looking at the standard deviation and by examining cases physically. Data were observed multivariate normal (for the purposes of SEM analysis) since all of the indicators passed the Kline (2011) test for skewness and kurtosis. The values for individual indicators were less than 3 and 10, respectively. See results in Appendix G.

## 7.2. Demographics of the Respondents

The demographics are shown in Figures 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7. In all these figures, N represents the total number of respondents in each category of questions. Compared to the NZKM sample, where male and female were almost equal in numbers, this sample had the majority (73%) male members, and there were only 22% female respondents. The average age of more than half (52%) of the respondents were over 50 years, and 30% of them were in the age bracket 40-49. The majority (29%) of the respondents was holding Masters' degrees or above, followed by 27% Bachelors' degrees and Diplomas. A large majority (78%) of the respondents were holding senior level positions in their organisations. The majority (42%) of the respondents in this sample were chief executives and general managers. Many of them (34%) belonged to professional, scientific, and technical service. Overall, the respondents in this sample were senior professionals who belonged to a variety of industry sectors and types of occupations.

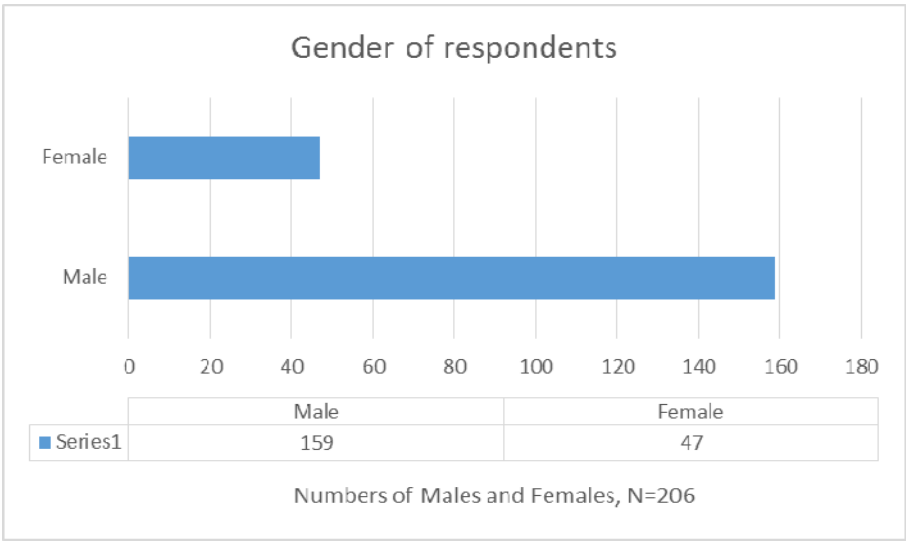


*Figure 7.1.* Gender specification.

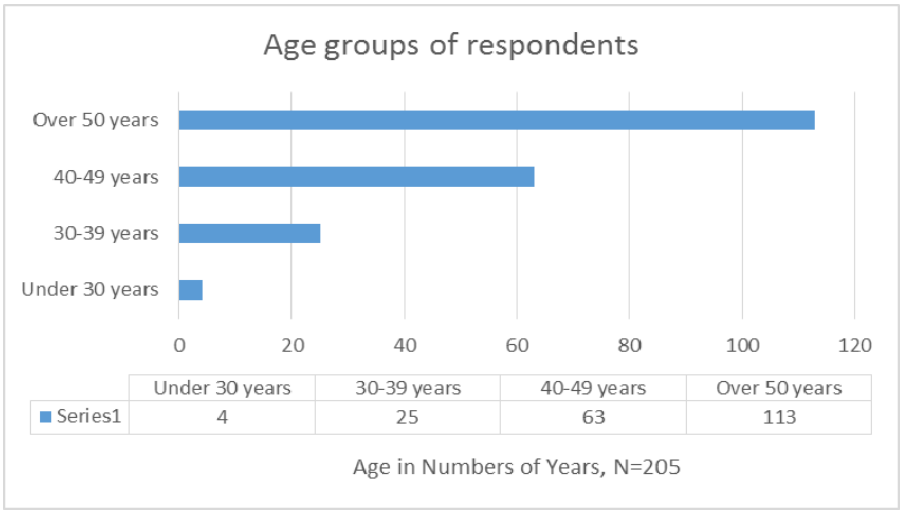


*Figure 7.2.* Age groups of the respondents.

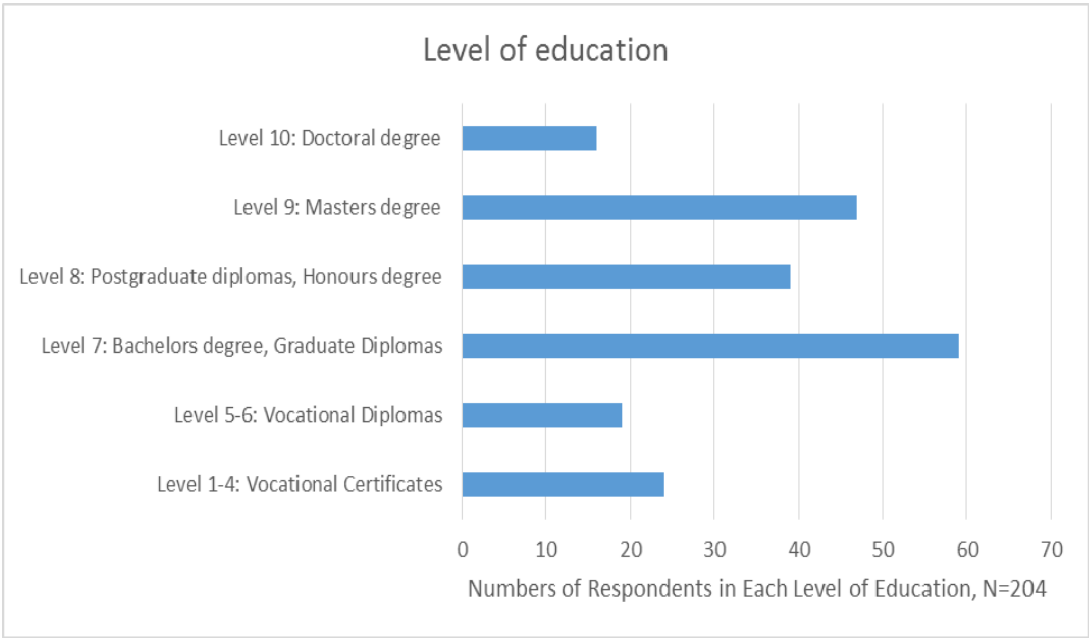


*Figure 7.3.* Level of education of the respondents.

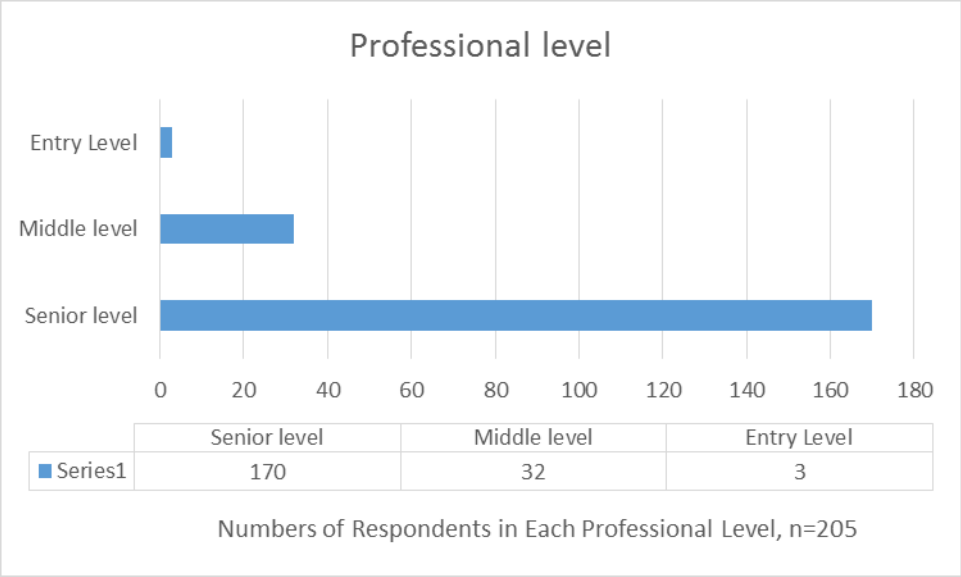


*Figure 7.4.* Professional level of the respondents.

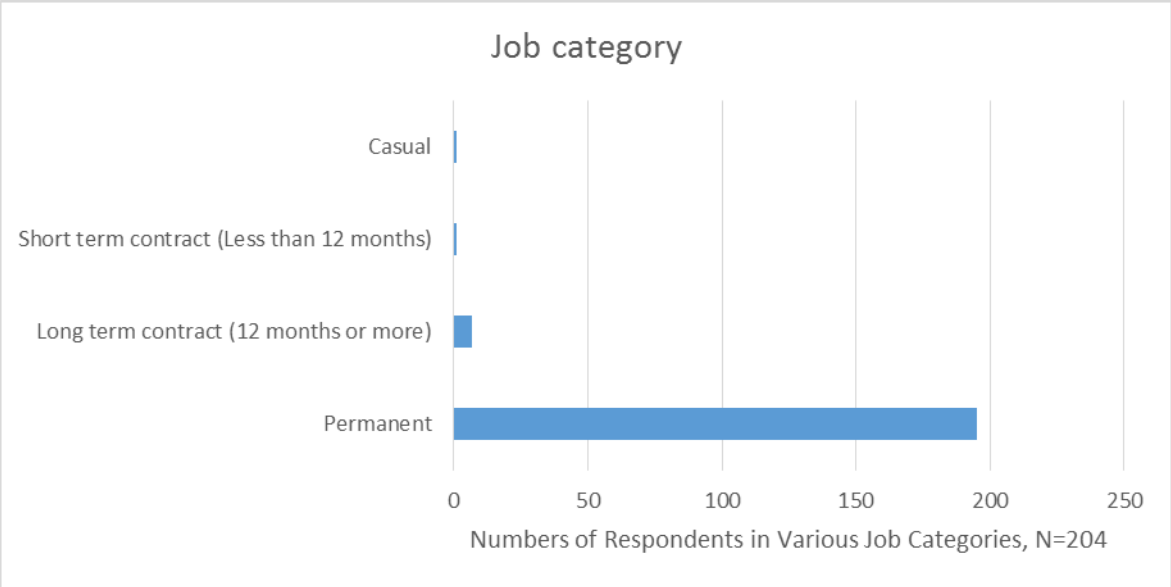


*Figure 7.5.* Job category of the respondents.

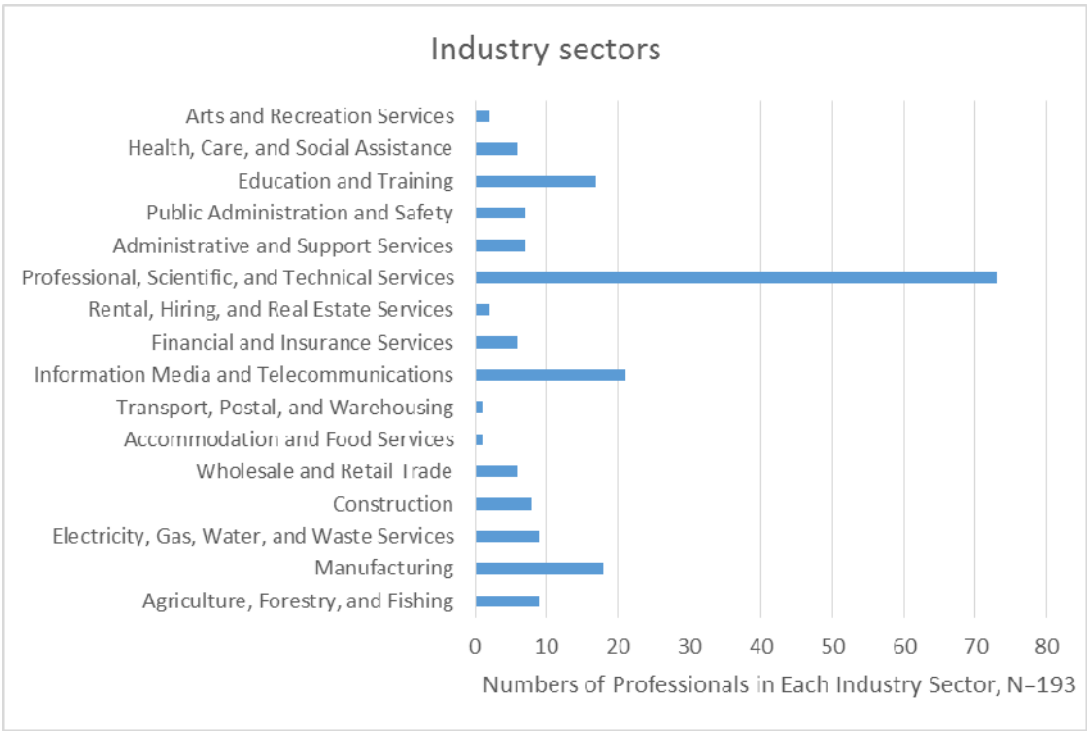


*Figure 7.6.* Industry sectors of the respondents.

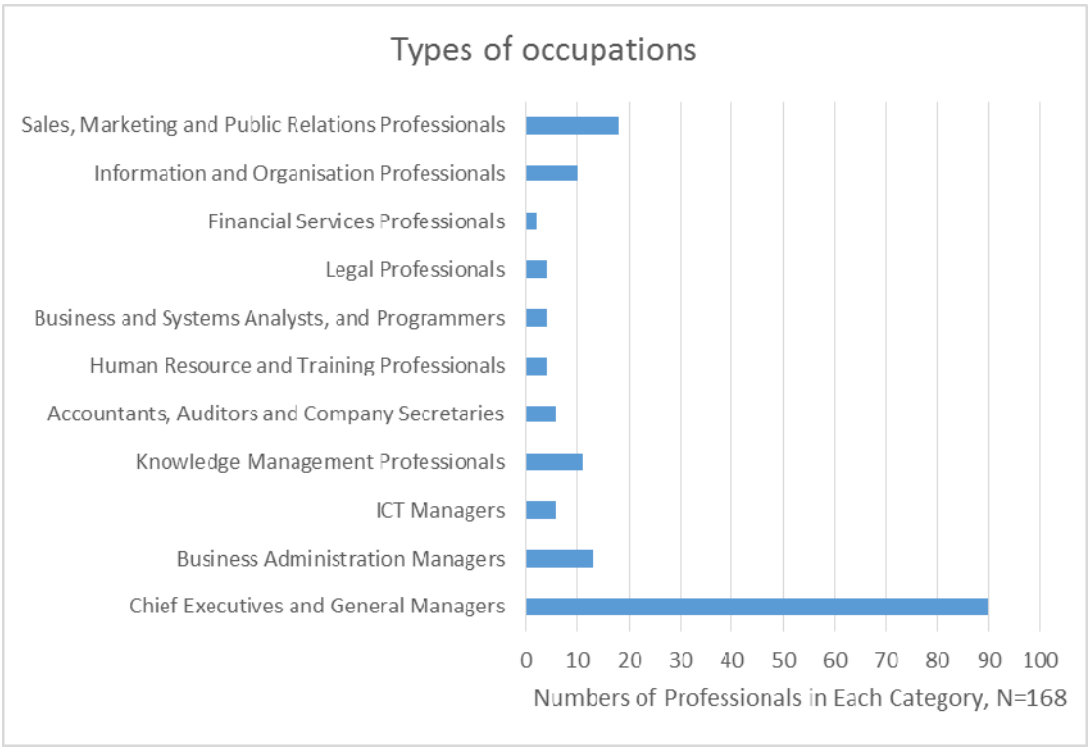


*Figure 7.7.* Types of occupations of the respondents.

### 7.2.1. Comparisons of Demographics of the Respondents

A comparison of the demographic characteristics of the respondents in both NZKM and Kompass samples is provided in Table 7.1. These results indicated many similarities in the demographics characteristics of respondents in both the samples.

Table 7.1 *Demographic Comparison of NZKM and Kompass Samples*

| **Sr.** | **Category** | **NZKM (N=194)** | **Kompass (N=217)** |
|---|---|---|---|
| 1. | Gender | Almost equal numbers of males (47%) and females (45%) | Majority of the respondents were males (73%) and females were only 22% |
| 2. | Age | 39% of the respondents were over 50 years of age, followed by 24% in the age range (40-49 years) and then 25% were in the age bracket (30-39 years) | 52% of the respondents were over 50 years of age, followed by 29% in the age range (40-49 years) and then 12% were in the age bracket (30-39 years) |
| 3. | Education | A majority 45% of the respondents hold Masters' degrees and above, followed by 20% having Postgraduate diplomas, and 20% Bachelors' degrees or Graduate diplomas | A majority (29%) of the respondents hold Masters' degrees and above followed by 27% having Bachelors' degrees or Graduate diplomas and 20% vocational certificates and diplomas |
| 4. | Professional status | 37% of the respondents were holding senior level positions in their organisations, followed by 53% at the middle level positions. | 78% of the respondents were holding senior level positions in their organisations, followed by 15% at the middle level positions |
| 5. | Job category | 81% of the respondents were holding permanent position in their jobs | 90% of the respondents were holding permanent position in their jobs |
| 6. | Mobility | 50% have had worked in just one organisation | 66% have had worked in just one organisation |

| Sr. | Category | NZKM (N=194) | Kompass (N=217) |
|---|---|---|---|
| 7. | Industry sector | 29% of the respondents were working in Professional, Scientific, and Technical Services, followed by 14% in Education, and 13% in Public Administration | 34% of the respondents were working in Professional, Scientific, and Technical Services, followed by 10% in Information Media and Telecommunications industry |
| 8. | Occupation type | 23% were Information and Organisational Professionals, followed by 16% Knowledge Management Professionals, and 10% Business Administration and ICT Managers | 42% were CEO and General Managers, followed by 8% Sales, Marketing, and Public Relations Professionals, and 9% Business Administration and ICT Managers |

## 7.3. Descriptives and Intercorrelations

The results showed that the majority of the respondents used to share work-related information with informal contacts who may work within or outside of their work organisations. See Figures 7.8, 7.9, 7.10, 7.11. Interestingly, the response indicated that people had more ties outside their work organisations as compared to their informal information sharing ties within their organisations (see Figures 7.10 and 7.11).

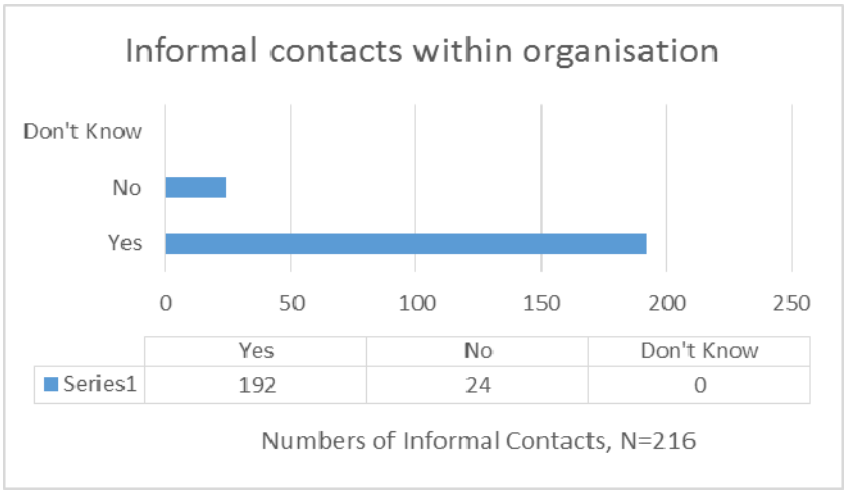


*Figure 7.8.* Informal contacts within organisation.

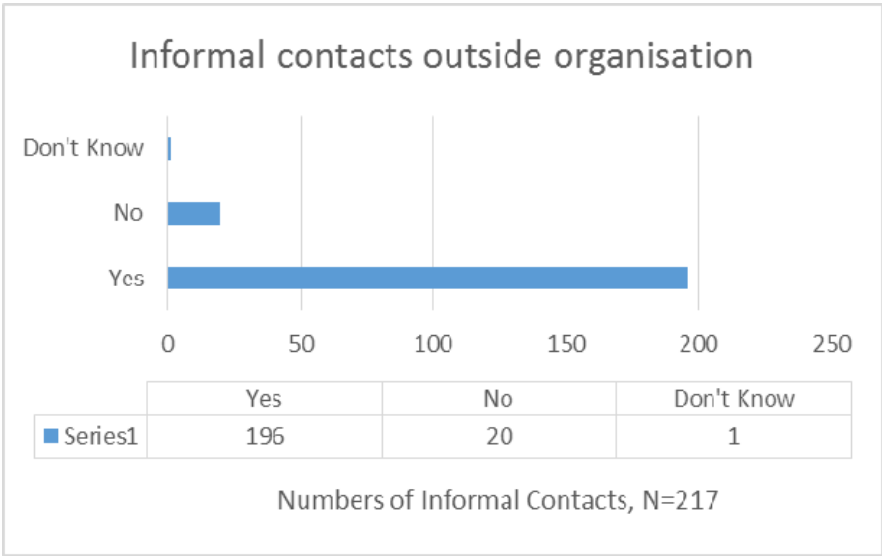


*Figure 7.9.* Informal contacts outside organisation.

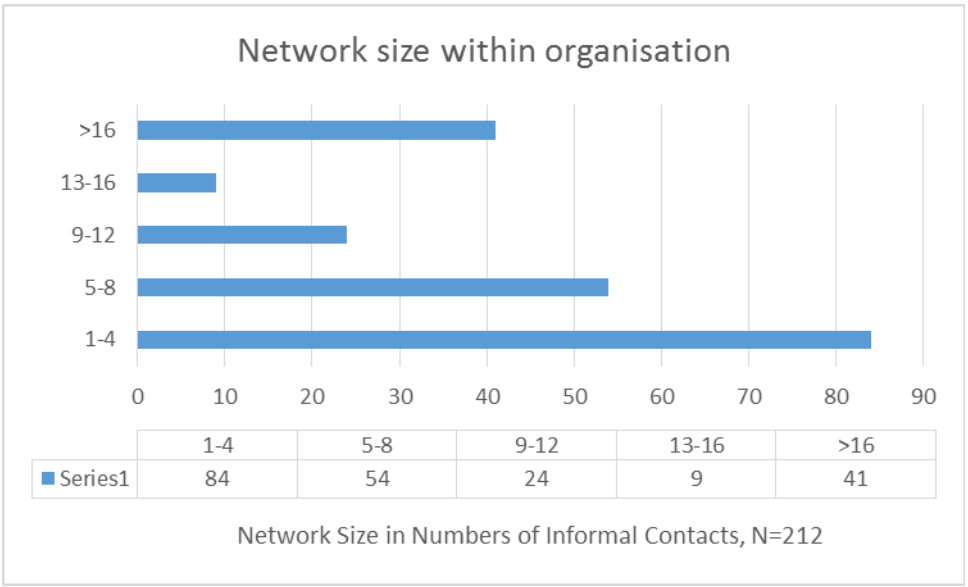


*Figure 7.10.* Network size within organisation.

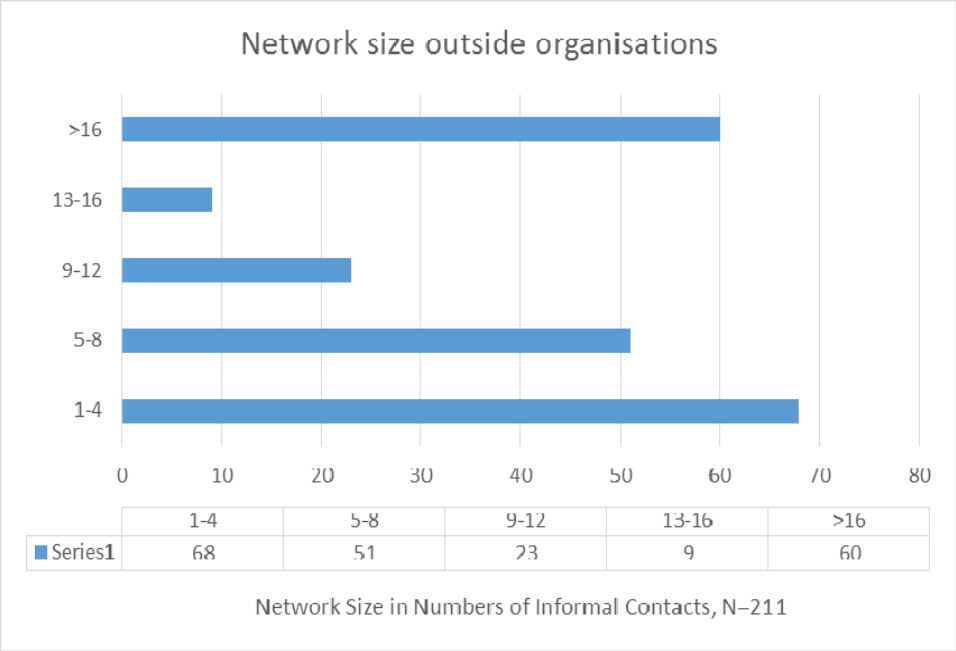


*Figure 7.11.* Network size outside organisation.

Table 7.2 presents the descriptives and intercorrelations between items. Means scores are calculated on multiple-items constructs on a 5-point Likert scale: *1='strongly disagree', 2='disagree', 3='neutral', 4='agree', 5='strongly agree'.* Similar to findings in the NZKM sample, it appears that professionals in this sample also frequently shared information with their informal contacts within organisations. In addition, the survey participants also reported frequent instances of information sharing with colleagues outside their work organisations. There appeared a strong correlation between internal and external information sharing. This suggests that individuals who shared information in external networks also shared learning in internal networks. The results also showed strong correlation between norms of reciprocity and interpersonal trust. This suggests that norms of reciprocity in their informal networks increase interpersonal trust between them. The results (see Table 7.2) also indicate statistically significant relationship between internal information trading, norms of reciprocity, interpersonal trust, and TMS of an individual.

Table 7.2 *Descriptives and Intercorrelations, N=217*

| | | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | External information sharing (04 items) | 2.6 | .93 | 1 | .57** | .05 | .07 | .16* | .11 |
| 2 | Internal information sharing (04 items) | 3.3 | 1.0 | .57** | 1 | .13* | .16* | .33** | .28** |
| 3 | Norms of reciprocity (03 items) | 3.8 | .60 | .05 | .13* | 1 | .68** | .53** | .58** |
| 4 | Interpersonal trust (03 items) | 3.5 | .74 | .07 | .16* | .68** | 1 | .50** | .54** |
| 5 | TMS in EGKNs (05 items) | 4.0 | .56 | .16* | .33** | .53** | .50** | 1 | .58** |
| 6 | Performance (03 items) | 4.1 | .60 | .11 | .28** | .58** | .54** | .58** | 1 |

** *Correlation is significant at the 0.01 level (2-tailed).*
* *Correlation is significant at the 0.05 level (2-tailed).*
*Means scores are calculated on a 5-point Likert scale*

### 7.3.1. Comparisons of Descriptive Results

The two independent samples were compared to explore the numbers of informal contacts, use of channels, and the similarity of information and knowledge sharing behaviours of respondents. Findings indicate that almost 90% of the respondents in NZKM sample have internal and external informal contacts (see Figures 6.8 & 6.9). Similar percentages were found in the Kompass sample (see Figures 7.8 & 7.9). Moreover, Table 7.3 shows that 66% of the participants in one sample and 63% in the other sample report that they have almost similar numbers of informal information sharing ties within and outside their work organisations. The comparisons of the use of information and knowledge sharing channels also reveal the similarity of the use of these channels in both samples (see Table 7.4). Finally, the comparisons of the Mean score (see Table 7.5) of the dependent and independent variables show no significant differences. These results indicate much similarity in both samples with regard to the

numbers of informal contacts within and across organisations and the information and knowledge sharing behavior of respondents.

Table 7.3 *Numbers of Informal Contacts Within and Outside the Organisation*

| **Sample** | **Total respondents** | **Exactly same numbers of contacts within and outside organisation** | **Difference of ( ± 1) in internal and external contacts** | **Total** | **% age** |
|---|---|---|---|---|---|
| NZKM | 194 | 72 | 56 | 128 | 66% |
| Kompass | 217 | 79 | 58 | 137 | 63% |

To investigate whether professionals used personal or impersonal means (e.g. email, internet) to share knowledge with colleagues, participants of the survey were asked about their preferred mode of knowledge sharing. In the first sample, 73% of the respondents preferred to use face-to-face meetings for the purpose of knowledge sharing. This was followed by phone calling and emails (both 38%), and then online discussion forums (10%), see Table 7.4. These results are almost similar in the second sample. This indicates that individuals preferred to share knowledge with their colleagues through face-to-face meetings.

Table 7.4 *Preferred Mode of Knowledge Sharing*

| **Preference** | **Mode of knowledge sharing** | **NZKM sample** | **Kompass sample** |
|---|---|---|---|
| 1st choice | Face to Face meetings | 73% | 76% |
| 2nd choice | Phone calling | 38% | 42% |
| 3rd choice | Emails | 38% | 40% |
| 4th choice | Online discussion forums | 10% | 7% |
| 5th choice | Others | 5% | 9% |

A comparison of means scores of both NZKM and Kompass samples is provided in Table 7.5. These results indicate much similarity in the behavior of respondents in both samples with regard to informal and knowledge sharing.

Table 7.5 *Comparison of Means, NZKM and Kompass Datasets*

| | | **NZKM Mean** N=194 | **SD** | **Kompass Mean** N=217 | **SD** |
|---|---|---|---|---|---|
| 1 | External information sharing (04 items) | 2.4 | .95 | 2.6 | .93 |
| 2 | Internal information sharing (04 items) | 3.3 | 1.0 | 3.3 | 1.0 |
| 3 | Norms of reciprocity (03 items) | 3.9 | .59 | 3.8 | .60 |
| 4 | Interpersonal trust (03 items) | 3.6 | .63 | 3.5 | .74 |
| 5 | TMS in EGKNs (05 items) | 3.9 | .65 | 4.0 | .56 |
| 6 | Performance (03 items) | 4.1 | .59 | 4.1 | .60 |

*Means scores are calculated on a 5-point Likert scale*

## 7.4. Measurement Model Cross-validation

The same procedure (as used in the first phase of the analysis, Chapter 6), was adopted to cross-validate the research model. The research model was first tested through CFA using AMOS Graphics (see Figure 7.12). Then, structural model testing (i.e. path analysis) was performed to verify the hypotheses associated with the research model. CFA for the new dataset confirm a reasonable fit of the data with the measurement model. Table 7.6 shows various indices determining the model fit.

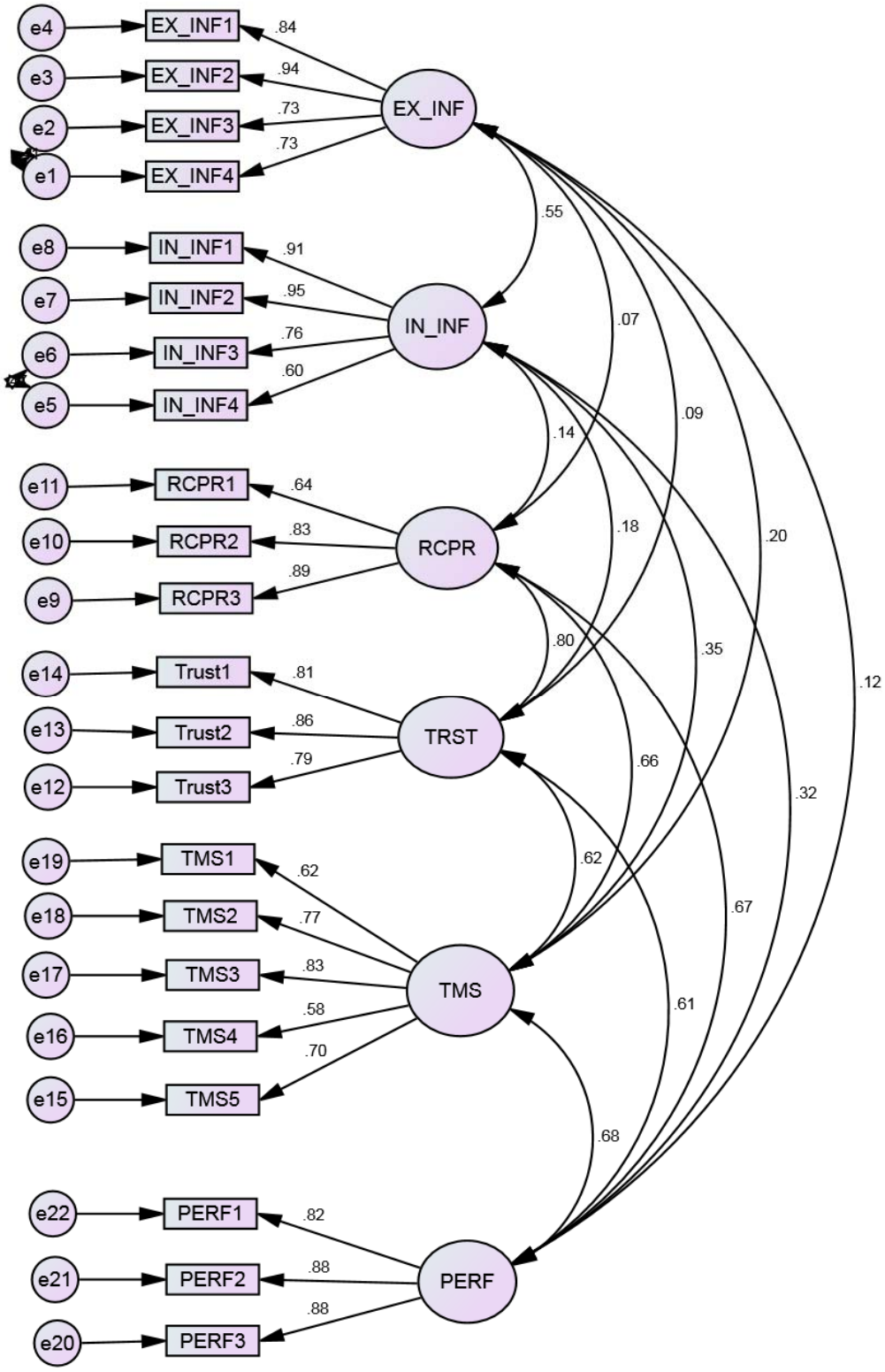


*Figure 7.12.* CFA model (Komapss dataset), e1-20 are the residuals or error variance.

Table 7.6 *Model Fit Indices for the Measurement Model*

| **Model fit indices** | **Observed value** | **Recommended value** |
|---|---|---|
| Chi-square/degree of freedom (CMIN/DF) | 1.46 | < 3.00 |
| Comparative fit index (CFI) | .97 | >.90 |
| Goodness-of-fit (GFI) | .89 | >.90 |
| Adjusted Goodness-of-fit (AGFI) | .86 | >.80 |
| Root mean square error of approximation (RMSEA) | .04 | < .08 |

The CFA results (Table 7.6) exhibited a good level of fit of the measurement model with the collected data. All the fit indices for CFA model (as shown in Table 7.6) indicated an acceptable fit of the model based on the criteria specified by Hu and Bentler (1999) and Kline (2005). The detailed results of CFA and model testing are provided in Appendix H. The measurement model was further evaluated for convergent and discriminant validity following the guidelines specified in sections 5.3.1.1 and 5.3.1.2.

### 7.4.1. Convergent Validity

Convergent validity was measured through following the guidelines provided in section 5.3.1.1. Indicator loadings, construct reliability, and AVE of each construct were evaluated, using the guidelines of Fornell & Larcker (1981). Table 7.6 shows factor loadings for all items, composite reliability, and AVE values of the constructs. The guidelines are that all loadings should be at least 0.5, and preferably 0.7; average variance extracted (AVE) measures should exceed 50 percent; and composite reliability should exceed 0.60. The lowest factor loadings is 0.57 (TMS4), and AVE for *TMS in EGKNs* is 0.50 (just acceptable). See these results in Table 7.6. The results indicate fair convergent validity of the measurement model.

Table 7.7 *Results of Convergent Validity*

| Construct and indicators | Factor Loadings | CR | AVE |
|---|---|---|---|
| *External information sharing* | | 0.89 | 0.66 |
| EX_INF1 | .835 | | |
| EX_INF2 | .936 | | |
| EX_INF3 | .734 | | |
| EX_INF4 | .728 | | |
| *Internal information sharing* | | 0.89 | 0.66 |
| IN_INF1 | .911 | | |
| IN_INF2 | .945 | | |
| IN_INF3 | .756 | | |
| IN_INF4 | .603 | | |
| *Norms of reciprocity* | | 0.83 | 0.63 |
| RCPR1 | .641 | | |
| RCPR2 | .831 | | |
| RCPR3 | .887 | | |
| *Interpersonal trust* | | 0.86 | 0.67 |
| Trust1 | .806 | | |
| Trust2 | .862 | | |
| Trust3 | .793 | | |
| *TMS in EGKNs* | | 0.83 | 0.50 |
| TMS1 | .624 | | |
| TMS2 | .770 | | |
| TMS3 | .832 | | |
| TMS4 | .576 | | |
| TMS5 | .703 | | |
| *Performance* | | 0.89 | 0.74 |
| PERF1 | .818 | | |
| PERF2 | .877 | | |
| PERF3 | .881 | | |

*CR= Composite reliability, AVE=Average variance extracted*

### 7.4.2. Discriminant validity

Discriminant validity was assessed using the guidelines outlined in section 5.3.1.2. According to these guidelines, AVE for a construct should be greater than any of the inter-factor correlations. The AVE (as shown in Table 7.7 and 7.8) was on or above with the squared correlations between any of the factors (see diagonal values in Table 7.8), except ‘norms of reciprocity’ (RCPR). The square root of the AVE for

RCPR is less than one the absolute value of the correlations with another factor, but it is still very close to it.

Table 7.8 *Composite Reliability, AVE, and Intercorrelations*

| | **CR** | **AVE** | **TMS** | **EX_INF** | **IN_INF** | **RCPR** | **TRST** | **PERF** |
|---|---|---|---|---|---|---|---|---|
| TMS | 0.83 | 0.50 | **0.71** | | | | | |
| EX_INF | 0.89 | 0.66 | 0.20 | **0.81** | | | | |
| IN_INF | 0.89 | 0.66 | 0.35 | 0.56 | **0.82** | | | |
| RCPR | 0.83 | 0.63 | 0.66 | 0.08 | 0.14 | **0.79*** | | |
| TRST | 0.86 | 0.67 | 0.62 | 0.09 | 0.18 | 0.80 | **0.82** | |
| PERF | 0.89 | 0.74 | 0.68 | 0.12 | 0.32 | 0.67 | 0.61 | **0.86** |

CR=Composite reliability, AVE=Average variance explained, TMS=TMS in EGKNs, EX_INF=External Information Sharing, IN_INF=Internal Information Sharing, RCPR=Reciprocity, Trust=Interpersonal trust, PERR=Performance

Overall, the measurement model demonstrated sufficient discriminant validity. There is only one minor issue with the discriminant validity with regard to the measurement items of the 'Reciprocity' construct. Since the value is much closer to the acceptable level and the minimum factor loadings of the items of 'Reciprocity' were greater than 0.5 (i.e. RCPR1=.641, see Table 7.7), it was assumed that the impact of this issue would not be significant. Moreover, this issue was not evident in the NZKM sample (see Table 6.5).

## 7.5. Common Method Variance

The Kompass dataset was also evaluated for common method variance using the same approach as illustrated in section 6.6. The same two tests (Harman's single factor test and common latent factor) were performed on the Kompass dataset.

### 7.5.1. Harman's Single Factor Test

As discussed in section 6.6.1, Harman's single factor method test was performed on the Kompass dataset using SPSS. The results in Table 7.9 indicate that no more than

34% of the items were explained by a single factor, suggesting non-existence of the common method issue. CLF was also performed to further check the likelihood of common method variance.

### 7.5.2. Common Latent Factor

As discussed in section 6.6.2, CLF was performed on the Kompass dataset. Using the same procedure, the latent factors in the CFA model (see Figure 7.12) were loaded into one common factor (i.e. CLF), and the common method variance were examined by comparing results with and without using the CLF (Podsakoff et al., 2003). The standardised regression weights of the two models (i.e. with and without CLF) were compared to find the existence of common method variance (Gaskin, 2012). The results indicate that there were no significant differences between the two models as suggested earlier. This confirms that common method bias was not an issue in this dataset. The results of common method variance are shown in Table 7.10.

Table 7.9 *Total Variance Explained*

| **Component** | **Initial Eigenvalues** | | | **Extraction Sums of Squared Loadings** | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 7.582 | 34.462 | 34.462 | 7.582 | 34.462 | 34.462 |
| 2 | 4.195 | 19.068 | 53.530 | | | |
| 3 | 1.607 | 7.304 | 60.834 | | | |
| 4 | 1.215 | 5.522 | 66.356 | | | |
| 5 | 1.090 | 4.955 | 71.311 | | | |
| 6 | .734 | 3.337 | 74.648 | | | |
| 7 | .696 | 3.163 | 77.811 | | | |
| 8 | .602 | 2.738 | 80.549 | | | |
| 9 | .573 | 2.604 | 83.153 | | | |
| 10 | .522 | 2.373 | 85.526 | | | |
| 11 | .442 | 2.009 | 87.535 | | | |
| 12 | .416 | 1.889 | 89.424 | | | |
| 13 | .372 | 1.692 | 91.117 | | | |
| 14 | .301 | 1.366 | 92.483 | | | |
| 15 | .281 | 1.279 | 93.762 | | | |
| 16 | .265 | 1.203 | 94.965 | | | |

| | | | |
|---|---|---|---|
| 17 | .221 | 1.004 | 95.969 |
| 18 | .216 | .980 | 96.948 |
| 19 | .204 | .929 | 97.878 |
| 20 | .181 | .824 | 98.702 |
| 21 | .164 | .747 | 99.450 |
| 22 | .121 | .550 | 100.000 |

*Extraction Method: Principal Component Analysis.*

Table 7.10 *Common Latent Factor, Using CFA*

| **Standardized Regression Weights: (with Common Latent Factor)** | | | | **Standardized Regression Weights: (without Common Latent Factor)** | | | | **Difference** |
|---|---|---|---|---|---|---|---|---|
| | | | *Estimate* | | | | *Estimate* | *Estimate* |
| EX_INF4 | <--- | EX_INF | 0.80 | EX_INF4 | <--- | EX_INF | 0.77 | -0.03 |
| EX_INF3 | <--- | EX_INF | 0.80 | EX_INF3 | <--- | EX_INF | 0.78 | -0.02 |
| EX_INF2 | <--- | EX_INF | 0.90 | EX_INF2 | <--- | EX_INF | 0.91 | 0.02 |
| EX_INF1 | <--- | EX_INF | 0.82 | EX_INF1 | <--- | EX_INF | 0.83 | 0.01 |
| IN_INF4 | <--- | IN_INF | 0.79 | IN_INF4 | <--- | IN_INF | 0.65 | -0.15 |
| IN_INF3 | <--- | IN_INF | 0.87 | IN_INF3 | <--- | IN_INF | 0.78 | -0.09 |
| IN_INF2 | <--- | IN_INF | 0.79 | IN_INF2 | <--- | IN_INF | 0.93 | 0.14 |
| IN_INF1 | <--- | IN_INF | 0.76 | IN_INF1 | <--- | IN_INF | 0.91 | 0.15 |
| RCPR3 | <--- | RCPR | 0.88 | RCPR3 | <--- | RCPR | 0.89 | 0.01 |
| RCPR2 | <--- | RCPR | 0.83 | RCPR2 | <--- | RCPR | 0.83 | 0.00 |
| RCPR1 | <--- | RCPR | 0.64 | RCPR1 | <--- | RCPR | 0.64 | 0.00 |
| Trust3 | <--- | TRST | 0.80 | Trust3 | <--- | TRST | 0.79 | 0.00 |
| Trust2 | <--- | TRST | 0.86 | Trust2 | <--- | TRST | 0.86 | 0.00 |
| Trust1 | <--- | TRST | 0.81 | Trust1 | <--- | TRST | 0.81 | 0.00 |
| TMS5 | <--- | TMS | 0.72 | TMS5 | <--- | TMS | 0.72 | 0.00 |
| TMS4 | <--- | TMS | 0.55 | TMS4 | <--- | TMS | 0.57 | 0.02 |
| TMS3 | <--- | TMS | 0.85 | TMS3 | <--- | TMS | 0.85 | -0.01 |
| TMS2 | <--- | TMS | 0.74 | TMS2 | <--- | TMS | 0.74 | 0.00 |
| TMS1 | <--- | TMS | 0.56 | TMS1 | <--- | TMS | 0.57 | 0.01 |
| PERF3 | <--- | PERF | 0.88 | PERF3 | <--- | PERF | 0.88 | 0.00 |
| PERF2 | <--- | PERF | 0.88 | PERF2 | <--- | PERF | 0.88 | 0.00 |
| PERF1 | <--- | PERF | 0.82 | PERF1 | <--- | PERF | 0.82 | 0.00 |

## 7.6. Structural Model Cross-validation

As outline in section 5.3.2, structural model test involves measuring the statistical significance of path coefficients and the amount of variance explained in dependent variables. This model allows a pictorial view of the relationships between external and internal information sharing, norms of reciprocity, interpersonal trust, and

TMS development. Figure 7.10 shows the structural model and path coefficient values. The significance values (*p-value*) and detailed results of structural model test are provided in Appendix I.

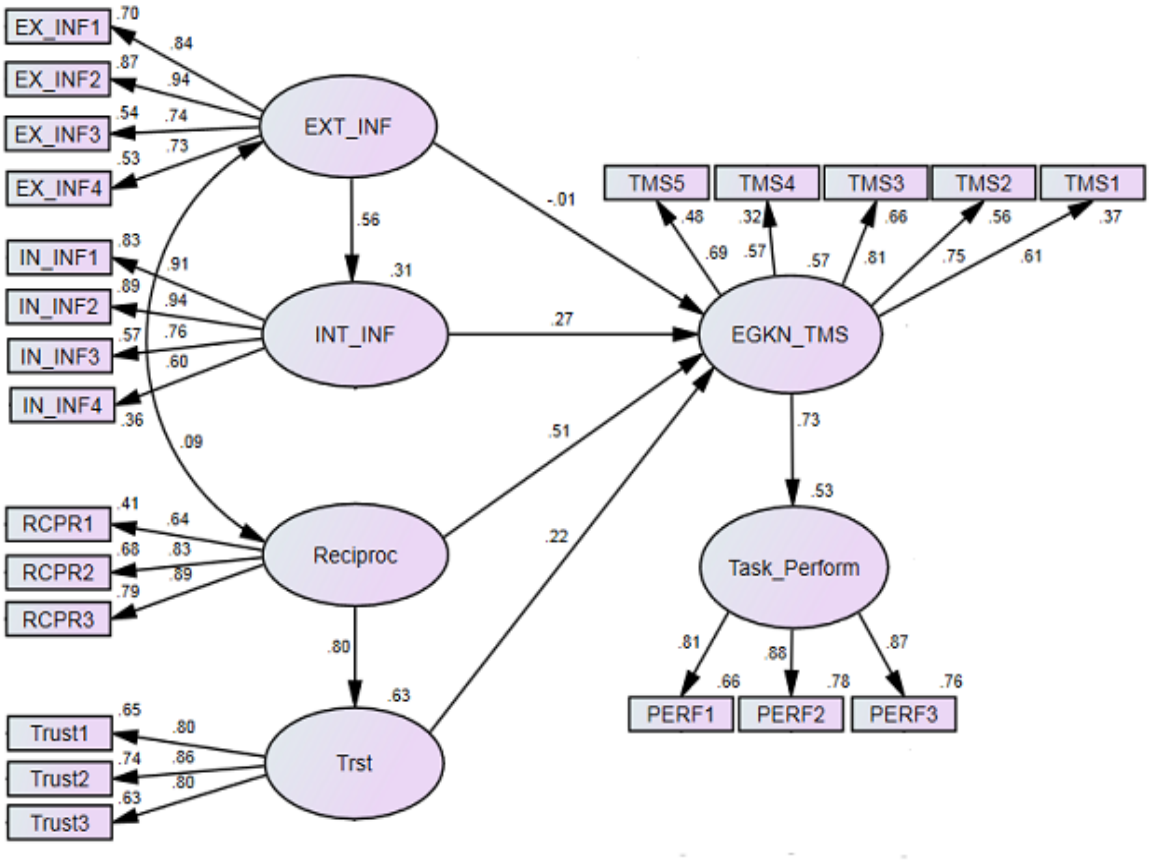


*Figure 7.13.* Structural model (Kompass dataset).

The results (Figure 7.10) indicate a significant contribution of internal information sharing, norms of reciprocity, and interpersonal trust, in the development of TMS structures in the EGKNs of professionals. Moreover, there is also a strong and significant link between TMS structures and task performance of individuals. A summary of the hypotheses results and comparisons of these results with those of the NZKM sample (see Table 6.8) are provided in Table 7.11.

Table 7.11 *Results of Hypotheses Testing*

| Sr. | Hypothesis | Results summary | Comparison with the NZKM sample |
|---|---|---|---|
| H1 | *External information sharing improves the level of TMS held by individuals in their EGKNs* | The direct relationship between cross-firm informal information sharing and TMS development is not significant ($\beta$ = 0.01, $p$ ns), thus rejecting H1 | Same outcome |
| H2 | *Individuals who share information externally, transfer learning in their internal informal networks* | Significant relationship found ($\beta$ = 0.56, $p$ < .001), thus supporting the hypothesis | - |
| H3 | *Internal (intra-organisational) information sharing improves the level of TMS held by individuals in their EGKNs* | Significant relationship found ($\beta$ = 0.27, $p$ < .001), thus supporting this hypothesis | Better supported here. This relationship was partially supported in the NZKM sample (see Table 6.7) |
| H4 | *Norms of reciprocity increase the level of TMS held by individuals in their EGKNs* | Well supported ($\beta$ = 0.51, $p$ < *.001*), indicating the role of expectations of reciprocity in the development of network TMS | Better supported here. This relationship was partially supported in the NZKM sample (see Table 6.7) |
| H5 | *Norms of reciprocity increase the level of trust between socially connected individuals* | Well supported. Strong and highly Significant relationship found ($\beta$ = 0.80, $p$ < *.001*) | Same outcome |
| H6 | *Interpersonal trust increases the level of TMS held by individuals in their EGKNs* | Hypothesis is partially supported since *p-value* is slightly higher than the standard significance level (.05) ($\beta$ = 0.22, $p$ =.07) | Better supported in the NZKM sample, as p-value < .01(see Table 6.7). Here it is partially supported |

| Sr. | Hypothesis | Results summary | Comparison with the NZKM sample |
|---|---|---|---|
| H7 | *TMS developed in EGKNs of professionals helps in problem solving and improves task performance* | Hypothesis is also well supported ($\beta = 0.73$, $p <$ .01), confirming that TMS developed in EGKNs of professionals positively impact on individual's problem solving ability and task performance | Same outcome |

## 7.7. Conclusion

This chapter compares the results of the analysis and model testing through an independent dataset, which was established from the Kompass New Zealand directory of business. Demographics of the survey participants show that most of them were CEOs and senior managers in their organisations. The descriptive statistics revealed that the majority of the respondents used their informal contacts to share work-specific information and knowledge across their work organisations. These professionals have internal and external information sharing networks and most of the respondents have equal numbers of information sharing ties within and outside their work organisations.

This chapter cross-validate the research model with the same procedure as applied for model testing. It first assesses the fitness of the measurement model with the data and then runs path analysis to test the hypotheses associated with the model. Findings indicate a good fit of the model with sufficient convergent and discriminant validity of the model. The structural model then tests the hypotheses associated with the model. Testing of the hypotheses indicate good support for the various predicted links except the link between external information sharing and TMS development in EGKNs of professionals. Unlike the NZKM sample, where there was a partial support (p-value = .07) for the link between norms of reciprocity and TMS, here the link between the two

is strong and significant (p-value < .001). Moreover, the relationship between norms of reciprocity and interpersonal is also well supported in the Komapss sample in comparison with the NZKM sample, where it was only partially supported (see Table 7.11). The link between external information sharing and TMS development is still non-significant. Nevertheless, the link between interpersonal trust and TMS development in EGKNs is still partially supported in both the samples (see Tables 6.8 and 7.11).

Overall, the similarity of the results in the two samples gives more strength to the validity of the research model and predicted links. Discussion of results is provided in Chapter 8.

# CHAPTER EIGHT

# DISCUSSION AND IMPLICATIONS

This chapter discusses and interprets the findings of the study in relation to the established literature and theory dealing with knowledge sharing and informal (personal) networking of individuals. The discussion evaluates various assumptions and links are drawn from the literature and are provided in the form of a conceptual model and hypotheses. These assumptions and links are assessed through the results of this study. Based on the main findings of the two surveys, contributions to theory and literature are drawn. A section on limitations of the study is also presented. Finally, implications for practice and further research stimulated by this study are provided.

## 8.1. TMS in Personal Networks (i.e. EGKNs) of Professionals

The overarching goal of this study is to highlight the importance of informal knowledge cooperation among socially connected individuals for ad-hoc problem solving and task performance. It also aims to understand how knowledge is coordinated and integrated among individuals in the absence of formal structures and organisational mechanisms. To this end, first a review of the literature was completed to gather evidence and understanding on informal networking and knowledge sharing (see Chapters two and three). Second, a model was developed (see Figure 4.1) to conceptualise the process of informal knowledge collaboration among individuals. Third, empirical studies were conducted to investigate the various assumptions and predicted links as highlighted in the model. The next sub-sections discuss how the findings of this study support the predicted links and whether the assumptions made in the development of the conceptual model actually work.

### 8.1.1. External Information Sharing and TMS Development in EGKNs

Literature review in Chapter 2 indicates that many individuals are linked through informal networks in order to get access to the differentiated sources of knowledge. The conceptual model (Figure 4.1) indicates that external information sharing with informal (personal) professional contacts develops transactive processes of knowledge coordination and integration among socially connected individuals. The descriptive results in section 6.3 and section 7.3 provide evidence that individuals develop informal knowledge sharing ties (i.e. EGKN) outside of their work organisations. Thus, a link has been predicted between external information sharing and TMS development in the EGKNs of professionals. The hypothesis states, *H1: External information sharing improves the level of TMS held by individuals in their EGKNs.*

The results (see Table 6.8 and Table 7.11) indicate that there is non-significant relationship between external information sharing and TMS development. This finding contrasts with the claims: 1) individuals maintain some form of directory of 'who knows what' about subjects of interests to them irrespective of the organisational boundaries and prescribed organisational channels (Cross & Cummings, 2004; Dahl & Pedersen, 2004a; Jarvenpaa & Majchrzak, 2008); and 2) information sharing with external contacts develops the ability of individuals to gather novel information to solve complex problems and improve creative performance (Schrader, 1991; Teigland & Wasko, 2003; Whelan et al., 2010). One possible explanation for the non-significant relationship between external information sharing and TMS development is that the individuals may be able to develop know-how directory through external information sharing, but they are not be able to coordinate and integrate external knowledge directly into their internal work processes.

Teigland and Wasko's (2003) study help to further explain the lack of association between external information sharing and the development of TMS (i.e. knowledge coordination and integration) in the EGKNs of professionals. They observed that "external information trading has no direct relationship with the performance of an individual; rather it affects creativity and general performance indirectly through its influence on internal information trading" (Teigland & Wasko, 2003; p. 279). Morever, knowledge gained through external information trading is more likely to bring performance benefits for an individual or a firm, if there exist efficient integrative mechanisms to absorb and process external knowledge (Teigland & Wasko, 2003). One such integrative mechanism is the local CoPs as discussed in section 2.7.2.1. Local CoPs allow sharing and integration of external knowledge with the existing knowledge of a firm (Teigland & Wasko, 2009).

### 8.1.2. Link between Internal and External Information Sharing

Individuals who are connected with external networks (e.g. ENoPs) are more likely to connect with internal networks (e.g. local CoPs) of an organisation. Teigland and Wasko (2009, p. 21) highlight that "individuals who are better connected within their local communities of practice and bridge across disparate communities through extended networks of practice take on more central positions in the organisation's overall structure of knowledge flows". These individuals, known as 'gatekeepers' (see sections 2.7 and 4.1.2), have the ability to direct the flow of external information and knowledge to the relevant parts (individuals or units) of their organisations (Allen, 1977; Allen & Cohen, 1969; Tushman & Scanlan, 1981; Whelan et al., 2010). Some researchers suggest that all modern knowledge workers can play the role of gatekeepers, as it is an inherent feature of their work that they interact and exchange knowledge with others and get access to the latest knowledge (Dahl & Pederson, 2004b, Teigland &

Wasko, 2003; Whelan et al., 2010). In view of this, the link between external and internal information sharing between individuals (through their informal networks) is investigated. The hypothesis states, *H2: Individuals who share information externally transfer learning in their internal informal networks.*

The findings of this study indicate that majority of the respondents have informal information sharing contacts both within and outside of their work organisations. Table 7.3 shows that 66% of the participants in one sample and 63% in the other sample report similar numbers of informal information sharing contacts within and outside their work organisations. A comparison of means scores of both NZKM and Kompass samples (see Table 7.5) indicates much similarity in the behavior of respondents in both samples with regard to information and knowledge sharing with informal contacts. In addition, the high R-square values (0.62) in the NZKM sample (see Figure 6.10) and (0.56) in the Kompass sample show that individuals who share information externally are likely to share information within their internal (organisational) informal networks. These findings confirm the link between external and internal information sharing between professionals, and thus support the hypothesis.

These findings support the assumption that the ability to coordinate and combine external knowledge involve linking it with the existing (internal) knowledge-base of the firm. The findings also support the theory of absorptive capacity in the sense that an individual or a firm can improve performance by assimilitating information from external sources (Cohen & Levinthal, 1990). Teigland & Wasko (2003) also suggested that individuals who are interested in enhancing absorptive capacity need to collaborate across organisations and prescribed channels of the organisation. Nonetheless, while sharing knowledge with professional colleagues, who are external to the organisation, individuals do not share the context necessary for the development of knowledge. This

may be the reason researchers argue that external ideas and solutions need to integrate seamlessly with the existing knowledge of a firm in order to make effective use of the external knowledge (Teigland & Wasko, 2003, 2009; Whelan et al., 2010). Hence, in order to use the external knowledge for performance gains one needs to be aware of the internal work processes and have the ability to assimilate external knowledge with the relevant internal knowledge.

### 8.1.3. Internal Information Sharing and TMS Development in EGKNs

The findings of this study and some prior research suggest that individuals who frequently share information outside their organisations are likely to be well-connected with co-located colleagues and internal networks (e.g. CoPs) of the organisations. Knowledge is relatively easy to transfer internally due to shared context and ready to access channels of communication (Foss & Pedersen, 2002; Szulanski, 2000). Networking with co-located colleagues and the use of existing channels of communication also help in the coordination and integration of knowledge with organisational knowledge sources. Through internal information sharing, organisational members know each other's areas of specialisation and develop the ability to coordinate specialised knowledge informally for ad-hoc problem solving. Thus the hypothesis states, *H3: Internal (intra-organisational) information sharing improves the level of TMS held by individuals in their EGKNs.*

This hypothesis has tested the relationship between internal information sharing and the development of TMS structures among socially connected individuals within the boundaries of the organisation. The results of the analysis indicate a significant link between internal information sharing and the development of TMS in the EGKNs of

professionals (see Table 6.8 and Table 7.7). Because members in one's EGKN hold different views, perspectives, experience and knowledge, internal information sharing develops 'know-who' directory of an individual. As discussed in section 3.5.3, individuals working in an organisation often know about each other's expertise outside of their current work units and coordinate relevant expertise for problem solving (Anand et al., 1998). Moreover, internal information sharing improves integrative capability of individuals and enables them to integrate external knowledge with exsiting knowledge to demonstrate better productivity and performance (Whelan et al., 2010).

Internal information sharing with people inside organisation updates 'know-who' directory of individuals and increases the ability of individuals to engage relevant knowledge experts for solving their problem situations. When individuals engage in problem solving for other, they can also learn new ways of doing things (in other words enhancing their own knowledge specialisation). Furthermore, individuals who help others also improve their own ability to coordinate and integrate advice from internal knowledge sources. Thus, individuals who are well-connected with internal networks of their organisations are able to develop TMS based structures for coordination and integration of knowledge inside their work organisations.

### 8.1.4. Norms of Reciprocity and TMS Development in EGKNs

The literature review highlights the role of social exchange theory in creating mutual dependence among socially connected individuals. The review also indicates that acquiring information from informal sources requires information trading managed through norms of reciprocity. Accessing advice and knowledge from personal contacts create sense of obligations to return similar favours. As discussed in section 3.1.1, the norms of reciprocity shape individuals' behaviours of knowledge sharing as well as improving their abilities to coordinate expertise from internal as well as extra-

organisational sources. Reciprocal exchanges strengthen the give-and-take relationships among individuals and this can improve transactive processes of knowledge coordination and integration. In this context, the fourth hypothesis states, *H4: Norms of reciprocity increase the level of TMS held by individuals in their EGKNs.*

The findings of this study indicate that the norms of reciprocity are important for expertise coordination and integration from peers, which support the link as suggested in the conceptual model (see Table 6.8 and Table 7.7). These findings can be related to previous studies that observed the information sharing in ENoPs. Previous studies investigating norms of reciprocity in ENoPs showed inconsistent results. For instance, Chiu et al. (2006) and Kankanhalli et al. (2005) found a positive relationship between the norms of reciprocity and knowledge sharing behaviour of individuals, whereas, Constant et al. (1996) and Wasko and Faraj (2005) found a negative relationship between reciprocity and individual knowledge contributions to the network of practice.

Nonetheless, exchanges in ENoPs are mostly based on generalised reciprocity as an individual's expectation of reciprocity may not be directly met by the receiving party (Wang & Noe, 2010). Informal information trading studies, on the other hand, highlight direct reciprocity as an important condition for the exchange of valuable information and know-how among collaborating individuals (Schrader 1991, Teigland & Wasko, 2003; von Hippel, 1987). The nature of exchanges in an EGKN is dyadic, where the norms of reciprocity create interdependence among interacting parties. The findings support the idea presented in the information trading literature that norms of reciprocity increase the probability of retrieving valuable information from peers (Schrader, 1991; Teigland & Wasko, 2003; von Hippel, 1987). The positive relationship between norms of reciprocity and information exchange also supports the idea that individuals can improve their ability to coordinate specialised knowledge from peers when they lack the

relevant knowledge to resolve a particular problem situation. They can engage the right individual (i.e. the one who possess relevant expertise) to help them resolve a particular problem situation based on the knowledge of their established TMS, that is, well-developed coordination and combination ability along with a 'know-who' directory.

### 8.1.5. Norms of Reciprocity and Interpersonal Trust

Social exchange involves beneficial acts through which individuals help one another "without negotiation of terms and without knowing whether or when the other will reciprocate" (Molm et al., 2000, p. 1396). In view of this, social exchanges bear the risk that a favour may not be returned. Molm et al. (2000) argue that it is important that people trust the intentions of others while making social transactions, because one has to bear the risk in order to develop a two-way exchange relationship. Thus, the next hypothesis examines the relationship between norms of reciprocity and interpersonal trust between individuals. This hypothesis states, *H5: Norms of reciprocity increase the level of trust between socially connected individuals*.

The findings of this study indicate a direct and mediating effect of norms of reciprocity in the development of TMS in EGKNs of professionals. In its mediating role, norms of reciprocity develop interpersonal trust among the interacting parties, which subsequently enhance knowledge coordination abilities of professionals from diverse sources. The statistical results provide highly significant links between norms of reciprocity and interpersonal trust (see Table 6.8 and Table 7.7). These results suggest that professionals, who develop norms of reciprocity with colleagues in exchange relationships, establish an environment of interpersonal trust. They believe that their personal contacts will help them by providing them with the relevant knowledge or expert advice to resolve their problem situation. Norms of reciprocity create social interdependence to provide a basis for expertise coordination and interpersonal trust

enable them to trust on the advice of colleagues. Thus, individuals' expectations to get pertinent advice are based on their mutual level of trust and norms of reciprocity between them.

When obligations are unspecified, individuals trust in the goodwill of their colleagues that they will reciprocate the favour whenever they are in need of it (Chowdhury, 2005). Studies have indicated that useful knowledge sharing relationships develop through repeated instances of information exchanges (Chiu et al., 2006; Cowan & Jonard, 2003; Cropanzano & Mitchell, 2005; Fleming & Frenken, 2007; Teigland & Wasko, 2003). In addition, there must be a level of interpersonal trust between the interacting parties to start a new exchange relation. The givers (i.e. knowledge providers) should have the confidence that their current knowledge sharing will be paid back whenever they need it. On the other hand, trust also develops through higher frequency of exchanges. Thus, norms of reciprocity and trust are closely related in establishing exchange relationships among individuals.

Members trust on the intentions of other team members that they will contribute knowledge in the interest of the teams and towards accomplishment of a joint organisational task (Ashleigh & Prichard, 2012). Nonetheless, members of EGKNs are not supposed to do common organisational tasks, the question arises how such perceptions of trustworthiness develop among EGKN members. The link between norms of reciprocity and interpersonal trust (see Table 7.11) suggests that perceptions of trustworthiness may develop through norms of reciprocity among EGKN members, as rreciprocity tends to engender stronger interpersonal bonds between individuals. In an environment where individuals regularly reciprocate favours, there is an incentive to acquire reputation through goodwill and reciprocal actions.

Developing the quality for being trustworthy is an asset since trust affects the willingness of an individual to share knowledge. Individuals can save effort and time through enabling trustworthy relationships with others instead of worrying or monitoring bahaviours of their peers. Their exchange relationships can be stronger as trust enables them to share useful information and knowledge more frequently. Nevertheless, trust takes time to be build and can easily be broken. In view of this, norms of reciprocity increase the level of trust, and provide the necessary conditions for the social exchanges of valuable resources over the period of time (Coleman, 1988). Thus, norms of reciprocity contribute to the development of long-term relationships between people that can be helpful for valuable resource exchange including information and knowledge.

### 8.1.6. Interpersonal Trust and TMS Development in EGKNs

This study has examined the role of interpersonal trust in TMS development in the EGKNs of professionals. As discussed in section 3.3, feelings of distrust exist among members of EGKNs of professionals as they belong to diverse groups and work settings (Jarvenpaa & Majchrzak, 2008). Interpersonal trust can help to overcome perceptions of distrust and encourages a knowledge worker to coordinate task-related expertise from social (informal) contacts. When trust exists, individuals are more likely to rely on information and advice of their EGKN members. In this way, interpersonal trust can increase the level of TMS in EGKNs by influencing transactive processes of knowledge coordination and integration. Thus, the research model (Figure 4.1) represents the link between interpersonal trust and TMS development in the EGKN of professionals, and the hypothesis states, *H6: Interpersonal trust increases the level of TMS held by individuals in their EGKNs.*

Prior studies on knowledge sharing suggest a direct influence of trust on the information and knowledge sharing behaviours of individuals (Abrams et al., 2003; Chowdhury, 2005; McAllister, 1995; McEvily et al., 2003). The findings of this study indicate that interpersonal trust help to develop TMS based structures in the EGKNs of professionals to help them coordinate and integrate task-related expertise. Trust enhances individuals' ability to coordinate knowledge from experts outside the formal structures and organisational boundaries. The results of present study are consistent with some of the previous studies indicating the link between interpersonal trust and TMS development in the context of organisational groups and teams (for example, Akgün et al., 2005; Ashleigh & Prichard, 2012; Chen & Huang, 2007; Kanawattanachai & Yoo, 2007). These studies indicate that group members trust on the competence and integrity of their colleagues that they will contribute knowledge in the interest of the whole group.

The KM literature has established trust as an important enabler of knowledge sharing (Abrams et al., 2003; Kramer & Cook, 2004; Mayer et al., 1995; McAllister, 1995; McEvily et al., Molm et al., 2000; 2003; Zaheer et al., 1998). In view of this, the decision to share knowledge with EGKN members is based on the perceptions of trust and trustworthiness among the EGKN members. The literature (see section 3.2.1) suggests that stronger interpersonal relationships facilitate the transfer of valuable information and knowledge between actors (Hansen, 1999; McEvily et al., 2003). If individuals (i.e. knowledge seekers) trust on the intentions and behaviours of the knowledge source, they are more likely to integrate knowledge from this source. Interpersonal trust influences knowledge sharing through building strong ties between members of networks (Granovetter, 1983; Hansen, 1999) and affect the transactive processes of knowledge coordination and integration (Ashleigh & Prichard, 2012).

Hence, trust can become an important precursor for TMS development in the EGKNs of professionals as if affect the transactive processes of knowledge coordination and integration.

It has been discussed in the literature review (see section 3.2) that all the three dimensions of social capital are useful in explaining a structure for knowledge sharing among individuals (Inkpen & Tsang, 2005; Nahapiet & Ghoshal, 1998; Tsai & Ghoshal, 1998). Grounded on the various dimensions of social capital, this study has suggested that professionals utilise their social capital to develop powerful structures (i.e. TMS) to develop and sustain task-specific knowledge cooperation through their EGKNs. The study has explicitly linked the relational dimension (i.e. trust and trustworthiness) of social capital with the TMS development in the EGKN of an individual by explaining the transactive processes of knowledge coordination and integration. The transactive processes of knowledge coordination and integration in a TMS not only require trusting the competence of others but also a belief in the intentions of others that they provide knowledge in the best interest of the knowledge seeker (Ashleigh & Prichard, 2012).

Although structural dimension is not tested in this thesis through some established techniques (e.g. Social Networking Analysis – SNA), the role of the structural dimension in developing EGKNs is highlighted in the literature review (see section 3.2.1). Moreover, the role of cognitive dimension (shared understanding + distributed cognition) in developing knowledge sharing structures is covered in the TMS literature (see section 3.3). In this way, all the three dimensions of social capital can be linked to some aspects of TMS development in the EGKNs of professionals, which is an area to be explored by future research.

## 8.2. TMS in EGKNs and Performance

TMS enhances an individual's ability to search for specialised knowledge needed to resolve problems and perform tasks jointly. Individuals use their TMS to access and retrieve knowledge from many different sources within an organisation (Alavi & Tiwana, 2002). In view of this, previous studies indicate strong relationship between TMS and performance of organisational groups and teams (Anand, Manz, & Glick, 1998; Brandon & Hollingshead, 2004; Lewis, 2003; Moreland & Argote, 2003; Moreland & Myaskovsky, 2000). However, little is talked about whether TMS could work in socially connected groups of individuals to facilitate ad-hoc informal knowledge collaboration.

Jarvenpaa and Majchrzak (2008) indicate that TMS have implications in ad-hoc knowledge collaborations as professionals utilise their personal contacts to get access to the task-related expertise. The level of TMS in EGKNs of professionals helps them decide with whom to share and what can be shared for problem solving and task performance (Jarvenpaa & Majchrzak, 2008). In view of this, the research model highlights a link between ad-hoc knowledge collaborations in EGKNs (through TMS based structures) and performance of individuals. The hypothesis states, *H7: TMS developed in EGKNs of professionals helps in problem solving and improves task performance.*

The findings of this study indicate a direct link between TMS in EGKNs of individuals and their task performance. These findings suggest that individuals enhance their problem solving skills and task performance by using their ability to coordinate and integrate knowledge from diverse sources. These findings are complemented by previous studies that highlight the effective role of TMS to achieve performance in complex work environments (Alavi & Tiwana, 2002; Lewis et al., 2005; Moreland &

Myaskovsky, 2000; Yoo & Kanawattanachai, 2001). Nonetheless, these studies provide evidence that TMS works in groups that comprise of co-located workers who hold tight interdependencies to accomplish joint tasks. The present study found the existence of TMS in socially connected groups of individuals (i.e. EGKNs) where task interdependence and joint problem solving cannot be assumed. However, this work is built on the previous studies of Anand et al. (1998) and Jarvenpaa and Majchrzak (2008).

Jarvenpaa and Majchrzak's (2008) study explored the existence and application of TMS among national security professionals who worked for different organisations in order to achieve a common objective, that is, National security. They suggested that TMS can work in the absence of current task interdependencies as members assumed future opportunities for collaboration and interdependence. This study has furthered the work of Jarvenpaa and Majchrzak (2008) and suggested the development of TMS in socially connected groups of individuals without task interdependence and shared goals. The findings of this study indicated that social interdependence (achieved through norms of reciprocity), interpersonal trust, and past instances of informal information sharing have provided necessary context for the development of TMS based structures in the EGKNs of professionals.

## 8.3. Conclusion

The overarching goal of this thesis is to to provide understanding about how individuals collaborate to share knowledge in the absence of formal structures and prescribed channels of communication. It aims to investigate the formulation of informal personal networks (i.e. EGKNs) and explore the underlying process of ad-hoc (informal) knowledge collaboration through EGKNs of professionals. The study first conducted literature review to find prior empirical evidence of informal networking and

identify relationships between various constructs and conceptualise the process of informal knowledge cooperation in the EGKNs of professionals. It then provides two empirical studies to test and conceptual model and then cross-validate findings to improve robustness of the model.

To fulfill the first research objective and to answer the research question *RQ1: What contributes to the development of EGKNs of professionals other than formal structures and organisational work processes*, the thesis provides prior empirical evidence to highlight informal information sharing through social (informal) networking and the role of communities and networks of practice in the development of EGKNs. It discusses empirical findings (see sections 6.3. and 7.3) to indicate that professionals have information sharing networks within and across organisations which they use to share work-specific knowledge. The review and empirical findings indicates that EGKNs develop through prior contacts, informal information sharing between individuals, and participation of the individuals in various communities of practice and professional networks. In addition, informal information sharing develops ability among individuals to engage relevant knowledge experts to resolve their problem situations.

To pursue the other research objective, the process of informal knowledge collaboration among professional was investigated to answer *RQ2: What enables and sustains informal knowledge collaboration among professionals connected through an EGKN.* The findings reveal that informal information sharing, interpersonal trust, and norms of reciprocity help to develop TMS-based structures in the EGKNs of professionals to facilitate knowledge collaboration in the absence of organisational structures and mechanisms. Such TMS is based on network members' understanding of the knowledge held by other members and the transactive processes to coordinate and integrate knowledge of network members. TMS in EGKNs of professionals help to

develop understanding about the locus of expertise, trusting on the competence of the knowledge source, and one's ability to coordinate knowledge from relevant sources.

Literature review identified TMS as a system for identification, coordination, and integration of information and knowledge from diverse sources to achieve collaborative task performance. TMS has been largely discussed in organizational groups and teams where people are bound to work together to complete task. However, the findings of this study suggest the development of TMS structures in the EGKNs of professionals. In view of this, the next research question *RQ3* investigates: *Where TMS-like structures exist in the EGKN of a professional, how they affect the job performance of an individual.* The findings of this study indicate that TMS-based structures in the EGKNs of professionals help professionals in problem and improve their performance at work. The knowledge professionals gained from outside is novel but when combined with internal knowledge base of the organisation improve productivity and task performance of individuals.

## 8.4. Contribution to Theory and Practice

The work presented in this thesis is a first attempt to understand the mechanism of informal knowledge collaboration among socially connected individuals in the absence of common goals and organisational mechanisms. Past research highlights the use of TMS in knowledge sharing and integration in organisational groups and project teams, however, it does not clarify how knowledge is shared and integrated in the absence of an organisational context. The results indicate that EGKNs are structured by TMS to develop information and knowledge collaboration with peers. It has shown how a form of TMS can develop in the EGKNs of professionals through informal information sharing, social interdependence, and application of interpersonal trust. The

exploration of TMS structures in groups of individuals, who are not working together to pursue common objectives in joint enterprises, is a novel contribution of this thesis.

A key contribution of this research is to offer a robust model to explain how informal knowledge cooperation is developed and sustained among socially connected individuals to improve their problem solving skills and task performance. Previously, SET and social capital have not been discussed in the context of TMS development. The model uniquely integrates SET and relational dimension of social capital (i.e. trust and trustworthiness) with the TMS theory to explain the context for informal knowledge cooperation in the EGKNs of professionals. The model provides a novel perspective by identifying the development of TMS in loosely connected groups of individuals, where task interdependence and goal congruence cannot be assumed. The model can be used to explore informal knowledge sharing and integration among individuals in different industry sectors in a variety of contexts.

The study can make useful contributions to the knowledge sharing and the KM literature. The study has highlighted the role and significance of informal knowledge sharing practices among professionals by consolidating evidence of informal information and knowledge sharing practice in different industry sectors and professional groups. Prior studies investigated informal information sharing in a few industry sectors and technology clusters and it was argued that such knowledge collaboration occurred under certain conditions. For instance, the informal information trading studies (see section 2.7.1) indicate that such information sharing practices develop under the conditions of uncertainty and the desire for collective innovation among firms in the steel mini-mill industry. The narrow focus on the antecedent conditions for such knowledge collaboration limited the scope and significance of informal personal networks of individuals and thus provided a rather simple justification

of the complex process of informal knowledge coordination and integration processes. This study has broaden the view of the antecedent conditions of informal knowledge collaboration by investigating such practices in a variety of industry sectors and professions without the existence of any pre-conditions previously which were associated with such informal information exchanges.

The testing and cross-validation of the links highlighted in the conceptual model provides new insights for knowledge sharing and TMS theory development. The link between the relational dimension of social capital (i.e. trust) and norms of reciprocity to create interdependence for TMS in socially connected individuals suggest rethinking of the various assumptions associated with the development of TMS, such as shared goals and joint tasks. Moreover, the role and contribution of informal networks (i.e. EGKN) of professionals in organisational learning and individual task performance, highlighted by this thesis, may encourage KM theorists to re-examine various KM theories (for instance, knowledge-based theory of the firm) to look beyond organisational structures and formal boundaries for the successful management of organisational knowledge for competitive success. A better understanding of the role and importance of informal networks of individuals, including EGKNs, provides a basis to further highlight the underlying theories that can help in the development of such networks and provide structures for knowledge coordination and combination in the absence of formal structures and control mechanisms.

Social networking and knowledge sharing through informal networks have been identified as key emerging themes in the knowledge management discipline into which further research is required (Argote, McEvily, & Reagans, 2003). In the context of dynamic industrial co-operation, successful inter-organisational knowledge transfer through social (informal) relations can play a key role in improving the innovation

capability of organisations. Yet there is little research into how informal knowledge occurred among knowledge intensive organisations through informal networking of employees (Allen et al., 2007). This study has addressed this gap by investigating the flow of knowledge in informal networks (i.e. EGKNs) of professionals and highlighting their significance in coordination and integration of work-specific knowledge from diverse sources (that exist within and outside the organisations). While the nature of this study is largely exploratory, it can provide some insights into the transfer of knowledge between firms through the development of TMS based structures in the informal networks (EGKNs) of individuals.

Even though TMS studies have provided structures for knowledge integration and coordination in organisational groups and project teams, past research is scant to clarify how TMS could develop and work in the absence of task interdependence and incongruent goals. Previously, there was only one study that investigated the application of TMS among cross organisational groups of socially connected individuals. Jarvenappa and Majchrzak's (2008) study proposed three constructs to suggest the development of TMS in the absence of organisational context (i.e. task interdependence and incongruent goals), they were: 1) dialogic practices (semi-structures that describe rules of conversation), 2) clarity of knowledge ownership (i.e. who owns the knowledge: 'individual' or the 'organisation'), and 3) knowledge dissemination protocols (what to share and what not to share). The present study may further the work of Jarvenappa and Majchrzak (2008) by adding new constructs (i.e. informal information sharing, norms of reciprocity, and interpersonal trust) to foster development of TMS in EGKNs of professionals. Nevertheless, the model can be extended by adding more constructs and links to represent organisational and cultural barriers or enablers

that may support or inhibit informal knowledge cooperation among socially connected individuals.

TMS studies have demonstrated a positive relationship between TMS and group effectiveness in organisational groups and teams who hold joint responsibilities and work collaboratively to complete tasks. While investigating the role of TMS in performance, past studies were restricted to team members and organisational groups. This might not reflect the process of knowledge coordination and integration among socially connected individuals. This study has broadened the scope of TMS by studying it in informal networks of individuals in the absence of task interdependence and common organisational goals. It provides empirical evidence to claim that TMS can develop and work in loosely connected groups of individuals (i.e. EGKNs), who are not supposed to pursue common organisational goals and where task interdependence cannot be assumed. The leaders and managers of the knowledge intensive organisations can benefit by acknowledging the importance of informal networks of their employees and thinking of new ways to utilise these connections for improving the overall knowledge-base and productivity of their organisations.

Most of the knowledge sharing literature deals with the motivators, enablers, antecedent conditions, and success factors for knowledge collaboration through formal/organisational structures and mechanisms. This study seeks to highlight the value of informal collaboration through informal means and extra-organisational channels. It can contribute to the small body of the existing literature on knowledge sharing, social or informal networking, and TMS to develop an understanding by both academics and practitioners, in the following ways:

- Theoretically, it can provide some insights into the process of knowledge coordination and integration through TMS based structures in the informal

networks of professionals, thus allowing future research to build upon the results of this study.

- Empirically, it adds to the limited studies done with regards to informal knowledge collaboration in the EGKNs of professionals, especially the role of TMS based structures in supporting such collaboration.
- Practically, it attempts to improve managerial understanding about the role and significance of informal knowledge sharing through personal networking of employees. This increase in understanding may bring some organisational support to the employees who are engaged in informal knowledge sharing practices and striving to improve their performance as well as adding value to their organisations.

## 8.5. Limitations of this Study

This study has a number of limitations. The findings were derived from retrospective data based on the responses of the survey participants, which were prone to recall and estimation errors. The indicators for measuring TMS and improvement in performance and problem solving capability of individuals were based on a self-report format. Although self-report measures are a common practice in social science research, the measurement of TMS could have improved if questions were asked in experimental settings or through a longitudinal field study. Moreover, the actual improvement in performance and problem solving capability could have measured through some definite organisational measures. Nonetheless, these arrangements were not easy for the researcher of this study, keeping in view the limitations of time and resources.

This study has investigated the collaborative nature of TMS (as discussed in sections 3.5.1 and 3.5.2) in socially connected groups of individuals. It only focuses on the identification of TMS-based structures for knowledge coordination and integration

in the EGKNs of professionals and does not aim to develop an instrument for measuring the improvement of performance. Thus, one limitation of this study was the inability to determine individual or group performance as a result of knowledge collaboration through TMS-based structures. In view this limitation, some recommendations of future research are provided in section 8.6.

While the majority of respondents reported that they have shared work-specific information and knowledge with their informal contacts, the same cannot be predicted for those who did not respond. This has also been linked with the fact that the present study was not able to develop a random sample of all professionals who used to share information and knowledge with their informal (personal) contacts. Keeping in view this limitation, the findings of the study from the first survey were cross-validated by establishing another dataset from an independent sample. The independent sample was established through non-random selection of professionals from the available contacts list in the Kompass business directory. Kompass directory contains important business contacts, primarily of the CEOs, senior managers, and key business and operational personnel. Despite similar findings in the two samples, it should not be understood that majority of the professionals' population in New Zealand share work-specific information and knowledge with their informal contacts.

The survey questionnaire (used for data collection) was developed by adopting and altering measurement items from previous studies which were conducted in many different contexts. The alteration of the survey questions to fit the context of this study might have caused validity issues of the scales. Care has been taken to identify and resolve this issue. Although, this study did not find enough difference in the data collected from the two different samples, it cannot be said with full confidence that the scale used by the present study is sufficiently reliable and valid to produce similar

results in other settings and with different groups of people. Lack of prior research on the informal knowledge sharing in EGKNs and TMS developments among socially connected individuals makes comparison of the results of this study a bit difficult. Although some evidence from prior research supports the findings of this study, further empirical research is necessary to develop any convincing argument.

In any research study, the important question that must be asked as to what degree the results from the research can be generalised for a larger group of people than those who participated in the study. It was assumed that the respondents of the study are professionals and doing knowledge-intensive activities in their organisations. In general, it was difficult to assess how representative the findings are for all populations of professionals and organisations where the nature of the task is knowledge intensive and where collaboration span organisational boundaries. While data for this study is collected from a variety of industry sectors and professions, the results cannot be generalised for all industry sectors and work environments due to the smaller sample sizes. In view of this, the study can be taken as an exploratory study with limited samples.

Despite the fact that this study finds similar trends across the two different samples studied, the results cannot be generalised to the entire population of professionals in New Zealand. Moreover, the self-reported objective data ignores the degree of subjectivity embedded in the topic of this research. Reflecting the participants' perceptions at a specific point of time through a static survey might not be able to portray the exact reality. In addition, causal direction may be the other way around. For instance, it is possible that a more developed TMS in an EGKN may enhance internal and external information sharing among individuals. Thus, TMS

development and informal information sharing would be supported in one way or the other way round.

These limitations of the study context, research design, and the nature of knowledge transfer in EGKNs may compromise the construct validity of this study which in turn may lead to confounding explanations of the phenomenon. Several steps have been taken to minimise such threats to construct validity. First, theoretical foundations were extensively reviewed to provide definitions and generate measures for the constructs of interest. Second, the measures were carefully tested using pilot data (see section 5.7). Third, convergent and divergent validity checks (see sections 5.3.1.1 and 5.3.1.2) were performed using field data. The result of common method bias using the Harman's one factor test (see section 6.6.1) and the more sophisticated CFA based test (see section 6.6.2) revealed that common method bias was not an issue in this study. While, the cross-validation of the results through an independent sample (see sections 7.5.1 and 7.5.2) re-confirmed the findings, it cannot be claimed that the knowledge sharing survey was able to resolve the possibility of bias caused by self-reporting.

EGKNs develop with people from different backgrounds and work settings. When trust exists, members are more likely to communicate and share useful information. However, perceptions of distrust and information leaks could affect the decision of information sharing with colleagues. The non-significant relationship between external information sharing and TMS development (see Table 6.8 and Table 7.11) may be due to the reason of distrust (see section 3.3) or information leaks. The link between external information sharing and TMS development in EGKNs of professionals can be investigated through perceptions of distrust. The conceptual model does not include variables to measure the impact of distrust on informal knowledge

sharing behaviour of individuals. This may be considered as another limitation of this study.

Social desirability is the tendency to respond to questions in a socially acceptable direction and is viewed as a general risk to the validity of a questionnaire (Fisher & Katz, 2000). The risk is greatest for items or questions that deal with personally or socially sensitive questions (King & Brunner, 2000). The questionnaire items measuring interpersonal trust may include socially desirable response bias. These questions are: 1) “I believe that other members of my PKN will always look out for my interests”; and 2) “All members of my PKN are trustworthy”.

Researchers argue that social desirability is most likely to occur where survey respondents can be easily identified (either by the person conducting the survey or by others external to the study) (Booth-Kewley, Larson, & Miyoshi, 2007; Pauls & Stemmler, 2003). Moreover, socially desirability may also arise where the topic is perceived to be of political significance and respondents have an interest in the results demonstrating a particular outcome that suits their own agenda. In view of this, collecting data through a mechanism that allows privacy may lessen social desirability issues.

As indicated in section 5.5, individuals were assured about the privacy of their demographic details. The participation in the survey was voluntary and specific personal details were not asked from the participants. The data obtained in the surveys were anonymous as no name or identification details were asked. The provision of complete anonymity and the extra-organisational context (i.e. not involving people of a single organisation or shared work context) of the study are presumed to minimise social desirability pressure and thus reduced the potential of this bias.

## 8.6. Implications for Research and Practice

The limitations should not overshadow the positive outcomes of this study, which can be seen as an exploratory study to understand the complex process of informal knowledge collaboration and the development of TMS structures in groups of socially connected individuals. Notwithstanding the limitations, this study highlights the role and significance of knowledge sharing through informal (personal) networking of professionals and provides new insights to the knowledge sharing researchers to study the effectiveness of informal structures in knowledge collaboration. Future research can compare the effectiveness of such informal means of information and knowledge cooperation with those prescribed by the organisations for the purpose of sharing and capturing knowledge of employees. Moreover, the study provide guidelines to the leaders of the organisations and KM practitioners to extend knowledge base of their organisations by including informal networks of employees as part of their knowledge management strategy.

Tsoukas (1996) argues that it is very difficult to fully specify in advance what kind of practical knowledge is going to be relevant for solving a particular problem situation, and when and where the required knowledge is available. The acquisition and provision of knowledge at the right time and the right place is a challenge for organisations as well as individuals. Large organisations though have a distributed knowledge base but sometimes it is difficult to find the expertise, even when it exists within the formal boundaries of the organisation. The same can be true in a regional cluster where individuals in many smaller firms hold distributed cognition, which is unable to be gathered due to organisational structures and hierarchies. The rapid growth of knowledge has made it difficult for an organisation to arrange and provide all the relevant knowledge sources that may be needed to resolve novel problem situations.

Given the importance of people as critical sources of knowledge and information, organisations may encourage their knowledge workers to seek and arrange relevant knowledge from informal or personal means, as well. This may also include knowledge societies and professional networks.

The results of this study have shown that many industry professionals make use of their EGKNs (both within and across organisations) to exchange work-related information and knowledge to improve work performance. Managers may allow such individuals the sufficient time and opportunities to actively engage in informal knowledge creation activities both within and across organisations. Leaders of the organisations can utilise the EGKNs of their employees to create value for their firms. Knowledge acquisition through extra-organisational channels would help to enhance the internal knowledge-base of the firm and add value to its product or process. Those individuals who possess significant internal and external knowledge sharing contacts and have demonstrated value through their internal and external collaborations should be rewarded by the organisations.

Future research efforts might also focus more strongly on the measurement of the impact of knowledge sharing (via EGKNs) on the performance of individuals and firms. Whereas some attempts have been made in the empirical literature, the direct measurement of the positive as well as negative effects is widely neglected. Developing complex measurement, that may include both objective and subjective indicators, can be an important step towards the identification of the real effects of informal cooperation. For instance, one might compare the performance of a firm which actively pursues strategies of informal information sharing with other firms where such practices are discouraged. With respect to the latter, it may also be interesting to investigate the type

as well as the effectiveness of formal mechanisms to encourage or restrict informal knowledge sharing across organisational boundaries.

Based on the limited representativeness of the population and perceptual data collected from the survey participants, it can only broadly be argued that informal knowledge collaboration and the development of TMS in EGKNs help professionals to improve their task performance. A longitudinal field study may help to determine the actual improvement in skills and capabilities of professionals, as a result of knowledge coordination and integration from diverse sources using their TMS-based structures. Researchers may use organisational performance indicators such as quality, timeliness, and productivity to measure actual improvement in the performance of individuals at different points in time. Researchers may also use the Kaplan and Norton (1996) balanced scorecard to measure improvement in performance in the four areas of an organisation, that is, financial, internal processes, learning and growth, and customer satisfaction.

Nonetheless, in order to effectively measure performance as a result of TMS development, the cause and effect can be measured in controlled environments in which instances of information and knowledge sharing could be measured in specific contexts (such as process improvement or implementing new technology) The TMS construct could also benefit from more complex measurement using finite groups of individuals by using the SNA technique. SNA will map and measure the relationships and flow of information or knowledge in the networks (e.g. EGKNs) of professionals. SNA will help to understand the location of actors in the network and identify central and key positions in the personal networks of professionals.

This study only investigated the role of the relational dimension of social capital (i.e. trust and trustworthiness) in the development of TMS among socially connected

individuals. The role of structural dimension of social capital (e.g. strong vs weak ties, centrality of the node) is discussed in the literature review (see section 3.2.1). The structural dimension is not investigated in this thesis through some established techniques (e.g. SNA). Moreover, the role of cognitive dimension (shared understanding + distributed cognition) in developing knowledge sharing structures is also not explored in this thesis as it is assumed that cognitive dimension is largely covered in the TMS literature (see section 3.3). Thus, the other two dimensions of social capital can be linked to some aspects of TMS development in the EGKNs of professionals in future research.

In large organisations, people have more opportunities of knowledge acquisition through formal and informal sources. In small and medium organisations, where training and development funds are often limited, informal networks of individuals can provide manifold opportunities for competency development. Employees' participation in CoPs, ENoPs, and other knowledge networks help them to improve their knowledge-base and therefore performance by integrating knowledge from diverse sources. Since the majority of the respondents in this study are senior managers and middle level professionals, it cannot be said how the informal knowledge collaboration model would work with lower level employees. The future research may identify how the patterns of informal information and knowledge sharing appear in entry level employees, middle level professionals, and among leaders of organisations.

A comparison of the demographic characteristics (see section 7.2.1) in both NZKM and Kompass samples indicate that respondents belong to different industries and type of professions. Table 7.2.1 indicates that respondents belong to different types of professions. For instance, majority (39%) of the respondents in the NZKM sample were 'Information and Knowledge Management' professionals. On the other hand, the

Kompass sample contains majority (42%) of the 'CEOs and General Managers'. However, the results (see Table 7.2.1) show that there is no significant difference in the information sharing behaviour of individuals in both the samples. These findings suggest that the job category of professionals do not affect their informal knowledge sharing behavior. However, future studies can look into more detail the impact of job category, professional status, and industry characteristic in the development of TMS structures among socially connected individuals.

The findings of this study indicate that CEOs and senior managers frequently used to share work-specific knowledge through personal contacts both within and across organisational boundaries. These findings suggest that managers realise the potential of informal networking and knowledge sharing through personal contacts. However, the study was not able to find what these mangers actually think about the knowledge sharing activities of their employees (i.e. subordinates); whether there is a gap in the perception of managers about what they actually do and what their employees are doing in terms of information and knowledge sharing outside the boundaries of the organisation. Future research may look into this issue and clarify whether managers support or inhibit their employees' external knowledge sharing activities that may also involve divulging proprietary information to others.

Nevertheless, there are some downsides of informal knowledge transfer (through EGKNs) that may undermine the enormous benefits of such knowledge transfer, for instance information leakage and misappropriation. Organisational policies discouraging external knowledge collaboration to prevent information leaks may also discourage knowledge acquisition from outside sources. Organisations should think of ways to limit losses (e.g. unintentional disclosure of sensitive information or know-how) without hampering the abilities of individuals to coordinate and share knowledge

from external sources. It would be interesting to extend the model further by adding other dimensions, such as, organisational culture, industry competition, and regional dynamics. This may improve the diversity of the model and improve its flexibility for replication in different work environments and organisational cultures.

Management should consider the knowledge network of employees and knowledge sharing activities through these networks. If an individual possess an extensive network of knowledge sharing then the individual's time may be spent on helping others and paying less attention to the task in hand. This can lead to both positive and negative results for the company. Negative in the sense those employees may be spending most of their time in organisations searching for solutions or taking advice from others, or sharing sensitive information with external contacts. The role and significance of these informal (personal) networks should be evaluated in an organisational context, and if knowledge sharing practices of employees are really useful for the organisations then organisations should allow their employees to engage in such practices. However, it is very difficult to keep a record of which information or knowledge sharing transaction is rewarding and which one is causing a disadvantage.

Employees may disclose proprietary information and firm-specific knowledge to competitors through their informal networks of contacts. In view of this, managers of organisations may be skeptical about the usefulness of informal networks and knowledge sharing practices by means of personal networking of employees. They may hold concerns about the effectiveness of such knowledge sharing practices with regard to organisational competitive advantage. In view of this, organisations may wish to know what knowledge is going out of the boundaries of the firm through participation of their workers in external knowledge sharing activities. The issue of protecting knowledge of an organisation is a long-standing debate between KM scholars and

practitioners. The knowledge sharing and knowledge protection tension is an ongoing phenomenon for individuals as well as for the organisations, and therefore remains an open area of research.

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# APPENDICES

## Appendix A- Survey Questionnaire - Knowledge Sharing Survey

### Section A: Informal Knowledge Contacts

An informal contact is a person who works in similar profession or knowledge domain with whom the knowledge worker's current relationship is primarily a social relationship.

| | | | | Yes | No | Don't Know |
|---|---|---|---|---|---|---|
| 1 | I share knowledge on work-related topics with my informal contacts | | | ☐ | ☐ | ☐ |
| 2 | Do you have informal contact with at least one person within your organisation who you share work-related knowledge? | | | ☐ | ☐ | ☐ |
| 3 | Do you have informal contact with at least one person who do not work for the same organisation as you and who you share work-related knowledge? | | | ☐ | ☐ | ☐ |
| | | 1-4 | 5-8 | 9-12 | 13-16 | >16 |
| 4 | What is the estimated number of people *within* your organisation who you have informally shared knowledge on work-related topics in the last 12 months | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | What is the estimated number of people who do not work for the same organisation as you and with who you shared knowledge on work-related topics in the last 12 months | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | **My preferred modes of knowledge sharing are:** | 1st choice | 2nd choice | 3rd choice | 4th choice | 5th choice |
| | Face to Face meetings | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Online discussion forums | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Phone calling | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Emails | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other (Please select if none of the above applies to you) | ☐ | ☐ | ☐ | ☐ | ☐ |

## Section B: Informal Information Sharing

Informal Information sharing is the sharing of know-how or expertise by means of informal contacts. The next set of questions will ask you about formal and informal information sharing activities performed by you ***within*** and ***outside*** your organisation during the past one year.

| | **During the past year, how frequently have the following happened?** | Never | A few times a year | Once a month | Once a week | Once a day |
|---|---|---|---|---|---|---|
| 7 | You were contacted by one of your informal contacts **within** your organisation for some specific technical information on a work-related topic | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8 | You gave out some specific technical information on a work-related topic to one of your informal contacts **within** your organisation | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9 | You sent ***formal***, written communications in the form of reports or data on a work-related topic to one of your informal contacts **within** your organisation | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10 | You sent ***informal***, written communications in the form of reports or data on a work-related topic to one of your informal contacts **within** your organisation | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | You were contacted by someone **outside** your organisation for some specific technical information on a work-related topic | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12 | You gave out some specific technical information on a work-related topic to one of your informal contacts **outside** your organisation | ☐ | ☐ | ☐ | ☐ | ☐ |
| 13 | You sent ***formal***, written communications in the form of reports or data on a work-related topic to one of your informal contacts **outside** your organisation | ☐ | ☐ | ☐ | ☐ | ☐ |
| 14 | You sent ***informal***, written communications in the form of reports or data on a work-related topic to one of your informal contacts **outside** your organisation | ☐ | ☐ | ☐ | ☐ | ☐ |

## Section C: Personal Knowledge Networks

A **P**ersonal **K**nowledge **N**etwork **(PKN)** is defined as collection of informal contacts that is used for informal sharing of work-related knowledge. The next set of questions will ask about the efficacy of your **PKN** in INFORMAL knowledge collaboration.

| | | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 15 | My work tasks demand creativity, new ideas, and solutions | ☐ | ☐ | ☐ | ☐ | ☐ |
| 16 | Some members of my PKN have specialised knowledge of some aspect of my job | ☐ | ☐ | ☐ | ☐ | ☐ |
| 17 | I know which of my PKN members have expertise in specific areas that can be helpful to my job | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18 | I trust the knowledge that my PKN members have about my job is credible | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 19 | I coordinate advice from my PKN members within my organisation if it concerns aspects of my job | ☐ | ☐ | ☐ | ☐ | ☐ |
| 20 | I coordinate advice from my PKN members working in other organisations if it concerns aspects of my job | ☐ | ☐ | ☐ | ☐ | ☐ |
| 21 | I believe that other members of my PKN will always look out for my interests | ☐ | ☐ | ☐ | ☐ | ☐ |
| 22 | All members of my PKN are trustworthy | ☐ | ☐ | ☐ | ☐ | ☐ |
| 23 | I have faith that other members of my PKN would always act as I expect | ☐ | ☐ | ☐ | ☐ | ☐ |
| 24 | I know that other members will help me, so I feel obligatory to help members of my PKN | ☐ | ☐ | ☐ | ☐ | ☐ |
| 25 | When I share knowledge with other members, I believe that the members of my PKN would help me if I need it | ☐ | ☐ | ☐ | ☐ | ☐ |
| 26 | When I share knowledge with other members, I believe that my future request for knowledge will be answered by members of my PKN | ☐ | ☐ | ☐ | ☐ | ☐ |
| 27 | Knowledge sharing with members of my PKN will increase my problem-solving capability | ☐ | ☐ | ☐ | ☐ | ☐ |
| 28 | Knowledge sharing with members of my PKN will help me confirm my own understanding of my work-related topics | ☐ | ☐ | ☐ | ☐ | ☐ |
| 29 | Knowledge sharing with members of my PKN will help me in my job and improve my performance | ☐ | ☐ | ☐ | ☐ | ☐ |

## Section D: Demographics

| | | | |
|---|---|---|---|
| 30 | Age | Under 30 years | ☐ |
| | | 30-39 years | ☐ |
| | | 40-49 years | ☐ |
| | | Over 50 years | ☐ |
| 31 | Education | Level 1-4: Vocational Certificates | ☐ |
| | | Level 5-6: Vocational Diplomas | ☐ |
| | | Level 7: Bachelor's degree, Graduate Diplomas | ☐ |
| | | Level 8: Postgraduate diplomas and certificates, Bachelors with honours | ☐ |
| | | Level 9: Master's degree | ☐ |
| | | Level 10: Doctoral degree | ☐ |
| 32 | Gender | Male | ☐ |
| | | Female | ☐ |
| 33 | Industry | Agriculture, Forestry, and Fishing | ☐ |
| | | Manufacturing | ☐ |
| | | Electricity, Gas, Water, and Waste Services | ☐ |
| | | Construction | ☐ |
| | | Wholesale and Retail Trade | ☐ |
| | | Accommodation and Food Services | ☐ |
| | | Transport, Postal, and Warehousing | ☐ |
| | | Information Media and Telecommunications | ☐ |
| | | Financial and Insurance Services | ☐ |
| | | Rental, Hiring, and Real Estate Services | ☐ |
| | | Professional, Scientific, and Technical Services | ☐ |
| | | Administrative and Support Services | ☐ |
| | | Public Administration and Safety | ☐ |
| | | Education and Training | ☐ |
| | | Health, Care, and Social Assistance | ☐ |
| | | Other (please specify): _____ | ☐ |
| 34 | Type of Occupation | Chief Executives and General Managers | ☐ |
| | | Business Administration Managers | ☐ |
| | | ICT Managers | ☐ |
| | | Knowledge Management Professionals | ☐ |
| | | Accountants, Auditors and Company Secretaries | ☐ |
| | | Human Resource and Training Professionals | ☐ |

| | | | |
|---|---|---|---|
| | | Tertiary Education Teachers | ☐ |
| | | Business and Systems Analysts, and Programmers | ☐ |
| | | Database and Systems Administrators | ☐ |
| | | ICT Security Specialists | ☐ |
| | | Legal Professionals | ☐ |
| | | Financial Services Professionals | ☐ |
| | | Information and Organisation Professionals | ☐ |
| | | Sales, Marketing and Public Relations Professionals | ☐ |
| | | Social and Welfare Professionals | ☐ |
| | | Other (please specify): _____ | |
| 35 | Professional work position | Senior level | ☐ |
| | | Middle level | ☐ |
| | | Other (please specify): _____ | |
| 36 | Tenure of current work | Permanent | ☐ |
| | | Long term contract (12 months or more) | ☐ |
| | | Short term contract (Less than 12 months) | ☐ |
| | | Other (please specify): _____ | |
| 37 | Work experience | *(Total number of years)* | ☐ |
| 38 | Number of organisations worked in the last 05 years | *( This includes your current organisation )* | ☐ |

# Appendix B - Invitation Letter

MASSEY UNIVERSITY
COLLEGE OF BUSINESS
KAUPAPA WHAI PAKIHI

February 10, 2012

Dear

I write to invite you to participate in a survey about the role of informal knowledge sharing practices of NZ knowledge workers.

The study is concerned with the extent to which professional share information informally with other professionals outside their own work organisation. It is seeking to establish the importance of this information sharing and how organisations and individuals may benefit from it. The study links to ideas and theories in knowledge management and to debates over the potential for New Zealand to participate in the knowledge economy.

To carry out his study, I require a questionnaire (whose link is given below) to be filled by professionals working in knowledge-intensive sectors of New Zealand. The survey comprises of 28 straight forward questions (excluding demographics) and can be completed in less than 10 minutes. Responses are confidential. A summary of the consolidated results will be provided to the interested participants.

I would appreciate if you complete and send this questionnaire at your earliest convenience. You can also fill this survey online by typing the URL below into your internet browser or requesting the same URL by sending me an email:

http://masseybusiness.eu.qualtrics.com/SE/?SID=SV_3BIWzFWJ1FVsz4g

Yours sincerely

Mahmood Ghaznavi
Doctoral Candidate
School of Management
Massey University (Palmerston North)
Tel: 06 356 9099 Extn: 7789
Email: M.Ghaznavi@massey.ac.nz

Declaration

This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committee. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O' Neill, Director (Research Ethics), telephone 06 350 5249, e-mail humanethics@massey.ac.nz.

# Appendix C – Ethics Approval

MASSEY UNIVERSITY

27 July 2011

Mahmood Ghaznavi
3/30 Worcester Street
West End
**PALMERSTON NORTH 4410**

Dear Mahmood

**Re: Knowledge Sharing in Ego-Centred Networks of Professionals: Role of Transactive Memory, Trust and Reciprocity**

Thank you for your Low Risk Notification which was received on 25 July 2011.

Your project has been recorded on the Low Risk Database which is reported in the Annual Report of the Massey University Human Ethics Committees.

The low risk notification for this project is valid for a maximum of three years.

Please notify me if situations subsequently occur which cause you to reconsider your initial ethical analysis that it is safe to proceed without approval by one of the University's Human Ethics Committees.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

**A reminder to include the following statement on all public documents:**

> *"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.*
>
> *If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director (Research Ethics), telephone 06 350 5249, e-mail humanethics@massey.ac.nz".*

Please note that if a sponsoring organisation, funding authority or a journal in which you wish to publish requires evidence of committee approval (with an approval number), you will have to provide a full application to one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

Yours sincerely

J. O'Neill

John G O'Neill (Professor)
**Chair, Human Ethics Chairs' Committee and**
**Director (Research Ethics)**

cc Assoc Prof Martin Perry
School of Management
**Wellington**

Dr Keri Logan
School of Management
**Wellington**

Prof Claire Massey, HoS
School of Management
**PN214**

# Appendix D – Exploratory Factor Analysis on NZKM Dataset

## Chapter 6

### Descriptive statistics

| | N | Minimum | Maximum | Mean | Std. Deviation | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|---|---|
| | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Std. Error |
| KS_IN1 | 194 | 1 | 5 | 3.50 | 1.171 | -.255 | .175 | -.998 | .347 |
| KS_IN2 | 194 | 1 | 5 | 3.63 | 1.163 | -.589 | .175 | -.538 | .347 |
| KS_IN3 | 194 | 1 | 5 | 3.13 | 1.239 | -.175 | .175 | -1.032 | .347 |
| KS_IN4 | 194 | 1 | 5 | 3.02 | 1.290 | -.029 | .175 | -1.081 | .347 |
| KS_EXT1 | 194 | 1 | 5 | 2.71 | 1.119 | .277 | .175 | -.660 | .347 |
| KS_EXT2 | 194 | 1 | 5 | 2.62 | 1.076 | .393 | .175 | -.440 | .347 |
| KS_EXT3 | 194 | 1 | 5 | 2.34 | 1.026 | .482 | .175 | -.211 | .347 |
| KS_EXT4 | 194 | 1 | 5 | 2.14 | 1.058 | .875 | .175 | .260 | .347 |
| TMS1 | 194 | 1 | 5 | 4.03 | .899 | -1.490 | .175 | 2.863 | .347 |
| TMS2 | 194 | 1 | 5 | 4.05 | .829 | -1.411 | .175 | 3.112 | .347 |
| TMS3 | 194 | 1 | 5 | 3.95 | .810 | -1.098 | .175 | 2.130 | .347 |
| TMS4 | 194 | 1 | 5 | 3.93 | .894 | -1.056 | .175 | 1.212 | .347 |
| TMS5 | 194 | 1 | 5 | 3.81 | .762 | -.872 | .175 | 1.563 | .347 |
| Trust1 | 194 | 1 | 5 | 3.54 | .721 | -.211 | .175 | .272 | .347 |
| Trust2 | 194 | 1 | 5 | 3.87 | .729 | -.599 | .175 | 1.028 | .347 |
| Trust3 | 194 | 1 | 5 | 3.58 | .825 | -.362 | .175 | .155 | .347 |
| RCPR1 | 194 | 1 | 5 | 3.86 | .808 | -.744 | .175 | 1.005 | .347 |
| RCPR2 | 194 | 1 | 5 | 4.01 | .644 | -.951 | .175 | 3.238 | .347 |
| RCPR3 | 194 | 1 | 5 | 3.92 | .675 | -.828 | .175 | 2.186 | .347 |
| PERF1 | 194 | 1 | 5 | 4.15 | .708 | -.930 | .175 | 2.186 | .347 |
| PERF2 | 194 | 1 | 5 | 4.22 | .639 | -.946 | .175 | 3.421 | .347 |
| PERF3 | 194 | 1 | 5 | 4.18 | .670 | -.958 | .175 | 2.877 | .347 |
| Valid N (listwise) | 194 | | | | | | | | |

### EFA Table: KMO and Bartlett's Test

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .844 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 2526.355 |
| | df | 231 |
| | Sig. | .000 |

**EFA Table: Communalities**

**Communalities**

| | Initial | Extraction |
|---|---|---|
| KS_IN1 | 1.000 | .746 |
| KS_IN2 | 1.000 | .824 |
| KS_IN3 | 1.000 | .730 |
| KS_IN4 | 1.000 | .654 |
| KS_EXT1 | 1.000 | .793 |
| KS_EXT2 | 1.000 | .862 |
| KS_EXT3 | 1.000 | .771 |
| KS_EXT4 | 1.000 | .818 |
| TMS1 | 1.000 | .714 |
| TMS2 | 1.000 | .639 |
| TMS3 | 1.000 | .724 |
| TMS4 | 1.000 | .518 |
| TMS5 | 1.000 | .555 |
| Trust1 | 1.000 | .570 |
| Trust2 | 1.000 | .655 |
| Trust3 | 1.000 | .655 |
| RCPR1 | 1.000 | .539 |
| RCPR2 | 1.000 | .624 |
| RCPR3 | 1.000 | .606 |
| PERF1 | 1.000 | .742 |
| PERF2 | 1.000 | .798 |
| PERF3 | 1.000 | .767 |

Extraction Method: Principal Component Analysis.

**EFA Results: Component matrix**

**Component Matrix[a]**

| | Component | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| KS_IN1 | | .617 | | -.484 | |
| KS_IN2 | | .764 | | -.374 | |
| KS_IN3 | | .732 | | -.335 | |
| KS_IN4 | | .727 | | | |
| KS_EXT1 | | .835 | | | |
| KS_EXT2 | | .832 | | .375 | |
| KS_EXT3 | | .771 | | .350 | |
| KS_EXT4 | | .746 | | .484 | |
| TMS1 | .513 | | .650 | | |
| TMS2 | .546 | | .562 | | |
| TMS3 | .690 | | .430 | | |
| TMS4 | .519 | | .450 | | |
| TMS5 | .614 | | .342 | | |
| Trust1 | .567 | | -.326 | | |
| Trust2 | .582 | -.340 | | | .360 |
| Trust3 | .641 | | | | |
| RCPR1 | .630 | | -.362 | | |
| RCPR2 | .716 | | | | |
| RCPR3 | .644 | | -.425 | | |
| PERF1 | .746 | | | | -.399 |
| PERF2 | .724 | | | | -.472 |
| PERF3 | .708 | | | | -.473 |

Extraction Method: Principal Component Analysis.
a. 5 components extracted.

# Appendix E – Measurement Model Testing Results (NZKM Dataset) – Chapter 6

**Assessment of normality (Group number 1)**

| Variable | min | max | skew | c.r. | kurtosis | c.r. |
|---|---|---|---|---|---|---|
| PERF1 | 1.000 | 5.000 | -.923 | -5.250 | 2.099 | 5.969 |
| PERF2 | 1.000 | 5.000 | -.938 | -5.335 | 3.302 | 9.389 |
| PERF3 | 1.000 | 5.000 | -.950 | -5.403 | 2.773 | 7.883 |
| TMS1 | 1.000 | 5.000 | -1.479 | -8.407 | 2.758 | 7.843 |
| TMS2 | 1.000 | 5.000 | -1.400 | -7.962 | 3.001 | 8.533 |
| TMS3 | 1.000 | 5.000 | -1.089 | -6.193 | 2.045 | 5.815 |
| TMS4 | 1.000 | 5.000 | -1.048 | -5.958 | 1.151 | 3.271 |
| TMS5 | 1.000 | 5.000 | -.866 | -4.922 | 1.492 | 4.242 |
| Trust1 | 1.000 | 5.000 | -.210 | -1.192 | .234 | .665 |
| Trust2 | 1.000 | 5.000 | -.595 | -3.381 | .971 | 2.761 |
| Trust3 | 1.000 | 5.000 | -.359 | -2.042 | .120 | .341 |
| RCPR1 | 1.000 | 5.000 | -.738 | -4.195 | .949 | 2.698 |
| RCPR2 | 1.000 | 5.000 | -.944 | -5.367 | 3.125 | 8.884 |
| RCPR3 | 1.000 | 5.000 | -.821 | -4.669 | 2.100 | 5.970 |
| IN_INF1 | 1.000 | 5.000 | -.253 | -1.436 | -1.003 | -2.852 |
| IN_INF2 | 1.000 | 5.000 | -.584 | -3.323 | -.555 | -1.577 |
| IN_INF3 | 1.000 | 5.000 | -.174 | -.988 | -1.036 | -2.945 |
| IN_INF4 | 1.000 | 5.000 | -.029 | -.164 | -1.084 | -3.082 |
| EX_INF1 | 1.000 | 5.000 | .274 | 1.560 | -.674 | -1.915 |
| EX_INF2 | 1.000 | 5.000 | .390 | 2.220 | -.460 | -1.308 |
| EX_INF3 | 1.000 | 5.000 | .478 | 2.718 | -.236 | -.671 |
| EX_INF4 | 1.000 | 5.000 | .869 | 4.939 | .222 | .632 |
| Multivariate | | | | | 101.507 | 21.754 |

**Notes for Model (Default model)**

Computation of degrees of freedom (Default model)

Number of distinct sample moments: 275

Number of distinct parameters to be estimated: 82

Degrees of freedom (275 - 82): 193

**Result (Default model)**

Minimum was achieved

Chi-square = 312.655

Degrees of freedom = 193

Probability level = .000

Estimates (NZKM Dataset- Default model)

Scalar Estimates (NZKM Dataset- Default model)

Maximum Likelihood Estimates

**Regression Weights: (NZKM Dataset- Default model)**

| | | | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| EX_INF4 | <--- | EX_INF | 1.000 | | | | |
| EX_INF3 | <--- | EX_INF | .974 | .072 | 13.597 | *** | par_1 |
| EX_INF2 | <--- | EX_INF | 1.148 | .071 | 16.068 | *** | par_2 |
| EX_INF1 | <--- | EX_INF | 1.097 | .077 | 14.257 | *** | par_3 |
| IN_INF4 | <--- | IN_INF | 1.000 | | | | |
| IN_INF3 | <--- | IN_INF | .992 | .090 | 11.048 | *** | par_4 |
| IN_INF2 | <--- | IN_INF | 1.075 | .085 | 12.673 | *** | par_5 |
| IN_INF1 | <--- | IN_INF | .896 | .085 | 10.512 | *** | par_6 |
| RCPR3 | <--- | RCPR | 1.000 | | | | |
| RCPR2 | <--- | RCPR | .999 | .098 | 10.236 | *** | par_7 |
| RCPR1 | <--- | RCPR | 1.138 | .121 | 9.386 | *** | par_8 |
| Trust3 | <--- | TRST | 1.000 | | | | |
| Trust2 | <--- | TRST | .881 | .083 | 10.633 | *** | par_9 |
| Trust1 | <--- | TRST | .733 | .081 | 9.012 | *** | par_10 |
| TMS5 | <--- | TMS | 1.000 | | | | |
| TMS4 | <--- | TMS | 1.079 | .137 | 7.859 | *** | par_11 |
| TMS3 | <--- | TMS | 1.326 | .136 | 9.782 | *** | par_12 |
| TMS2 | <--- | TMS | 1.015 | .128 | 7.931 | *** | par_13 |
| TMS1 | <--- | TMS | 1.112 | .139 | 8.015 | *** | par_14 |
| PERF3 | <--- | PERF | 1.000 | | | | |
| PERF2 | <--- | PERF | .997 | .075 | 13.353 | *** | par_15 |
| PERF1 | <--- | PERF | 1.004 | .083 | 12.081 | *** | par_16 |

**Standardized Regression Weights: (NZKM Dataset- Default model)**

| | | | Estimate |
|---|---|---|---|
| EX_INF4 | <--- | EX_INF | .822 |
| EX_INF3 | <--- | EX_INF | .826 |
| EX_INF2 | <--- | EX_INF | .928 |
| EX_INF1 | <--- | EX_INF | .853 |
| IN_INF4 | <--- | IN_INF | .759 |
| IN_INF3 | <--- | IN_INF | .783 |
| IN_INF2 | <--- | IN_INF | .904 |
| IN_INF1 | <--- | IN_INF | .749 |
| RCPR3 | <--- | RCPR | .757 |
| RCPR2 | <--- | RCPR | .793 |
| RCPR1 | <--- | RCPR | .719 |
| Trust3 | <--- | TRST | .799 |
| Trust2 | <--- | TRST | .796 |
| Trust1 | <--- | TRST | .670 |
| TMS5 | <--- | TMS | .693 |
| TMS4 | <--- | TMS | .637 |
| TMS3 | <--- | TMS | .864 |
| TMS2 | <--- | TMS | .646 |
| TMS1 | <--- | TMS | .653 |
| PERF3 | <--- | PERF | .830 |
| PERF2 | <--- | PERF | .867 |
| PERF1 | <--- | PERF | .789 |

**Intercepts: (NZKM Dataset- Default model)**

| | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|
| EX_INF4 | 2.144 | .076 | 28.235 | *** | par_33 |
| EX_INF3 | 2.335 | .074 | 31.695 | *** | par_34 |
| EX_INF2 | 2.624 | .077 | 33.957 | *** | par_35 |
| EX_INF1 | 2.711 | .080 | 33.737 | *** | par_36 |
| IN_INF4 | 3.015 | .093 | 32.570 | *** | par_37 |
| IN_INF3 | 3.134 | .089 | 35.217 | *** | par_38 |
| IN_INF2 | 3.634 | .083 | 43.524 | *** | par_39 |
| IN_INF1 | 3.500 | .084 | 41.642 | *** | par_40 |
| RCPR3 | 3.923 | .048 | 80.987 | *** | par_41 |
| RCPR2 | 4.010 | .046 | 86.770 | *** | par_42 |
| RCPR1 | 3.856 | .058 | 66.476 | *** | par_43 |
| Trust3 | 3.577 | .059 | 60.400 | *** | par_44 |
| Trust2 | 3.866 | .052 | 73.883 | *** | par_45 |
| Trust1 | 3.536 | .052 | 68.338 | *** | par_46 |
| TMS5 | 3.809 | .055 | 69.666 | *** | par_47 |
| TMS4 | 3.933 | .064 | 61.300 | *** | par_48 |
| TMS3 | 3.954 | .058 | 67.996 | *** | par_49 |
| TMS2 | 4.046 | .060 | 67.999 | *** | par_50 |
| TMS1 | 4.031 | .065 | 62.486 | *** | par_51 |
| PERF3 | 4.180 | .048 | 86.881 | *** | par_52 |
| PERF2 | 4.216 | .046 | 91.849 | *** | par_53 |
| PERF1 | 4.149 | .051 | 81.666 | *** | par_54 |

**Covariances: (NZKM Dataset- Default model)**

| | | | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| EX_INF | <--> | IN_INF | .532 | .088 | 6.071 | *** | par_17 |
| EX_INF | <--> | RCPR | .026 | .037 | .701 | .483 | par_18 |
| EX_INF | <--> | TRST | -.086 | .048 | -1.788 | .074 | par_19 |
| EX_INF | <--> | TMS | -.013 | .037 | -.355 | .722 | par_20 |
| PERF | <--> | EX_INF | .030 | .039 | .772 | .440 | par_21 |
| IN_INF | <--> | RCPR | .050 | .043 | 1.178 | .239 | par_22 |
| IN_INF | <--> | TRST | -.084 | .055 | -1.529 | .126 | par_23 |
| IN_INF | <--> | TMS | .041 | .043 | .956 | .339 | par_24 |
| PERF | <--> | IN_INF | .091 | .045 | 2.013 | .044 | par_25 |
| RCPR | <--> | TRST | .250 | .040 | 6.270 | *** | par_26 |
| RCPR | <--> | TMS | .125 | .028 | 4.469 | *** | par_27 |
| PERF | <--> | RCPR | .195 | .032 | 6.172 | *** | par_28 |
| TRST | <--> | TMS | .171 | .036 | 4.729 | *** | par_29 |
| PERF | <--> | TRST | .201 | .037 | 5.435 | *** | par_30 |
| PERF | <--> | TMS | .160 | .031 | 5.208 | *** | par_31 |
| e18 | <--> | e19 | .207 | .041 | 5.048 | *** | par_32 |

**Correlations: (NZKM Dataset- Default model)**

| | | | Estimate |
|---|---|---|---|
| EX_INF | <--> | IN_INF | .628 |
| EX_INF | <--> | RCPR | .059 |
| EX_INF | <--> | TRST | -.151 |
| EX_INF | <--> | TMS | -.029 |
| PERF | <--> | EX_INF | .062 |
| IN_INF | <--> | RCPR | .101 |
| IN_INF | <--> | TRST | -.131 |
| IN_INF | <--> | TMS | .079 |
| PERF | <--> | IN_INF | .168 |
| RCPR | <--> | TRST | .747 |
| RCPR | <--> | TMS | .465 |
| PERF | <--> | RCPR | .691 |
| TRST | <--> | TMS | .495 |
| PERF | <--> | TRST | .552 |
| PERF | <--> | TMS | .547 |
| e18 | <--> | e19 | .482 |

**Variances: (NZKM Dataset- Default model)**

| | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|
| EX_INF | .753 | .110 | 6.854 | *** | par_55 |
| IN_INF | .952 | .159 | 5.986 | *** | par_56 |
| RCPR | .260 | .045 | 5.753 | *** | par_57 |
| TRST | .432 | .070 | 6.150 | *** | par_58 |
| TMS | .277 | .054 | 5.119 | *** | par_59 |
| PERF | .308 | .046 | 6.738 | *** | par_60 |
| e1 | .360 | .044 | 8.227 | *** | par_61 |
| e2 | .333 | .041 | 8.179 | *** | par_62 |
| e3 | .160 | .031 | 5.147 | *** | par_63 |
| e4 | .340 | .044 | 7.749 | *** | par_64 |
| e5 | .702 | .085 | 8.299 | *** | par_65 |
| e6 | .592 | .074 | 8.019 | *** | par_66 |
| e7 | .245 | .050 | 4.910 | *** | par_67 |
| e8 | .599 | .071 | 8.396 | *** | par_68 |
| e9 | .193 | .026 | 7.375 | *** | par_69 |
| e10 | .153 | .023 | 6.727 | *** | par_70 |
| e11 | .313 | .040 | 7.887 | *** | par_71 |
| e12 | .245 | .038 | 6.487 | *** | par_72 |
| e13 | .193 | .030 | 6.540 | *** | par_73 |
| e14 | .285 | .034 | 8.329 | *** | par_74 |
| e15 | .300 | .037 | 8.188 | *** | par_75 |
| e16 | .472 | .055 | 8.643 | *** | par_76 |
| e17 | .165 | .034 | 4.803 | *** | par_77 |
| e18 | .398 | .047 | 8.509 | *** | par_78 |
| e19 | .461 | .054 | 8.461 | *** | par_79 |
| e20 | .139 | .020 | 6.816 | *** | par_80 |
| e21 | .101 | .018 | 5.774 | *** | par_81 |
| e22 | .188 | .025 | 7.624 | *** | par_82 |

**Squared Multiple Correlations: (NZKM Dataset- Default model)**

| | Estimate |
|---|---|
| PERF1 | .623 |
| PERF2 | .751 |
| PERF3 | .689 |
| TMS1 | .427 |
| TMS2 | .417 |
| TMS3 | .746 |
| TMS4 | .406 |
| TMS5 | .480 |
| Trust1 | .449 |
| Trust2 | .634 |
| Trust3 | .638 |
| RCPR1 | .518 |
| RCPR2 | .629 |
| RCPR3 | .574 |
| IN_INF1 | .561 |
| IN_INF2 | .818 |
| IN_INF3 | .613 |
| IN_INF4 | .576 |
| EX_INF1 | .727 |
| EX_INF2 | .861 |
| EX_INF3 | .682 |
| EX_INF4 | .676 |

## Model Fit Summary

### CMIN

| Model | NPAR | CMIN | DF | P | CMIN/DF |
|---|---|---|---|---|---|
| Default model | 82 | 312.655 | 193 | .000 | 1.620 |
| Saturated model | 275 | .000 | 0 | | |
| Independence model | 44 | 2637.979 | 231 | .000 | 11.420 |

### Baseline Comparisons

| Model | NFI Delta1 | RFI rho1 | IFI Delta2 | TLI rho2 | CFI |
|---|---|---|---|---|---|
| Default model | .881 | .858 | .951 | .941 | .950 |
| Saturated model | 1.000 | | 1.000 | | 1.000 |
| Independence model | .000 | .000 | .000 | .000 | .000 |

### Parsimony-Adjusted Measures

| Model | PRATIO | PNFI | PCFI |
|---|---|---|---|
| Default model | .835 | .736 | .794 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 1.000 | .000 | .000 |

### NCP

| Model | NCP | LO 90 | HI 90 |
|---|---|---|---|
| Default model | 119.655 | 75.203 | 172.020 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 2406.979 | 2245.389 | 2575.944 |

### FMIN

| Model | FMIN | F0 | LO 90 | HI 90 |
|---|---|---|---|---|
| Default model | 1.620 | .620 | .390 | .891 |
| Saturated model | .000 | .000 | .000 | .000 |
| Independence model | 13.668 | 12.471 | 11.634 | 13.347 |

**RMSEA**

| Model | RMSEA | LO 90 | HI 90 | PCLOSE |
|---|---|---|---|---|
| Default model | .057 | .045 | .068 | .167 |
| Independence model | .232 | .224 | .240 | .000 |

**AIC**

| Model | AIC | BCC | BIC | CAIC |
|---|---|---|---|---|
| Default model | 476.655 | 498.844 | | |
| Saturated model | 550.000 | 624.412 | | |
| Independence model | 2725.979 | 2737.885 | | |

**ECVI**

| Model | ECVI | LO 90 | HI 90 | MECVI |
|---|---|---|---|---|
| Default model | 2.470 | 2.239 | 2.741 | 2.585 |
| Saturated model | 2.850 | 2.850 | 2.850 | 3.235 |
| Independence model | 14.124 | 13.287 | 15.000 | 14.186 |

**HOELTER**

| Model | HOELTER .05 | HOELTER .01 |
|---|---|---|
| Default model | 140 | 150 |
| Independence model | 20 | 21 |

# Appendix F – Structural Model Testing Results (NZKM Dataset) Chapter 6

**Notes for Model (Default model)**

Computation of degrees of freedom (Default model)

| | |
|---|---|
| Number of distinct sample moments: | 275 |
| Number of distinct parameters to be estimated: | 77 |
| Degrees of freedom (275 - 77): | 198 |

**Result (Default model)**

Minimum was achieved

Chi-square = 369.146

Degrees of freedom = 198

Probability level = .000

Estimates (NZKM Dataset- Default model)

Scalar Estimates (NZKM Dataset- Default model)

Maximum Likelihood Estimates

**Regression Weights: (NZKM Dataset- Default model)**

| | | | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| INT_INF | <--- | EXT_INF | .641 | .085 | 7.550 | *** | par_22 |
| Trst | <--- | Reciproc | .968 | .123 | 7.844 | *** | par_25 |
| EGKN_TMS | <--- | EXT_INF | -.061 | .064 | -.956 | .339 | par_13 |
| EGKN_TMS | <--- | Reciproc | .282 | .160 | 1.762 | .078 | par_14 |
| EGKN_TMS | <--- | Trst | .310 | .126 | 2.464 | .014 | par_15 |
| EGKN_TMS | <--- | INT_INF | .112 | .064 | 1.763 | .078 | par_20 |
| Task_Perform | <--- | EGKN_TMS | .587 | .093 | 6.332 | *** | par_16 |
| EX_INF2 | <--- | EXT_INF | 1.175 | .077 | 15.302 | *** | par_1 |
| EX_INF1 | <--- | EXT_INF | 1.116 | .081 | 13.842 | *** | par_2 |
| RCPR3 | <--- | Reciproc | 1.000 | | | | |
| RCPR2 | <--- | Reciproc | 1.004 | .102 | 9.846 | *** | par_3 |
| RCPR1 | <--- | Reciproc | 1.144 | .125 | 9.152 | *** | par_4 |
| Trust3 | <--- | Trst | 1.000 | | | | |
| Trust2 | <--- | Trst | .876 | .084 | 10.407 | *** | par_5 |
| Trust1 | <--- | Trst | .737 | .082 | 8.982 | *** | par_6 |
| TMS1 | <--- | EGKN_TMS | 1.000 | | | | |
| TMS2 | <--- | EGKN_TMS | .919 | .088 | 10.441 | *** | par_7 |
| TMS3 | <--- | EGKN_TMS | 1.195 | .135 | 8.841 | *** | par_8 |
| TMS4 | <--- | EGKN_TMS | .992 | .135 | 7.334 | *** | par_9 |
| TMS5 | <--- | EGKN_TMS | .930 | .118 | 7.893 | *** | par_10 |
| PERF3 | <--- | Task_Perform | 1.000 | | | | |
| PERF2 | <--- | Task_Perform | .992 | .076 | 13.119 | *** | par_11 |
| PERF1 | <--- | Task_Perform | .978 | .083 | 11.805 | *** | par_12 |
| IN_INF3 | <--- | INT_INF | 1.078 | .102 | 10.597 | *** | par_17 |
| IN_INF2 | <--- | INT_INF | 1.215 | .097 | 12.470 | *** | par_18 |
| IN_INF1 | <--- | INT_INF | 1.000 | | | | |
| EX_INF3 | <--- | EXT_INF | .973 | .069 | 14.107 | *** | par_19 |
| EX_INF4 | <--- | EXT_INF | 1.000 | | | | |
| IN_INF4 | <--- | INT_INF | 1.095 | .106 | 10.324 | *** | par_21 |

**Standardized Regression Weights: (NZKM Dataset- Default model)**

| | | | Estimate |
|---|---|---|---|
| INT_INF | <--- | EXT_INF | .625 |
| Trst | <--- | Reciproc | .748 |
| EGKN_TMS | <--- | EXT_INF | -.091 |
| EGKN_TMS | <--- | Reciproc | .251 |
| EGKN_TMS | <--- | Trst | .357 |
| EGKN_TMS | <--- | INT_INF | .172 |
| Task_Perform | <--- | EGKN_TMS | .599 |
| EX_INF2 | <--- | EXT_INF | .935 |
| EX_INF1 | <--- | EXT_INF | .854 |
| RCPR3 | <--- | Reciproc | .755 |
| RCPR2 | <--- | Reciproc | .794 |
| RCPR1 | <--- | Reciproc | .721 |
| Trust3 | <--- | Trst | .799 |
| Trust2 | <--- | Trst | .792 |
| Trust1 | <--- | Trst | .674 |
| TMS1 | <--- | EGKN_TMS | .638 |
| TMS2 | <--- | EGKN_TMS | .635 |
| TMS3 | <--- | EGKN_TMS | .846 |
| TMS4 | <--- | EGKN_TMS | .636 |
| TMS5 | <--- | EGKN_TMS | .700 |
| PERF3 | <--- | Task_Perform | .838 |
| PERF2 | <--- | Task_Perform | .871 |
| PERF1 | <--- | Task_Perform | .776 |
| IN_INF3 | <--- | INT_INF | .764 |
| IN_INF2 | <--- | INT_INF | .919 |
| IN_INF1 | <--- | INT_INF | .751 |
| EX_INF3 | <--- | EXT_INF | .812 |
| EX_INF4 | <--- | EXT_INF | .810 |
| IN_INF4 | <--- | INT_INF | .747 |

**Intercepts: (NZKM Dataset- Default model)**

| | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|
| EX_INF2 | 2.624 | .077 | 33.957 | *** | par_28 |
| EX_INF1 | 2.711 | .080 | 33.737 | *** | par_29 |
| RCPR3 | 3.923 | .048 | 80.987 | *** | par_30 |
| RCPR2 | 4.010 | .046 | 86.770 | *** | par_31 |
| RCPR1 | 3.856 | .058 | 66.476 | *** | par_32 |
| Trust3 | 3.577 | .059 | 60.400 | *** | par_33 |
| Trust2 | 3.866 | .052 | 73.883 | *** | par_34 |
| Trust1 | 3.536 | .052 | 68.338 | *** | par_35 |
| TMS1 | 4.031 | .065 | 62.472 | *** | par_36 |
| TMS2 | 4.046 | .060 | 67.984 | *** | par_37 |
| TMS3 | 3.954 | .058 | 67.970 | *** | par_38 |
| TMS4 | 3.933 | .064 | 61.286 | *** | par_39 |
| TMS5 | 3.809 | .055 | 69.648 | *** | par_40 |
| PERF3 | 4.180 | .048 | 86.869 | *** | par_41 |
| PERF2 | 4.216 | .046 | 91.835 | *** | par_42 |
| PERF1 | 4.149 | .051 | 81.656 | *** | par_43 |
| IN_INF3 | 3.134 | .089 | 35.217 | *** | par_44 |
| IN_INF2 | 3.634 | .083 | 43.524 | *** | par_45 |
| IN_INF1 | 3.500 | .084 | 41.642 | *** | par_46 |
| EX_INF3 | 2.335 | .074 | 31.695 | *** | par_47 |
| EX_INF4 | 2.144 | .076 | 28.235 | *** | par_48 |
| IN_INF4 | 3.015 | .093 | 32.570 | *** | par_49 |

**Variances: (NZKM Dataset- Default model)**

| | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|
| EXT_INF | .730 | .110 | 6.649 | *** | par_50 |
| Reciproc | .258 | .046 | 5.646 | *** | par_51 |
| e32 | .469 | .083 | 5.639 | *** | par_52 |
| e33 | .190 | .042 | 4.544 | *** | par_53 |
| e24 | .215 | .049 | 4.397 | *** | par_54 |
| e25 | .201 | .033 | 6.129 | *** | par_55 |
| e5 | .145 | .033 | 4.333 | *** | par_56 |
| e6 | .338 | .044 | 7.597 | *** | par_57 |
| e7 | .195 | .027 | 7.117 | *** | par_58 |
| e8 | .152 | .024 | 6.336 | *** | par_59 |
| e9 | .312 | .041 | 7.631 | *** | par_60 |
| e10 | .245 | .039 | 6.337 | *** | par_61 |
| e11 | .197 | .030 | 6.484 | *** | par_62 |
| e12 | .282 | .034 | 8.229 | *** | par_63 |
| e13 | .477 | .055 | 8.599 | *** | par_64 |
| e14 | .408 | .047 | 8.615 | *** | par_65 |
| e15 | .186 | .034 | 5.535 | *** | par_66 |
| e16 | .473 | .055 | 8.660 | *** | par_67 |
| e17 | .295 | .036 | 8.155 | *** | par_68 |
| e21 | .133 | .021 | 6.317 | *** | par_69 |
| e22 | .098 | .019 | 5.269 | *** | par_70 |
| e23 | .198 | .026 | 7.676 | *** | par_71 |
| e26 | .635 | .080 | 7.900 | *** | par_72 |
| e27 | .210 | .054 | 3.891 | *** | par_73 |
| e28 | .594 | .071 | 8.361 | *** | par_74 |
| e29 | .356 | .044 | 8.026 | *** | par_75 |
| e30 | .383 | .048 | 8.055 | *** | par_76 |
| e31 | .731 | .090 | 8.087 | *** | par_77 |

**Squared Multiple Correlations: (NZKM Dataset- Default model)**

| | **Estimate** |
|---|---|
| INT_INF | .390 |
| Trst | .560 |
| EGKN_TMS | .343 |
| Task_Perform | .359 |
| IN_INF4 | .558 |
| EX_INF4 | .656 |
| EX_INF3 | .660 |
| IN_INF1 | .564 |
| IN_INF2 | .844 |
| IN_INF3 | .584 |
| PERF1 | .602 |
| PERF2 | .759 |
| PERF3 | .702 |
| TMS5 | .490 |
| TMS4 | .405 |
| TMS3 | .715 |
| TMS2 | .403 |
| TMS1 | .407 |
| Trust1 | .454 |
| Trust2 | .628 |
| Trust3 | .638 |
| RCPR1 | .520 |
| RCPR2 | .631 |
| RCPR3 | .570 |
| EX_INF1 | .729 |
| EX_INF2 | .874 |

## Model Fit Summary

### CMIN

| Model | NPAR | CMIN | DF | P | CMIN/DF |
|---|---|---|---|---|---|
| Default model | 77 | 369.146 | 198 | .000 | 1.864 |
| Saturated model | 275 | .000 | 0 | | |
| Independence model | 44 | 2637.979 | 231 | .000 | 11.420 |

### Baseline Comparisons

| Model | NFI Delta1 | RFI rho1 | IFI Delta2 | TLI rho2 | CFI |
|---|---|---|---|---|---|
| Default model | .860 | .837 | .930 | .917 | .929 |
| Saturated model | 1.000 | | 1.000 | | 1.000 |
| Independence model | .000 | .000 | .000 | .000 | .000 |

### Parsimony-Adjusted Measures

| Model | PRATIO | PNFI | PCFI |
|---|---|---|---|
| Default model | .857 | .737 | .796 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 1.000 | .000 | .000 |

### NCP

| Model | NCP | LO 90 | HI 90 |
|---|---|---|---|
| Default model | 171.146 | 120.946 | 229.167 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 2406.979 | 2245.389 | 2575.944 |

#### FMIN

| Model | FMIN | F0 | LO 90 | HI 90 |
|---|---|---|---|---|
| Default model | 1.913 | .887 | .627 | 1.187 |
| Saturated model | .000 | .000 | .000 | .000 |
| Independence model | 13.668 | 12.471 | 11.634 | 13.347 |

**RMSEA**

| Model | RMSEA | LO 90 | HI 90 | PCLOSE |
|---|---|---|---|---|
| Default model | .067 | .056 | .077 | .005 |
| Independence model | .232 | .224 | .240 | .000 |

**AIC**

| Model | AIC | BCC | BIC | CAIC |
|---|---|---|---|---|
| Default model | 523.146 | 543.981 | | |
| Saturated model | 550.000 | 624.412 | | |
| Independence model | 2725.979 | 2737.885 | | |

**ECVI**

| Model | ECVI | LO 90 | HI 90 | MECVI |
|---|---|---|---|---|
| Default model | 2.711 | 2.450 | 3.011 | 2.819 |
| Saturated model | 2.850 | 2.850 | 2.850 | 3.235 |
| Independence model | 14.124 | 13.287 | 15.000 | 14.186 |

**HOELTER**

| Model | HOELTER .05 | HOELTER .01 |
|---|---|---|
| Default model | 122 | 130 |
| Independence model | 20 | 21 |

# Appendix G – Kurtosis and Skewness test on Kompass Dataset –

# Chapter 7

| Descriptive Statistics | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | Minimum | Maximum | Mean | Std. Dev. | Skewness | | Kurtosis | |
| | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Std. Error |
| IN_INF1 | 217 | 1 | 5 | 3.76 | 1.210 | -.819 | .165 | -.196 | .329 |
| IN_INF2 | 217 | 1 | 5 | 3.70 | 1.209 | -.788 | .165 | -.288 | .329 |
| IN_INF3 | 217 | 1 | 5 | 3.17 | 1.291 | -.183 | .165 | -1.106 | .329 |
| IN_INF4 | 217 | 1 | 5 | 2.86 | 1.194 | -.093 | .165 | -1.088 | .329 |
| EX_INF1 | 217 | 1 | 5 | 3.08 | 1.031 | -.005 | .165 | -.790 | .329 |
| EX_INF2 | 217 | 1 | 5 | 2.88 | 1.109 | .166 | .165 | -.838 | .329 |
| EX_INF3 | 217 | 1 | 5 | 2.40 | 1.080 | .614 | .165 | -.316 | .329 |
| EX_INF4 | 217 | 1 | 5 | 2.19 | 1.071 | .519 | .165 | -.706 | .329 |
| TMS1 | 217 | 1 | 5 | 4.09 | .780 | -1.337 | .165 | 3.221 | .329 |
| TMS2 | 217 | 1 | 5 | 4.17 | .716 | -1.334 | .165 | 3.935 | .329 |
| TMS3 | 217 | 1 | 5 | 4.00 | .694 | -.839 | .165 | 2.050 | .329 |
| TMS4 | 217 | 1 | 5 | 4.00 | .761 | -1.345 | .165 | 3.714 | .329 |
| TMS5 | 217 | 1 | 5 | 3.86 | .709 | -.811 | .165 | 1.560 | .329 |
| Trust1 | 217 | 1 | 5 | 3.44 | .821 | -.422 | .165 | .116 | .329 |
| Trust2 | 217 | 1 | 5 | 3.75 | .857 | -.656 | .165 | .353 | .329 |
| Trust3 | 217 | 1 | 5 | 3.55 | .843 | -.495 | .165 | -.008 | .329 |
| RCPR1 | 217 | 1 | 5 | 3.76 | .794 | -.880 | .165 | 1.080 | .329 |
| RCPR2 | 217 | 1 | 5 | 4.00 | .620 | -.939 | .165 | 3.474 | .329 |
| RCPR3 | 217 | 1 | 5 | 3.87 | .688 | -.858 | .165 | 1.890 | .329 |
| PERF1 | 217 | 1 | 5 | 4.18 | .657 | -.694 | .165 | 1.958 | .329 |
| PERF2 | 217 | 1 | 5 | 4.12 | .639 | -.749 | .165 | 2.655 | .329 |
| PERF3 | 217 | 1 | 5 | 4.10 | .717 | -.906 | .165 | 2.412 | .329 |
| Valid N (listwise) | 217 | | | | | | | | |

# Appendix H – Measurement Model Cross-validation (Kompass Dataset) – Chapter 7

**Assessment of normality (Group number 1)**

| Variable | min | max | skew | c.r. | kurtosis | c.r. |
|---|---|---|---|---|---|---|
| PERF1 | 1.000 | 5.000 | -.689 | -4.146 | 1.886 | 5.670 |
| PERF2 | 1.000 | 5.000 | -.744 | -4.475 | 2.567 | 7.718 |
| PERF3 | 1.000 | 5.000 | -.900 | -5.412 | 2.329 | 7.003 |
| TMS1 | 1.000 | 5.000 | -1.328 | -7.984 | 3.120 | 9.381 |
| TMS2 | 1.000 | 5.000 | -1.324 | -7.964 | 3.817 | 11.478 |
| TMS3 | 1.000 | 5.000 | -.833 | -5.012 | 1.976 | 5.940 |
| TMS4 | 1.000 | 5.000 | -1.336 | -8.034 | 3.602 | 10.830 |
| TMS5 | 1.000 | 5.000 | -.805 | -4.842 | 1.497 | 4.501 |
| Trust1 | 1.000 | 5.000 | -.419 | -2.520 | .086 | .258 |
| Trust2 | 1.000 | 5.000 | -.651 | -3.917 | .318 | .955 |
| Trust3 | 1.000 | 5.000 | -.492 | -2.958 | -.036 | -.108 |
| RCPR1 | 1.000 | 5.000 | -.874 | -5.256 | 1.027 | 3.089 |
| RCPR2 | 1.000 | 5.000 | -.932 | -5.607 | 3.367 | 10.124 |
| RCPR3 | 1.000 | 5.000 | -.852 | -5.122 | 1.819 | 5.469 |
| IN_INF1 | 1.000 | 5.000 | -.813 | -4.892 | -.219 | -.660 |
| IN_INF2 | 1.000 | 5.000 | -.782 | -4.704 | -.309 | -.928 |
| IN_INF3 | 1.000 | 5.000 | -.182 | -1.092 | -1.108 | -3.331 |
| IN_INF4 | 1.000 | 5.000 | -.092 | -.553 | -1.091 | -3.279 |
| EX_INF1 | 1.000 | 5.000 | -.005 | -.028 | -.800 | -2.404 |
| EX_INF2 | 1.000 | 5.000 | .165 | .994 | -.846 | -2.544 |
| EX_INF3 | 1.000 | 5.000 | .610 | 3.669 | -.336 | -1.010 |
| EX_INF4 | 1.000 | 5.000 | .515 | 3.099 | -.717 | -2.157 |
| Multivariate | | | | | 105.989 | 24.023 |

**Notes for Model (Default model)**

**Computation of degrees of freedom (Default model)**

Number of distinct sample moments: 275

Number of distinct parameters to be estimated: 83

Degrees of freedom (275 - 83): 192

**Result (Default model)**

Minimum was achieved

Chi-square = 280.497

Degrees of freedom = 192

Probability level = .000

Estimates (Kompass Dataset- Default model)

Scalar Estimates (Kompass Dataset- Default model)

Maximum Likelihood Estimates

**Regression Weights: (Kompass Dataset- Default model)**

| | | | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| EX_INF4 | <--- | EX_INF | 1.000 | | | | |
| EX_INF3 | <--- | EX_INF | 1.018 | .074 | 13.790 | *** | |
| EX_INF2 | <--- | EX_INF | 1.332 | .104 | 12.811 | *** | |
| EX_INF1 | <--- | EX_INF | 1.105 | .092 | 12.038 | *** | |
| IN_INF4 | <--- | IN_INF | 1.000 | | | | |
| IN_INF3 | <--- | IN_INF | 1.356 | .114 | 11.861 | *** | |
| IN_INF2 | <--- | IN_INF | 1.588 | .156 | 10.178 | *** | |
| IN_INF1 | <--- | IN_INF | 1.532 | .152 | 10.065 | *** | |
| RCPR3 | <--- | RCPR | 1.000 | | | | |
| RCPR2 | <--- | RCPR | .843 | .057 | 14.753 | *** | |
| RCPR1 | <--- | RCPR | .833 | .081 | 10.298 | *** | |
| Trust3 | <--- | TRST | 1.000 | | | | |
| Trust2 | <--- | TRST | 1.104 | .083 | 13.355 | *** | |
| Trust1 | <--- | TRST | .989 | .079 | 12.482 | *** | |
| TMS5 | <--- | TMS | 1.000 | | | | |
| TMS4 | <--- | TMS | .880 | .113 | 7.771 | *** | |
| TMS3 | <--- | TMS | 1.158 | .107 | 10.842 | *** | |
| TMS2 | <--- | TMS | 1.106 | .109 | 10.184 | *** | |
| TMS1 | <--- | TMS | .976 | .116 | 8.384 | *** | |
| PERF3 | <--- | PERF | 1.000 | | | | |
| PERF2 | <--- | PERF | .887 | .053 | 16.705 | *** | |
| PERF1 | <--- | PERF | .852 | .057 | 15.054 | *** | |

**Standardized Regression Weights: (Kompass Dataset- Default model)**

| | | | Estimate |
|---|---|---|---|
| EX_INF4 | <--- | EX_INF | .728 |
| EX_INF3 | <--- | EX_INF | .734 |
| EX_INF2 | <--- | EX_INF | .936 |
| EX_INF1 | <--- | EX_INF | .835 |
| IN_INF4 | <--- | IN_INF | .603 |
| IN_INF3 | <--- | IN_INF | .756 |
| IN_INF2 | <--- | IN_INF | .945 |
| IN_INF1 | <--- | IN_INF | .911 |
| RCPR3 | <--- | RCPR | .887 |
| RCPR2 | <--- | RCPR | .831 |
| RCPR1 | <--- | RCPR | .641 |
| Trust3 | <--- | TRST | .793 |
| Trust2 | <--- | TRST | .862 |
| Trust1 | <--- | TRST | .806 |
| TMS5 | <--- | TMS | .703 |
| TMS4 | <--- | TMS | .576 |
| TMS3 | <--- | TMS | .832 |
| TMS2 | <--- | TMS | .770 |
| TMS1 | <--- | TMS | .624 |
| PERF3 | <--- | PERF | .881 |
| PERF2 | <--- | PERF | .877 |
| PERF1 | <--- | PERF | .818 |

**Intercepts: (Kompass Dataset- Default model)**

| | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|
| EX_INF4 | 2.194 | .073 | 30.164 | *** | |
| EX_INF3 | 2.401 | .073 | 32.736 | *** | |
| EX_INF2 | 2.876 | .075 | 38.197 | *** | |
| EX_INF1 | 3.078 | .070 | 43.977 | *** | |
| IN_INF4 | 2.862 | .081 | 35.312 | *** | |
| IN_INF3 | 3.166 | .088 | 36.123 | *** | |
| IN_INF2 | 3.700 | .082 | 45.102 | *** | |
| IN_INF1 | 3.756 | .082 | 45.738 | *** | |
| RCPR3 | 3.871 | .047 | 82.824 | *** | |
| RCPR2 | 3.995 | .042 | 94.949 | *** | |
| RCPR1 | 3.756 | .054 | 69.710 | *** | |
| Trust3 | 3.553 | .057 | 62.058 | *** | |
| Trust2 | 3.751 | .058 | 64.494 | *** | |
| Trust1 | 3.442 | .056 | 61.779 | *** | |
| TMS5 | 3.857 | .048 | 80.143 | *** | |
| TMS4 | 4.005 | .052 | 77.548 | *** | |
| TMS3 | 4.000 | .047 | 84.918 | *** | |
| TMS2 | 4.171 | .049 | 85.820 | *** | |
| TMS1 | 4.088 | .053 | 77.220 | *** | |
| PERF3 | 4.097 | .049 | 84.198 | *** | |
| PERF2 | 4.115 | .043 | 94.910 | *** | |
| PERF1 | 4.175 | .045 | 93.557 | *** | |

**Covariances: (Kompass Dataset- Default model)**

| | | | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| EX_INF | <--> | IN_INF | .310 | .058 | 5.342 | *** | |
| EX_INF | <--> | RCPR | .035 | .036 | .973 | .331 | |
| EX_INF | <--> | TRST | .045 | .040 | 1.130 | .259 | |
| EX_INF | <--> | TMS | .077 | .031 | 2.481 | .013 | |
| PERF | <--> | EX_INF | .058 | .037 | 1.551 | .121 | |
| IN_INF | <--> | RCPR | .061 | .034 | 1.807 | .071 | |
| IN_INF | <--> | TRST | .087 | .038 | 2.302 | .021 | |
| IN_INF | <--> | TMS | .124 | .032 | 3.891 | *** | |
| PERF | <--> | IN_INF | .147 | .038 | 3.879 | *** | |
| RCPR | <--> | TRST | .324 | .043 | 7.530 | *** | |
| RCPR | <--> | TMS | .199 | .031 | 6.376 | *** | |
| PERF | <--> | RCPR | .257 | .036 | 7.131 | *** | |
| TRST | <--> | TMS | .204 | .034 | 5.926 | *** | |
| PERF | <--> | TRST | .258 | .040 | 6.457 | *** | |
| PERF | <--> | TMS | .214 | .033 | 6.533 | *** | |
| e5 | <--> | e6 | .375 | .065 | 5.733 | *** | |
| e1 | <--> | e2 | .219 | .047 | 4.694 | *** | |

**Correlations: (Kompass Dataset- Default model)**

| | | | Estimate |
|---|---|---|---|
| EX_INF | <--> | IN_INF | .555 |
| EX_INF | <--> | RCPR | .075 |
| EX_INF | <--> | TRST | .087 |
| EX_INF | <--> | TMS | .200 |
| PERF | <--> | EX_INF | .118 |
| IN_INF | <--> | RCPR | .139 |
| IN_INF | <--> | TRST | .182 |
| IN_INF | <--> | TMS | .347 |
| PERF | <--> | IN_INF | .324 |
| RCPR | <--> | TRST | .796 |
| RCPR | <--> | TMS | .658 |
| PERF | <--> | RCPR | .670 |
| TRST | <--> | TMS | .616 |
| PERF | <--> | TRST | .614 |
| PERF | <--> | TMS | .683 |
| e5 | <--> | e6 | .468 |
| e1 | <--> | e2 | .409 |

**Variances: (Kompass Dataset- Default model)**

| | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|
| EX_INF | .605 | .101 | 5.986 | *** | |
| IN_INF | .515 | .108 | 4.754 | *** | |
| RCPR | .371 | .047 | 7.913 | *** | |
| TRST | .445 | .067 | 6.691 | *** | |
| TMS | .247 | .044 | 5.612 | *** | |
| PERF | .397 | .050 | 7.953 | *** | |
| e1 | .538 | .059 | 9.123 | *** | |
| e2 | .535 | .059 | 9.070 | *** | |
| e3 | .151 | .044 | 3.447 | *** | |
| e4 | .320 | .042 | 7.544 | *** | |
| e5 | .904 | .091 | 9.967 | *** | |
| e6 | .712 | .076 | 9.412 | *** | |
| e7 | .155 | .041 | 3.789 | *** | |
| e8 | .247 | .043 | 5.762 | *** | |
| e9 | .100 | .018 | 5.535 | *** | |
| e10 | .119 | .016 | 7.383 | *** | |
| e11 | .369 | .039 | 9.516 | *** | |
| e12 | .263 | .033 | 8.046 | *** | |
| e13 | .188 | .029 | 6.390 | *** | |
| e14 | .235 | .030 | 7.807 | *** | |
| e15 | .253 | .028 | 8.911 | *** | |
| e16 | .385 | .040 | 9.647 | *** | |
| e17 | .148 | .021 | 6.957 | *** | |
| e18 | .208 | .025 | 8.157 | *** | |
| e19 | .370 | .039 | 9.434 | *** | |
| e20 | .115 | .018 | 6.504 | *** | |
| e21 | .094 | .014 | 6.649 | *** | |
| e22 | .142 | .017 | 8.169 | *** | |

## Model Fit Summary

### CMIN

| Model | NPAR | CMIN | DF | P | CMIN/DF |
|---|---|---|---|---|---|
| Default model | 83 | 280.497 | 192 | .000 | 1.461 |
| Saturated model | 275 | .000 | 0 | | |
| Independence model | 44 | 3220.319 | 231 | .000 | 13.941 |

### Baseline Comparisons

| Model | NFI Delta1 | RFI rho1 | IFI Delta 2 | TLI rho2 | CFI |
|---|---|---|---|---|---|
| Default model | .913 | .895 | .971 | .964 | .970 |
| Saturated model | 1.000 | | 1.000 | | 1.000 |
| Independence model | .000 | .000 | .000 | .000 | .000 |

### Parsimony-Adjusted Measures

| Model | PRATIO | PNFI | PCFI |
|---|---|---|---|
| Default model | .831 | .759 | .807 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 1.000 | .000 | .000 |

### NCP

| Model | NCP | LO 90 | HI 90 |
|---|---|---|---|
| Default model | 88.497 | 47.769 | 137.223 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 2989.319 | 2809.622 | 3176.358 |

### FMIN

| Model | FMIN | F0 | LO 90 | HI 90 |
|---|---|---|---|---|
| Default model | 1.299 | .410 | .221 | .635 |
| Saturated model | .000 | .000 | .000 | .000 |
| Independence model | 14.909 | 13.839 | 13.008 | 14.705 |

**RMSEA**

| Model | RMSEA | LO 90 | HI 90 | PCLOSE |
|---|---|---|---|---|
| Default model | .046 | .034 | .058 | .697 |
| Independence model | .245 | .237 | .252 | .000 |

**AIC**

| Model | AIC | BCC | BIC | CAIC |
|---|---|---|---|---|
| Default model | 446.497 | 466.280 | | |
| Saturated model | 550.000 | 615.544 | | |
| Independence model | 3308.319 | 3318.806 | | |

**ECVI**

| Model | ECVI | LO 90 | HI 90 | MECVI |
|---|---|---|---|---|
| Default model | 2.067 | 1.879 | 2.293 | 2.159 |
| Saturated model | 2.546 | 2.546 | 2.546 | 2.850 |
| Independence model | 15.316 | 14.484 | 16.182 | 15.365 |

**HOELTER**

| Model | HOELTER .05 | HOELTER .01 |
|---|---|---|
| Default model | 174 | 186 |
| Independence model | 18 | 20 |

# Appendix I – Structural Model Cross-validation (Kompass Dataset) - Chapter 7

**Notes for Model (Default model)**

**Computation of degrees of freedom (Default model)**

| | |
|---|---|
| Number of distinct sample moments: | 253 |
| Number of distinct parameters to be estimated: | 54 |
| Degrees of freedom (253 - 54): | 199 |

**Result (Default model)**

Minimum was achieved

Chi-square = 312.006

Degrees of freedom = 199

Probability level = .000

Estimates (Kompass Dataset- Default model)

Scalar Estimates (Kompass Dataset- Default model)

Maximum Likelihood Estimates

**Regression Weights: (Kompass Dataset- Default model)**

| | | | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| INT_INF | <--- | EXT_INF | .789 | .106 | 7.478 | *** | |
| Trst | <--- | Reciproc | .872 | .082 | 10.564 | *** | |
| EGKN_TMS | <--- | EXT_INF | -.005 | .043 | -.124 | .901 | |
| EGKN_TMS | <--- | Reciproc | .388 | .099 | 3.903 | *** | |
| EGKN_TMS | <--- | Trst | .152 | .085 | 1.797 | .072 | |
| EGKN_TMS | <--- | INT_INF | .115 | .032 | 3.635 | *** | |
| Task_Perform | <--- | EGKN_TMS | .964 | .124 | 7.767 | *** | |
| EX_INF2 | <--- | EXT_INF | 1.330 | .104 | 12.804 | *** | |
| EX_INF1 | <--- | EXT_INF | 1.105 | .092 | 12.039 | *** | |
| RCPR3 | <--- | Reciproc | 1.000 | | | | |
| RCPR2 | <--- | Reciproc | .835 | .057 | 14.572 | *** | |
| RCPR1 | <--- | Reciproc | .831 | .081 | 10.298 | *** | |
| Trust3 | <--- | Trst | 1.000 | | | | |
| Trust2 | <--- | Trst | 1.099 | .082 | 13.362 | *** | |
| Trust1 | <--- | Trst | .984 | .079 | 12.485 | *** | |
| TMS1 | <--- | EGKN_TMS | 1.000 | | | | |
| TMS2 | <--- | EGKN_TMS | 1.135 | .133 | 8.554 | *** | |
| TMS3 | <--- | EGKN_TMS | 1.186 | .132 | 8.979 | *** | |
| TMS4 | <--- | EGKN_TMS | .917 | .131 | 6.978 | *** | |
| TMS5 | <--- | EGKN_TMS | 1.038 | .128 | 8.092 | *** | |
| PERF3 | <--- | Task_Perform | 1.000 | | | | |
| PERF2 | <--- | Task_Perform | .903 | .055 | 16.373 | *** | |
| PERF1 | <--- | Task_Perform | .856 | .059 | 14.632 | *** | |
| IN_INF3 | <--- | INT_INF | .883 | .062 | 14.299 | *** | |
| IN_INF2 | <--- | INT_INF | 1.032 | .049 | 20.961 | *** | |
| IN_INF1 | <--- | INT_INF | 1.000 | | | | |
| EX_INF3 | <--- | EXT_INF | 1.019 | .074 | 13.794 | *** | |
| EX_INF4 | <--- | EXT_INF | 1.000 | | | | |
| IN_INF4 | <--- | INT_INF | .652 | .065 | 10.076 | *** | |

**Standardized Regression Weights: (Kompass Dataset- Default model)**

| | | | Estimate |
|---|---|---|---|
| INT_INF | <--- | EXT_INF | .557 |
| Trst | <--- | Reciproc | .796 |
| EGKN_TMS | <--- | EXT_INF | -.009 |
| EGKN_TMS | <--- | Reciproc | .507 |
| EGKN_TMS | <--- | Trst | .217 |
| EGKN_TMS | <--- | INT_INF | .272 |
| Task_Perform | <--- | EGKN_TMS | .728 |
| EX_INF2 | <--- | EXT_INF | .935 |
| EX_INF1 | <--- | EXT_INF | .835 |
| RCPR3 | <--- | Reciproc | .891 |
| RCPR2 | <--- | Reciproc | .826 |
| RCPR1 | <--- | Reciproc | .642 |
| Trust3 | <--- | Trst | .796 |
| Trust2 | <--- | Trst | .861 |
| Trust1 | <--- | Trst | .805 |
| TMS1 | <--- | EGKN_TMS | .606 |
| TMS2 | <--- | EGKN_TMS | .751 |
| TMS3 | <--- | EGKN_TMS | .812 |
| TMS4 | <--- | EGKN_TMS | .569 |
| TMS5 | <--- | EGKN_TMS | .693 |
| PERF3 | <--- | Task_Perform | .872 |
| PERF2 | <--- | Task_Perform | .884 |
| PERF1 | <--- | Task_Perform | .814 |
| IN_INF3 | <--- | INT_INF | .755 |
| IN_INF2 | <--- | INT_INF | .943 |
| IN_INF1 | <--- | INT_INF | .913 |
| EX_INF3 | <--- | EXT_INF | .735 |
| EX_INF4 | <--- | EXT_INF | .728 |
| IN_INF4 | <--- | INT_INF | .603 |

**Variances: (Kompass Dataset- Default model)**

| | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|
| EXT_INF | .605 | .101 | 5.988 | *** | |
| Reciproc | .374 | .047 | 7.940 | *** | |
| e32 | .838 | .104 | 8.085 | *** | |
| e33 | .164 | .032 | 5.179 | *** | |
| e24 | .095 | .022 | 4.274 | *** | |
| e25 | .180 | .028 | 6.451 | *** | |
| e5 | .153 | .044 | 3.495 | *** | |
| e6 | .320 | .042 | 7.530 | *** | |
| e7 | .097 | .018 | 5.297 | *** | |
| e8 | .121 | .016 | 7.416 | *** | |
| e9 | .369 | .039 | 9.500 | *** | |
| e10 | .260 | .033 | 7.972 | *** | |
| e11 | .190 | .030 | 6.390 | *** | |
| e12 | .236 | .030 | 7.805 | *** | |
| e13 | .378 | .040 | 9.550 | *** | |
| e14 | .218 | .026 | 8.487 | *** | |
| e15 | .160 | .021 | 7.550 | *** | |
| e16 | .385 | .040 | 9.697 | *** | |
| e17 | .256 | .028 | 9.042 | *** | |
| e21 | .121 | .018 | 6.591 | *** | |
| e22 | .087 | .014 | 6.157 | *** | |
| e23 | .144 | .018 | 8.132 | *** | |
| e26 | .713 | .076 | 9.404 | *** | |
| e27 | .160 | .042 | 3.851 | *** | |
| e28 | .242 | .043 | 5.598 | *** | |
| e29 | .534 | .059 | 9.055 | *** | |
| e30 | .537 | .059 | 9.112 | *** | |
| e31 | .903 | .091 | 9.960 | *** | |

**Squared Multiple Correlations: (Kompass Dataset- Default model)**

| | Estimate |
|---|---|
| INT_INF | .310 |
| Trst | .634 |
| EGKN_TMS | .568 |
| Task_Perform | .531 |
| IN_INF4 | .364 |
| EX_INF4 | .530 |
| EX_INF3 | .541 |
| IN_INF1 | .834 |
| IN_INF2 | .890 |
| IN_INF3 | .570 |
| PERF1 | .662 |
| PERF2 | .781 |
| PERF3 | .761 |
| TMS5 | .480 |
| TMS4 | .324 |
| TMS3 | .659 |
| TMS2 | .564 |
| TMS1 | .367 |
| Trust1 | .648 |
| Trust2 | .741 |
| Trust3 | .633 |
| RCPR1 | .412 |
| RCPR2 | .682 |
| RCPR3 | .794 |
| EX_INF1 | .698 |
| EX_INF2 | .875 |

## Model Fit Summary

### CMIN

| Model | NPAR | CMIN | DF | P | CMIN/ DF |
|---|---|---|---|---|---|
| Default model | 54 | 312.006 | 199 | .000 | 1.568 |
| Saturated model | 253 | .000 | 0 | | |
| Independence model | 22 | 3220.319 | 231 | .000 | 13.941 |

### RMR, GFI

| Model | RMR | GFI | AGFI | PGFI |
|---|---|---|---|---|
| Default model | .061 | .890 | .860 | .700 |
| Saturated model | .000 | 1.000 | | |
| Independence model | .300 | .264 | .194 | .241 |

### Baseline Comparisons

| Model | NFI Delta1 | RFI rho1 | IFI Delta2 | TLI rho2 | CFI |
|---|---|---|---|---|---|
| Default model | .903 | .888 | .963 | .956 | .962 |
| Saturated model | 1.000 | | 1.000 | | 1.000 |
| Independence model | .000 | .000 | .000 | .000 | .000 |

### Parsimony-Adjusted Measures

| Model | PRATIO | PNFI | PCFI |
|---|---|---|---|
| Default model | .861 | .778 | .829 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 1.000 | .000 | .000 |

### NCP

| Model | NCP | LO 90 | HI 90 |
|---|---|---|---|
| Default model | 113.006 | 68.976 | 164.973 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 2989.319 | 2809.622 | 3176.358 |

**FMIN**

| Model | FMIN | F0 | LO 90 | HI 90 |
|---|---|---|---|---|
| Default model | 1.444 | .523 | .319 | .764 |
| Saturated model | .000 | .000 | .000 | .000 |
| Independence model | 14.909 | 13.839 | 13.008 | 14.705 |

**RMSEA**

| Model | RMSEA | LO 90 | HI 90 | PCLOSE |
|---|---|---|---|---|
| Default model | .051 | .040 | .062 | .413 |
| Independence model | .245 | .237 | .252 | .000 |

**AIC**

| Model | AIC | BCC | BIC | CAIC |
|---|---|---|---|---|
| Default model | 420.006 | 432.876 | 602.520 | 656.520 |
| Saturated model | 506.000 | 566.301 | 1361.114 | 1614.114 |
| Independence model | 3264.319 | 3269.562 | 3338.677 | 3360.677 |

**ECVI**

| Model | ECVI | LO 90 | HI 90 | MECVI |
|---|---|---|---|---|
| Default model | 1.944 | 1.741 | 2.185 | 2.004 |
| Saturated model | 2.343 | 2.343 | 2.343 | 2.622 |
| Independence model | 15.113 | 14.281 | 15.979 | 15.137 |

**HOELTER**

| Model | HOELTER .05 | HOELTER .01 |
|---|---|---|
| Default model | 162 | 172 |
| Independence model | 18 | 20 |