The predictability of individual, organizational, and technology factors on knowledge sharing processes in the construction industry of Hong Kong

By

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Doctor of Business Administration (DBA)

Date of submission: June 30, 2009
DECLARATION

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ABSTRACT

The purpose of the research is to investigate the predictability of individual (trust, enjoyment to help, and knowledge self-efficacy), organizational (top management support and organizational reward), and technology (IT support) factors on knowledge sharing processes (knowledge donating and knowledge collecting) in the construction industry of Hong Kong. The research finds that trust, enjoyment to help, knowledge self-efficacy, top management support, and IT support can significantly predict the knowledge sharing processes of both knowledge donating and knowledge collecting. However, organizational reward can only significantly predict knowledge donating but not knowledge collecting. Indeed, there is no systematic association for the relation between organizational reward and knowledge collecting. Except for organizational reward, the research findings indicate that a higher level of knowledge sharing enablers is generally associated with a higher level of knowledge donating and knowledge collecting, medium with medium, and lower with lower. Moreover, the research findings show that the individual construction practitioners of Hong Kong are generally ready to share knowledge with their colleagues. For theoretical contribution, a new knowledge sharing conceptual framework that relates the knowledge sharing enablers to the knowledge sharing processes is established in the construction industry of Hong Kong. For practical managerial implication, organizations can utilize knowledge sharing enablers under the classifications of individual, organizational, and technology factors to improve the knowledge sharing processes throughout the organizational culture and structure. As a result, organizations can create and maintain more sustainable and inimitable competitive advantages due to the advanced knowledge sharing practices. In general, the national culture of Hong Kong allows the individual construction practitioners to share knowledge with their colleagues.
CHAPTER 1: INTRODUCTION

1.1 BACKGROUND OF STUDY

The research begins by introducing the background of Hong Kong’s construction industry. According to the 2007 Annual Survey of Building, Construction and Real Estate Sectors by the Census and Statistics Department of Hong Kong, the gross output of Hong Kong’s construction industry was 264.05 billion Hong Kong dollars (Census and Statistics Department, 2008) (Appendix A). In the report, the definition of the construction industry includes building and civil engineering, architecture, surveying, project engineering, real estate development, leasing, brokerage, and maintenance management. At present, the construction industry of Hong Kong is an open market that offers numerous business opportunities for both local and overseas organizations. As required by the Government of the Hong Kong Special Administrative Region, local and oversea organizations can easily enter the construction industry by simply registering their organizations and hiring employees with certified professional qualifications. Most of Hong Kong’s construction organizations are small in size. They usually act as subcontractors to large organizations that tend to be the main contractors. In 2006, 91.9% of the construction organizations had less than 10 million Hong Kong dollars gross value of construction work (HKTDC, 2008). At the year end of 2007, there were totally 25,830 registered construction organizations and 226,149 practitioners who directly engage in the construction industry of Hong Kong (Census and Statistics Department, 2008) (Appendix A). The evidences show that many construction organizations and practitioners have constituted a fiercely competitive environment among themselves within the construction industry of Hong Kong.

According to Porter (2008), when the barrier to entry of an industry is low, the rivalry and competition within the industry can be intense. As competitors can imitate each other’s products, services, technologies, and processes, many
construction organizations may encounter problems in creating and sustaining inimitable competitive advantages. To be the winners among the numerous competitions and imitations, many scholars in the field of knowledge management suggest organizations to utilize knowledge management to create and sustain more competitive advantages (Barney, 1991; Grant, 1991; Drucker, 1995; Szulanski, 1996; Lank, 1997; Carrillo, Anumba & Kamara, 2000; Gupta & Govindarajan, 2000; Kelleher & Levene, 2001).

Knowledge management is defined as the “effective learning processes associated with exploration, exploitation and sharing of human knowledge (tacit and explicit) that use appropriate technology and cultural environments to enhance an organization’s intellectual capital and performance” (Jashapara, 2004, p. 12). In knowledge management, knowledge can exist in individual and organizational levels (Sveiby, 1996), and in tacit and explicit forms (Ryle, 1949; Polanyi, 1967). Within the knowledge management cycle to discover, generate, evaluate, share, and leverage knowledge (Jashapara, 2004), knowledge sharing is an important process that exists in the means of internalization, externalization, socialization, and combination (Nonaka & Takeuchi, 1995; Marwick, 2001). Indeed, the knowledge sharing processes can be classified into knowledge donating and knowledge collecting (Van den Hooff & De Ridder, 2004; Van den Hooff & Van Weenen, 2004; De Vries, Van den Hooff & De Ridder, 2006). However, the power of knowledge sharing may be underestimated by many organizations in the construction industry of Hong Kong. Although knowledge sharing may seem to be an unquantifiable process, organizations can ultimately utilize knowledge sharing to improve their abilities and efficiencies in creating and maintaining competitive advantages (Reid, 2003). After all, successful knowledge sharing can enrich knowledge resources and enhance shared intellectual capital within an organization (Van den Hooff & De Ridder, 2004; Van den Hooff & Van Weenen, 2004).
Knowledge sharing can be enhanced by fostering a knowledge sharing culture (Pettigrew, 1979; Davenport & Prusak, 1998; Nahapiet & Ghoshal, 1998; McDermott & O’Dell, 2001). Indeed, knowledge sharing is closely related to organizational culture. Within an organizational culture, there exists a wide variety of knowledge sharing enablers that can act as catalysts in changing the organizational culture toward a knowledge sharing culture (Tampoe, 1993; Davenport & Prusak, 1998; O’Dell & Grayson, 1998; Elliot & O’Dell, 1999; Al-Alawi, Al-Marzooqi & Mohammed, 2007). In particular, Lin (2007) categorizes knowledge sharing enablers into individual, organizational, and technology factors in which the knowledge sharing enablers are positively related to the knowledge sharing processes.

1.2 CONCEPTUAL UNDERPINNING OF STUDY
There is a wide variety of conceptual underpinning in knowledge management that supports the research. For example, the research will investigate certain knowledge sharing enablers. In fact, knowledge sharing enablers can be classified into individual, organizational, and technology factors (Connelly & Kelloway, 2003; Lee & Choi, 2003; Taylor & Wright, 2004; Lin, 2007). According to Lin (2007), the knowledge sharing enablers under the classifications of individual, organizational, and technology factors can positively influence the knowledge sharing processes. If organizations can identify which knowledge sharing enablers can significantly predict their own knowledge sharing processes, they will probably gain an upper hand in knowledge sharing to create and maintain more competitive advantages (Leonard-Barton, 1995). Specifically, Lin’s (2007) framework relates knowledge sharing enablers to knowledge sharing processes by including enjoyment to help and knowledge self-efficacy as individual factors, top management support and organizational reward as organizational factors, and IT support as technology factor.
First, individual factors in Lin’s (2007) model include enjoyment to help and knowledge self-efficacy. Enjoyment to help is primarily based on altruism (Krebs, 1975; Smith, 1981; Organ, 1988; Constant, Kiesler & Sproull, 1994). Sometimes, employees are more favorable to share knowledge when they try to help others (Wasko & Faraj, 2000; Wasko & Faraj, 2005). For another factor, knowledge self-efficacy involves employees’ own judgment of their capabilities in achieving a certain level of performance (Bandura, 1986; Constant et al., 1994; Spreitzer, 1995). In knowledge sharing, employees are often motivated by self-efficacy (Wasko & Faraj, 2005).

Second, organizational factors in Lin’s (2007) model include top management support and organizational reward. Top management support can help an organization to increase knowledge sharing and maintain a knowledge sharing culture (Liebowitz, 1999; Tan & Zhao, 2003). For another factor, organizational reward involves establishing a reward system with either monetary or non-monetary incentives (Davenport & Prusak, 1998; Hargadon, 1998).

Third, technology factors in Lin’s (2007) model include IT support. In particular, IT support can help to assist the knowledge sharing processes, facilitate rapid access to knowledge, and integrate fragmented knowledge (Lee & Choi, 2003). Furthermore, IT support can eliminate communication barriers and support convenient knowledge sharing (Ruggles, 1998). However, IT support alone cannot maintain employees’ commitment to knowledge sharing (Currie & Kerrin, 2004).

As Nahapiet & Ghoshal (1998) and Lee & Choi (2003) point out, an individual factor of trust can positively influence the amount of knowledge sharing. However, Lin’s (2007) model does not include trust as an individual factor. In fact, trust involves reciprocal faith (Kreitner & Kinicki, 1992) and lack of trust creates a
knowledge sharing barrier (Szulanski, 1996). Therefore, there is a strong belief that trust can be added into Lin’s (2007) model for further modification. By adding an additional knowledge enabler of trust, the research will replicate Lin’s (2007) model and apply it to the construction industry of Hong Kong.

1.3 STATEMENT OF PROBLEM
The research strives to cope with a common problem that is faced by many construction organizations in Hong Kong. As competitors in the construction industry of Hong Kong can often replicate new products, services, technologies, and processes within a short period of time, many construction organizations can face problems to create and maintain sustainable and inimitable competitive advantages. To increase the tendency for more sustainable and inimitable competitive advantages, organizations can utilize knowledge sharing to improve their abilities and efficiencies (Reid, 2003). One major method to enhance knowledge sharing is to identify the knowledge sharing enablers that can positively influence the knowledge sharing processes within an organization. In particular, Lin (2007) proposes a knowledge sharing framework that identifies knowledge sharing enablers under the categories of individual, organizational, and technology factors.

While evidence of Lin’s (2007) model is established in the geographical location of Taiwan, no such evidence is investigated in the geographical location of Hong Kong. Furthermore, Lin’s (2007) model is generally applied to many industries. There is a need to replicate and confirm its application to only the construction industry in order to confirm its generalizability. As Ma, Qi & Wang (2008) debate, Western theories of knowledge management can only be partially valid in China. It becomes valuable to investigate the applicability of Lin’s (2007) model in Hong Kong where the city is now a part of China but was a British colony before. Moreover, Lin’s (2007) model does not include the individual factor of trust that
can directly determine the amount of knowledge sharing as claimed by Nahapiet & Ghoshal (1998) and Lee & Choi (2003). Therefore, the individual factor of trust will be included into Lin’s (2007) model for further modification.

1.4 PURPOSE OF STUDY

As stated in the research topic, the purpose of the research is to investigate the predictability of individual, organizational, and technology factors on knowledge sharing processes in the construction industry of Hong Kong. By adding trust as an extra individual factor, the research will replicate Lin’s (2007) model and apply it to the construction industry of Hong Kong. As a result, the research aims to test whether individual (trust, enjoyment to help, and knowledge self-efficacy), organizational (top management support and organizational reward), and technology factors (IT support) can significantly predict knowledge sharing processes (knowledge donating and knowledge collecting) in the construction industry of Hong Kong. Hence, the following research question and sub-questions are proposed.

Research question –
How do individual, organizational, and technology factors predict knowledge sharing processes in the construction industry of Hong Kong?

Research sub-questions –
1. How do individual factors (trust, enjoyment to help, and knowledge self-efficacy) predict knowledge sharing processes (knowledge donating and knowledge collecting) in the construction industry of Hong Kong?

2. How do organizational factors (top management support and organizational reward) predict knowledge sharing processes (knowledge donating and knowledge collecting) in the construction industry of Hong Kong?
3 How do technology factors (IT support) predict knowledge sharing processes (knowledge donating and knowledge collecting) in the construction industry of Hong Kong?

In order to answer the aforementioned research question and sub-questions, a new conceptual model will be established by proposing hypotheses for testing. In the research, the proposed conceptual framework and hypotheses mostly originate from Lin’s (2007) study. By adding an individual factor of trust to Lin’s (2007) study, six hypotheses are proposed to examine the relationships within the proposed conceptual framework. Since the research aims to investigate the predictability of individual factors (trust, enjoyment to help, and knowledge self efficacy), organizational factors (to management support and organizational reward), and technology factors (IT support), the following six hypotheses with parts (a) and (b) are formulated.

Individual factors - Trust:
H 1 (a) Trust can significantly predict employee’s willingness to donate knowledge.
H 1 (b) Trust can significantly predict employee’s willingness to collect knowledge.

Individual factors - Enjoyment to help:
H 2 (a) Enjoyment to help can significantly predict employee’s willingness to donate knowledge.
H 2 (b) Enjoyment to help can significantly predict employee’s willingness to collect knowledge.

Individual factors - Knowledge self-efficacy:
H3 (a) Knowledge self-efficacy can significantly predict employee’s willingness to donate knowledge.

H3 (b) Knowledge self-efficacy can significantly predict employee’s willingness to collect knowledge.

Organizational factors - Top management support:

H4 (a) Top management support can significantly predict employee’s willingness to donate knowledge.

H4 (b) Top management support can significantly predict employee’s willingness to collect knowledge.

Organizational factors - Organizational reward:

H5 (a) Organizational reward can significantly predict employee’s willingness to donate knowledge.

H5 (b) Organizational reward can significantly predict employee’s willingness to collect knowledge.

Technology factors - IT support:

H6 (a) IT support can significantly predict employee’s willingness to donate knowledge.

H6 (b) IT support can significantly predict employee’s willingness to collect knowledge.

1.5 METHODOLOGY OF STUDY

At the year end of 2007, the total population of individual construction practitioners in Hong Kong was 226,149 (Census and Statistics Department, 2008) (Appendix A). Because a sample size of 180 is already statistically sufficient in the original study of Lin (2007), the research will target a sample size of 180 individual construction practitioners in Hong Kong. The qualification of being an
individual construction practitioner includes employees working in building and civil engineering, architecture, surveying, project engineering, real estate development, leasing, brokerage, and maintenance management. By using cluster sampling technique, potential respondents will be drawn from 448 construction organizational members of the Hong Kong General Chamber of Commerce. In the hope of achieving a sample size of 180 individual construction practitioner, research invitations will be sent out to the email contacts of the 448 construction organizations.

By using a seven-point Likert scale, the research will conduct an anonymous self-completion online survey. In the online questionnaire, there will be totally thirty-one items with 4 items from Lee & Choi (2003), 4 items from Wasko & Faraj (2000), 4 items from Spreitzer (1995), 4 items from Tan & Zhao (2003), 4 items from Davenport & Prusak (1998) and Hargadon (1998), 4 items from Lee & Choi (2003), 3 items from Van den Hooff & Van Weenen (2004), and 4 items from Van den Hooff & Van Weenen (2004). Trust, enjoyment to help, knowledge self-efficacy, top management support, organizational reward, and IT support are six independent variables. Knowledge donating and knowledge collecting are two dependent variables. All eight key variables will be measured by the aforementioned thirty-one items respectively.

Data collection involves contacting potential respondents by email with a cover letter (Appendix B), and referring them to complete an online survey (Appendix E) in a research website. The address of the research website is listed in the cover letter within the initial contacting email. The information statement (Appendix D) will be posted in the research website for the respondents to read before participating in the online survey. The survey will have both English and Chinese with translation verification from the Hong Kong Management Association (Appendix C).
Data analysis will be conducted once the number of collected data meets the required sample size of 180. The main tool for data analysis will be the Statistical Package for Social Sciences (SPSS). Factor analysis and Cronbach’s alpha will be used to test for validity and reliability respectively. Univariate linear regression will be the chosen statistical technique to test the predictability of independent variables on dependent variables in the research.

1.6 SCOPE OF STUDY
The scope of the research is limited within a few areas. First of all, at the year end of 2007, there were 226,149 individual construction practitioners that constitute the scope of the total research population (Census and Statistics Department, 2008) (Appendix A). In particular, the scope of the individual construction practitioners includes employees working in building and civil engineering, architecture, surveying, project engineering, real estate development, leasing, brokerage, and maintenance management. Moreover, a sample size of 180 individual construction practitioners will become the scope of the sample. By using cluster sampling technique, research sample will be drawn from the scope of 448 construction organizations that are members of the Hong Kong General Chamber of Commerce. Because initial contacts will be made by email and an online survey will be used, only individual construction practitioners who have internet access can be located within the scope of the research.

1.7 SIGNIFICANCE OF STUDY
By replicating Lin’s (2007) model and applying it to the construction industry of Hong Kong, the research attempts to generate certain significance. First, the research is anticipated to provide empirical evidence in supporting the proposed hypotheses. Specifically, the proposed research is expected to provide empirical evidence in supporting the hypotheses that the knowledge sharing enablers under
the classifications of individual (trust, enjoyment to help, and knowledge self-efficacy), organizational (top management support and organizational reward), and technology factors (IT support) can significantly predict the knowledge sharing processes in the construction industry of Hong Kong. Second, the research is expected to create theoretical contribution. By adding an individual factor of trust to Lin’s (2007) model, a new conceptual framework linking knowledge sharing enablers to knowledge sharing processes will be established in the construction industry of Hong Kong. Third, the research attempts to provide practical managerial implication in knowledge sharing. In order to create and sustain inimitable competitive advantages, construction organizations can promote knowledge sharing by creating a knowledge sharing culture and developing a knowledge sharing strategy. If an organization can identify and cultivate the knowledge sharing enablers by looking into its individual, organizational, and technology factors, the organization will gain an upper hand in knowledge management. As a result, the organization can create and sustain more inimitable competitive advantages due to the advanced knowledge sharing practices. The direction of future research can investigate additional knowledge sharing enablers, modify the new conceptual framework, and apply the research to other industries and geographical locations.

1.8 ETHICAL CONCERNS
The research shall comply with the ethical standards set by The University of Newcastle. Under ethical concerns, the physical and psychological wellbeing of all research respondents shall be protected without being harmed. During the participation of the online survey, all respondents are voluntary to participate or exit at anytime they want. The research shall respect all respondents with dignity and avoid causing any anxiety and discomfort. An online information statement will clearly explain the academic purpose and implied consent of the research. Implied consent is confirmed once the respondents submit the online
questionnaire because of the anonymous nature of the online survey. Anonymity and privacy of respondents will be carefully protected without being abused or invaded. Only the declared researchers and the examiners of the dissertation are allowed to access the electronic data of the research. The electronic data will be stored in the primary researcher’s personal computer with password protection. In addition, the backup compact disc will be locked in the primary researcher’s safekeeping. Both electronic data and backup compact disc will be stored for at least five years before disposal and destruction. There is no conflict of interest, funding, sponsorship, or affiliation that may impact the research findings.

1.9 LIMITATIONS OF STUDY
There are several limitations to the positivist research. First, there may be response bias that may influence the research findings. Second, there is no measurement if employees are sharing or withholding knowledge fully or partially in knowledge sharing. Third, cluster sampling technique may reduce accuracy of research findings when the investigation occurs in the pre-established group of the Hong Kong General Chamber of Commerce. Fourth, there may be distorted accuracy caused by the respondents’ unwillingness and inability to reveal facts. Fifth, the research has a cross-sectional design with a data collection period of one month only. Sixth, characteristics such as age, education, work experience, company size, and financial capital may create unforeseeable moderation or mediation effect. Seventh, the same respondent may generate multiple responses in the online survey. Eighth, respondents without internet access are incapable to participate in the online survey. Ninth, the research findings are quantitative and not triangulated.

1.10 OUTLINE OF STUDY
The research is primarily organized into five chapters. Some chapters may have relevant sections and sub-sections for further explanations in the relative areas. An
outline and brief description of each chapter is listed in the following order.

Chapter 1: Introduction. The chapter provides an overview of the research. After introducing the background of the research, the chapter will briefly describe the conceptual underpinning, statement of problem, purpose, methodology, scope, significance, ethical concerns, limitations, and outline of the research.

Chapter 2: Literature Review. The chapter reviews the literatures in the areas of knowledge management, knowledge sharing processes, organizational culture, knowledge sharing culture, and knowledge sharing enablers. In addition, the chapter will review the components of individual, organizational, and technology factors in Lin’s (2007) model and the proposed conceptual framework. Thus, the literatures regarding trust, enjoyment to help, knowledge self-efficacy, top management support, organizational reward, and IT support will be reviewed. After reviewing the relevant literatures, literature gaps will be identified in order to develop appropriate research question and sub-questions in addressing the research topic for the construction industry of Hong Kong. Moreover, several practical case studies are brought up to support the relevant literatures.

Chapter 3: Research Methodology. The chapter summarizes the research methodology. After listing the proposed research question and sub-questions, the chapter will review the epistemology, ontology, and methodology that are suitable to the research in justifying the use of a positivist research paradigm. Then, the chapter will demonstrate the logic of using a descriptive and cross-sectional research design. Based on the modification of Lin’s (2007) model, the proposed conceptual framework and hypotheses for testing will be illustrated. In addition, measurement and scaling of the research concerning validity, reliability, independent variables, and dependent variables will be explained. Furthermore, the chapter will demonstrate the logic of adopting items from previous research in
the design of the questionnaire. The coding of the items in the questionnaire will be introduced. Moreover, the logic of choosing the appropriate population, sample, and sampling of the research will be discussed. For data collection methods, the matters concerning the online survey, initial contacts, languages, information statement, and the questionnaire will be described. For data analysis, the use of factor analysis, Cronbach’s alpha, and univariate linear regression will be described. After all, the ethical considerations and limitations of the research will be listed in details.

Chapter 4: Data Analysis and Discussion. The chapter summarizes and discusses the research findings from the data analysis. Data coding of the research’s key variables will be introduced. Descriptive statistics will be generated to provide an overview of the data’s central tendency, skewness, kurtosis, and frequency distribution. Statistical figures and tables produced by the SPSS will be presented in the chapter to illustrate the statistical analyses of factor analysis, Cronbach’s alpha, and univariate linear regression on a step by step basis. Then, the research findings will form a generalized discussion of the research findings. The predictability of individual, organizational, and technology factors in terms of trust, enjoyment to help, knowledge self-efficacy, top management support, organizational reward, and IT support will be critically analyzed to determine if they can significantly predict the knowledge sharing processes in terms of knowledge donating and knowledge collecting. After all, a new knowledge sharing conceptual framework in the construction industry of Hong Kong will be established.

Chapter 5: Conclusion. The chapter concludes the research by stating the results of the investigation of the predictability of individual, organizational, and technology factors on knowledge sharing processes in the construction industry of Hong Kong. Moreover, the chapter summarizes the research study and findings.
Finally, the interpretation, recommendation, future direction, theoretical contribution, and practical implication of the research will be concluded.

1.11 CONCLUSION

The introduction chapter provides an overview of the formation and sequence of the research content. After introducing briefly the background, conceptual underpinning, statement of problem, purpose, methodology, scope, significance, ethics and limitations, and outline of the research, the required content of the research in achieving the research objectives are identified. Thus, the academic literatures of previous scholars and practical case studies relating to the areas under investigation shall be reviewed in order to distinguish the literature gaps that permit further research development.
CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Knowledge can be the greatest intangible asset of organizations in today’s discontinuous and turbulent market conditions (Arora, 2002). As Kaplan & Norton (2004) describe, an intangible asset is a product of human capital, organization capital, and information capital. Today, the intangible assets regarding workforce, customer, technology, and market in creating wealth is increasingly recognizable by organizations because such intangible assets can often be commoditized into tangible products (Wagner, 2001). When knowledge is considered as a resource, Hall (1993) and Darroch (2005) argue that knowledge can be both tangible and intangible. Although knowledge seems more likely to be an intangible asset, some scholars believe that such intangible asset is more important than tangible assets such as capital and land in creating and sustaining competitive advantages (Kelleher & Levene, 2001).

Construction organizations may collect knowledge that is unimportant at the present, but such knowledge may prove to be useful in the long run (Al-Ghassani, Kamara, Anumba & Carrillo, 2004). Similar to knowledge management, the success of construction project management relies on both knowledge and the organization (Kamara, Anumba & Carrillo, 2005). The construction industry is characterized by processes that are complex, diversified, and non-standardized (Clough, Sears & Sears, 2000). As Styhre (2008, p. 944) describes, “the construction industry is based on advanced civil engineering competencies, project management skills, and the ability to lead and coordinate diverse professional and occupational groups in day-to-day work.” Indeed, most construction knowledge is derived from experience “either from experiential learning or observing other peoples’ practices. The remainder are derived from reading, seminars, and schooling” (Fong & Wong, 2005, p. 75). As Sheehan,
Poole, Lyttle & Egbu (2005, p. 56) state, “reflecting on past experiences can enable project-based competencies, leading to sustained competitive advantage.” Accordingly, the construction industry values the assets of experiential knowledge in which tacit knowledge and competitive advantages can be lost when employees resign or retire from an organization (Sheehan et al., 2005).

A project is defined as an “unique process, consisting of a set of co-ordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements including the constraints of time, cost and resources” (Lockyer & Gordon, 2005, p. 1). When an employee leaves an organization, the tacit knowledge possessed by the employee is gone (Tsoukas, 1996; Reid, 2003). Furthermore, when an employee or partner resigns or leaves, the tacit knowledge derived from one project is also lost or buried in unread reports, and thus leading to weakened performance and wasted effort (Carrillo et al., 2000). Moreover, the temporary nature of projects prevents effective knowledge transfer from one project to the next (Fong & Wong, 2005). Upon the accomplishment of a project, the lost professional and practical knowledge may not be recalled or reused in future projects (Issa & Haddad, 2008). Therefore, there is a fundamental demand for knowledge management in the construction industry, especially when employees work from one project to another with new entrances and exits of various partners and supply chains (Carrillo et al., 2000). As a result, effective knowledge management shall be an integral part of any construction organization that aims to manage knowledge assets, especially when knowledge management is increasingly recognized as an important basis in creating competitive advantages (Dutta, 1997).

In fact, organizations can share and retain information, experience, and knowledge by knowledge management in promoting the best practices and preventing the mistakes that have already been encountered in the past. Knowledge management
can be the key to organizational survival in the long run especially when knowledge will become the core competency for any organization (Leonard-Barton, 1995). As Drucker (1995) predicts, knowledge will be today’s key economic resource and dominant source of competitive advantages. Organizations that can create and manage unique knowledge tend to create more sustainable and inimitable competitive advantages (Barney, 1991; Grant, 1991; Lank, 1997). Besides, sharing the best practices within an organization can influence an organization's ability in creating competitive advantages (Szulanski, 1996). By creating and sharing knowledge faster than competitors, organizations can ultimately create and reshape their competitive advantages everyday (Gupta & Govindarajan, 2000).

The research will conduct a literature review regarding the research topic and knowledge management in the construction industry. Under the parent literature of knowledge management, the knowledge sharing processes form an important part that relates to the research topic significantly. Then, the research will look at the literatures of how an organizational culture can be transformed into a knowledge sharing culture. After summarizing the literatures in the area of knowledge sharing enablers, the research will review the literatures of individual, organizational, and technology factors based on Lin’s (2007) model. Moreover, the literatures of trust, enjoyment to help, knowledge self-efficacy, top management support, organizational reward, and IT support will be reviewed. By reviewing the relevant literatures, literature gaps will be identified for the proposal of the research question and sub-questions.

2.2 KNOWLEDGE MANAGEMENT

Utilizing knowledge management is a relatively new terminology in the construction industry (Carrillo & Anumba, 2002). Previous research has established various definitions of knowledge management. For example, Snowden
(1999, p. 63) defines knowledge management as the “identification, optimization, and active management of intellectual assets, either in the form of explicit knowledge held in artifacts or as tacit knowledge possessed by individuals or communities.” Moreover, Carillo et al. (2000, p. 156) add that it is “the identification, optimisation and active management of intellectual assets to create value, increase productivity, and gain and sustain competitive advantage.” From another view, Kululanga & McCaffer (2001, p. 347) describe it as “a process of acquiring, creating, sharing, utilizing and storing intellectual assets and other stimuli from the internal and external business environments that facilitates an organization to perform successfully.” Furthermore, Liebowitz (1999, p. 37) explains that it is “the process of creating value from an organization’s intangible assets … with creating, securing, combining, retrieving, and distributing knowledge in the organization, both internally and externally.” In the construction context, Tserng & Lin (2005, p. 303) fit it as “a discipline that promotes an integrated approach to the creation, capture, access, and use of a profession’s domain knowledge on products, services, and processes.” After all, knowledge management is a new concept that provides both process and outcome perspectives to the construction industry (Al-Ghassani et al., 2004). However, Ma et al. (2008) argue that Western knowledge management theories are only partially valid in China.

Knowledge is subjective, embedded, transferable, spontaneous, self-reinforcing, and perishable (Kluge, Stein & Licht, 2001). Sveiby (1996) finds that knowledge can be divided into two tracks and two levels. For the two tracks, knowledge can be learned from objects as IT-track in the management of information or from processes as people-track in the management of people. For the two levels, knowledge can be learned in either individual or organizational level. Both individual and organizational knowledge are proved to contribute to create and sustain competitive advantages (Nonaka, 1994; Nonaka & Takeuchi, 1995;
Tacit knowledge is hidden knowledge that is not clearly recorded and stated. It is highly personal, invisible, difficult to codify and formalize, and hard to express and communicate when sharing with others (Civi, 2000; Haldin-Herrgard, 2000; Smith, 2001). Buckman (1998) points out that the greatest knowledge base does not come from a computer database, but from the brains of the individual employees. Tacit knowledge is “deeply rooted in an individual’s actions and experience as well as in the ideals, values or emotions” (Civi, 2000, p. 166). “Knowledge is held by individuals and may be passed from individual to individual, but it is unlikely to be adequately recorded” (Rooke & Clark, 2005, p. 562). Sheehan et al. (2005) estimate that 80% of useful knowledge is tacit and cannot be recorded. As Gupta & Govindarajan (2000) highlight, codifying tacit knowledge is an important knowledge sharing process. However, there is a limit to the proportion of tacit knowledge that can be codified. Haldin-Herrgard (2000) finds that it is difficult to share tacit knowledge due to time availability, different values, distances, languages, and perceptions among employees. Furthermore, Bagshaw (2001) claims that there is knowledge potential to create new knowledge when sharing tacit knowledge. In the construction context, tacit knowledge is “experiential, judgmental, context-specific and therefore difficult to codify and share” (Egbru & Robinson, 2005, p. 34). As employees' collective knowledge can become the competitive advantages of an organization (Soliman & Spooner, 2000; Fong, 2005), some employees and organizations may not want to share their tacit knowledge so that nobody can imitate their competitive advantages. Examples of tacit knowledge in the construction industry include “estimating and tendering skills acquired over time through hands-on experience of preparing bids,
understanding the construction process, interaction with clients/customers and project team members in the construction supply chain, as well as understanding tender markets” (Egbu & Robinson, 2005, p. 34).

In contrast, explicit knowledge is knowledge that is clearly recorded and ready for people to learn and use. Explicit knowledge is usually “written down in a knowledge base or captured in a formal document” (Buckman, 1998, p. 12). It can be expressed by “words and numbers and shared in the form of data, scientific formula, specifications and manuals” (Civi, 2000, p. 166). Within the construction industry, explicit knowledge can be codified and reused for easy sharing (Egbu & Robinson, 2005). Ma et al. (2008) argue that tacit knowledge can create barriers to knowledge sharing while explicit knowledge can facilitate knowledge sharing. When organizations transform tacit knowledge into explicit knowledge, organizations can self-create knowledge, dynamics for innovation, and competitive advantages (Nonaka & Takeuchi, 1995; Marwick, 2001). Examples of explicit knowledge in the construction industry include “design codes of practice, performance specifications, drawings in paper-based or electronic format and construction techniques. Materials testing procedures, design sketches and images, 3-D models and textbooks” (Egbu & Robinson, 2005, p. 34).

In addition to various definitions of knowledge management, there are also numerous knowledge management models (Liebowitz & Beckman, 1998; Soliman & Spooner, 2000; Parikh, 2001; Davidson & Voss, 2002; Jashapara, 2004). Similarly, all knowledge management models have a common goal to systematically generate knowledge, make the most use out of knowledge, and ultimately benefit from knowledge. For example, Jashapara (2004) proposes a knowledge management cycle to discover, generate, evaluate, share, and leverage knowledge. Knowledge sharing is an important knowledge management process that transfers knowledge in the means of internalization (from explicit to tacit),
externalization (from tacit to explicit), socialization (from tacit to tacit), and combination (from explicit to explicit) (Nonaka & Takeuchi, 1995; Marwick, 2001). Moreover, Abou-Zeid (2003) distinguishes the mobilization of knowledge can be from human to human, from human to artifact, from artifact to human, and from artifact to artifact. Knowledge sharing is the greatest challenge within the knowledge management processes because employees are often unwilling to share knowledge (Issa & Haddad, 2008). However, organizations strive to encourage knowledge sharing as it can ultimately lead to new knowledge creation and competitive advantages that are difficult for competitors to imitate (Mitchell, 2003). If knowledge management problem cannot be addressed, the competitive advantages of an organization will be reduced (Sarvary, 1999).

2.3 KNOWLEDGE SHARING PROCESSES
Knowledge sharing is defined as a “behaviour by which individuals collectively increase others’ understanding through the articulation and demonstration of personal knowledge” (Ding, Ng & Cai, 2007, p. 938). Lee (2001, p. 324) claims that it involves “activities of transferring or disseminating knowledge from one person, group, or organization to another.” Sharing knowledge across individual and organizational boundaries is reliable on an employee’s knowledge sharing behaviors (Chou, Chang, Tsai & Cheng, 2005). As Kamara et al. (2005, p. 109) highlight, cross-project knowledge in the construction industry can be shared in both tacit and explicit forms by “recruitment, mentoring, informal organisational networks, databases, intranets and expert systems.” In the construction industry, the knowledge sharing processes can provide common benefits to a project at various levels. For example, Kamara et al. (2005) identify that knowledge sharing exists among different professionals in different phases of a project, among different stages of a project, and among transferring knowledge from a project to the organizational database.
The knowledge sharing processes can be classified into two dimensions that include knowledge donating and knowledge collecting (Van den Hooff & De Ridder, 2004; Van den Hooff & Van Weenen, 2004). The concept of knowledge donating and knowledge collecting is analogous to concepts such as knowledge source and receiver (Weggeman, 2000), knowledge carrier and requester (Oldenkamp, 2001), knowledge supply and demand (Ardichvili, Page & Wentling, 2003), knowledge contributor and seeker (Kankanahalli, Tan & Wei, 2005), knowledge owner and recipient (Issa & Haddad, 2008), and knowledge seller and buyer (Davenport & Prusak, 1998; Reid, 2003; Ma et al., 2008). In addition, Davenport & Prusak (1998) identify the role of knowledge broker who acts as a gatekeeper or boundary spanner in making connections between knowledge donators and collectors.

Within the knowledge sharing processes, knowledge donating is about “communicating to others what one’s personal intellectual capital is” (Van den Hooff & De Ridder, 2004, p. 118). Intellectual capital consists of intellectual materials such as knowledge, information, intellectual property, and experience that can be put together in creating wealth (Stewart, 1997). Besides, intellectual capital is constituted by human, organizational, and structural capitals (Petrash, 1996; Edvinsson & Malone, 1997). Knowledge donators can always reserve the rights whether to share knowledge or not because knowledge is a private and personal asset (Hall, 2003). When knowledge donators donate knowledge and abandon the sole claim of the knowledge superiority, they may fear to lose personal power, value, and benefits (Gray, 2001). Therefore, potential knowledge donators may keep away from knowledge donating if they believe they can be more beneficial by hoarding knowledge instead of sharing knowledge (Davenport & Prusak, 1998).

Comparatively, knowledge collecting is about “consulting colleagues in order to...
get them to share their intellectual capital” (Van den Hooff & De Ridder, 2004, p. 118). The willingness to share knowledge originally comes from “the intention for people to share their knowledge” (Ding et al., 2007, p. 938). After all, an employee’s willingness to share knowledge is positively related to knowledge donating and knowledge collecting (De Vries et al., 2006). Van den Hooff & Van Weenen (2004) urge organizations to distinguish different processes of knowledge sharing (donating and collecting), different levels of commitment and knowledge sharing (organizational and departmental), and different modes of IT communication in order to understand the relationships between commitment, knowledge sharing, and IT communication. Nevertheless, organizations shall clearly identify the relationships of knowledge donators and collectors, as well as the associated enablers and resistors (Al-Ghassani et al., 2004).

2.4 ORGANIZATIONAL CULTURE
Organizational culture is defined as “a pattern of basic assumptions - invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration - that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems” (Schein, 1985, p. 9). Al-Alawi et al. (2007, p. 24) describe it as “the shared, basic assumptions that an organization learnt while coping with the environment and solving problems of external adaptation and internal integration that are taught to new members as the correct way to solve those problems.” Organizational culture involves a network of meanings and shared experiences where people have a shared and accepted reality (Pettigrew, 1979). Boisot (1998) argues that only a small part of cultural knowledge is embedded in technologies and artifacts when a large part is embedded in people's head, social process, tradition, and institutional practice. Under a dominant organizational culture consisting common values shared by most employees, there can be various subgroups of subcultures that may compete
with the dominant culture especially in large organizations (Robbins, Waters-Marsh, Cacioppe & Millet, 1994). Furthermore, McDermott & O’Dell (2001) suggest organizational culture can be reflected by an organization’s structure, stories, and spaces.

In the real world, knowledge management often involves “deadlines, office politics, and organizational leadership” (Davenport & Prusak, 1998, p. 144). To change toward a knowledge sharing culture, organizational culture is the key ingredient that needs to be changed in the first place. Before any knowledge management implementation, Zack (2003) emphasizes the importance of the preparation of cultural change. DeTienne, Dyer, Hoopes & Harris (2004) indicate that effective knowledge management is dependent on the cultural change in trust, incentive, and cooperation. In fostering a knowledge sharing culture, organizations are required to create an organizational culture of open communication and collective ownership (Smith, 2001; De Kretser & Wilkinson, 2005). In fact, knowledge sharing has a close connection with organizational culture in which organizations can always enhance knowledge sharing by adapting a knowledge sharing culture (Pettigrew, 1979; Nahapiet & Ghoshal, 1998). For successful knowledge management, organizational culture shall be capable to evolve from conventional thinking and working processes to computerized and knowledge based processes (Abdou, Radaideh & Lewis, 2005). After all, the biggest challenge in knowledge management is more related to soft issues such as organizational culture and people rather than technology (Chase, 1997; Skyrme & Amidon, 1997; Gumbley, 1998; Chong & Choi, 2005; Issa & Haddad, 2008).

Previous research agrees that organizational culture can create the most substantial barriers to knowledge sharing (Buckman, 1998; O'Dell & Grayson, 1998; Ruggles, 1998; Holton, 2001; McDermott & O'Dell, 2001; Moore & Dainty,
2001). In the investigation of the top 100 firms in the UK’s New Civil Engineer 2001 Contractors File and the top 70 firms in the UK’s New Civil Engineers 2001 Consultants File, Carrillo, Robinson, Al-Ghassani & Anumba, (2004) identify organizational culture, lack of standardized work processes, inadequate time and money, employee resistance, and poor IT infrastructure as the main knowledge management barriers. Furthermore, cultural barriers to knowledge sharing can be caused by the incompatibility between local and foreign cultures, especially in international joint ventures where knowledge needs to be shared across multiple organizational and national cultures (Dulaimi, 2007). Nevertheless, any knowledge sharing method has to suit with the organizational and national cultures of the organization (Davenport & Prusak, 1998). When national culture is involved, organizations need to account for the standard cultural dimensions as suggested by Hofstede (1983) and Trompenaars (1993). As McDermott & O’Dell (2001) conclude, cultural barriers are indeed the key inhibitors to knowledge sharing.

2.5 KNOWLEDGE SHARING CULTURE
A typical construction organization usually does not inherit a knowledge sharing culture (Carillo et al., 2000). To facilitate a knowledge sharing culture, organizations need to provide corporate vision, mission statement, reward, and information service to their employees (Chong, Holden, Wilhelmij & Schmidt, 2000). In the case study of one of the largest construction organizations with more than 3,200 employees in Hong Kong, Dainty, Qin & Carrillo (2005) find that the major barriers to developing a knowledge sharing culture are due to unsupportive culture, time constraint, and poor communication structure. Although LeCompte & Goetz (1982) argue that qualitative theory generated from a small sample size or case study can only offer low representativeness, Sarantakos (1998) claims that such qualitative theory can allow analytic generalization in which the sample units can typically represent a class of phenomena. Therefore, the analytic
generalization indicates that the major barriers to developing a knowledge sharing culture may also exist in other construction organizations in Hong Kong as a general pattern. Moreover, Dainty et al. (2005) report that the national culture of Hong Kong causes employees not to share knowledge because they have concerns about losing their status of possessing specialty knowledge, their chance of promotion, and their job security. After all, they receive little benefit and recognition from knowledge sharing. Nevertheless, the unsupportive culture is detrimental to knowledge sharing in addition to time constraint and poor communication structure. To solve this problem, the case study organization proposes informal knowledge workshop, knowledge exchange seminar, departmental meeting, site visit program, summary report, project award scheme, coaching and mentoring, and intranet and e-library as knowledge sharing techniques to overcome the aforementioned barriers to knowledge sharing. Consequently, Dainty et al. (2005) advise Hong Kong’s construction organizations to recognize and reward knowledge sharing, develop effective training and development system, and change organizational structure and work content as part of their knowledge sharing strategies.

In fact, there are many types of barriers that can hinder the development of a knowledge sharing culture. Davenport & Prusak (1998) identify lack of trust, different cultures, lack of time and meeting places, knowledge owner’s special status and reward, lack of absorptive capacity, knowledge prerogative of particular group, and intolerance for mistake as cultural frictions in knowledge sharing. Szulanski (1996) argues that the major cultural barriers to internal knowledge sharing are due to lack of absorptive capacity, causal ambiguity, and an arduous relationship between the knowledge donators and the knowledge collectors. Voelpel & Han (2005) blame cultural barriers to different languages, characteristics of national culture, unreliable incentive system, unsuitable operations, and other miscellaneous factors. After all, organizational culture may
sometimes inhibit knowledge sharing.

Nevertheless, organizations can develop a knowledge intensive culture that encourages and aggregates knowledge sharing behaviors (Davenport & Prusak, 1998). For example, to smoothen the aforementioned cultural frictions, Davenport & Prusak (1998) suggest organizations to build trust in face-to-face meeting, create common grounds, create time and places for knowledge sharing, provide incentive for knowledge sharing, provide time and resources for learning, hire people open to learning, encourage quality of idea, reward creative collaboration, and allow mistake. Drucker (1999) recommends organizations to hire employees open to change, work hard and long with the employees to implement change, and extend knowledge management practices thoroughly to other parts of the organizations. Sheehan et al. (2005) believe that a knowledge sharing culture shall allow employees to ask for help, make mistakes, share lessons, and seek and apply new learning. Connelly & Kelloway (2003) add that organizations can develop a knowledge sharing culture by promoting employees’ willingness to share knowledge and integrating knowledge management with business strategies. Dainty et al. (2005) include reciprocity, shared vision, trust, and teamwork as desirable aspects of a knowledge sharing culture. Egbu & Robinson (2005) urge organizations to provide top management support, connection to economic performance and strategy, clear purpose and shared language, flexibility of communications, risk tolerance, employee ownership, job security, technical infrastructure, organizational infrastructure, openness and willingness to share information, change in motivation, and education and training to create and sustain a knowledge sharing culture.

Knowledge hoarding refers to lack of communicating personal knowledge among employees. The behavior may be intentional and deliberately caused by employees in order to protect or increase an employee’s self-interest, power,
importance, job security, or privileged status (Martin, 2000; Reid, 2003; Ma et al., 2008). Sometimes, employees may deliberately not to share knowledge if they are treated badly at work or believe knowledge hoarding can help them to further advance their careers (Storey & Quintas, 2001). When organizations value the power of knowledge sharing, the tendency of employees in hoarding knowledge can be reduced (Chong & Choi, 2005). Since knowledge shall be treated as an organizational resource rather than an individual’s asset, Gupta & Govindarajan (2000) advise organizations to ban knowledge hoarding by recognizing and rewarding knowledge donators as heroes. Although Chong (2006) claims that a knowledge sharing culture shall make knowledge sharing mandatory from top to bottom across the organizational hierarchy and structure, Kelloway & Barling (2000) argue that knowledge sharing has to be voluntary. In the case study of Wates Group, which is a medium sized building company in the UK, the organization requires four and a half years for the employees to accept the concept of knowledge sharing (Carillo et al., 2000).

Willingness to share knowledge is defined as “the extent to which an individual is prepared to grant other group members access to his or her individual intellectual capital” (De Vries et al., 2006, p. 177). As Syed-Ikhsan & Rowland (2004, p. 96) point out, “knowledge transfer requires the willingness of a group or individual to work with others and share knowledge to their mutual benefit.” Employees who are willing to share knowledge tend to seek a balance between knowledge donating and knowledge collecting (De Vries et al., 2006). When employees believe their employment relationships are unfair and do not trust their employers in keeping future promises and commitments, employees will have a low willingness to share knowledge at work (Patch, Guest, Davey & Kidd, 2000). Alternatively, with a supportive culture for knowledge sharing (Carter & Scarbrough, 2001), employees will have a high willingness to share knowledge because they feel knowledge sharing is a natural and normal practice within the
organization (McDermott & O’Dell, 2001). As Perrin, Vidal & McGill (2006, p. 31) suggest, knowledge sharing “needs to be a natural part of the working style and culture of an organization. Once this is achieved knowledge sharing touches all parts of the organization and every function. Its pervasiveness will result in something that cannot be managed but rather is part of the culture and management style of the company.” For example, Fluor is a USA based publicly owned organization that provides services in construction, engineering, procurement, maintenance, and project management. Fluor has offices in over twenty-five countries across six continents. Fluor is well recognized for its knowledge sharing culture that enhances enterprise knowledge sharing, collaboration, organizational learning, and transformation of enterprise knowledge into shareholder’s value (Teleos, 2008). In fact, knowledge sharing practices can be embedded in daily work processes to penetrate knowledge sharing throughout the organization as a day-to-day culture (Sheehan et al., 2005). Subsequently, competitive advantages can be created based on the foundation of a day-to-day knowledge sharing culture.

2.6 KNOWLEDGE SHARING ENABLERS
Previous research investigates a wide variety of knowledge sharing enablers that act as catalysts in changing an organizational culture toward a knowledge sharing culture. Some knowledge sharing enablers can directly influence the performance of knowledge sharing. For example, Elliot & O’Dell (1999) stress culture, technology, infrastructure, and measurement as four key enablers in sharing knowledge and best practices within an organization. Wright & Taylor (2003) highlight six antecedents such as innovative culture, information quality, accountability, strategic connections, change readiness, and clarity of responsibility that enable knowledge sharing in the delivery of public services. Syed-Ikhsan & Rowland (2004) discover that knowledge assets, organizational culture, organizational structure, technology, people or human resources, and
political directives are enabling factors that influence the performance of knowledge sharing. Connelly & Kelloway (2003) investigate the perceptions of management’s support for knowledge sharing, social interaction culture, technology, and gender as significant predictors on the perceived knowledge sharing culture. Taylor & Wright (2004) state six significant predictors such as open leadership climate, learning from failure, information quality, performance orientation, satisfaction with change process, and a vision for change to enable knowledge sharing in the public sector. Fong (2005) distinguishes openness, motivation, trust, and time pressure as contributory factors enabling the process of knowledge sharing positively as well as negatively among experienced construction professionals.

Specifically, there are knowledge sharing enablers regarding the knowledge sharing environment and knowledge sharing culture. For example, Tampoe (1993) claims that commercial relevance of job, task competency, task consistency, directed skills, creative autonomy, resources, commitment, and peer contacts are eight requirements to enable an effective knowledge sharing environment. O’Dell & Grayson (1998) bring out technology, culture, reward, senior leadership, and measurement as five enablers to create an environment for internal sharing of best practices. Al-Alawi et al. (2007) add trust, communication between staff, information systems, reward system, and organization structure as critical success factors enabling knowledge sharing within the organizational culture. Davenport & Prusak (1998) indicate nine factors including multiple channels for knowledge transfer, some level of knowledge structure, nontrivial motivational aid, clarity of language and vision, a modicum of process orientation, a link to economics or industry value, senior management support, technical and organizational infrastructure, and a knowledge oriented culture that enables successful knowledge sharing.
In addition, there are knowledge management enablers that simultaneously enable knowledge sharing. For example, Chong & Choi (2005) identify eleven critical knowledge management enablers that include employee training, employee involvement, teamwork, employee empowerment, top management leadership and commitment, organizational constraints, information system infrastructure, performance measurement, egalitarian culture, benchmarking, and knowledge structure. Moffett, McAdam & Parkinson (2003) propose the MeCTIP model that consists of constructs such as personal contributors, informational contributors, technical contributors, internal technical climate, organizational climate, and macro environment in enabling knowledge management within organizations. Ryan & Prybutok (2001) add user-centric technology installation, IT investment per employee, industry classification, and strategic relevance of IT as influential enablers in the adoption of knowledge management technologies. Nelson & Middleton (2003) find that information architecture, information behavior, organizational culture, information management processes, IT practices, knowledge management processes, people management, information policy and strategy, information politics, and organizational structures are ten organizational factors that enable information and knowledge management activities. Voelpel & Han (2005) emphasize that culture and incentive are two major enablers that determine employees’ willingness to share knowledge in the Chinese context in China. Nevertheless, culture can decisively influence knowledge sharing behavior. When necessary adjustment is made to the cultural context, potential for knowledge sharing in China can be higher than expectation.

Knowledge sharing enablers can be classified into individual, organizational, and technology factors (Connelly & Kelloway, 2003; Lee & Choi, 2003; Taylor & Wright, 2004; Lin, 2007). By relating knowledge sharing enablers to knowledge sharing processes, Lin (2007) proposes a knowledge sharing framework that similarly sorts knowledge sharing enablers into individual, organizational, and
technology factors. In Lin’s (2007) study, individual, organizational, and technology factors constitute the dimension of knowledge sharing enablers that positively influences the dimension of knowledge sharing processes. In the dimension of knowledge sharing enablers, Lin (2007) includes enjoyment to help and knowledge self-efficacy as individual factors, top management support and organizational reward as organizational factors, and IT support as technology factors. As mentioned earlier, the dimension of knowledge sharing processes is composed by knowledge donating and knowledge collecting (Van den Hooff & De Ridder, 2004; Van den Hooff & Van Weenen, 2004).

2.7 INDIVIDUAL FACTORS
First, individual factors in Lin’s (2007) model include enjoyment to help (Wasko & Faraj, 2000) and knowledge self-efficacy (Spreitzer, 1995). Basically, all knowledge is personal and possessed by individuals as either tacit or explicit knowledge (Nonaka & Takeuchi, 1995). As Nahapiet & Ghoshal (1998) and Lee & Choi (2003) confirm, the individual factor of trust can positively influence the amount of knowledge sharing. Therefore, it is justifiable to include trust as an additional individual factor. Thus, the literatures of individual factors regarding trust, enjoyment to help, and knowledge self-efficacy will be reviewed.

2.7.1 Trust
Trust is defined 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 party” (Mayer, Davis & Schoorman, 1995, p. 712). It involves “an expectancy held by an individual or a group that the word, promise, verbal, or written statement of another individual or group can be relied on” (Rotter, 1971, p. 444). Trust is developed on the basis of “frequent and meaningful interaction, where individuals learn to feel comfortable and open in sharing their individual
insights and concerns, where ideas and assumptions can be challenged without fear or risk of repercussion and where diversity of opinion is valued over commonality or compliance” (Holton, 2001, p. 36). In order to enable knowledge sharing, trust shall simultaneously exist in the dimensions of integrity, benevolence, and competence (Usoro, Sharratt, Tsui & Shekhar, 2007). As Choi, Kang & Lee (2008, p. 745) explain, trust is “a set of expectations shared by all those in an exchange; it is a multi-faceted concept that can be conceptualized across three dimensions such as integrity, benevolence, and competence.”

Trust involves reciprocal faith (Kreitner & Kinicki, 1992). Ives, Torrey & Gordon (2000) believe that knowledge sharing cannot be performed without genuine trust. Nahapiet & Ghoshal (1998) name trust as a key aspect of social capital that is embedded in the network of human relationships. Cohen (2007) adds that employees need time and space to meet and work closely together in developing trust and mutual understanding. For example, Buro Happold is a UK based worldwide company that provides services in structural engineering, building, infrastructure, environment, transport, cost engineering, and project management. To enable a physical environment for effective knowledge sharing, one of Buro Happold’s first knowledge management projects is to redesign an open physical workspace for employees to have a closer communication and collaboration (Palmer & Platt, 2005).

Although trust is sometimes not identified as an individual factor that influences willingness to share knowledge (Ding et al., 2007), strong trust can nevertheless increase goodwill among employees (Abrams, Cross, Lesser & Levin, 2003) and increase employees’ willingness to cooperate in order to further develop trust (Tyler & Kramer, 1996). Davenport & Prusak (1998) claim that trust shall be visible, pervasive, and start at the top management. When employees believe there is high trust in their relationships, they are more interested to participate in social
interactions and knowledge exchange (Levin & Cross, 2004). It is difficult to mention knowledge sharing without trust as employees may not want to risk sharing their knowledge if they do not trust each other (Ellis, 2001; Ma et al., 2008). Indeed, knowledge donators will only share knowledge when they trust the knowledge collectors (Issa & Haddad, 2008). Consequently, knowledge donators need to trust their donated knowledge will be used appropriately whereas knowledge collectors shall also believe their collected knowledge is the best available knowledge (Buckman, 1998).

The concept of knowledge donator and collector matches Mayer at al.’s (1995) concept of a trustor and a trustee. In the case study of architects within project design teams in China, Ding et al. (2007) find that the team members’ attitudes towards work, abilities with regard to work, personalities, and social interactions can directly affect trust and willingness to share knowledge. In another example, construction contractors of the Turkish Contractors Association in Turkey admit that knowledge is one of their most valuable assets, and there are mutual trust and collaborations among their employees in knowledge sharing (Dikmen, Birgonul & Ataoglu, 2005). Even the best technology infrastructure is inadequate to practice the best knowledge sharing without a culture of trust and teamwork (Lank, 1997). In fact, team oriented employees with mutual trust can be more successful in knowledge sharing than others with merely technology superiority (Geraint, 1998). If employees share knowledge because of an organization’s knowledge policy, their level of trust will naturally increase (Bowles, 1999). When the level of trust increases, the values and benefits obtained from knowledge sharing will also increase (Wang & Rubenstein-Montano, 2003).

A culture of trust is essential in knowledge sharing (Scarborough, Swan & Preston, 1999). For example, in the case study of ConCo, site managers require a certain level of trust for a continuous flow of expertise, experience, and information
Styhre, 2008). With 150 employees, ConCo is a medium-sized Swedish specialist rock engineering and construction company that provides advanced services in roof bolting, rock bolt support, and rock reinforcement. In ConCo, the main form of knowledge sharing is based on oral communication either by phone or face-to-face discussion during coffee break. When mutual trust is established upon a proper organizational culture (Issa & Haddad, 2008), there is a sense of shared meanings and common goals that helps to build trust among employees (Bechky, 2003). As Rolland & Chauvel (2000, p. 239) claim, trust is “the single most important precondition for knowledge exchange.” Subsequently, “the increase in knowledge exchange brought on by mutual trust results in knowledge creation” (Lee & Choi, 2003, p. 191).

2.7.2 Enjoyment to help
Enjoyment to help is based on altruism in which people help others without expecting anything in return (Krebs, 1975; Smith, 1981; Organ, 1988; Constant et al., 1994). Altruistic behaviors can allow knowledge donators to gain satisfaction (Wasko & Faraj, 2000) that is derived from the intrinsic enjoyment of helping others (Constant et al., 1994; Ba et al., 2001). As Wasko & Faraj (2000, p. 170) state, “people participate and help others because participation is fun, and helping others is enjoyable and brings satisfaction.” Amabile (1997) agrees that enjoyment to help can create intrinsic motivation for employees to share knowledge. Moreover, employees may become more favorable in sharing knowledge by helping others (Wasko & Faraj, 2000; Wasko & Faraj, 2005). When self-concern only plays a minor role in an employee’s motivation of an action, there is relative altruism. Alternatively, absolute altruism exists when there is an absolute absence of self-concern in the motivation of an action. Under most circumstances in help, Smith (1981) finds that relative altruism is more dominant than absolute altruism. As Davenport & Prusak (1998) identify, knowledge donators may be motivated by relative altruism when they want to help others.
Knowledge altruism flourishes when organizations hire nice employees and treat the employees nicely (Davenport & Prusak, 1998). However, altruism can be constrained by cultural factors, and employees’ lack of time and energy (Davenport & Prusak, 1998). Recognizing the benefits of knowledge donating can increase the sense of altruism for knowledge donators (Davenport & Prusak, 1998). For example, in the case study of the World Bank, an altruistic sharing of global knowledge can accelerate problem solving and help developing countries to overcome crises in a faster way (Wah, 1999). The World Bank is a USA based international financial institution that provides financial and technical assistance aiming to alleviate poverty and improve the living standards of developing countries of the world. When the Governor of Pakistan asks the World Bank about new technologies for the maintenance of a deteriorating highway system, the task manager of the World Bank can quickly collect global knowledge from highway experts around the world, capture the knowledge in the database, and apply the knowledge to the situation in Pakistan. Since the World Bank’s mission is to share knowledge about development externally, its communities of practice consisting of global highway experts are dedicated to help based on enjoyment and altruism. Although employees who enjoy helping others may not provide more helpful advice (Wasko & Faraj, 2005), Wasko & Faraj (2000) argue that enjoyment to help is due to moral obligation that results in altruistic and pro-social behaviors. If employees treat knowledge as a public good, they will have a sense of moral obligation in sharing knowledge in which the moral obligation will exceed the desire to maximize self-interest (Wasko & Faraj, 2000). When people enjoy to help, “people do not act only out of self-interest, but forego the tendency to free-ride out of a sense of fairness, public duty, and concern for their community… People often behave altruistically and pro-socially, contributing to the welfare of others without apparent compensation” (Wasko & Faraj, 2000, p. 162).
2.7.3 Knowledge self-efficacy

Knowledge self-efficacy is defined as “people’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses” (Bandura, 1986, p. 391). As Spreitzer (1995, p. 1443) describes, “competence, or self-efficacy, is an individual’s belief in his or her capability to perform activities with skill.” Indeed, knowledge self-efficacy is the employees’ own judgments of their capabilities in achieving certain levels of performance (Constant et al., 1994; Spreitzer, 1995). It refers to the employees’ own beliefs that they are capable of finishing their job tasks successfully (Chong & Choi, 2005). Self-efficacy has three distinct components that include strength, magnitude, and generality (Bandura, 1986; Compeau & Higgins, 1995; Downey, Rainer & Bartczak, 2008). Strength involves the assessment of confidence in accomplishing a task successfully. Magnitude concerns the levels of difficulty in completing a task. For example, with higher knowledge self-efficacy, employees will believe they can accomplish tasks with higher levels of difficulty. Moreover, generality refers to the degree in which the self-efficacy judgment can be applied to other tasks in another domain.

Believing that knowledge sharing is a “usual, correct, and socially expected workplace behavior” can increase knowledge sharing within an organization (Constant et al., 1994, p. 404). When employees donate useful knowledge to the organization, they will gain confidence of their capabilities and increase their knowledge self-efficacies (Constant et al., 1994). For example, in the case study of ConCo, site managers are confident and proud of their abilities to work in complex projects without major disruptions and handle different kinds of challenges in their routine work (Styhre, 2008). With knowledge self-efficacy, employees will believe their knowledge can improve work efficiency (Ba,
Knowledge self-efficacy is a motivational force in knowledge sharing (Wasko & Faraj, 2005). The motivational concept of knowledge self-efficacy can be created by empowering employees with a certain level of freedom, independence, discretion, and autonomy in their work activities (Conger & Kanungo, 1988; Spreitzer, 1995; Chong & Choi, 2005). Furthermore, knowledge self-efficacy can be enhanced by assigning work with high level of task significance and empowering employees with control over their own performance feedback (Chong & Choi, 2005). Gupta & Govindarajan (2000) recommend organizations to cultivate empowerment by providing slack resources to employees. When employees are empowered, they may begin to be more responsible in their jobs and learn new skills for organizational problem solving, which will eventually increase their competencies (Ahanotu, 1998). Although empowerment may influence knowledge sharing positively by allowing empowered employees to be more willing to share knowledge, Ma et al. (2008) claim that empowerment does not influence knowledge sharing significantly within construction project teams. Although knowledge self-efficacy seems to be an individual characteristic, it can be affected in the group level that is characterized as group-efficacy (McFarland & Buehler, 1995). Gibson (1999) argues that group-efficacy can be a significant indicator of group performance. The relationship between self-efficacy and group-efficacy is complex because it involves how individuals compare themselves within their groups (Cho & Chang, 2008).

2.8 ORGANIZATIONAL FACTORS
Second, organizational factors in Lin’s (2007) model include top management
support (Tan & Zhao, 2003) and organizational reward (Davenport & Prusak, 1998; Hargadon, 1998). By providing the necessary resources, top management support is essential to knowledge sharing (Davenport & Prusak, 1998; Tan & Zhao, 2003). As Buckman (1999) emphasizes that the intangible activities for creating and sharing knowledge cannot be forced, it is unrealistic to assume employees to automatically share knowledge without a strong rewarding motivator (Syed-Ikhsan & Rowland, 2004; Al-Alawi et al., 2007). Thus, the literatures of organizational factors about top management support and organizational reward will be reviewed.

2.8.1 Top management support
Top management has the responsibility to set up goals and objectives, allocate resources, prepare budgeting, provide training, create knowledge roles, design organizational and technical infrastructure, measure performance, and consider the needs and priorities in supporting knowledge sharing within an organization. Starns & Odom (2006) suggest managerial attention shall be placed on organizational culture and structure as people and organization are the fundamental knowledge management components. In fact, top management has the greatest capability to promote knowledge management as they can influence many critical success factors and eliminate many organizational constraints to show their support to knowledge management activities (Chong, 2006). Besides, top management are required to approve knowledge management spending within an agreed budget, assign clear responsibilities of the employees, and support the authorized employee or team in introducing organizational change (Palmer & Platt, 2005). Chong & Choi (2005) recommend organizations to deploy a knowledge management program, reduce the tendency of knowledge hoarding, and embed the belief that knowledge sharing is the only way for organizational survival. If top management hoards knowledge, other employees cannot be expected to share knowledge (Bukowitz & Williams, 2000). Chong & Choi (2005)
and Chong (2006) argue that top management shall eliminate any encountered problem or constraint that may lead to knowledge management barriers.

Top management support is required in the execution of a knowledge based policy that will change the organizational culture toward a knowledge sharing culture (Civi, 2000; Koch, 2003; Reid, 2003). “With senior managers and company knowledge managers providing structure, facilitation, and support” (De Kretser & Wilkinson, 2005, p. 15), a knowledge sharing culture can be cultivated and sustained (Liebowitz, 1999). For example, Armstrong Pumps is a Canada based family-owned global manufacturer of pumps for residential, industrial, and commercial facilities. Armstrong Pumps has eight manufacturing facilities on three continents to provide services in over fifty countries. As a case study, the managing director of Armstrong Pumps emphasizes that top management support must be given for successful knowledge management (Palmer & Platt, 2005). By changing the organizational structure and implementing new software for resource planning, Armstrong Pumps can save time, enjoy promoted growth, reuse expertise developed in one area to another, and enforce employees to be more productive. Moreover, Armstrong Pumps can significantly reduce the time of launching new products to the market from two years to one year. Tan & Zhao (2003, p. 601) uses the term perceived management support to express “the degree to which all levels of management are perceived to believe in encouraging and supporting technical information inquiry.” Because only top management has the authority and ability to change the organizational culture toward a knowledge sharing culture, making the invisible dimensions of knowledge sharing visible to the employees is critical to the success of knowledge sharing (McDermott & O’Dell, 2001)

Top management can support knowledge sharing by creating new knowledge roles such as chief knowledge officer and communities of practice (Ruggles, 1998;
Liebowitz, 1999; Soliman & Spooner, 2000; Wenger & Snyder, 2000; DeTienne et al., 2004). Chief knowledge officer is the “designer and overseer of an organization’s knowledge infrastructure, and take the leading role in the design and implementation of an organization’s knowledge architectures” (Liebowitz, 1999, p. 38). Comparatively, communities of practice are groups of people who “share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger, McDermott & Snyder, 2002, p. 4). Carter & Scarbrough (2001) suggest that a good knowledge sharing environment requires the integration of human resource management. Soliman & Spooner (2000) advise the human resource department to support knowledge management activities by organizing social gathering for employees, redesigning office layout, enhancing trust among employees, reducing differences in cultures and languages, facilitating support with timeliness, and including top management involvement and support. For example, Arup is a UK based global organization that delivers services in construction, engineering, designing, planning, and business consulting. Arup has over 10,000 employees working in more than ninety offices in thirty-seven countries. At one time, Arup has over 10,000 projects running simultaneously. As a case study, Arup creates an informal knowledge sharing environment for staff gathering. By investing in the Arup Café, employees can directly communicate their knowledge with each other regardless of their positions as either a frontline employee or a senior manager (Palmer & Platt, 2005). When top management support to knowledge management is perceived to be high, employees will believe their knowledge management practices are encouraged positively (Tan & Zhao, 2003).

In a socio-technical perspective, top management support can penetrate an organization’s infrastructure, info-structure, and info-culture to create a common knowledge sharing objective for all employees (Pan & Scarbrough, 1998).
Knowledge management is doomed to failure if top management does not provide additional support by falsely thinking that a well designed IT infrastructure is already sufficient to support all knowledge management processes (McDermott & O’Dell, 2001). In the case study of Turner Construction Company, which is the largest commercial builder in the USA with a nationwide network of forty-six offices and over 5,500 employees, the top management supports knowledge sharing by creating knowledge objects from interviews with the board members, superintendents, and executives (Lemons, 2005). After capturing the tacit knowledge from interviews, the top management will convert such knowledge into knowledge objects and codify the knowledge objects in the Turner Knowledge Network. Then, the top management will email the knowledge objects to the seekers who want to learn the knowledge. All employees of the Turner Construction Company can access the knowledge objects through the Turner Knowledge Network. Furthermore, the employees can send the knowledge objects outside the network for external use with business partners. Knowledge management is particularly important in large organizations because it is difficult to identify which employee knows what specific knowledge (Davenport & Prusak, 1998). Therefore, donators and collectors of specific knowledge shall be ready to deal with knowledge management as they are probably the most suitable designers of their own roles in knowledge management.

2.8.2 Organizational reward

Knowledge sharing shall be encouraged and rewarded (Davenport & Prusak, 1998; Wah, 1999). Organizational reward is defined as “a situational condition which can motivate members of companies because of their individual structure of needs with regard to a certain performance level of behavior within the context of an organization” (VonKortzfleisch & Mergel, 2002, p. 246). A reward system is defined as “the sum of all with each other coordinated incentives which on the one hand side produce or reinforce desired behaviors of employees and on the other
hand side reduce the likelihood that undesirable behaviors occur” (VonKortzfleisch & Mergel, 2002, p. 246). Organizational reward involves establishing a reward system with either monetary or non-monetary incentives (Davenport & Prusak, 1998; Hargadon, 1998). Incentives and motives of reward can be categorized into intrinsic motives, extrinsic motives, material incentives, and immaterial incentives (VonKortzfleisch & Mergel, 2002). As Voelpel & Han (2005) describe, motivating knowledge sharing is complex and multifaceted. Many scholars argue whether intrinsic motivation such as enjoyment, satisfaction, interest, and challenge is more important than extrinsic motivation such as financial and physical rewards (Amabile, 1998; Bartol & Srivastava, 2002; VonKortzfleisch & Mergel, 2002). Organizational reward can range from intrinsic incentives such as public recognition and praise to extrinsic incentives such as increased salary, bonus, promotion, job security, and career development (Kankanahalli et al., 2005; Choi et al., 2008). VonKortzfleisch & Mergel (2002) discover organizations that are more knowledge intensive tend to adopt a cultural change that supports intrinsic motivation by immaterial incentives in knowledge sharing. Conversely, organizations that are less knowledge intensive emphasize on material incentives and status symbols to extrinsically motivate knowledge sharing.

It is usually easier for employees to achieve extrinsic incentives rather than intrinsic incentives (Bartol & Srivastava, 2002). However, Bock, Zmud, Kim & Lee (2005) argue that extrinsic incentives in monetary terms may cause negative effects on the knowledge sharing intentions of employees. Besides, Murray (2000) adds that formal peer recognition can be a high motivator for experts and organizations shall provide a visible reward structure even though the reward is not financial. For example, Taylor Woodrow is a UK based international construction, property, and housing organization with over 7,000 employees. In the case study of Taylor Woodrow, intrinsic incentive is primarily driven by
self-esteem that is generated from peer recognition (Coakes, Bradburn & Black, 2005). As Sheehan (2000) claims, financial reward may sometimes create divisions among employees and peer recognition can be better than financial incentives in encouraging knowledge sharing in the construction industry. Occasionally, financial incentives may inspire employees to produce artificial, irrelevant, or useless knowledge (Snowden, 2002). Instead of a short term reward system, organizations shall provide a long term reward system to enable sustainable knowledge sharing (Davenport & Prusak, 1998; Chong & Choi, 2005) and prevent employees from abusing the system for rewards (Chong, 2006). Alternatively, organizations can exchange the employees’ knowledge for rewards in terms of future training and development (Gumbley, 1998). Although financial reward may create a temporary interest in knowledge management, the motivation is not sustainable because knowledge sharing is not a tradition in the culture of the construction industry (Carillo, 2004).

Although some organizations may not believe a reward and recognition system can effectively motivate employees to share knowledge, aligning reward and recognition with knowledge sharing can at least highlight the importance of knowledge sharing to all employees (McDermott & O'Dell, 2001). For example, Lafarge is a France based global manufacturer of cement, gypsum, roofing solutions, and aggregates and concrete in the construction materials industry with more than 77,000 employees in seventy-nine countries (Perrin et al., 2006). By identifying the best practices such as safety practices within the organization, Lafarge enables all employees to benefit from the experiences of others so that all employees will make their own progress. Initiative prizes are awarded as organizational reward to sites where original and effective initiatives are developed. Such initiatives will then be shared and transferred as knowledge to use in other sites. Bukowitz & Williams (2000) suggest organizations to provide promotion opportunity and priority in development by giving credits to employees
who share their knowledge. Davenport & Prusak (1998) find that if employees have the reputation to be valuable knowledge donators, they are likely to eventually receive tangible rewards such as increased salary, bonus, promotion, and job security. However, Wasko & Faraj (2000) argue that tangible incentives will actually encourage knowledge hoarding behaviors and competitive actions that diminish knowledge flows among employees.

In fact, knowledge sharing can be integrated into daily work processes in the form of performance appraisal (Robertson & Hammersley, 2000; McDermott & O’Dell, 2001). Carillo (2004) advises organizations to recognize the contributions of knowledge donators by tracking the employees’ input and use of knowledge management systems. By aligning knowledge sharing practices with reward and appraisal systems, there will be more visible evidences to demonstrate what an organization values as important knowledge management practices (Davenport & Prusak, 1998; McDermott & O’Dell, 2001). Significant changes in the reward system are required to encourage employees to share their knowledge (Bartol & Srivastava, 2002). However, changing the reward system often involves changes in the organizational culture as well (Harman & Brelade, 2000). Hargadon (1998, p. 225) suggests organizations to change to a common culture that “reflects the willingness of members to seek out others’ disparate knowledge and to share their own; it can best be summarized as an ‘attitude of wisdom.’ People who have an attitude of wisdom are cooperative because they are neither too arrogant nor too insecure to ask others for help.” Furthermore, organizations shall offer formal and informal rewards to support such attitude of wisdom (Hargadon, 1998).

2.9 TECHNOLOGY FACTORS

Third, technology factors in Lin’s (2007) model include IT support (Lee & Choi, 2003). Knowledge management is unthinkable and inapplicable without a proper IT infrastructure (Savary, 1999; Ryan & Prybutok, 2001; Moffett et al., 2003). IT
support shall provide knowledge management systems that can be easily accessed by all parties searching, donating, or collecting knowledge (De Kretser & Wilkinson, 2005). In the construction industry, the application of knowledge management systems can affect many areas and processes such as planning, monitoring, material and equipment selection, site investigation, contractual dispute, and risk management (Wanous, 2000). De Kretser & Wilkinson (2005) claim that technology shall be utilized as a tool that does not necessarily restrict or complicate an organization’s knowledge management systems. As Mitchell (2003) points out, technology provides an excellent platform for knowledge sharing in which technology and knowledge cannot stand in isolation. Thus, the literatures of technology factors about IT support will be reviewed.

2.9.1 IT support
IT can be a key enabler that contributes to knowledge sharing (Davenport & Prusak, 1998; Carillo et al., 2000; Lee & Choi, 2003; Mitchell, 2003; Choi et al., 2008). In addition to being an enabler, IT can also add value to the value chain of an organization as a value adder (Porter, 1985; Porter & Millar, 1985; Mitchell, 2003). Davenport & Prusak (1998) indicate that IT can enable new knowledge management behaviors. By using IT as a platform to create multiple communication channels, various knowledge workers can join together to share knowledge (Binney, 2001). Carrillo et al. (2000) propose that the primary initiative of knowledge management is to reduce fragmentation by using IT to integrate the construction process through electronic sharing of data and information. Because of the project based nature of the construction industry, IT support is necessary to connect people especially when they need to communicate, share information or knowledge, and join together for problem solving across dispersed geographical distances (Walker, Maqsood & Finegan, 2005). However, IT support may be inadequate and inaccessible under circumstances where construction offices and work sites are located in isolated and undeveloped areas.
IT within knowledge management has evolved through mainframe, personal computer, and networking in which networking is the latest dominant model in offering a wide interconnection in knowledge sharing (Moffett et al., 2003). Current knowledge management system can offer a wide variety of technologies such as email, instant messaging, search engine, data warehouse, groupware, training, and process management. Technology requires both hardware and software to be supportive. On one hand, hardware shall be made available to possess the required functionalities of routine work and meet the basic knowledge management system requirement. On the other hand, software shall provide convenience and assistance to employees in accomplishing their required job tasks and duties, and create communication channels to enable smooth and rapid information flow among knowledge donators and collectors. In the case study of Taylor Woodrow, the UK based organization constructs a knowledge management system called Tayweb for the distribution of organizational knowledge (Coakes et al., 2005). With Tayweb, Taylor Woodrow stresses the relationships between different partners and collaborations via the intranet and various project specific extranets. In order to prevent potential, repeatable, or costly mistakes, Tayweb can enable both internal and external knowledge sharing by delivering a wide range of benefits to the stakeholders of the organization. Consequently, an effective IT infrastructure can turn knowledge into the core and sustainable competitive advantages, and create a cultural change in the construction industry (Walker et al., 2005).

Knowledge management system is defined as “a class of information systems applied to managing organizational knowledge. That is, they are IT-based systems developed to support and enhance the organizational processes of knowledge creation, storage/retrieval, transfer, and application” (Alavi & Leidner, 2001, p.
It is “developed to manage knowledge directly or indirectly to give support for an improved quality of a decision made in workers’ daily work and, by extension, an increased organizational ability” (Ericsson & Avdic, 2003, p. 42). There is a wide variety of knowledge management systems and tools that are designed for various purposes. For example, Sheehan et al. (2005) distinguish technologies in the construction industry into four categories such as people-supporting, projects-supporting, organizations-supporting, and industries-supporting. Laudon & Laudon (1998) assort information systems into four categories including knowledge work system that creates knowledge, office automation system that distributes knowledge, group collaboration system that shares knowledge, and artificial intelligence system that captures and codifies knowledge. Ruggles (1998) recommends organizations to create knowledge management tools such as the intranet, knowledge repository, data warehouse, decision support tool, and groupware to support collaborations. Ericsson & Avdic (2003) stress the importance of perceived relevance, system accessibility, and management support for determining the acceptance of a knowledge management system in the Requirements of Acceptance Model.

In addition, current enabling technologies can map into Binney’s (2001) knowledge management spectrum that classifies knowledge management applications into six categories. The six categories include analytical, asset management, developmental, process, transactional, and innovation and creation. For example, Fong & Wong (2005) propose a prototype knowledge management system in Hong Kong that can capture and reuse knowledge and experience from different professionals in building maintenance. Concurring with the analytical and asset management categories in Binney’s (2001) knowledge management spectrum, Fong & Wong’s (2005) prototype knowledge management system can capture and reuse the intellectual properties of “not only professional building surveyors, but also building services engineers, architects, facilities managers, and
so forth” (Fong & Wong, 2005, p. 86). Since professionals’ decisions are usually affected by the decisions of other professionals, Fong & Wong’s (2005) prototype knowledge management system can benefit all professionals and support their decision making in building maintenance in Hong Kong by sharing their knowledge and experience among each other. After all, the objective of the prototype knowledge management system is “to allow people to share and tap into the knowledge of others” (Fong & Wong, 2005, p. 77). In another case study in Hong Kong, Dainty et al. (2005) find that one of the largest construction organizations uses intranet to communicate between work sites and head office, online bulletin board to discuss and highlight key issues and problems arising in projects, electronic repository to store new and innovative ideas, searchable e-learning system for learning and development, and e-library to access information and other knowledge resources. According to the six categories in Binney’s (2001) knowledge management spectrum, the case study organization nearly utilizes all six categories in maximizing the benefits of knowledge sharing in the construction industry of Hong Kong. As Binney (2001) states, the benefits of knowledge management can be maximized by integrating enabling technologies with knowledge management applications in the knowledge management spectrum.

For easy access, all knowledge management systems shall be designed for employees who are not computer experts with special considerations about their accesses across time, space, culture, and hierarchy of the organizational structure (Buckman, 1998). In the case study of Turner Construction Company, the Turner Knowledge Network can enable knowledge sharing by allowing employees to have access to documents, publications, archived news, learning, people search, intranet business sites, collaboration, and virtual store (Lemons, 2005). Whether the employees are at home, in office, or travelling, they are still capable to share knowledge via the Turner Knowledge Network. Without IT support, organizations
are “very difficult to access the vast amount of information that is available in the external environment” and “to link people both internally and externally for the sharing of knowledge” (Mitchell, 2003, p. 66). In addition to a user friendly design, knowledge management systems shall also possess protective firewalls that can block hackers and unauthorized entries from hacking the knowledge database and stealing any confidential information (Walker et al., 2005).

There is often a misconception that developing or buying a knowledge management system is very costly (Chong & Choi, 2005). Indeed, creating a knowledge management system does not require a huge amount of money. In the case study of Buro Happold, the management of the organization believes that it is a mistake to direct all knowledge management costs to the development of IT (Palmer & Platt, 2005). To save costs, organizations can often combine their current IT capabilities to support their knowledge management systems (Tiwana, 2000). Some organizations, especially small organizations with limited financial budget, may even think investing in knowledge management system is a waste of money. Nevertheless, any IT investment shall not exceed a monetary budget of more than one-third of the total knowledge management investment (O'Dell, Hasanali, Hunbert, Lopez & Raybourn, 2000). Depending on the project type, an average IT investment can vary from 1.5 to 15 million US dollars (Chong et al., 2000).

The role of IT can create a lot of benefits to an organization. For example, Alavi & Leidner (2001) believe that IT can enable more extensive networks, more communication channels, and faster access to knowledge sources. Lee & Choi (2003) emphasize the significance of IT can help organizations and their stakeholders to participate in knowledge sharing processes, integrate fragmented knowledge, and facilitate rapid access to knowledge on a scale that is impracticable in the past. Moreover, IT can provide great benefits to support,
facilitate, and enhance the natural exchange of knowledge by transferring, storing, and accessing knowledge on a large and international scale (De Kretser & Wilkinson, 2005). However, employees shall be well trained beforehand to understand and apply the technology in order to enjoy the maximum benefits of IT (Mitchell, 2003).

IT by itself cannot create a knowledge management culture (Davenport & Prusak, 1998). Although IT can assist employees in knowledge sharing, it cannot motivate employees to share their knowledge (Issa & Haddad, 2008) nor maintain their commitments to knowledge sharing (Currie & Kerrin, 2004). Moreover, investing in IT may reduce socialization which in some way results in less knowledge sharing (Issa & Haddad, 2008). Although not all types of knowledge can be shared and stored by IT (Issa & Haddad, 2008), a well designed technology infrastructure can often improve knowledge discovery, information flow, decision making, and collaboration (Moffett et al., 2003). After all, IT can eliminate communication barriers and support convenient knowledge sharing (Ruggles, 1998; Lee & Choi, 2003).

2.10 LITERATURE GAPS
After reviewing the relevant literatures in the study of knowledge sharing, several literature gaps are identified. First, Lin’s (2007) model is only applied to the geographical location of Taiwan. Another research replication of Lin’s (2007) model can be conducted to the geographical location of Hong Kong in the hope of generating new findings. Second, Lin’s (2007) model is generally studied in all industries and is not applied to the specific industry of construction. Therefore, a further investigation in the construction industry is essential to expand Lin’s (2007) model’s generalizability. Third, Lin’s (2007) model does not include the individual factor of trust that is confirmed to positively influence the amount of knowledge sharing in previous research (Nahapiet & Ghoshal, 1998; Lee & Choi, 2003).
As Davenport & Prusak (1998) point out, knowledge initiative will fail in the first place without trust. Moreover, Szulanski (1996) argues that knowledge sharing barriers can be created by a lack of trust. Lee & Choi (2003) add that employees with high mutual trust are more enthusiastic in sharing knowledge without any withholding. Therefore, there is a strong belief that the individual factor of trust can be added to modify Lin’s (2007) model. As a result, the research will investigate the predictability of trust (Lee & Choi, 2003), enjoyment to help (Wasko & Faraj, 2000), knowledge self-efficacy (Spreitzer, 1995), top management support (Tan & Zhao, 2003), organizational reward (Davenport & Prusak, 1998; Hargadon, 1998), and IT support (Lee & Choi, 2003) on knowledge donating and knowledge collecting (Van den Hooff & Van Weenen, 2004). By adding the individual factor of trust, the research will replicate Lin’s (2007) model and apply it to the construction industry of Hong Kong.

2.11 CONCLUSION
The literature review chapter summarizes some contributions and debates of previous scholars. In addition, several practical case studies are brought up to support the relative literatures. After reviewing the relevant literatures in the areas of knowledge management, knowledge sharing processes, organizational culture, knowledge sharing culture, and knowledge sharing enablers, literature gaps are identified for potentially further replication of Lin’s (2007) model. By adding an individual factor of trust, the research aims to replicate Lin’s (2007) model with the homogeneous sets of variables and relationships but in a heterogeneous setting of the construction industry of Hong Kong. In order to fill the aforementioned literature gaps, the research needs to develop appropriate research question and sub-questions in addressing the research topic. Furthermore, the research paradigm and methodology must be carefully chosen to suit the investigation of the proposed research question and sub-questions.
CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

The research uses research methodology that is based on replicating Lin’s (2007) study, although several changes are made due to different research settings. The research topic is refined into one specific research question and further narrowed down into three research sub-questions. After discussing the advantages and disadvantages of using either positivism or interpretivism as the research paradigm, the research will justify the use of a positivist paradigm regarding epistemology, ontology, and methodology to suit the research topic and questions. By employing a descriptive research approach with a cross-sectional design, the proposed conceptual model and hypotheses are established upon Lin’s (2007) general framework for studying knowledge sharing.

Validity and reliability are essential elements in the research. For measurement, valid and reliable items are adopted from previous research to measure the individual factors (trust, enjoyment to help, and knowledge self-efficacy), organizational factors (top management support and organizational reward), technology factors (IT support), and knowledge sharing processes (knowledge donating and collecting). For scaling, a seven-point Likert scale will be used to measure the degree of agreement with each item that is associated with the eight key variables of the research. The six independent variables of the research include trust, enjoyment to help, knowledge self-efficacy, top management support, organizational reward, and IT support. The two dependent variables of the research are knowledge donating and knowledge collecting. In the research, the questionnaire design consists of four items from Lee & Choi (2003), four items from Wasko & Faraj (2000), four items from Spreitzer (1995), four items from Tan & Zhao (2003), four items from Davenport & Prusak (1998) and Hargadon (1998), four items from Lee & Choi (2003), three items from Van den
Hooff & Van Weenen (2004), and four items from Van den Hooff & Van Weenen (2004) respectively, with a total of thirty-one items.

The quantitative research will survey a sample of 180 individual construction practitioners in Hong Kong out of a total population of 226,149 (Census and Statistics Department, 2008) (Appendix A). The scope of individual construction practitioner includes all employees working in building and civil engineering, architecture, surveying, project engineering, real estate development, leasing, brokerage, and maintenance management. Sampling uses cluster sampling technique to locate potential respondents who are employees in 448 construction organizations that are organizational members of the Hong Kong General Chamber of Commerce. Data collection uses an online survey that is processed via the internet. An information statement and an anonymous questionnaire will be uploaded online to a research website. Potential respondents will be initially contacted by email with a cover letter (Appendix B), and then referred to the research website to self-complete the online questionnaire (Appendix E). The online questionnaire has both English and Chinese. Data analysis uses factor analysis and Cronbach’s alpha to test for validity and reliability respectively. Univariate linear regression is used to test the predictability of the independent variables on the dependent variables. Ethical considerations and limitations of the research will be discussed.

3.2 RESEARCH QUESTION AND SUB-QUESTIONS

The purpose of the research is to investigate the predictability of individual, organizational, and technology factors on knowledge sharing processes in the construction industry of Hong Kong. To refine and narrow down the topic into specific research question and sub-questions, and to fill the aforementioned literature gaps in literature review, the following one research question and three sub-questions are proposed:
Research question –
How do individual, organizational, and technology factors predict knowledge sharing processes in the construction industry of Hong Kong?

Research sub-questions –
4 How do individual factors (trust, enjoyment to help, and knowledge self-efficacy) predict knowledge sharing processes (knowledge donating and knowledge collecting) in the construction industry of Hong Kong?

5 How do organizational factors (top management support and organizational reward) predict knowledge sharing processes (knowledge donating and knowledge collecting) in the construction industry of Hong Kong?

6 How do technology factors (IT support) predict knowledge sharing processes (knowledge donating and knowledge collecting) in the construction industry of Hong Kong?

3.3 PARADIGM, POSITIVISM, AND INTERPRETIVISM
To answer the proposed research question and sub-questions, the research needs to choose either positivism or interpretivism as a research paradigm. Positivism and interpretivism are the two most commonly used research paradigms that nowadays research is based on (Neuman, 2000). A paradigm can be explained as “a set of basic beliefs (or metaphysics) that deals with ultimates or first principles. It represents a worldview that defines, for its holder, the nature of the ‘world’, the individual’s place in it, and the range of possible relationships to that world and its parts” (Guba & Lincoln, 1994, p. 107). Positivism is often associated with precise quantitative data that is derived from experiments, statistics, and surveys. It is “an organized method for combining deductive logic with precise empirical
observations of individual behavior in order to discover and confirm a set of probabilistic causal laws that can be used to predict general patterns of human activity” (Neuman, 2000, p. 66). Deduction “begins with a theoretical proposition and then moves towards concrete empirical evidence” (Cavana, Delahaye & Sekaran, 2001, p. 35).

Alternatively, interpretivism requires participant observation and field research. It is a “systematic analysis of socially meaningful action through the direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds” (Neuman, 2000, p. 71). The interpretivist paradigm involves induction to “observe certain phenomena and arrive at certain conclusions” (Cavana et al., 2001, p. 36). To look at the fundamental differences of positivism and interpretivism, the research will discuss the epistemology, ontology, and methodology in justifying positivism as the chosen research paradigm for testing the proposed hypotheses that are built on the research question and sub-questions.

3.3.1 Epistemology
Epistemology involves “what is regarded as acceptable knowledge in a discipline” (Bryman, 2008, p. 13). The philosophical issue is about choosing a particular epistemological foundation in determining the preference of more suitable research methods (Bryman, 1984; Drisko, 1997). As “the investigator and the invested ‘object’ are assumed to be independent entities, and the investigator to be capable of studying the object without influencing it or being influenced by it” (Guba & Lincoln, 1994, p. 110), the positivist paradigm is described as dualist and objectivist. Researcher and objects under investigation are independent entities that do not influence each other during the investigation. Quantitative research lacks qualitative richness and cannot delve deeply into human oriented matters that are "complex, messy, and involve a range of stakeholders with different
concerns and perceptions” (Skinner, Tagg & Holloway, 2000, p. 163).

On the other hand, epistemology of the interpretivist paradigm is described as transactional and subjectivist. As “the investigator and the object of investigation are assumed to be interactively linked so that the ‘findings’ are literally created as the investigation proceeds” (Guba & Lincoln, 1994, p. 111), knowledge is generated once there is interaction between researcher and respondents. Although interpretivism can create new and exploratory knowledge, it sometimes contributes to epistemological and methodological confusion (Denzin & Lincoln, 1994; Prasad & Prasad, 2002). Moreover, interpretivism is often criticized to be difficult to replicate, impossible to generalize, lack of transparency, and overly subjective (Bryman, 2008).

3.3.2 Ontology
Ontology involves “the nature of social entities” (Bryman, 2008, p. 18). Quantitative and qualitative research can produce different knowledge and understanding based on respective ontological foundations (Draper, 2004). As “an apprehendable reality is assumed to exist, driven by immutable natural laws and mechanisms” (Guba & Lincoln, 1994, p. 109), the ontology of the positivist paradigm is defined as a critical realism in which objective reality is hypothesized upon imperfect apprehension. By hypothetical deduction, the aim of quantitative research is to test hypothesis in the constitution of universal laws of causes and effects (Draper, 2004). Establishing new quantitative theories can start from looking at existing theories and theory verification takes place when theory building is complete (Sarantakos, 1998).

In contrast, the ontology of the interpretivist paradigm is described as relativist. “Realities are apprehendable in the form of multiple, intangible mental constructions, socially and experientially based, local and specific in nature
(although elements are often shared among many individuals and even across cultures), and dependent for their form and content on the individual persons or groups holding the constructions” (Guba & Lincoln, 1994, p. 110). Relativism in apprehending, conflicting, and multiple realities are assumed to be changeable and complex products of human intellecfts (Guba & Lincoln, 1994). It emphasizes phenomenological base in which human and the social worlds constitute knowledge through lived experience of reality that is inconsistent to be justified based on objectivist epistemology and ontology (Sandberg, 2005). However, subjectivity elements shall be treated as assets because they can absorb the core of a phenomenon without disfiguring its genuine nature (Gummesson, 2006).

3.3.3 Methodology
Methodology involves critically evaluating alternative research strategies and methods (Blaikie, 2000). It refers to an epistemological position whether research uses a positivist or interpretivist paradigm (Bryman, 1984). Positivism and interpretivism may sometimes be mutually exclusive and opposing, but the two methodologies are not distinct and indeed complementary to each other (Dabbs, 1982; Baker, 2001). The positivist paradigm is described as experimental and manipulative. As “questions and/or hypotheses are stated in propositional form and subjected to empirical test to verify them; possible confounding conditions must be carefully controlled (manipulated) to prevent outcomes from being improperly influenced” (Guba & Lincoln, 1994, p. 110), the methodology of positivism focuses on proposal and verification of hypotheses.

Alternatively, the interpretivist paradigm is described as hermeneutical and dialectical. As “the variable and personal (intramental) nature of social constructions suggests that individual constructions can be elicited and refined only through interaction between and among investigator and respondents” (Guba & Lincoln, 1994, p. 111), the methodology of interpretivism targets on
reconstructing previously existing constructions. By using conventional hermeneutical techniques, various constructions in the social sciences can be analyzed and compared through proper dialectical interchange. Furthermore, interpretivism can be a prelude for combining methods to form triangulation with positivism (Bryman, 1984; Cassell, Symon, Buehring & Johnson, 2006) in which triangulation is "the combination of methodologies in the study of the same phenomenon" (Denzin, 1978, p. 291). However, not all research is capable, appropriate, or in the best practice to collect data through triangulation.

3.3.4 Justification for positivism

The main preoccupations of quantitative research are replication, causality, generalization, scientific measurement, and objectivity (Baxter & Eyles, 1997; Cavana et al., 2001; Bryman, 2008). Replication describes the degree in which findings can be replicated. Replicability is an important quality in quantitative research (Bryman, 2008). If there is a failure in replication, there will be serious problems about the validity of the research findings. Causality concerns with the internal validity in establishing causal relationships among variables. Quantitative research does not merely describe how things are, but tends to analyze the causes to explain why things are the way they are. Generalization refers to the external validity of research findings to go beyond the boundaries of specific research contexts. The idea is about developing a representative sample from a survey research. Then, the research findings can be generalized beyond the examined cases with an attempt to create universal laws of causes and effects in the natural sciences. Scientific measurement includes the most distinctive concepts of validity and reliability. The concepts of validity and reliability will be discussed later in measurement and scaling. Moreover, objectivity shall be based upon “facts derived from the findings from actual data, and not based on our own subjective or emotional values” (Cavana et al. 2001, p.30). In order to achieve objectivity, abstract notions such as enjoyment, motivation, or satisfaction may be reduced
and broken down into observable behaviors and characteristics. Indeed, the existence of social phenomena and social meanings are independent on social actors (Baxter & Eyles, 1997).

Although there are many compliments about quantitative research, it also receives criticisms about depending excessively on procedures and instruments that are separated from reality, processing an artificial and spurious sense of accuracy and precision in measurement, creating an irrelevant or static view of social life from the analyses of relationships between variables, and failing to distinguish human and social entities in the natural settings of the social worlds (Bryman, 2008). Statistical analysis of quantitative data is also criticized to be too "simplistic, ahistorical, decontextualized, reductionist, aphilosopohical, and nonreflexive" (Prasad & Prasad, 2002, p. 5). Nevertheless, particular methods and evaluation principles must bridge the gaps between philosophical concerns of epistemology, ontology, and methodology (Baxter & Eyles, 1997).

There are a few reasons that justify the research to use a positivist paradigm. First, the research replicates Lin’s (2007) study and hypotheses in which prior knowledge of knowledge sharing enablers and knowledge sharing processes already exists. Second, positivism can analyze the causality among variables that are essential to investigate the predictability of independent variables on dependent variables in the hypotheses. Third, since the conceptual framework and hypotheses are already established in Lin’s (2007) study, the use of positivism can test the hypotheses and establish the universal laws of causes and effects in the logic of hypothetical deduction (Draper, 2004). Fourth, because generalization of Lin’s (2007) conceptual framework is necessary to support the application of the proposed research framework in the construction industry of Hong Kong, a positivist paradigm is more appropriate for the research context. Fifth, as the direction of quantitative theory building begins from an existing theory and
verification takes place when theory building is complete (Sarantakos, 1998). Lin’s (2007) study already provides sufficient underlying theories that allow new quantitative theory building and verification in a positivist paradigm. Sixth, the scientific measurements of the key variables in Lin’s (2007) study are adopted from previous research and are ready for further replication.

Due to prior knowledge and existing theories in the content of knowledge sharing enablers and knowledge sharing processes from previous literature, the research “on the basis of what is known about in a particular domain and of theoretical considerations in relation to that domain, deduces a hypothesis (or hypotheses) that must then be subjected to empirical scrutiny” (Bryman, 2008, p. 9). After all, the positivist paradigm has the relative strengths to illustrate replication, causality, generalization, scientific measurement, and objectivity that can meet the research objectives and answer the research question and sub-questions through hypothesis testing. Thus, the research design will be established on the basis of a positivist paradigm.

3.4 RESEARCH DESIGN
Research design is a framework that collects and analyzes data while considering the priority and importance of certain research dimensions. Such research dimensions concern about expressing the causal relationships among variables, achieving a temporary recognition of the social phenomena and interconnections, identifying the meaning and meaning of the behaviors in specific social contexts, and generalizing larger groups of individuals than the original groups under investigation (Bryman, 2008). In a positivist paradigm, the research will use a descriptive research approach with cross-sectional design. The proposed conceptual model and hypotheses are established upon Lin’s (2007) general framework for studying knowledge sharing.
3.4.1 Descriptive research

Descriptive research is “a type of conclusive research that has as its major objective the description of something” (Malhotra, 2004, p. 78). It is particularly useful to describe certain characteristics of relevant groups, estimate the percentage of a specific population exhibiting a particular behavior, determine the perceptions of product characteristics, determine the degree to which variables are associated, and make specific predictions (Malhotra, 2004). A conclusive research can “assist the decision maker in determining, evaluating, and selecting the best course of action in a given situation” (Malhotra, 2002, p. 85).

Since the research topic is about the predictability of individual, organizational, and technology factors on knowledge sharing processes, a descriptive research approach will be appropriate for the research objectives. A descriptive research approach can help to describe the knowledge sharing characteristics in the Hong Kong construction group, estimate the percentage of individual construction practitioners exhibiting particular knowledge sharing behavior, determine the perceptions of knowledge sharing characteristics, determine the degree to which knowledge sharing variables are associated, and investigate the specified predictability.

3.4.2 Cross-sectional design

Cross-sectional design, also known as a survey design, “entails the collection of data on more than one case (usually quite a lot more than one) and at a single point in time in order to collect a body of quantititative or quantifiable data in connection with two or more variables (usually many more than two), which are then examined to detect patterns of association” (Bryman, 2008, p. 44). It is considered as “a snapshot of the marketplace taken at a specific point in time” (Malhotra, 2002, p.90). In a cross-sectional design, the chosen group of respondents from any sample of population is measured only once.
Compared with a longitudinal design, in which “two or more measurements on the same variables are obtained from a given group of respondents at different points in time” (Malhotra, 2002, p. 91), cross-sectional design is relatively more simple and cost effective in selecting a representative sample “whose characteristics of interest are a reflection of the entire population” (Malhotra, 2002, p. 93). Furthermore, response bias can be minimized because different respondents are selected to participate in the research each time. A cross-sectional design is appropriate for the research method that uses a survey to analyze the variation in more than one case, collect data at a single point in time, examine quantitative or quantifiable associations among variables, and identify the patterns of associations among variables. However, cross-sectional design is less capable than longitudinal design in detecting change, collecting large amount of data, and achieving accuracy (Malhotra, 2002).

3.4.3 Conceptual framework

Based on Lin’s (2007) general framework for studying knowledge sharing, the proposed conceptual framework of the research is established on the dimensions of knowledge sharing enablers and knowledge sharing processes as in Figure 3.1.
As illustrated in Figure 3.2, in the original study of Lin (2007), the dimension of knowledge sharing enablers includes individual, organizational, and technology factors that can positively influence the dimension of knowledge sharing processes that consists of knowledge donating and knowledge collecting. In the dimension of knowledge sharing enablers, five key variables are identified in the original study of Lin (2007). First, individual factors include enjoyment to help and knowledge self-efficacy as two key independent variables. Second, organizational factors include top management support and organizational reward as two key independent variables. Third, technology factors include IT support as one key independent variable. In the dimension of knowledge sharing processes, knowledge donating and knowledge collecting are identified as two key dependent variables. There are totally seven key variables in the original research.
model of Lin (2007).

To construct the proposed knowledge sharing conceptual framework in the construction industry of Hong Kong, by adding an extra key independent variable of trust, there are eight key variables as organized in Figure 3.3. The proposed conceptual framework forms the basis for testing the six proposed hypotheses of the research.

Figure 3.2: Knowledge sharing enablers and knowledge sharing processes in the original research model (Lin, 2007, p.318).
3.4.4 Hypotheses testing

Research hypotheses are “predictive statements about the relationship between variables” (Leech et al., 2008, p. 3). Proposed hypotheses can be the tentative answers to the research question and sub-questions (Neuman, 2000). The purpose of hypothesis testing is to “explain the nature of certain relationships, or establish the differences among groups or the independence of two or more factors in a situation” (Cavana et al., 2001). A causal hypothesis shall have at least two variables, represent a cause-effect relationship between the variables, relate to a research question and a theory logically, be capable to test to be true or false against empirical evidence, and represent a prediction of anticipated future outcome (Neuman, 2000).

In the research, there are six proposed hypotheses for testing the relationships among the eight key variables in the conceptual model. Since the dimension of knowledge sharing processes can be divided into knowledge donating and knowledge collecting (Van den Hooff & De Ridder, 2004; Van den Hooff & Van
Weenen, 2004), each proposed hypothesis is denoted separately by part (a) and part (b) that represent the testing of hypotheses for knowledge donating and knowledge collecting respectively.

For individual factors, the original study of Lin (2007) does not include trust in the dimension of knowledge sharing enablers. In fact, trust can positively influence the amount of knowledge sharing (Nahapiet & Ghoshal, 1998; Lee & Choi, 2003). Trust is based on reciprocal faith (Kreitner & Kinicki, 1992). Lack of trust among employees may create knowledge sharing barriers within the organization (Szulanski, 1996). Employees with high mutual trust are more enthusiastic to share knowledge without any withholding (Lee & Choi, 2003). Thus, the first hypothesis with parts (a) and (b) is formulated as below.

Individual factors - Trust:

H\textsubscript{1} (a)  Trust can significantly predict employee’s willingness to donate knowledge.

H\textsubscript{1} (b)  Trust can significantly predict employee’s willingness to collect knowledge.

Enjoyment to help is based on altruism (Organ, 1988; Constant et al., 1994). Employees may become more favorable to share knowledge when helping the others (Wasko & Faraj, 2000; Wasko & Faraj, 2005). Although enjoyment to help can initiate intrinsic motivation for knowledge sharing (Amabile, 1997), it is claimed that relative altruism is more prevalent than absolute altruism (Smith, 1981). Thus, the second hypothesis with parts (a) and (b) is formulated as below.

Individual factors - Enjoyment to help:

H\textsubscript{2} (a)  Enjoyment to help can significantly predict employee’s willingness to donate knowledge.
H 2 (b) Enjoyment to help can significantly predict employee’s willingness to collect knowledge.

Knowledge self-efficacy involves an employee’s own judgment of his or her capability in achieving a certain level of performance (Constant et al., 1994; Spreitzer, 1995). Self-efficacy is a motivational force in knowledge sharing (Wasko & Faraj, 2005). However, an employee may decline from knowledge donating if he or she believes the knowledge cannot make a positive impact (Kankanhalli et al., 2005). Thus, the third hypothesis with parts (a) and (b) is formulated as below.

Individual factors - Knowledge self-efficacy:

H 3 (a) Knowledge self-efficacy can significantly predict employee’s willingness to donate knowledge.

H 3 (b) Knowledge self-efficacy can significantly predict employee’s willingness to collect knowledge.

For organizational factors, if the support from top management is perceived to be high by the employees, employees will believe their knowledge sharing practices are encouraged positively (Tan & Zhao, 2003). In a socio-technical perspective, top management support can penetrate organizations’ infrastructure, info-structure, and info-culture to derive a knowledge sharing objective for all employees (Pan & Scarbrough, 1998). With top management support, an organization can cultivate and sustain a knowledge sharing culture (Liebowitz, 1999). Thus, the fourth hypothesis with parts (a) and (b) is formulated as below.

Organizational factors - Top management support:

H 4 (a) Top management support can significantly predict employee’s willingness to donate knowledge.
H 4 (b) Top management support can significantly predict employee’s willingness to collect knowledge.

Organizational reward requires the establishment of a reward system with either monetary or non-monetary incentives (Davenport & Prusak, 1998; Hargadon, 1998). There is a controversy that intrinsic motivation such as enjoyment, satisfaction, interest, and challenge is more important than extrinsic motivation such as money and physical reward (Amabile, 1998). It is unrealistic to assume employees will automatically share knowledge without a strong rewarding motivator (Al-Alawi et al., 2007). Thus, the fifth hypothesis with parts (a) and (b) is formulated as below.

Organizational factors - Organizational reward:
H 5 (a) Organizational reward can significantly predict employee’s willingness to donate knowledge.
H 5 (b) Organizational reward can significantly predict employee’s willingness to collect knowledge.

For technology factors, IT support can eliminate communication barriers and support convenient knowledge sharing (Ruggles, 1998). However, IT support alone cannot maintain employees’ commitment to knowledge sharing (Currie & Kerrin, 2004). In fact, IT support helps organizations and their stakeholders to facilitate rapid access to knowledge, participate in knowledge sharing processes, and integrate fragmented knowledge (Lee & Choi, 2003). Thus, the sixth hypothesis with parts (a) and (b) is formulated as below.

Technology factors - IT support:
H 6 (a) IT support can significantly predict employee’s willingness to donate knowledge.
H 6 (b) IT support can significantly predict employee’s willingness to collect knowledge.

To test the six proposed hypotheses, valid and reliable measurement and scaling must be carefully chosen in order to meet the research objectives and answer the research question and sub-questions.

3.5 MEASUREMENT AND SCALING
In any research, the measurement and scaling are qualified to be sufficient only if there are relatively high values of validity and reliability. Any scientific technique must be subjected to checks and controls on validity and reliability (Baker, 2002a). Without assessment criteria in the identified epistemology, ontology, and methodology, research will be unclear and misunderstanding (Drisko, 1997). Therefore, the explicit criterion of validity and reliability must be consistent with the chosen epistemology, ontology, and methodology within the positivist paradigm. Measurement is about “assigning numbers or other symbols to characteristics of objects according to certain prespecified rules” (Malhotra, 2004, p. 236). It is about measuring some characteristics of an object instead of measuring the object itself directly (Malhotra, 2002). The measurement process of quantitative research is in the sequence of conceptualization, operationalization, and applying the operational definition (Neuman, 2000). The flow moves deductively from the abstract level of theory to the concrete level of empirical findings in reality. To choose an itemized rating scale that has numbers and brief descriptions associated with different categories, a seven-point Likert scale will be used to measure the eight key variables of the research.

Any variable in a deductive hypothesis can be either an independent variable that causes something, or a dependent variable that is caused by something (Neuman, 2000). In the dimension of knowledge sharing enablers, trust, enjoyment to help,
and knowledge self-efficacy are categorized as three independent variables in the individual factors. Top management support and organizational reward are classified as two independent variables in the organizational factors. IT support is recognized as one independent variable in the technology factors. In the dimension of knowledge sharing processes, knowledge donating and knowledge collecting are identified as two dependent variables that can be significantly predicted by the independent variables.

3.5.1 Validity

Validity concerns “the extent to which a measurement actually measures those features the investigator wishes to measure, and provides information that is relevant to the questions being asked” (Baker, 2002b, p. 105). It refers to “the extent to which any measuring instrument measures what it is intended to measure” (Carmines & Zeller, 1979, p. 17), “the scientific utility of a measuring instrument, broadly statable in terms of how well it measures what it purports to measure” (Nunnally & Bernstein, 1994, p. 83), and “whether an indicator (or set of indicators) that is devised to gauge a concept really measures that concept” (Bryman, 2008, p. 151). Generally, validity is more difficult to achieve than reliability (Neuman, 2000).

There are several types of measurement validity that enhance a true or correct measure. For example, there are face validity, concurrent validity, content validity, construct validity, convergent validity, criterion validity, and predictive validity (Neuman, 2000; Bryman, 2008). Face validity is confirmed by asking others if the measure truly reflects the content of the research concept. Concurrent validity uses a criterion to measure cases that are known to be different and relevant to the research concept. Content validity concerns if the full content of a definition is represented in the research concept. Construct validity requires the deduction of hypotheses from other theories that are relevant to the research concept.
Convergent validity involves the comparison of measurements that are developed by other methods but in the same research concept. Criterion validity utilizes certain standard or criterion to measure the research concept accurately. Predictive validity uses a future criterion instead of a contemporary one in measuring the research concept. Validity has the accuracy and specificity that can relate a variable to actually answering the research question and sub-questions. To establish validity in the research findings, the research will use factor analysis to check for validity in data analysis.

3.5.2 Reliability
Reliability concerns “the extent to which an experiment, test, or any measuring procedure yields the same results on repeated trails” (Carmines & Zeller, 1979, p. 11) and “the extent to which measurement is repeatable and consistent” to be free from random error (Baker, 2002b, p. 104). In general, there are external and internal reliability. External reliability “refers to the degree of consistency of a measure over time” (Bryman & Cramer, 2009, p. 76). Internal reliability is especially important to multiple-item scaling. It checks “whether each scale is measuring a single idea and hence whether the items that make up the scale are internally consistent” (Bryman & Cramer, 2009, p. 77). The consistency to measure a concept is supported by stability, internal reliability, and inter-observer consistency (Bryman, 2008). When being reliable, “the numerical results produced by an indicator do not vary because of characteristics of the measurement process or measurement instrument itself” (Neuman, 2000, p. 164). There are a few types of measurement reliability. For example, there are stability reliability, equivalence reliability, representative reliability, and inter-observer consistency (Neuman, 2000; Bryman, 2008). Stability reliability involves if the measurement of the same sample on different occasions is stable over time. Equivalence reliability requires the use of multiple indicators in a measurement. Representative reliability concerns the coverage across sub-groups and
sub-populations in a measurement. Inter-observer consistency concerns when there is a lot of subjective judgments that cause a lack of consistency in a measurement. Reliability has precision, sensitivity, resolution, and consistency in supporting unbiased measurement of a variable. To confirm reliability in the research findings, the research will use Cronbach’s alpha to check for internal reliability in data analysis.

3.5.3 Measurement
Measurement “consists of rules for assigning symbols to objects so as to (1) represent quantities of attributes numerically (scaling) or (2) define whether the objects fall in the same or different categories with respect to a given attribute (classification)” (Nunnally & Bernstein, 1994, p. 3). A consistent measurement can be a yardstick to estimate the degree of relationships among concepts and distinguish the fine differences among respondents in terms of characteristics when answering the research question and sub-questions (Bryman, 2008). Therefore, an indicator shall be used in the measurement of each identified variable especially when the variable cannot be directly quantifiable.

An indicator is “something that is devised or already exists and that is employed as though it were a measure of a concept” (Bryman, 2008, p. 145). It refers to “single variable used in conjunction with one or more other variables to form a composite measure” (Hair, Anderson, Tatman & Black, 1998, p. 89). For example, an indicator can be expressed in the form of a question in a self-completion questionnaire, a recording of an individual’s behavior in a structured observation, or an examination of mass media content in content analysis (Bryman, 2008). The concern of the research is whether using one indicator is sufficient to measure a concept precisely. By using a single indicator to measure, the research may classify samples and individuals incorrectly, be too general and capture only a limited portion of the underlying concept, and be incapable to classify things into
finer distinctions (Bryman, 2008). Furthermore, individual item in a single indicator usually relates poorly to the specific attributes of the research questions, possesses a degree of specificity that does not relate to the relevant attributes, tends to relate to other attributes instead of the intended attributes, has random measurement error that decreases reliability, and classifies respondents into small number of groups (Nunnally & Bernstein, 1994). Rather than using a single indicator, the research will employ a multiple indicators measure to measure each key variable. The formation of the multiple indicators measure will be further explained in questionnaire design.

3.5.4 Scaling

Scaling is an extension and part of a measurement in which objects are being placed along a continuum for measurement (Malhotra, 2004). A scale is a measure that “captures the intensity, direction, level, or potency of a variable construct” (Neuman, 2000, p. 176). It can help to increase validity and reliability, reduce excessive data, and simplify and condense the abundant information from data collection (Neuman, 2000). The primary scales of measurement can be classified into nominal scale, ordinal scale, interval scale, and ratio scale (Nunnally & Bernstein, 1994; Malhotra, 2004). Nominal scale involves a figurative label in which objects are identified and classified by a labeling of numbers. Ordinal scale is a ranking scale that indicates the relative positioning of objects but not their magnitudes of differences. Interval scale divides a measurement equally into numerical distances in which differences of objects can be compared. Ratio scale consists of the characteristics of nominal scale, ordinal scale, and interval scale in addition to the computation of ratios in comparing different objects.

Likert scale is “a multiple-indicator or multiple-item measure of a set of attitudes relating to a particular area” (Bryman, 2008, p.146). It “states the issue or opinion and obtains the respondents’ degree of agreement or disagreement” (Alreck &
Settle, 2004, p. 120). The purpose of the Likert scale is to measure the intensity of feelings when a respondent is asked to indicate a level of agreement with each item (statement) that relates to a particular theme in a questionnaire. The seven-point Likert scale ranges numerically from 1 as strongly disagree, 4 as neutral, to 7 as strongly agree. In the research, a seven-point Likert scale will be the chosen measurement scale because the same seven-point scale has been used in the original study of Lin (2007). By using a Likert scale, the numerical scores of all respondents will be aggregated across items to form a total score for each item in the questionnaire. Then, the aggregated scores of each item will be analyzed on an item by item basis to generate research findings in data analysis.

A questionnaire in the form of a Likert scale is easy to create and administer. The simplicity of the Likert scale can provide the advantages of “flexibility, economy, and ease of composition” (Alreck & Settle, 2004, p. 121). The flexibility allows items to be freely written in short or long sentences, and in simple or complicated wordings. The economy permits one set of scales and instructions to measure many different kinds of items. The ease of composition enables the questionnaire to be constructed easily and quickly by adopting and combining previously constructed items. Furthermore, Likert scale has the ability to measure unquantifiable attitude or opinion to obtain an aggregated numerical value for data analysis. Since respondents can simply understand how to use the Likert scale, it is appropriate for the research to use the scale in the self-completion online questionnaire. However, respondents may need more time to read each statement and complete the questionnaire than other itemized rating scales (Malhotra, 2004).

3.5.5 Independent variables

Independent variables and dependent variables can “reflect the tendency to think in terms of causes and effects” (Bryman, 2008, p.156). In quantitative research, each hypothesis must have at least two variables. Within the dimension of
knowledge sharing enablers, the independent variables of the research can be classified into individual, organization, and technology factors. The individual factors include trust, enjoyment to help, and knowledge self-efficacy as three independent variables. The organizational factors include top management support and organizational reward as two independent variables. Moreover, the technology factors include IT support as one independent variable. The research has totally six independent variables.

3.5.6 Dependent variables
Within the dimension of knowledge sharing processes, knowledge donating and knowledge collecting are identified as two dependent variables. In order to construct the proposed conceptual framework, the research will test the six proposed hypotheses to see if the six independent variables can significantly predict the two dependent variables. The six independent variables and two dependent variables constitute six proposed hypotheses or twelve relationships. Each hypothesis is denoted by part (a) and part (b) for analyzing the two dependent variables of knowledge donating and knowledge collecting respectively. The six independent variables and two dependent variables will constitute the questionnaire design of the research.

3.6 QUESTIONNAIRE DESIGN
A questionnaire is “a formalized set of questions for obtaining information from respondents” (Malhotra, 2002, p. 310). It is also a “package that presents the questions and later contains the record of response for one respondent” (Alreck & Settle, 2004, p. 146). In the research, the first part of the questionnaire introduces the survey and the academic purpose of the research to the potential respondents through the use of an information letter. The central part of the questionnaire consists of thirty-one structured items and a Likert scale that will be used to measure the eight key variables relating to the research topic. The questionnaire
design of the research is primarily based on the original study of Lin (2007). By adding four items from Lee & Choi (2003) to measure the additional individual factor of trust, and subtracting the irrelevant items that measure firm innovation capability from the original study of Lin (2007), the questionnaire of the research consists of thirty-one items that are expressed in the form of statements. Since the thirty-one items are adopted from previous research, a seven-point Likert scale instead of other forms of itemized rating scale will be used in order to maintain the validity and reliability that are possessed in the original studies of Lee & Choi (2003) and Lin (2007), especially when both research simultaneously use a seven-point Likert scale in measuring the relevant variables in their previous questionnaires.

The eight key variables of the research are trust, enjoyment to help, knowledge self-efficacy, top management support, organizational reward, IT support, knowledge donating, and knowledge collecting. To construct the questionnaire, four items are adopted from Lee & Choi (2003), four items are adopted from Wasko & Faraj (2000), four items are adopted from Spreitzer (1995), four items are adopted from Tan & Zhao (2003), four items are adopted from Davenport & Prusak (1998) and Hargadon (1998), four items are adopted from Lee & Choi (2003), three items are adopted from Van den Hooff & Van Weenen (2004), and four items are adopted from Van den Hooff & Van Weenen (2004) respectively in measuring the eight key variables, with a total of thirty-one items.

In the dimension of knowledge sharing enablers, for individual factors, the following four items are adopted from Lee & Choi (2003) to measure the independent variable of trust, which is coded as TR.

Individual factors - Trust (4 items):

TR 1  My colleagues are generally trustworthy.
TR 2 My colleagues have reciprocal faith in others’ intentions and behaviors.
TR 3 My colleagues have reciprocal faith in others’ abilities.
TR 4 My colleagues have reciprocal faith in others’ decisions towards organizational interests than individual interests.

The following four items are adopted from Wasko & Faraj (2000) to measure the independent variable of enjoyment to help, which is coded as EH.

Individual factors - Enjoyment to help (4 items):
EH 1 I enjoy sharing my knowledge with colleagues.
EH 2 I enjoy helping colleagues by sharing my knowledge.
EH 3 It feels good to help someone by sharing my knowledge.
EH 4 Sharing my knowledge with colleagues is pleasurable.

The following four items are adopted from Spreitzer (1995) to measure the independent variable of knowledge self-efficacy, which is coded as SE.

Individual factors - Knowledge self-efficacy (4 items):
SE 1 I am confident in my ability to provide knowledge that others in my company consider valuable.
SE 2 I have the expertise required to provide valuable knowledge for my company.
SE 3 It does not really make any difference whether I share my knowledge with colleagues.
SE 4 Most other employees can provide more valuable knowledge than I can.

For organizational factors, the following four items are adopted from Tan & Zhao (2003) to measure the independent variable of top management support, which is coded as MS.
Organizational factors - Top management support (4 items):

MS 1  Top managers think that encouraging knowledge sharing with colleagues is beneficial.
MS 2  Top managers always support and encourage employees to share their knowledge with colleagues.
MS 3  Top managers provide most of the necessary help and resources to enable employees to share knowledge.
MS 4  Top managers are keen to see that the employees are happy to share their knowledge with colleagues.

The following four items are adopted from Davenport & Prusak (1998) and Hargadon (1998) to measure the independent variable of organizational reward, which is coded as OR.

Organizational factors - Organizational reward (4 items):

OR 1  Sharing my knowledge with colleagues shall be rewarded with higher salary.
OR 2  Sharing my knowledge with colleagues shall be rewarded with higher bonus.
OR 3  Sharing my knowledge with colleagues shall be rewarded with promotion.
OR 4  Sharing my knowledge with colleagues shall be rewarded with increased job security.

For technology factors, the following four items are adopted from Lee & Choi (2003) to measure the independent variable of IT support, which is coded as IT.

Technology factors - IT support (4 items):
IT 1  Employees make extensive use of electronic storage to access knowledge.

IT 2  Employees use electronic knowledge networks to communicate with other colleagues.

IT 3  My company uses technology that allows employees to share knowledge with other persons inside the organization.

IT 4  My company uses technology that allows employees to share knowledge with other persons outside the organization.

In the dimension of knowledge sharing processes, the following three items are adopted from Van den Hooff & Van Weenen (2004) to measure the dependent variable of knowledge donating, which is coded as KD.

Knowledge sharing processes - Knowledge donating (3 items):

KD 1  When I have learned something new, I tell my colleagues about it.
KD 2  When they have learned something new, my colleagues tell me about it.
KD 3  Knowledge sharing among colleagues is considered normal in my company.

The following four items are adopted from Van den Hooff & Van Weenen (2004) to measure the dependent variable of knowledge collecting, which is coded as KC.

Knowledge sharing processes - Knowledge collecting (4 items):

KC 1  I share information I have with colleagues when they ask for it.
KC 2  I share my skills with colleagues when they ask for it.
KC 3  My colleagues share knowledge with me when I ask them to.
KC 4  My colleagues share their skills with me when I ask them to.

Adopting already existing items is a very common practice among research. If the
thirty-one items are confirmed to be valid and reliable in previous research, the measuring quality of the items is already proved to be valid and reliable in measuring the eight key variables. Thus, the thirty-one items that are adopted from previous research tend to be valid and reliable in constituting the questionnaire design of the research. To utilize the questionnaire, proper sample size and sampling technique are required to locate the qualified respondents in answering the questionnaire.

3.7 POPULATION, SAMPLE, AND SAMPLING
Within the total research population, locating suitable sample and using appropriate sampling technique can generally increase the representativeness and generalization of the research findings (Cavana et al., 2001). By employing a positivist paradigm, the research will survey a sample size of 180 out of a total population of 226,149 individual construction practitioners in Hong Kong (Census and Statistics Department, 2008) (Appendix A). Sampling will use cluster sampling technique to gain quick access to a large sample size within a limited time period.

3.7.1 Population
At the year end of 2007, Hong Kong had a total population of 226,149 individual construction practitioners (Census and Statistics Department, 2008) (Appendix A). The scope of individual construction practitioners includes all employees working in building and civil engineering, architecture, surveying, project engineering, real estate development, leasing, brokerage, and maintenance management in Hong Kong. To identify potential respondents as sample from the target population, choosing an appropriate sample size and sampling technique is required.

3.7.2 Sample
A sample can be defined as a “segment of the population that is selected for
investigation” (Bryman, 2008, p. 168) or a “subgroup of the population selected for participation in the study” (Malhotra, 2004, p. 314). A sample unit, that is “the smallest entity that will provide one response” in the questionnaire (Alreck & Settle, 2004, p. 56), will be an individual construction practitioner who works in the construction industry of Hong Kong. To determine a suitable sample size for the target population, the research will investigate a sample size of 180 individual construction practitioners in Hong Kong. The reasoning for choosing 180 individual construction practitioners as the sample size is because a sample size of 180 is already statistically sufficient in generating research findings in the original study of Lin (2007).

3.7.3 Sampling

Sampling is “the process of selecting a sufficient number of elements from the population so that by studying the sample, and understanding the properties or characteristics of the sample subjects, it would be possible to generalise the properties or characteristics to the population elements” (Cavana et al., 2001, p. 253). The process can be primarily classified into probability sampling and non-probability sampling.

Probability sampling is applied when the probability of each sample unit chosen from the population is known and the chance to be selected is fairly equal. The approach is “often associated with survey and to a lesser extent experiment research” (Saunders, Lewis & Thornhill, 2003, p. 152). Non-probability sampling is applied when the probability of each sample unit chosen from the population is unknown, making it impossible to answer the research questions, address the research objectives, and analyze the statistical characteristics within the population. In the research, probability sampling will be used because the probability of each sample unit chosen from the target population is already known and there is a fairly equal chance to be selected. Moreover, probability
sampling is more suitable to the research that is conducted in a survey design. Simple random sampling, systematic sampling, stratified random sampling, multi-stage sampling, and cluster sampling are several sampling techniques that associate with probability sampling (Saunders et al., 2003).

Among all probability sampling techniques, the research will employ cluster sampling technique to locate potential respondents as sample. In cluster sampling, the target population is divided into naturally occurring groups based on an industry or a geographical area (Saunders et al., 2003). The naturally occurring groups are “mutually exclusive and collectively exhaustive subpopulations called clusters” (Malhotra, 2004, p. 328). Cluster sampling technique relates sampling to relevant clusters instead of individuals. For example, cluster sampling will investigate the clusters including an industry or an area in the initial stage, and then investigate the sample units from the selected clusters (Bryman, 2008). Cluster sampling can increase sample efficiency, decrease cost, and enable a quick access to obtain a large sample (Malhotra, 2002). However, it also has a tradeoff of losing precision when investigating naturally occurring groups. Due to the time constraint of only one month for data collection, cluster sampling is suitable for the research to access a large sample size within a short period of time.

In the research, cluster sampling will involve the cluster of the construction industry of Hong Kong in which sample units of individual construction practitioners will be selected from a naturally occurring group. To apply the cluster sampling technique, the research will frame the target sample by investigating a pre-established naturally occurring group of the Hong Kong General Chamber of Commerce. Founded in 1861, the Hong Kong General Chamber of Commerce is the oldest and largest chamber of commerce in Hong Kong with more than 4,000 organizational members (Hong Kong General Chamber of Commerce, 2009). By identifying all the 448 construction
organizational members of the Hong Kong General Chamber of Commerce, the research will randomly select individual construction practitioners from the 448 organizations to represent the construction industry of Hong Kong. The Hong Kong General Chamber of Commerce has a public website that posts a business directory of the 448 organizations online. All individual construction practitioners working in the 448 organizations are qualified to be potential respondents in answering the research questionnaire. After determining the proper sample and sampling technique, the research needs to consider feasible data collection methods.

3.8 DATA COLLECTION METHODS
Survey is the most popularly used quantitative data collection method especially when the research objective is to collect data that associates with self-reported behavior, attitude, characteristic, classification, expectation, and knowledge (Neuman, 2000). It can be “an easier, quicker, less expensive, or more accurate way” to collect data (Alreck & Settle, 2004, p. 3). By creating a broad data collection channel in a large population economically, survey is “logical, deterministic, general, parsimonious and specific” to conform to scientific specifications (Hart, 1987, p. 187). Furthermore, survey possesses the characteristics of flexibility, versatility, specialization, and efficiency (Alreck & Settle, 2004). The merits of survey can develop transparent research procedures, quantifiable data for decision making, simple presentation of complex information, comparability, and acquisition of complexity on a comparable basis (Ticehurst & Veal, 2000). However, survey may have distorted accuracy caused by the influence of the questioning process, and unwillingness and inability of the respondents in sharing the desired data (Hart, 1987).

3.8.1 Online survey
In the research, data collection is processed via an online survey in the internet.
Compared with traditional survey, online survey can be economical in terms of money and time, eliminate physical boundaries and geographical distances, penetrate a large sample of the population easily, collect and manage data efficiently, and avoid missing data and unanswered questions (Bryman, 2008). Although internet access is still not universal, the coverage and usage of the internet is very common in Hong Kong. An internet based survey is suitable to target employees at work, reach organizational contacts, and approach computer related and professional occupations (Alreck & Settle, 2004). However, an online survey may have low response rate when potential respondents ignore the invitation to participate in the online survey, lack motivation to answer the online questionnaire, worry about the anonymity and confidentiality of the online responses, and have anxiety about computer hacker and internet fraud (Bryman, 2008). Moreover, there is a risk that some respondents may generate online responses more than once to influence the research findings.

3.8.2 Initial contacts
By randomly selecting individual construction practitioners working in the 448 organizations in the construction industry of Hong Kong, potential respondents are initially contacted by email with a cover letter (Appendix B), and then referred to the research website in which the information statement (Appendix D) and questionnaire (Appendix E) are uploaded. The email contacts of the potential respondents can be found in the business directory under the public website of the Hong Kong General Chamber of Commerce.

3.8.3 Languages
Since the official languages in Hong Kong are both English and Chinese, the information letter and questionnaire will include both English and Chinese with academic translation verification from the Hong Kong Management Association (Appendix C). The English and Chinese wordings of the online survey aim to
possess “focus, brevity, and clarity” (Alreck & Settle, 2004, p. 89).

3.8.4 Information statement

The information statement is posted in the research website for potential respondents to read before participating in the online survey (Appendix D). It will clearly explain the research topic, academic purpose, expected time of completing the questionnaire, anonymous nature, and implied consent of the survey to the respondents. The contacts of the researchers and The University of Newcastle will also be included in the information statement in case the respondents have any inquiry or complaint about the research. Furthermore, the access, storage, and disposal of the gathered electronic data will be briefly described in the information statement.

3.8.5 Questionnaire

The beginning of the questionnaire will state the definition of an individual construction practitioner and guide the respondents to self-complete the online questionnaire. Then, the questionnaire will introduce the seven-point Likert scale that will be used to rate the respondents’ degree of agreement with each item in the latter part of the questionnaire. Before answering the questionnaire, the respondents will be reminded again about the voluntariness and implied consent in participating in the research. If the respondents agree to participate in the online questionnaire, they are required to answer the thirty-one structured items with closed answers in about ten minutes. To fill in the online questionnaire, the respondents need to click on one of the seven icons in which a dot will appear to indicate a level of agreement with each item in the seven-point Likert scale.

When the respondents submit the self-completed questionnaire online (Appendix E), implied consent is already confirmed because of the anonymous nature of the survey. Collecting data online is almost instantaneous and at a low cost. The
collected data will be stored in the research website until the data collection period ends. The data collection period is expected to be one month from the date of receiving ethics approval from The University of Newcastle. Once the number of collected data reaches the targeted sample size of 180, the collected data will be downloaded to the primary researcher’s personal computer for further statistical analysis.

3.9 DATA ANALYSIS
The SPSS software will be the main tool for data analysis. Factor analysis will be used to test for validity and Cronbach’s alpha will be used to test for reliability of the research findings. Univariate linear regression will be used to test the predictability of the independent variables on the dependent variables for the hypotheses. The hypothesis is statistically one-tailed as the direction is given for the type of relationship.

3.9.1 Factor analysis
To test for validity, factor analysis is “employed in relation to multiple-indicator measures to determine whether groups of indicators tend to bunch together to form distinct clusters, referred to as factors” (Bryman, 2008, p. 161). It analyzes “the way in which each respondent completed all the opinion items and compares this with the way in which every other respondent completed each and every item, and then suggests that certain items have come together on particular factors” (Cavana et al., 2001, p. 439). Factor analysis is particularly useful to analyze relationships “among a large number of variables and to explain these variables in terms of their common underlying dimensions (factors)” (Hair et al., 1998, p. 14), especially “in relation to multiple-item measures, like Likert scales” (Bryman, 2008, p. 161).

There are primarily two classes of factor analysis, namely exploratory factor
analysis and confirmatory factor analysis. Exploratory factor analysis “uses statistics to identify an underlying structure among the various items that form a scale” (Allen, Titsworth & Hunt, 2009, p. 179). In particular, research associated with exploratory factor analysis “may not have any specific expectations regarding the number or the nature of underlying constructs of factors” (Thompson, 2004, p. 5). Alternatively, confirmatory factor analysis requires a research to define the measurement model or factors, a priori, before performing the analysis. Research associated with confirmatory factor analysis “requires or expects particular items to be associated with a particular factor” (Allen et al., 2009, p. 183). In confirmatory factor analysis, a research shall have “specific expectations regarding (a) the number of factors, (b) which variables reflect given factors, and (c) whether the factors are correlated” (Thompson, 2004, p. 6). Since the research is a replication of Lin’s (2007) study, using confirmatory factor analysis is more appropriate than exploratory factor analysis, especially when specific expectations regarding the criteria mentioned above already exist.

In the research, a multiple items measure is used to measure each key variable. Therefore, a principal components analysis will be conducted on all items of each scale to examine a single factor structure. Significant factors will be screened by calculating the eigenvalue > 1 in which the total variance of each significant factor in the other items will be explained (Hair et al., 1998). According to Hair et al.’s (1998) 0.5 criterion, the analysis will check if each item has a statistically satisfactory factor loading on the first component. A factor loading represents the “correlation between the original variables and the factors, and the key to understanding the nature of a particular factor” (Hair et al., 1998, p. 89). Sometimes, an item may load negatively on the first component. To solve this, a reversed coding is required to change the Likert scale rating from 1 to 7, 2 to 6, 3 to 5, 5 to 3, 6 to 2, and 7 to 1. If any item has a factor loading lower than 0.5, it will be removed from the relative scale because it fails to load on the first
component satisfactorily. After removing the items that have dissatisfactory loadings, another principal components analysis will be conducted until all remaining items have satisfactory loadings of above the 0.5 level as suggested by Hair et al. (1998).

3.9.2 Cronbach’s alpha
Cronbach’s alpha can provide “actual estimates of reliability” (Nunnally & Bernstein, 1994, p. 212) by calculating the “average of all possible split-half reliability coefficients” (Bryman, 2008, p. 151). The alpha varies from 0 to 1. As the number of scale items increases, the value of the Cronbach’s alpha also tends to increase (Malhotra, 2004). Higher value of the Cronbach’s alpha indicates higher reliability among the indicators (Hair et al., 1998). To test for internal reliability, Cronbach’s alpha will be calculated to check if the result is above Nunnally’s (1978) 0.7 criterion. Even if the result is below 0.7, a Cronbach’s alpha of more than 0.6 is still acceptable (Hair et al., 1998). Only scale that has satisfactory internal reliability can provide empirical evidence in supporting the relevant hypotheses. If internal reliability is dissatisfactory, the items cannot be combined into a single scale factor.

3.9.3 Univariate linear regression
Regression analysis is “a statistical method that develops an equation (usually a linear model) that relates a dependent variable to one or more independent (predictor or explanatory) variables” (Cavana et al., 2001, p. 461). Univariate linear regression is powerful to analyze the associative relationship and significance between one independent variable and one dependent variable (Malhotra, 2004). Since the research topic is to investigate the predictability of the individual, organizational, and technology factors on knowledge sharing processes, univariate linear regression is the most suitable analysis to test if each independent variable can significantly predict each dependent variable. After all, regression analysis
can “predict the future with an acceptable level of accuracy” (Hair, Babin, Money & Samouel, 2003, p. 291).

Regression analysis requires one independent variable and one dependent variable to be identified and derived from an interval scale like the Likert scale (Alreck & Settle, 2004). To have successful prediction, the significance level of the regression analysis needs to be less than 0.05 (De Veaux, Velleman & Bock, 2007; Leech, Barrett & Morgan, 2008). Although the independent variable can explain a significant variation in the dependent variable to test whether a relationship exists, regression analysis concerns only “the nature and degree of association between variables and does not imply or assume any causality” (Malhotra, 2004, p. 503).

3.10 ETHICAL CONSIDERATIONS
The research complies with all ethical implications set by The University of Newcastle. Under ethical concerns, all respondents shall be protected without being harmed physically or psychologically. By respecting the dignity of the respondents, the research avoids causing any legal harm, career harm, income harm, anxiety, discomfort, stress, or loss of self-esteem to the respondents (Neuman, 2000). All respondents will not receive any reward, payment, or reimbursement for participating in the research. Moreover, there is no conflict of interest, funding, sponsorship, or affiliation that may impact the research findings. After all, the research aims to be honest and transparent without any deception or misrepresentation (Bell & Bryman, 2007).

The information statement of the research will clearly explain the academic purpose and emphasize the implied consent of the anonymous online survey. Implied consent is confirmed once the respondents submit the self-completed questionnaire online because of the anonymous nature of the online survey. All respondents will be reminded by the information statement that they are voluntary
to participate or exit the online survey at anytime. By closing the questionnaire in the internet, voluntary respondents have the rights to withdraw at any stage of the survey with their entered data being destroyed accordingly. The access, storage, and disposal of the collected electronic data will also be explained in the information statement. In addition, the information statement will state the contacts of the researchers and The University of Newcastle in case the respondents have any inquiry or complaint about the research.

Anonymity and privacy of the respondents, as well as the confidentiality of the collected electronic data, will be carefully protected without being invaded or abused (Bryman, 2008). Only the declared researchers and the examiners of the dissertation are authorized to access the collected electronic data that is stored in the primary researcher’s personal computer with password protection. The electronic data will be copied to a compact disc as backup data and locked in the primary researcher’s safekeeping for at least five years before disposal. Upon expiry of the five years period, the gathered electronic data that is stored in the primary researcher’s personal computer will be deleted permanently and the backup compact disc will be destroyed accordingly by a shredder.

3.11 LIMITATIONS
There are several limitations that may impact the research findings in the positivist research. First, there may be response bias that may affect research findings because respondents may answer the questionnaire in the way they think the researchers want them to answer rather than according to their true beliefs. Second, there is no benchmark to measure if employees are sharing or withholding knowledge fully or partially in knowledge sharing. Third, using cluster sampling technique to investigate the pre-established naturally occurring group of the Hong Kong General Chamber of Commerce may reduce precision of research findings. Fourth, there may be distorted accuracy caused by
unwillingness and inability in revealing facts when respondents self-complete the online survey. Fifth, the research has a cross-sectional design and the data collection period has a time constraint of only one month. A prolonged longitudinal study with changes over time is not feasible to conduct. Sixth, personal traits such as age, education, work experience, and organizational characteristics such as company size and financial capital, may cause unforeseeable moderation or mediation effect on the research findings. Seventh, it is impossible to monitor if the same respondent generates multiple online responses to influence the research findings. Eighth, potential respondents who do not have internet access are incapable to participate in the research because initial contacts are made by email and the research uses an online survey. Ninth, the research findings are not triangulated because only quantitative research method is used.

3.12 CONCLUSION
The research methodology chapter narrows down the research topic into one research question and three research sub-questions. By discussing the epistemology, ontology, and methodology between positivism and interpretivism, the research justifies to use positivism as the chosen research paradigm. Based on a descriptive research approach with cross-sectional design, the research proposes a conceptual model and six hypotheses for testing in the construction industry of Hong Kong. Emphasizing the importance of measurement validity and reliability, the research will employ a multiple-indicator measure for measurement and a seven-point Likert scale for scaling. The research has six independent variables and two dependent variables. The questionnaire design consists of thirty-one items that are adopted from previous research. By using cluster sampling technique, the research will survey a sample of 180 out of a total population of 226,149 individual construction practitioners who work in the 448 construction organizations that are organizational members of the Hong Kong General
Data collection uses an online survey in which potential respondents will be initially contacted by email with a cover letter, and then referred to self-complete the online questionnaire in a research website. Data analysis uses factor analysis and Cronbach’s alpha to test for validity and reliability respectively. Univariate linear regression is used to test if the independent variables can significantly predict the dependent variables. Ethical considerations and limitations of the research are clearly discussed. When the number of collected data meets the required sample size of 180, the research can move onto further data analysis and discussion.
CHAPTER 4: DATA ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

When the number of collected data reaches the targeted sample size of 180, the data is downloaded from the research website for further statistical analyses in the SPSS. First of all, the collected data will be aggregated and averaged to form a net score for each key variable. The net scores of trust, enjoyment to help, knowledge self-efficacy, top management support, organizational reward, IT support, knowledge donating, and knowledge collecting will be calculated and coded as NTR, NEH, NSE, NMS, NOR, NIT, NKD, and NKC respectively. Second, descriptive statistics will be generated to have an overview of the collected data’s central tendency, skewness, kurtosis, and frequency distribution. Third, factor analysis will be conducted in the SPSS to perform a principal components analysis in testing the validity of the multiple-indicator measures for all key variables. A principal components analysis can check whether the relative items in the questionnaire can be combined into a single scale of measurement that can demonstrate validity. For example, as for the key variable of trust, the items of TR 1, TR 2, TR 3, and TR 4 will be checked by factor analysis to confirm if the four items can be combined into a single scale in measuring trust. Subsequently, all thirty-one items in the questionnaire will be tested by factor analysis to confirm if each item can fit in its relative single scale of measurement in establishing validity. Fourth, Cronbach’s alpha will be calculated for checking the internal reliability of the measurement scale. As Cronbach’s alpha cannot test for unidimensionality, therefore it is conducted after a principal components analysis. Moreover, Cronbach’s alpha is only used for unidimensional scales. Fifth, the statistical technique of univariate linear regression will be performed to test the six proposed hypotheses to confirm if each independent variable can significantly predict each dependent variable. Sixth, there will be discussion of the research findings. Finally, there will be a conclusion of the chapter to conclude the research findings and
4.2 DATA CODING

Data coding is about “systematically reorganizing raw data into a format that is machine readable” (Neuman, 2000, p. 314). In order to measure each key variable of the research, the scores of the relative items in the questionnaire will be aggregated and averaged to form a net score for each variable. For example, for the key variable of trust, the items of TR 1, TR 2, TR 3, and TR 4 will be aggregated and averaged to form a net score of trust, which is coded as NTR. Similarly, the net scores of enjoyment to help, knowledge self-efficacy, top management support, organizational reward, IT support, knowledge donating, and knowledge collecting will be calculated and coded as NEH, NSE, NMS, NOR, NIT, NKD, and NKC respectively as shown in Table 4.1. Specifically, as in the original study of Lin (2007), the items of SE 3 and SE 4 in NSE need to be reversely coded for data analysis. For example, the scores of items SE 3 and SE 4 will change from 1 to 7, 2 to 6, 3 to 5, 5 to 3, 6 to 2, and 7 to 1 to align with other items in the seven-point Likert scale. The coding of all key variables is illustrated in Table 4.1.

<table>
<thead>
<tr>
<th>Key variables</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Trust (TR 1, TR 2, TR 3, and TR 4)</td>
<td>NTR</td>
</tr>
<tr>
<td>2. Enjoyment to help (EH 1, EH 2, EH 3, and EH 4)</td>
<td>NEH</td>
</tr>
<tr>
<td>3. Knowledge self-efficacy (SE 1, SE 2, SE 3*, and SE 4*)</td>
<td>NSE</td>
</tr>
<tr>
<td>4. Top management support (MS 1, MS 2, MS 3, and MS 4)</td>
<td>NMS</td>
</tr>
<tr>
<td>5. Organizational reward (OR 1, OR 2, OR 3, and OR 4)</td>
<td>NOR</td>
</tr>
<tr>
<td>6. IT support (IT 1, IT 2, IT 3, and IT 4)</td>
<td>NIT</td>
</tr>
<tr>
<td>7. Knowledge donating (KD 1, KD 2, and KD 3)</td>
<td>NKD</td>
</tr>
<tr>
<td>8. Knowledge collecting (KC 1, KC 2, KC 3, and KC 4)</td>
<td>NKC</td>
</tr>
</tbody>
</table>

* Items need to be reversely coded.
4.3 DESCRIPTIVE STATISTICS

After coding the data and making it computable in the SPSS, descriptive statistics are generated to create an overview of the collected data as in Table 4.2. In the 180 collected samples, no data is missing because one advantage of using an online survey is that it does not accept any missing data during data collection. By conducting multiple statistical tests, SPSS can calculate descriptive statistics to examine the normality of the frequency distribution (Park, 2008). As shown in Table 4.2, the eight key variables of the research have means between 4.59 and 5.9. Their medians are between 4.5 and 6. The results show that most respondents indicate their intensity of feelings between neutral and strongly agree when they are asked to indicate a level of agreement with each item in the seven-point Likert scale. It is obvious that NOR has the lowest average whereas NEH has the highest average among the eight key variables. In addition, the variances of the eight key variables are between 0.814 and 2.306. Variance is a measure of statistical dispersion that calculates how much a variable deviates from its mean. The result shows that all variances are reasonable and acceptable. Moreover, the maximum ratings of all key variables are 7 whereas the minimum ratings are equal to or less than 3.25. The widest range is 6 for NOR and the narrowest range is 3.75 for NEH. Although the ranges of the variables vary widely, the result shows that the maximum and minimum ratings are within a reasonable and acceptable range. In general, the descriptive statistics show that there is no missing or abnormal data. As a result, the collected data is good and acceptable for further statistical analysis.
Statistics

<table>
<thead>
<tr>
<th></th>
<th>NTR</th>
<th>NEH</th>
<th>NSE</th>
<th>NMS</th>
<th>NOR</th>
<th>NIT</th>
<th>NKD</th>
<th>NKC</th>
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</thead>
<tbody>
<tr>
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<td>180</td>
<td>180</td>
<td>180</td>
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<td>180</td>
<td>180</td>
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<td>0</td>
<td>0</td>
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<td>5.2639</td>
<td>5.3208</td>
<td>4.5903</td>
<td>5.1597</td>
<td>4.8796</td>
<td>5.6097</td>
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<td>.06745</td>
<td>.08919</td>
<td>.11320</td>
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<td>.08341</td>
<td>.07203</td>
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<td>4.5000</td>
<td>5.2500</td>
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<td>5.7500</td>
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<td>8.19</td>
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<td>1.252</td>
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<td>-.365</td>
<td>-.057</td>
<td>-.590</td>
<td>-.266</td>
<td>-.602</td>
<td>-.072</td>
<td>-.410</td>
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<td>-.411</td>
<td>-.467</td>
<td>-.004</td>
<td>-.311</td>
<td>-.502</td>
<td>-.335</td>
<td>.001</td>
</tr>
<tr>
<td>Std. Error of Kurtosis</td>
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<td>.360</td>
<td>.360</td>
<td>.360</td>
<td>.360</td>
<td>.360</td>
<td>.360</td>
<td>.360</td>
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<td>4.00</td>
<td>5.50</td>
<td>6.00</td>
<td>5.75</td>
<td>5.67</td>
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<td>3.00</td>
<td>1.50</td>
<td>1.00</td>
<td>1.25</td>
<td>1.35</td>
<td>2.50</td>
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<tr>
<td>Maximum</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
</tr>
</tbody>
</table>

Table 4.2: Descriptive statistics of trust, enjoyment to help, knowledge self-efficacy, top management support, organizational reward, IT support, knowledge donating, and knowledge collecting.

Skewness measures the degree of symmetry in a probability frequency distribution (Leech et al., 2008). When the values in a distribution are skewed, they are likely to cluster at either end of the frequency distribution (Bryman & Cramer, 2009). If skewness is positive, the distribution is skewed to the right in which the right tail is longer. It indicates the distribution is more concentrated on the left and thus there are fewer high values. In contrast, if skewness is negative, the distribution is skewed to the left in which the left tail is longer. It represents the distribution is more concentrated on the right and thus there are more high values. As illustrated in Table 4.2, only NSE has a positive skewness. As indicated, the distribution of NSE is slightly skewed to the right and has a longer right tail in the frequency distribution. Therefore, the distribution of NSE is more concentrated on the left and has relatively fewer high values. On the other hand, the distributions of NTR, NEH, NMS, NOR, NIT, NKD, and NKC have negative skewness. They are skewed to the left and have longer left tail in the frequency distribution. As a result, their distributions are more concentrated on the right and have relatively more high values. Overall, the frequency distributions of all key variables do not have a large positive or negative skewness value, which means...
that all key variables are approximately normally distributed and do not deviate significantly from normality (Leech et al., 2008). As long as the key variables are not extremely skewed, they are sufficient and acceptable to answer the research question and sub-questions.

Skewness and kurtosis indicate how much a variable deviates from normal distribution (Park, 2008). Kurtosis refers to the degree of steepness in a frequency distribution and demonstrates whether there are too many or too few data lying close to the mean. A positive kurtosis is leptokurtic which means the kurtosis is too steep and there are too many data lying close to the mean. Conversely, a negative kurtosis is platykurtic which means the kurtosis is too flat and there are too many data lying away from the mean. In the research, only NIT has a positive kurtosis which means there are too many data lying close to the mean. However, NTR, NEH, NSE, NMS, NOR, and NKD have negative kurtosis which means there are too many data lying away from the mean. Furthermore, NKC has a kurtosis near to zero which means it is nearly mesokurtic. In general, there is no unanticipated or abnormal result in analyzing the skewness and kurtosis. As a result, the skewness and kurtosis show that the collected data is good and acceptable for more in-depth statistical analysis.

To present a more detailed overview of the collected data, the research will display the frequency distributions of all key variables in the form of a histogram. As shown in Figure 4.1, NTR has a mean of 4.9375 and a standard deviation of 1.0698. With a skewness of -0.086 and a kurtosis of -0.471, NTR is negatively skewed and platykurtic. The interpretation of the histogram shows that the collected data of trust is good and reliable for further analysis.
As shown in Figure 4.2, NEH has a mean of 5.9042 and a standard deviation of 0.90246. With a skewness of -0.585 and a kurtosis of -0.411, NEH is negatively skewed and platykurtic. The interpretation of the histogram illustrates that the collected data of enjoyment to help is good and reliable for further analysis.
As shown in Figure 4.3, NSE has a mean of 5.2639 and a standard deviation of 0.90495. With a skewness of 0.057 and a kurtosis of -0.467, NSE is positively skewed and platykurtic. The interpretation of the histogram indicates that the collected data of knowledge self-efficacy is good and reliable for further analysis.
As shown in Figure 4.4, NMS has a mean of 5.3208 and a standard deviation of 1.19656. With a skewness of -0.59 and a kurtosis of -0.094, NMS is negatively skewed and platykurtic. The interpretation of the histogram illustrates that the collected data of top management support is good and reliable for further analysis.
As shown in Figure 4.5, NOR has a mean of 4.5903 and a standard deviation of 1.51868. With a skewness of -0.266 and a kurtosis of -0.311, NOR is negatively skewed and platykurtic. The interpretation of the histogram demonstrates that the collected data of organizational reward is good and reliable for further analysis.
As shown in Figure 4.6, NIT has a mean of 5.1597 and a standard deviation of 1.23913. With a skewness of -0.662 and a kurtosis of 0.502, NIT is negatively skewed and leptokurtic. The interpretation of the histogram illustrates that the collected data of IT support is good and reliable for further analysis.
As shown in Figure 4.7, NKD has a mean of 4.8796 and a standard deviation of 1.11908. With a skewness of -0.072 and a kurtosis of -0.335, NKD is negatively skewed and platykurtic. The interpretation of the histogram shows that the collected data of knowledge donating is good and reliable for further analysis.
As shown in Figure 4.8, NKC has a mean of 5.6097 and a standard deviation of 0.96632. With a skewness of -0.41 and a kurtosis of 0.001, NKC is negatively skewed and nearly mesokurtic. The interpretation of the histogram shows that the collected data of knowledge collecting is good and reliable for further analysis.
4.4 FACTOR ANALYSIS

Confirmatory factor analysis will be performed by using the principal components analysis to check the validity of each key variable. Items of each key variable will be examined to test if they can form the proposed single factor structure for the relevant key variable. According to the eigenvalue > 1 rule, the significant factor is the principal component that explains the percentage of the total variance among the examined items. If an item has satisfactory loading above the 0.5 level as recommended by Hair et al. (1998), it is proved to be valid to constitute the single factor structure. Otherwise, if an item has dissatisfactory loading of less than the 0.5 level as suggested by Hair et al. (1998), it will be removed from its relative scale and followed by another principal components analysis.

4.4.1 Trust
A principal components analysis is conducted on the trust scale to see if TR 1, TR 2, TR 3, and TR 4 can constitute the proposed single factor structure for NTR. According to the eigenvalue > 1 rule, there is only one significant factor and it is the principal component that explains 73.9% of the total variance in the four items. As shown in Table 4.3, all four items have satisfactory loadings above the 0.5 level as recommended by Hair et al. (1998). Thus, the result suggests that all four items can form a single factor structure for the trust scale.

<table>
<thead>
<tr>
<th>Component</th>
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<th>Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR1</td>
<td>1.000</td>
<td>.740</td>
</tr>
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<td>TR2</td>
<td>1.000</td>
<td>.842</td>
</tr>
<tr>
<td>TR3</td>
<td>1.000</td>
<td>.759</td>
</tr>
<tr>
<td>TR4</td>
<td>1.000</td>
<td>.615</td>
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Extraction Method: Principal Component Analysis.

<table>
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<tr>
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<th>Extraction Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>73.900</td>
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<tr>
<td>2</td>
<td>.496</td>
<td>12.402</td>
</tr>
<tr>
<td>3</td>
<td>.344</td>
<td>8.609</td>
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Extraction Method: Principal Component Analysis.

<table>
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</thead>
<tbody>
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<td>TR1</td>
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<tr>
<td>TR2</td>
<td>.918</td>
</tr>
<tr>
<td>TR3</td>
<td>.871</td>
</tr>
<tr>
<td>TR4</td>
<td>.784</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

\* 1 components extracted.

Table 4.3: Factor analysis of trust.

4.4.2 Enjoyment to help

A principal components analysis is conducted on the enjoyment to help scale to see if EH 1, EH 2, EH 3, and EH 4 can constitute the proposed single factor structure for NEH. According to the eigenvalue > 1 rule, there is only one
significant factor and it is the principal component that explains 79.8% of the total variance in the four items. As shown in Table 4.4, all four items have satisfactory loadings above the 0.5 level as recommended by Hair et al. (1998). Thus, the result suggests that all four items can form a single factor structure for the enjoyment to help scale.

### Communalities

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<td>1.000</td>
<td>.851</td>
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<td>EH3</td>
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<td>.786</td>
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Extraction Method: Principal Component Analysis

### Total Variance Explained

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<th>Extraction Sums of Squared Loadings</th>
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</table>

Extraction Method: Principal Component Analysis

### Component Matrix

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<td>EH3</td>
<td>.891</td>
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<tr>
<td>EH4</td>
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</table>

Extraction Method: Principal Component Analysis

a. 1 components extracted.

Table 4.4: Factor analysis of enjoyment to help.

#### 4.4.3 Knowledge self-efficacy

A principal components analysis is conducted on the knowledge self-efficacy scale to see if SE 1, SE 2, SE 3, and SE 4 can constitute the proposed single factor structure for NSE. According to the eigenvalue > 1 rule, there is only one significant factor and it is the principal component that explains 50.099% of the total variance in the four items. As shown in Table 4.5, all four items have
satisfactory loadings above the 0.5 level as recommended by Hair et al. (1998). Thus, the result suggests that all four items can form a single factor structure for the knowledge self-efficacy scale.

<table>
<thead>
<tr>
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<tbody>
<tr>
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</tr>
<tr>
<td>SE2</td>
</tr>
<tr>
<td>SE3</td>
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<tr>
<td>SE4</td>
</tr>
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</table>

Extraction Method: Principal Component Analysis.

<table>
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<th>Total Variance Explained</th>
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<td>Total</td>
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<tr>
<td>3</td>
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<tr>
<td>4</td>
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Extraction Method: Principal Component Analysis.

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<tr>
<td>SE3</td>
</tr>
<tr>
<td>SE4</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
a. 2 components extracted.

Table 4.5: Factor analysis of knowledge self-efficacy.

4.4.4 Top management support

A principal components analysis is conducted on the top management support scale to see if MS 1, MS 2, MS 3, and MS 4 can constitute the proposed single factor structure for NMS. According to the eigenvalue > 1 rule, there is only one significant factor and it is the principal component that explains 74.39% of the total variance in the four items. As shown in Table 4.6, all four items have satisfactory loadings above the 0.5 level as recommended by Hair et al. (1998). Thus, the result suggests that all four items can form a single factor structure for
the knowledge self-efficacy scale.

\[
\begin{array}{|c|c|c|}
\hline
\text{Communalities} & \text{Initial} & \text{Extraction} \\
\hline
\text{MS1} & 1.000 & .715 \\
\text{MS2} & 1.000 & .818 \\
\text{MS3} & 1.000 & .680 \\
\text{MS4} & 1.000 & .762 \\
\hline
\end{array}
\]

Extraction Method: Principal Component Analysis.

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Total Variance Explained} & \text{Initial Eigenvalues} & \text{Extraction Sums of Squared Loadings} \\
\hline
\text{Component} & \text{Total} & \% \text{of Variance} & \text{Cumulative \%} & \text{Total} & \% \text{of Variance} & \text{Cumulative \%} \\
\hline
1 & 2.976 & 74.390 & 74.390 & 2.976 & 74.390 & 74.390 \\
2 & .515 & 12.866 & 87.256 & \\
3 & .295 & 7.383 & 94.639 & \\
4 & .214 & 5.361 & 100.000 & \\
\hline
\end{array}
\]

Extraction Method: Principal Component Analysis.

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Component Matrix} & \text{a} \\
\hline
\text{Component} & 1 \\
\hline
\text{MS1} & .846 \\
\text{MS2} & .904 \\
\text{MS3} & .825 \\
\text{MS4} & .873 \\
\hline
\end{array}
\]

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Table 4.6: Factor analysis of top management support.

4.4.5 Organizational reward

A principal components analysis is conducted on the organizational reward scale to see if OR 1, OR 2, OR 3, and OR 4 can constitute the proposed single factor structure for NOR. According to the eigenvalue > 1 rule, there is only one significant factor and it is the principal component that explains 86.317% of the total variance in the four items. As shown in Table 4.7, all four items have satisfactory loadings above the 0.5 level as recommended by Hair et al. (1998). Thus, the result suggests that all four items can form a single factor structure for the organizational reward scale.
### Communalities

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</tr>
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<td>1.000</td>
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<td>OR3</td>
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<td>0.872</td>
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<tr>
<td>OR4</td>
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<td>0.767</td>
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</table>

Extraction Method: Principal Component Analysis.

### Total Variance Explained

<table>
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<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Total % of Variance</td>
<td>Cumulative %</td>
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<tr>
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<tr>
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Extraction Method: Principal Component Analysis.

### Component Matrix

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<td>OR2</td>
<td>0.934</td>
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<tr>
<td>OR3</td>
<td>0.876</td>
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</table>

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Table 4.7: Factor analysis of organizational reward.

#### 4.4.6 IT support

A principal components analysis is conducted on the IT support scale to see if IT 1, IT 2, IT 3, and IT 4 can constitute the proposed single factor structure for NIT. According to the eigenvalue > 1 rule, there is only one significant factor and it is the principal component that explains 69.209% of the total variance in the four items. As shown in Table 4.8, all four items have satisfactory loadings above the 0.5 level as recommended by Hair et al. (1998). Thus, the result suggests that all four items can form a single factor structure for the IT support scale.
Table 4.8: Factor analysis of IT support.

4.4.7 Knowledge donating

A principal components analysis is conducted on the knowledge donating scale to see if KD 1, KD 2, and KD 3 can constitute the proposed single factor structure for NKD. According to the eigenvalue > 1 rule, there is only one significant factor and it is the principal component that explains 74.755% of the total variance in the three items. As shown in Table 4.9, all three items have satisfactory loadings above the 0.5 level as recommended by Hair et al. (1998). Thus, the result suggests that all three items can form a single factor structure for the knowledge donating scale.
Table 4.9: Factor analysis of knowledge donating.

4.4.8 Knowledge collecting

A principal components analysis is conducted on the knowledge collecting scale to see if KC 1, KC 2, KC 3, and KC 4 can constitute the proposed single factor structure for NKC. According to the eigenvalue > 1 rule, there is only one significant factor and it is the principal component that explains 75.669% of the total variance in the four items. As shown in Table 4.10, all four items have satisfactory loadings above the 0.5 level as recommended by Hair et al. (1998). Thus, the result suggests that all four items can form a single factor structure for the knowledge collecting scale.
Communalities

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</tr>
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<td>KC2</td>
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<td>.774</td>
</tr>
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<td>KC4</td>
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Extraction Method: Principal Component Analysis.

Total Variance Explained

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</tr>
</thead>
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<table>
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<th>Cumulative %</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>75.669</td>
<td>75.669</td>
</tr>
<tr>
<td>2</td>
<td>95.026</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>98.265</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>100.000</td>
<td></td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

Component Matrix

<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>KC1</td>
<td>.841</td>
</tr>
<tr>
<td>KC2</td>
<td>.874</td>
</tr>
<tr>
<td>KC3</td>
<td>.880</td>
</tr>
<tr>
<td>KC4</td>
<td>.884</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Table 4.10: Factor analysis of knowledge collecting.

4.5 CRONBACH’S ALPHA

Cronbach’s alpha will be used to indicate the internal reliability of a multiple items scale. According to Nunnally (1978), a Cronbach’s alpha of above 0.7 is satisfactory. However, some scholars such as Hair et al. (1998) claim that a Cronbach’s alpha of above 0.6 is still regarded as acceptable. When a Cronbach’s alpha is greater than 0.9, it means that the items are repetitious or the relative scale has more items than necessary to create an internally reliable measure of a concept (Leech et al., 2008).

4.5.1 Trust

Cronbach’s alpha is calculated to check the internal reliability of the four items in the trust scale. As shown in Table 4.11, the Cronbach’s alpha of TR 1, TR 2, TR 3,
and TR 4 is reported to be 0.873, which is above Nunnally’s (1978) 0.7 criterion. Thus, the result indicates that the four items scale has satisfactory internal reliability.

<table>
<thead>
<tr>
<th>Cronbach’s Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.873</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TR1</th>
<th>TR2</th>
<th>TR3</th>
<th>TR4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.000</td>
<td>.762</td>
<td>.649</td>
<td>.533</td>
</tr>
<tr>
<td>.762</td>
<td>1.000</td>
<td>.751</td>
<td>.619</td>
</tr>
<tr>
<td>.649</td>
<td>.751</td>
<td>1.000</td>
<td>.583</td>
</tr>
<tr>
<td>.533</td>
<td>.619</td>
<td>.583</td>
<td>1.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scale Mean if Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item-Total Correlation</th>
<th>Squared Multiple Correlation</th>
<th>Cronbach’s Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR1</td>
<td>14.54</td>
<td>11.110</td>
<td>.730</td>
<td>.597</td>
</tr>
<tr>
<td>TR2</td>
<td>14.78</td>
<td>10.908</td>
<td>.828</td>
<td>.713</td>
</tr>
<tr>
<td>TR3</td>
<td>14.82</td>
<td>10.739</td>
<td>.753</td>
<td>.597</td>
</tr>
<tr>
<td>TR4</td>
<td>15.10</td>
<td>10.191</td>
<td>.640</td>
<td>.419</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean</th>
<th>Variance</th>
<th>Std. Deviation</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.75</td>
<td>18.311</td>
<td>4.279</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4.11: Cronbach’s alpha of trust.

4.5.2 Enjoyment to help

Cronbach’s alpha is calculated to check the internal reliability of the four items in the enjoyment to help scale. As shown in Table 4.12, the Cronbach’s alpha of EH 1, EH 2, EH 3, and EH 4 is reported to be 0.914, which is highly above Nunnally’s (1978) 0.7 criterion. Thus, the result indicates that the four items scale has strong internal reliability. According to Leech et al. (2008), a very high
Cronbach’s alpha of above 0.9 means that the items in the scale are repetitious or the scale has more items than necessary in measuring the concept with internal reliability. As a result, the items in the enjoyment to help scale are found to be repetitive or more than necessary in measuring the enjoyment to help concept with internal reliability. In future research, the number of repetitive items in the enjoyment to help scale may be reduced.

### Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach’s Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.914</td>
<td>.915</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inter-Item Correlation Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>EH1</td>
</tr>
<tr>
<td>1.000</td>
</tr>
<tr>
<td>.772</td>
</tr>
<tr>
<td>.636</td>
</tr>
<tr>
<td>.715</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item-Total Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale Mean if Item Deleted</td>
</tr>
<tr>
<td>EH1</td>
</tr>
<tr>
<td>EH2</td>
</tr>
<tr>
<td>EH3</td>
</tr>
<tr>
<td>EH4</td>
</tr>
</tbody>
</table>

### Scale Statistics

<table>
<thead>
<tr>
<th>Mean</th>
<th>Variance</th>
<th>Std. Deviation</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.62</td>
<td>13.031</td>
<td>3.610</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4.12: Cronbach’s alpha of enjoyment to help.

### 4.5.3 Knowledge self-efficacy

Cronbach’s alpha is calculated to check the internal reliability of the four items in the knowledge self-efficacy scale. As shown in Table 4.13, the Cronbach’s alpha
of SE 1, SE 2, SE 3, and SE 4 is reported to be 0.63, which is below Nunnally’s (1978) 0.7 criterion. However, Hair et al. (1998) suggest that a Cronbach’s alpha of above 0.6 is still regarded as acceptable. Thus, the result indicates that the four items scale has acceptable internal reliability.

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.63</td>
<td>.661</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inter-Item Correlation Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE1</td>
</tr>
<tr>
<td>SE1</td>
</tr>
<tr>
<td>SE2</td>
</tr>
<tr>
<td>SE3</td>
</tr>
<tr>
<td>SE4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item-Total Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale Mean if Item Deleted</td>
</tr>
<tr>
<td>SE1</td>
</tr>
<tr>
<td>SE2</td>
</tr>
<tr>
<td>SE3</td>
</tr>
<tr>
<td>SE4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scale Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>21.06</td>
</tr>
</tbody>
</table>

Table 4.13: Cronbach’s alpha of knowledge self-efficacy.

4.5.4 Top management support

Cronbach’s alpha is calculated to check the internal reliability of the four items in the top management support scale. As shown in Table 4.14, the Cronbach’s alpha of MS 1, MS 2, MS 3, and MS 4 is reported to be 0.884, which is above Nunnally’s (1978) 0.7 criterion. Thus, the result indicates that the four items scale
has satisfactory internal reliability.

### Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.884</td>
<td>.885</td>
<td>4</td>
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</tbody>
</table>

### Inter-Item Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>MS1</th>
<th>MS2</th>
<th>MS3</th>
<th>MS4</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS1</td>
<td>1.000</td>
<td>.767</td>
<td>.531</td>
<td>.619</td>
</tr>
<tr>
<td>MS2</td>
<td>.767</td>
<td>1.000</td>
<td>.640</td>
<td>.699</td>
</tr>
<tr>
<td>MS3</td>
<td>.531</td>
<td>.640</td>
<td>1.000</td>
<td>.690</td>
</tr>
<tr>
<td>MS4</td>
<td>.619</td>
<td>.699</td>
<td>.690</td>
<td>1.000</td>
</tr>
</tbody>
</table>

### Item-Total Statistics

<table>
<thead>
<tr>
<th></th>
<th>Scale Mean if Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item-Total Correlation</th>
<th>Squared Multiple Correlation</th>
<th>Cronbach’s Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS1</td>
<td>15.62</td>
<td>14.495</td>
<td>.719</td>
<td>.601</td>
<td>.862</td>
</tr>
<tr>
<td>MS2</td>
<td>15.95</td>
<td>12.841</td>
<td>.809</td>
<td>.690</td>
<td>.826</td>
</tr>
<tr>
<td>MS3</td>
<td>16.28</td>
<td>13.330</td>
<td>.699</td>
<td>.524</td>
<td>.870</td>
</tr>
<tr>
<td>MS4</td>
<td>16.01</td>
<td>12.877</td>
<td>.768</td>
<td>.599</td>
<td>.842</td>
</tr>
</tbody>
</table>

### Scale Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Variance</th>
<th>Std. Deviation</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21.28</td>
<td>22,908</td>
<td>4.786</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4.14: Cronbach’s alpha of top management support.

### 4.5.5 Organizational reward

Cronbach’s alpha is calculated to check the internal reliability of the four items in the organizational reward scale. As shown in Table 4.15, the Cronbach’s alpha of OR 1, OR 2, OR 3, and OR 4 is reported to be 0.947, which is well above Nunnally’s (1978) 0.7 criterion. Thus, the result indicates that the four items scale has strong internal reliability. According to Leech et al. (2008), a very high Cronbach’s alpha of above 0.9 means that the items in the scale are repetitious or the scale has more items than necessary for an internally reliable measure of the
concept. As a result, the items in the organizational reward scale are found to be repetitive or more than necessary in measuring the organizational reward concept with internal reliability. In future research, the number of repetitive items in the organizational scale may be reduced.

### Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.947</td>
<td>.947</td>
<td>4</td>
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</tbody>
</table>

### Inter-Item Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>OR1</th>
<th>OR2</th>
<th>OR3</th>
<th>OR4</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR1</td>
<td>1.000</td>
<td>.934</td>
<td>.859</td>
<td>.761</td>
</tr>
<tr>
<td>OR2</td>
<td>.934</td>
<td>1.000</td>
<td>.836</td>
<td>.736</td>
</tr>
<tr>
<td>OR3</td>
<td>.859</td>
<td>.836</td>
<td>1.000</td>
<td>.773</td>
</tr>
<tr>
<td>OR4</td>
<td>.761</td>
<td>.736</td>
<td>.773</td>
<td>1.000</td>
</tr>
</tbody>
</table>

### Item-Total Statistics

<table>
<thead>
<tr>
<th>Item-Total Statistics</th>
<th>Scale Mean if Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item-Total Correlation</th>
<th>Squared Multiple Correlation</th>
<th>Cronbach’s Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR1</td>
<td>13.83</td>
<td>19.942</td>
<td>.922</td>
<td>.895</td>
<td>.914</td>
</tr>
<tr>
<td>OR2</td>
<td>13.83</td>
<td>20.445</td>
<td>.901</td>
<td>.877</td>
<td>.921</td>
</tr>
<tr>
<td>OR3</td>
<td>13.81</td>
<td>21.573</td>
<td>.880</td>
<td>.777</td>
<td>.928</td>
</tr>
<tr>
<td>OR4</td>
<td>13.62</td>
<td>22.539</td>
<td>.789</td>
<td>.634</td>
<td>.955</td>
</tr>
</tbody>
</table>

### Scale Statistics

<table>
<thead>
<tr>
<th>Mean</th>
<th>Variance</th>
<th>Std. Deviation</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.36</td>
<td>36.902</td>
<td>6.075</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4.15: Cronbach’s alpha of organizational reward.

### 4.5.6 IT support

Cronbach’s alpha is calculated to check the internal reliability of the four items in the IT support scale. As shown in Table 4.16, the Cronbach’s alpha of IT 1, IT 2, IT 3, and IT 4 is reported to be 0.844, which is above Nunnally’s (1978) 0.7 criterion. Thus, the result indicates that the four items scale has satisfactory
internal reliability.

### Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.844</td>
<td>.851</td>
<td>4</td>
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</table>

### Inter-Item Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>IT1</th>
<th>IT2</th>
<th>IT3</th>
<th>IT4</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT1</td>
<td>1.000</td>
<td>.735</td>
<td>.554</td>
<td>.485</td>
</tr>
<tr>
<td>IT2</td>
<td>.735</td>
<td>1.000</td>
<td>.647</td>
<td>.466</td>
</tr>
<tr>
<td>IT3</td>
<td>.554</td>
<td>.647</td>
<td>1.000</td>
<td>.670</td>
</tr>
<tr>
<td>IT4</td>
<td>.455</td>
<td>.466</td>
<td>.670</td>
<td>1.000</td>
</tr>
</tbody>
</table>

### Item-Total Statistics

<table>
<thead>
<tr>
<th></th>
<th>Scale Mean if Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item-Total Correlation</th>
<th>Squared Multiple Correlation</th>
<th>Cronbach’s Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT1</td>
<td>15.22</td>
<td>15.425</td>
<td>.669</td>
<td>.557</td>
<td>.808</td>
</tr>
<tr>
<td>IT2</td>
<td>15.19</td>
<td>14.836</td>
<td>.718</td>
<td>.623</td>
<td>.788</td>
</tr>
<tr>
<td>IT3</td>
<td>15.46</td>
<td>14.171</td>
<td>.753</td>
<td>.593</td>
<td>.772</td>
</tr>
<tr>
<td>IT4</td>
<td>16.05</td>
<td>13.713</td>
<td>.610</td>
<td>.459</td>
<td>.844</td>
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</tbody>
</table>

### Scale Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Variance</th>
<th>Std. Deviation</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20.64</td>
<td>24.567</td>
<td>4.957</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4.16: Cronbach’s alpha of IT support.

### 4.5.7 Knowledge donating

Cronbach’s alpha is calculated to check the internal reliability of the three items in the knowledge donating scale. As shown in Table 4.17, the Cronbach’s alpha of KD 1, KD 2, and KD 3 is reported to be 0.83, which is above Nunnally’s (1978) 0.7 criterion. Thus, the result indicates that the four items scale has satisfactory internal reliability.
### Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.830</td>
<td>0.831</td>
<td>3</td>
</tr>
</tbody>
</table>

### Inter-Item Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>KD1</th>
<th>KD2</th>
<th>KD3</th>
</tr>
</thead>
<tbody>
<tr>
<td>KD1</td>
<td>1.000</td>
<td>0.579</td>
<td>0.588</td>
</tr>
<tr>
<td>KD2</td>
<td>0.579</td>
<td>1.000</td>
<td>0.695</td>
</tr>
<tr>
<td>KD3</td>
<td>0.588</td>
<td>0.695</td>
<td>1.000</td>
</tr>
</tbody>
</table>

### Item-Total Statistics

<table>
<thead>
<tr>
<th></th>
<th>Scale Mean if Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item-Total Correlation</th>
<th>Squared Multiple Correlation</th>
<th>Cronbach’s Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>KD1</td>
<td>9.41</td>
<td>6.243</td>
<td>0.633</td>
<td>0.401</td>
<td>0.820</td>
</tr>
<tr>
<td>KD2</td>
<td>10.08</td>
<td>5.122</td>
<td>0.720</td>
<td>0.528</td>
<td>0.734</td>
</tr>
<tr>
<td>KD3</td>
<td>9.79</td>
<td>4.938</td>
<td>0.726</td>
<td>0.535</td>
<td>0.728</td>
</tr>
</tbody>
</table>

### Scale Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Variance</th>
<th>Std. Deviation</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14.64</td>
<td>11.271</td>
<td>3.357</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 4.17: Cronbach’s alpha of knowledge donating.

4.5.8 Knowledge collecting

Cronbach’s alpha is calculated to check the internal reliability of the four items in the knowledge collecting scale. As shown in Table 4.18, the Cronbach’s alpha of KC 1, KC 2, KC 3, and KC 4 is reported to be 0.889, which is above Nunnally’s (1978) 0.7 criterion. Thus, the result indicates that the four items scale has satisfactory internal reliability.
Table 4.18: Cronbach’s alpha of knowledge collecting.

### 4.6 UNIVARIATE LINEAR REGRESSION

Univariate linear regression is conducted to test the predictive utility of independent variables with respect to dependent variables. The univariate linear regression equation is written as

\[ Y = a + bx + e \]

where \( Y \) is the dependent variable, \( a \) is the value of the constant or intercept, \( b \) is the regression coefficient or slope, \( x \) is the independent or predictor variable, and \( e \) is the error term (Allen et al., 2009). From the SPSS output, R square is the coefficient of determination that indicates the amount of variation in the dependent variable explained by the independent variable (Bryman & Cramer, 2009). F test will be conducted within the analysis where the degrees of freedom is 1 for the numerator (regression) and 178 for the
denominator (residual). According to De Veaux et al. (2007) and Leech et al. (2008), when the significance level \( p < 0.05 \), the research finding is statistically significant and the null hypothesis shall be rejected. As a result, univariate linear regression can determine whether an independent variable can be a significant predictor of a dependent variable or not after the analysis. When a regression is significant and the unstandardized regression coefficient \( B \) of an independent variable is positive, there exists a relation that a high level of independent variable is generally associated with a high level of dependent variable, medium with medium, and low with low (Leech et al., 2008). On the other hand, when a regression is significant and the unstandardized regression coefficient \( B \) of an independent variable is negative, there exists a relation that a high level of independent variable is predictive of a low level of dependent variable, medium with medium, and low with high (Leech et al., 2008). If the regression is not significant, there is no statistically significant systematic association between an independent variable and a dependent variable (Leech et al., 2008).

4.6.1 Trust
As shown in Table 4.19, the regression equation of knowledge donating by trust is expressed as: \( \text{knowledge donating} = 1.968 + 0.59 \times \text{trust} \). The significance levels of the t tests for the constant and regression coefficient of the regression equation are very statistically significant. R square indicates that 31.8% of the variance in knowledge donating is explained by trust. The significance level associated with the F test is 0.000 which is a very high level. Thus, trust \( (B = 0.59, F (1, 178) = 82.931, t = 9.107, p < 0.001) \) is a very significant predictor of knowledge donating. Because the regression is significant and positive (Leech et al., 2008), the relation indicates that high trust is generally associated with high knowledge donating, medium with medium, and low with low.
Table 4.19: Univariate linear regression analysis of trust and knowledge donating.

As shown in Table 4.20, the regression equation of knowledge collecting by trust is expressed as: (knowledge collecting) = 3.519 + 0.423 (trust). The significance levels of the t tests for the constant and regression coefficient of the regression equation are very statistically significant. R square indicates that 22% of the variance in knowledge collecting is explained by trust. The significance level associated with the F test is 0.000 which is a very high level. Thus, trust (B = 0.423, F (1, 178) = 50.118, t = 7.079, p < 0.001) is a very significant predictor of knowledge collecting. Because the regression is significant and positive, the relation indicates that high trust is generally associated with high knowledge collecting, medium with medium, and low with low.
Table 4.2: Univariate linear regression analysis of trust and knowledge collecting.

4.6.2 Enjoyment to help

As shown in Table 4.2, the regression equation of knowledge donating by enjoyment to help is expressed as: (knowledge donating) = 1.653 + 0.547 (enjoyment to help). The significance levels of the t tests for the constant and regression coefficient of the regression equation are very statistically significant. R square indicates that 19.4% of the variance in knowledge donating is explained by enjoyment to help. The significance level associated with the F test is 0.000 which is a very high level. Thus, enjoyment to help (B = 0.547, F (1, 178) = 42.91, t = 6.551, p < 0.001) is a very significant predictor of knowledge donating. Because the regression is significant and positive, the relation indicates that high enjoyment to help is generally associated with high knowledge donating, medium with medium, and low with low.
Table 4.2: Univariate linear regression analysis of enjoyment to help and knowledge donating.

As shown in Table 4.2, the regression equation of knowledge collecting by enjoyment to help is expressed as: (knowledge collecting) = 1.936 + 0.622 (enjoyment to help). The significance levels of the t tests for the constant and regression coefficient of the regression equation are very statistically significant. R square indicates that 33.8% of the variance in knowledge collecting is explained by enjoyment to help. The significance level associated with the F test is 0.000 which is a very high level. Thus, enjoyment to help (B = 0.622, F (1, 178) = 90.738, t = 9.526, p < 0.001) is a very significant predictor of knowledge collecting. Because the regression is significant and positive, the relation indicates that high enjoyment to help is generally associated with high knowledge collecting, medium with medium, and low with low.
Table 4.2: Univariate linear regression analysis of enjoyment to help and knowledge collecting.

4.6.3 Knowledge self-efficacy

As shown in Table 4.23, the regression equation of knowledge donating by knowledge self-efficacy is expressed as: (knowledge donating) = 2.565 + 0.44 (knowledge self-efficacy). The significance levels of the t tests for the constant and regression coefficient of the regression equation are very statistically significant. R square indicates that 12.6% of the variance in knowledge donating is explained by knowledge self-efficacy. The significance level associated with the F test is 0.000 which is a very high level. Thus, knowledge self-efficacy (B = 0.44, F (1, 178) = 25.772, t = 5.077, p < 0.001) is a very significant predictor of knowledge donating. Because the regression is significant and positive, the relation indicates that high knowledge self-efficacy is generally associated with high knowledge donating, medium with medium, and low with low.
Table 4.23: Univariate linear regression analysis of knowledge self-efficacy and knowledge donating.

As shown in Table 4.24, the regression equation of knowledge collecting by knowledge self-efficacy is expressed as: (knowledge collecting) = 3.03 + 0.49 (knowledge self-efficacy). The significance levels of the t tests for the constant and regression coefficient of the regression equation are very statistically significant. R square indicates that 21.1% of the variance in knowledge collecting is explained by knowledge self-efficacy. The significance level associated with the F test is 0.000 which is a very high level. Thus, knowledge self-efficacy (B = 0.49, F (1, 178) = 47.516, t = 6.893, p < 0.001) is a very significant predictor of knowledge collecting. Because the regression is significant and positive, the relation indicates that high knowledge self-efficacy is generally associated with high knowledge collecting, medium with medium, and low with low.
Table 4.24: Univariate linear regression analysis of knowledge self-efficacy and knowledge collecting.

4.6.4 Top management support

As shown in Table 4.25, the regression equation of knowledge donating by top management support is expressed as: (knowledge donating) = 1.915 + 0.557 (top management support). The significance levels of the t tests for the constant and regression coefficient of the regression equation are very statistically significant. R square indicates that 35.5% of the variance in knowledge donating is explained by top management support. The significance level associated with the F test is 0.000 which is a very high level. Thus, top management support (B = 0.557, F (1, 178) = 97.912, t = 9.895, p < 0.001) is a very significant predictor of knowledge donating. Because the regression is significant and positive, the relation indicates that high top management support is generally associated with high knowledge donating, medium with medium, and low with low.
Table 4.2: Univariate linear regression analysis of top management support and knowledge donating.

As shown in Table 4.2, the regression equation of knowledge collecting by top management support is expressed as: (knowledge collecting) = 3.304 + 0.433 (top management support). The significance levels of the t tests for the constant and regression coefficient of the regression equation are very statistically significant. R square indicates that 28.8% of the variance in knowledge collecting is explained by top management support. The significance level associated with the F test is 0.000 which is a very high level. Thus, knowledge self-efficacy (B = 0.433, F (1, 178) = 71.939, t = 8.482, p < 0.001) is a very significant predictor of knowledge collecting. Because the regression is significant and positive, the relation indicates that high top management support is generally associated with high knowledge collecting, medium with medium, and low with low.
Model Summary

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a. Predictors: (Constant), NMS

ANOVA

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a. Predictors: (Constant), NMS
b. Dependent Variable: NKC

Coefficient

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a. Dependent Variable: NKC

Table 4.26: Univariate linear regression analysis of top management support and knowledge collecting.

4.6.5 Organizational reward

As shown in Table 4.27, the regression equation of knowledge donating by organizational reward is expressed as: (knowledge donating) = 4.25 + 0.137 (organizational reward). The significance levels of the t tests for the constant and regression coefficient of the regression equation are statistically significant. R square indicates that only 3.5% of the variance in knowledge donating is explained by organizational reward. The significance level associated with the F test is 0.012 which is a high level. Thus, organizational reward (B = 0.137, F (1, 178) = 6.388, t = 2.527, p < 0.05) is a significant predictor of knowledge donating. Because the regression is significant and positive, the relation indicates that high organizational reward is generally associated with high knowledge donating, medium with medium, and low with low.
Table 4.27: Univariate linear regression analysis of organizational reward and knowledge donating.

As shown in Table 4.28, the regression equation of knowledge collecting by organizational reward is expressed as: (knowledge collecting) = 5.293 + 0.069 (organizational reward). The significance level of the t test for the constant is statistically significant, but for the regression coefficient of the regression equation is not significant. R square indicates that only 1.2% of the variance in knowledge collecting is explained by organizational reward. The significance level associated with the F test is 0.147 which is a low level. Thus, organizational reward (B = 0.069, F (1, 178) = 2.125, t = 1.458, p > 0.05) cannot be a predictor of knowledge collecting. Because the regression is not significant (Leech et al., 2008), there is no statistically significant systematic association between organizational reward and knowledge collecting. In addition, the regression equation of knowledge collecting by organizational reward is unsupported.
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a. Predictors: (Constant), NOR
b. Dependent Variable: NKC

### Coefficient

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a. Dependent Variable: NKC

Table 4.28: Univariate linear regression analysis of organizational reward and knowledge collecting.

#### 4.6.6 IT support

As shown in Table 4.29, the regression equation of knowledge donating by IT support is expressed as: (knowledge donating) = 2.52 + 0.457 (IT support). The significance levels of the t tests for the constant and regression coefficient of the regression equation are statistically significant. R square indicates that 25.6% of the variance in knowledge donating is explained by IT support. The significance level associated with the F test is 0.000 which is a very high level. Thus, organizational reward (B = 0.457, F (1, 178) = 61.407, t = 7.836, p < 0.05) is a very significant predictor of knowledge donating. Because the regression is significant and positive, the relation indicates that high IT support is generally associated with high knowledge donating, medium with medium, and low with low.
As shown in Table 4.30, the regression equation of knowledge collecting by IT support is expressed as: (knowledge collecting) = 3.969 + 0.318 (IT support). The significance levels of the t tests for the constant and regression coefficient of the regression equation are very statistically significant. R square indicates that 16.6% of the variance in knowledge collecting is explained by IT support. The significance level associated with the F test is 0.000 which is a very high level. Thus, IT support (B = 0.318, F (1, 178) = 35.509, t = 5.959, p < 0.001) is a very significant predictor of knowledge collecting. Because the regression is significant and positive, the relation indicates that high IT support is generally associated with high knowledge collecting, medium with medium, and low with low.
Model Summary

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a. Predictors: (Constant), NIT

ANOVA

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a. Predictors: (Constant), NIT
b. Dependent Variable: NKC

Coefficient

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a. Dependent Variable: NKC

Table 4.30: Univariate linear regression analysis of IT support and knowledge collecting.

4.7 CONCEPTUAL FRAMEWORK

From the statistical analyses, the research finds that the proposed hypotheses of H 1 (a), H 1 (b), H 2 (a), H 2 (b), H 3 (a), and H 3 (b) are generally supported by rejecting the null hypotheses. Therefore, the individual factors of trust, enjoyment to help, and knowledge self-efficacy can significantly predict the knowledge sharing processes of knowledge donating and knowledge collecting. In addition, the research finds that the proposed hypotheses of H 4 (a), H 4 (b), and H 5 (a) are generally supported by rejecting the null hypotheses. Only H 5 (b) is unsupported by accepting the null hypothesis. Consequently, the organizational factor of top management support can significantly predict the knowledge sharing processes of knowledge donating and knowledge collecting. However, the organizational factor of organizational reward can only significantly predict the knowledge sharing process of knowledge donating. Hypothesis testing shows that organizational
reward cannot significantly predict the knowledge sharing process of knowledge collecting. Furthermore, the research finds that the proposed hypotheses of H 6 (a) and H 6 (b) are generally supported by rejecting the null hypotheses. Hence, the technology factor of IT support can significantly predict the knowledge sharing processes of knowledge donating and knowledge collecting. As a result, based on testing the six proposed hypotheses, a new knowledge sharing conceptual framework is established as in Figure 4.9.

![Figure 4.9: The new knowledge sharing conceptual framework in the construction industry of Hong Kong.](image)

### 4.8 DISCUSSION

The research provides both theoretical and practical contributions to Hong Kong’s construction industry. Theoretically, a new knowledge sharing conceptual framework is established by linking knowledge sharing enablers to predict the knowledge sharing processes in the construction industry of Hong Kong. For individual factors, the results show that all trust, enjoyment to help, and knowledge self-efficacy can significantly predict the knowledge sharing processes of both knowledge donating and knowledge collecting. For organizational factors,
the results indicate that organizational reward can only significantly predict knowledge donating and not knowledge collecting. However, top management support can significantly predict both knowledge donating and knowledge collecting. For technology factors, the results confirm that IT support can significantly predict the knowledge sharing processes of both knowledge donating and knowledge collecting.

For practical managerial implication, the research provides hints to organizations regarding how a knowledge sharing culture can be promoted by monitoring and encouraging the knowledge sharing enablers within the organizations. To promote a knowledge sharing culture, organizations can often encourage the individual, organizational, and technology factors of the knowledge sharing enablers in order to positively influence the knowledge sharing processes (knowledge donating and knowledge collecting). From the data analysis, except for organizational reward, the results indicate that a higher level of knowledge sharing enabler is generally associated with a higher level of knowledge donating and knowledge collecting, and lower with lower. In particular, organizational reward cannot positively influence knowledge collecting. To solve this, organizations may need to spend extra effort to set up new reward system with monetary or non-monetary incentives to motivate employees towards collecting new knowledge. By delving into the individual, organizational, and technology factors, an organization can identify and cultivate the knowledge sharing enablers to create an upper hand in knowledge management. Consequently, the organization can create and sustain more inimitable competitive advantages due to the advanced knowledge sharing practices (Kelleher & Levene, 2001; Reid, 2003).

4.9 CONCLUSION
The research organizes data coding for the key variables. In addition, the data analysis and discussion chapter generates descriptive statistics to analyze the
collected data’s central tendency, skewness, kurtosis, and frequency distribution. By conducting multiple statistical analyses, research findings are created from the collected data. The data collected from the 180 responses is examined by factor analysis and Cronbach’s alpha to confirm its validity and reliability respectively. In general, several key issues of the research findings are discussed. Other than the relation between organizational reward and knowledge collecting, univariate linear regression indicates that all independent variables can significantly predict all dependent variables. Except for hypothesis H 5 (b), all hypotheses H 1 (a), H 1 (b), H 2 (a), H 2 (b), H 3 (a), H 3 (b), H 4 (a), H 4 (b), H 5 (a), H 6 (a), H 6 (b) are supported in the constitution of the new knowledge sharing conceptual framework in the construction industry of Hong Kong. In addition, a higher level of knowledge sharing enabler is generally associated with a higher level of knowledge donating and knowledge collecting, medium with medium, and lower with lower. However, the relation between organizational reward and knowledge collecting has no systematic association.
Chapter 5: CONCLUSION

5.1 SUMMARY
By adding an individual factor of trust into Lin’s (2007) model and applying it to the construction industry of Hong Kong, the aim of the research is to investigate whether individual (trust, enjoyment to help, and knowledge self-efficacy), organizational (top management support and organizational reward), and technology factors (IT support) can significantly predict knowledge sharing processes (knowledge donating, knowledge collecting) in the construction industry of Hong Kong. After evaluating the epistemology, ontology, and methodology that suits the research topic and questions, the research chooses to use a positivist paradigm or quantitative approach. In addition, the research employs a descriptive research approach with a cross-sectional design.

For measurement, valid and reliable items are adopted from previous research. For scaling, a seven-point Likert scale is used to measure the degree of agreement with each item that is associated with each key variable. The six independent variables of the research include trust, enjoyment to help, knowledge self-efficacy, top management support, organizational reward, and IT support. The two dependent variables of the research include knowledge donating and knowledge collecting. The questionnaire design consists of four items from Lee & Choi (2003), four items from Wasko & Faraj (2000), four items from Spreitzer (1995), four items from Tan & Zhao (2003), four items from Davenport & Prusak (1998) and Hargadon (1998), four items from Lee & Choi (2003), three items from Van den Hooff & Van Weenen (2004), and four items from Van den Hooff & Van Weenen (2004) respectively, with a total of thirty-one items.

For data collection, the research surveys a sample of 180 individual construction practitioners in Hong Kong out of a total population of 226,149 (Census and
Statistics Department, 2008) (Appendix A). The scope of individual construction practitioners includes all employees working in building and civil engineering, architecture, surveying, project engineering, real estate development, leasing, brokerage, and maintenance management. Cluster sampling technique is used to identify potential respondents who work in 448 construction organizations that are organizational members of the Hong Kong General Chamber of Commerce. Data collection uses an online survey in which an information statement and an anonymous questionnaire are uploaded online to a research website. Potential respondents are initially contacted by email that is attached with a cover letter (Appendix B), and then guided to the research website to self-complete the online questionnaire (Appendix E). The address of the research website is listed in the cover letter within the initial contacting email. The information statement (Appendix D) will be posted in the research website for the respondents to read before participating in the online survey. The online questionnaire is in both English and Chinese languages with translation verification from the Hong Kong Management Association (Appendix C). Implied consent is confirmed once the respondents submit the self-completed questionnaires online.

For data analysis, factor analysis and Cronbach’s alpha are used to check for validity and reliability respectively. The results show that all collected data has satisfactory validity and reliability. By using univariate linear regression, the predictability of the independent variables on the dependent variables is tested. The research findings indicate that the knowledge sharing enablers of individual (trust, enjoyment to help, and knowledge self-efficacy), organizational (top management support), and technology factors (IT support) can significantly predict the knowledge sharing processes (knowledge donating and knowledge collecting). However, for organizational factors, organizational reward can only significantly predict knowledge donating. Hypothesis testing shows that organizational reward cannot significantly predict knowledge collecting.
Furthermore, data analysis indicates that the relation between organizational reward and knowledge collecting has no systematic association. Except for the relation between organizational reward and knowledge collecting, the research provides empirical evidence to support all other hypotheses in constituting a new knowledge sharing conceptual framework in the construction industry of Hong Kong. Although the relation between organizational reward and knowledge collecting has no systematic association, the research finds that a higher level of knowledge sharing enabler is generally associated with a higher level of knowledge donating and knowledge collecting, medium with medium, and lower with lower.

5.2 INTERPRETATION
After summarizing the study, findings, theoretical contribution, and practical implication of the research, the research will interpret the percentages of individual construction practitioners who practice each key variable for knowledge sharing in their organizations. When a measure is above neutral in the seven-point Likert scale, it is believed that an individual construction practitioner has a tendency to practice or the organization has a tendency to facilitate the relevant key variable for knowledge sharing. Because the research findings indicate that most key variables can significantly predict the knowledge sharing processes of knowledge donating and knowledge collecting, the interpretation will compare the percentages and discuss how each key variable can be better facilitated and enhanced for knowledge sharing in the construction industry of Hong Kong.

5.2.1 Trust
For individual factors, the percentage of individual construction practitioners who practice trust for knowledge sharing is illustrated in Table 5.1. Out of the 180 responses, 73.9 percent of them have a tendency to practice trust for knowledge
sharing in their organizations. For the 26.1 percent who distrust their colleagues in knowledge sharing, their organizations can arrange more social gatherings and face-to-face activities for them in the aim to build up their reciprocal faith in others and stimulate their knowledge sharing among each other (Davenport & Prusak, 1998; Soliman & Spooner, 2000; Styhre, 2008). In addition, the organizations can set up new knowledge policy so that the individual construction practitioners can share their knowledge and increase their level of trust simultaneously (Bowles, 1999). When a basic foundation of trust is established, it can increase the individual construction practitioners’ willingness to cooperate in order to develop further trust (Tyler & Kramer, 1996). Consequently, the developed mutual trust can facilitate knowledge sharing and knowledge creation in the construction industry of Hong Kong (Lee & Choi, 2003).

<table>
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Table 5.1: Percentage of individual construction practitioners who practice trust for knowledge sharing.

5.2.2 Enjoyment to help
As shown in Table 5.2, a majority of 94.4 percent of the 180 individual construction practitioners in Hong Kong have a tendency to practice enjoyment to help for knowledge sharing. The result indicates that a majority of the individual construction practitioners possess altruism in which they can help others without expecting anything in return (Krebs, 1975; Smith, 1981; Organ, 1988; Constant et al., 1994). Because enjoyment to help can create intrinsic motivation for the individual construction practitioners to share knowledge (Amabile, 1997; Davenport & Prusak, 1998), the individual construction practitioners are willing to become knowledge donators so that they can gain satisfaction (Wasko & Faraj, 2000) and intrinsic enjoyment in helping others (Constant et al., 1994; Ba et al., 2001). Only a minority of 5.6 percent do not possess enjoyment in helping others when sharing knowledge with colleagues in their organizations.

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Table 5.2: Percentage of individual construction practitioners who practice enjoyment to help for knowledge sharing.

5.2.3 Knowledge self-efficacy

As illustrated in Table 5.3, 90 percent of the 180 individual construction practitioners in Hong Kong have a tendency to practice knowledge self-efficacy
for knowledge sharing. The result means that a high percentage of the individual construction practitioners are confident of their capabilities in achieving certain levels of performance or finishing their job tasks successfully (Constant et al., 1994; Spreitzer, 1995; Chong & Choi, 2005). Furthermore, they believe their knowledge can improve work efficiency (Ba et al., 2001) and make a difference to their organizations (Wasko & Faraj, 2000). For the 10 percent who are not confident of their capabilities, their organizations can create knowledge self-efficacy for them by empowering them with a certain level of freedom, independence, discretion, and autonomy in their work activities (Conger & Kanungo, 1988; Spreitzer, 1995; Chong & Choi, 2005). Moreover, the organizations can increase their knowledge self-efficacy by assigning work with high level of task significance and empowering them with control over their own performance feedback (Chong & Choi, 2005).

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Table 5.3: Percentage of individual construction practitioners who practice knowledge self-efficacy for knowledge sharing.

5.2.4 Top management support
For organizational factors, the percentage of individual construction practitioners whose organizations facilitate top management support for knowledge sharing is illustrated in Table 5.4. Out of the 180 responses, 83.3 percent of the individual construction practitioners believe that there is top management support for knowledge sharing. In contrast, 16.7 percent of the individual construction practitioners think that top management provides inadequate support for knowledge sharing. When the individual construction practitioners perceive there is a high level of top management support to knowledge sharing, the individual construction practitioners will believe their organizations are positively encouraging their knowledge sharing practices (Tan & Zhao, 2003). Organizations can often enforce top management support on knowledge sharing by creating new knowledge roles such as chief knowledge officer and communities of practice (Ruggles, 1998; Liebowitz, 1999; Soliman et al., 2000; Wenger & Snyder, 2000; DeTienne et al., 2004). Furthermore, top management shall take the leading role to share knowledge and not to hoard knowledge (Bukowitz & Williams, 2000). In addition, top management is responsible to execute a knowledge based policy that can support the organizational culture to change toward a knowledge sharing culture (Civi, 2000; Koch, 2003; Reid, 2003). Because top management usually possesses more superior capabilities and power, any problem or constraint that may create barriers to knowledge sharing shall be eliminated by the top management (Chong & Choi, 2005; Chong, 2006).
Table 5.4: Percentage of individual construction practitioners whose organizations facilitate top management support for knowledge sharing.

5.2.5 Organizational reward

As shown in Table 5.5, only 56.1 percent of the 180 individual construction practitioners in Hong Kong believe that their organizations shall facilitate more organizational reward for knowledge sharing. However, 43.9 percent of the individual construction practitioners think that it is unnecessary for their organizations to offer more organization reward for knowledge sharing. Although the percentage that agrees with more organizational reward for knowledge sharing is higher, the difference between the two percentages is obviously very small. Hence, the result suggests that the individual construction practitioners do not have a common agreement on whether more organizational reward can lead to more knowledge sharing. As Davenport & Prusak (1998) and Hargadon (1998) point out, organizational reward requires organizations to establish a reward system with either monetary or non-monetary incentives. In addition,
organizational reward can be derived from intrinsic incentives such as public recognition and praise, and from extrinsic incentives such as higher salary, bonus, promotion, job security, and career development (Kankanhalli et al., 2005; Choi et al., 2008). As reported in the research findings, organizational reward can only significantly predict knowledge donating but not knowledge collecting in the knowledge sharing processes. In order to motivate the individual construction practitioners to actively collect knowledge, organizations must strive to identify the intrinsic motives, extrinsic motives, material incentives, and immaterial incentives that the individual construction practitioners desire (VonKortzfleisch & Mergel, 2002).

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Table 5.5: Percentage of individual construction practitioners whose organizations facilitate organizational reward for knowledge sharing.
5.2.6 IT support

For technology factors, the percentage of individual construction practitioners whose organizations facilitate IT support for knowledge sharing is illustrated in Table 5.6. The result indicates that 82.2 percent of the individual construction practitioners believe that their organizations can provide sufficient IT support for knowledge sharing. Indeed, IT support is a key enabler to knowledge sharing (Davenport & Prusak, 1998; Carillo et al., 2000; Lee & Choi, 2003; Mitchell, 2003; Choi et al., 2008). In contrast, 17.8 percent of the individual construction practitioners think that there is insufficient IT support in their organizations for knowledge sharing. To improve the level of IT support for knowledge sharing, organizations can map current enabling technologies to Binney’s (2001) knowledge management spectrum that classifies knowledge management applications into analytical, asset management, developmental, process, transactional, and innovation and creation. However, organizations shall not invest more than one-third of the total knowledge management investment into only IT (O’Dell et al., 2000). Nevertheless, IT support can assist the individual construction practitioners, their organizations, and their stakeholders to combine fragmented knowledge, gain rapid access to knowledge, and engage in the knowledge sharing processes (Lee & Choi, 2003).
Table 5.6: Percentage of individual construction practitioners whose organizations facilitate IT support for knowledge sharing.

### 5.2.7 Knowledge donating

For knowledge donating, as illustrated in Table 5.7, 70 percent of the individual construction practitioners have a tendency to practice knowledge donating in knowledge sharing. Conversely, 30 percent of the individual construction practitioners do not practice knowledge donating in knowledge sharing. As Van den Hooff & De Ridder (2004) and Van den Hooff & Van Weenen (2004) describe, knowledge donating is one direction of the two-way street in the knowledge sharing processes. Besides, knowledge donating involves how an individual construction practitioner communicates to others with his or her personal intellectual capital (Van den Hooff & De Ridder, 2004). According to the research findings, it is easier and more preferable for organizations to control or influence the knowledge sharing enablers instead of knowledge donating because
knowledge donating is dependent on the knowledge sharing enablers in the new conceptual framework.

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Table 5.7: Percentage of individual construction practitioners who practice knowledge donating for knowledge sharing.

5.2.8 Knowledge collecting

For knowledge collecting, as shown in Table 5.8, a majority of 92.8 percent of the individual construction practitioners have a tendency to practice knowledge collecting in knowledge sharing. On the other hand, only 7.2 percent of the individual construction practitioners have no tendency to practice knowledge collecting in knowledge sharing. As opposed to knowledge donating, knowledge collecting is an opposite direction of the two-way street in the knowledge sharing processes (Van den Hooff & De Ridder, 2004; Van den Hooff & Van Weenen, 2004). Indeed, knowledge collecting requires the individual construction practitioners to consult their colleagues in order to absorb their colleagues’ intellectual capital (Van den Hooff & De Ridder, 2004). Based on the research findings, it is more difficult for organizations to manipulate or affect knowledge collecting than the knowledge sharing enablers. The reason is that knowledge
collecting is dependent on the knowledge sharing enablers in the new conceptual framework.

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<td>5.0</td>
<td>5.0</td>
<td>82.2</td>
</tr>
<tr>
<td>6.75</td>
<td>2</td>
<td>1.1</td>
<td>1.1</td>
<td>83.3</td>
</tr>
<tr>
<td>7.00</td>
<td>30</td>
<td>16.7</td>
<td>16.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.8: Percentage of individual construction practitioners who practice knowledge collecting for knowledge sharing.

5.3 RECOMMENDATION

If an organization can identify the knowledge sharing enablers by investigating the individual, organizational, and technology factors, the organization can in fact cultivate or manipulate such knowledge sharing enablers in some ways. Subsequently, the organization can utilize the knowledge sharing enablers to positively influence the knowledge sharing processes (knowledge donating and knowledge collecting). Other than trust, enjoyment to help, knowledge self-efficacy, top management support, organizational reward, and IT support, an organization can often discover new or unidentified knowledge sharing enablers based on the individual, organizational, and technology factors. When an organization gains an upper hand in knowledge sharing, the organization can
create and sustain more inimitable competitive advantages due to its leading and more advanced knowledge sharing practices (Kelleher & Levene, 2001; Reid, 2003).

Furthermore, organizations shall focus on creating and maintaining a high level of all knowledge sharing enablers. As the research findings indicate, a higher level of knowledge sharing enablers is generally associated with a higher level of knowledge donating and knowledge collecting, medium with medium, and lower with lower. For example, if an organization possesses a low level of trust, it will operate in a low level of knowledge sharing. As in the relation between organizational reward and knowledge collecting, some knowledge sharing enablers may actually have no systematic association with the knowledge sharing processes. Nevertheless, organizations shall keep an eye on the knowledge sharing enablers that have a positive association with knowledge donating and knowledge collecting. For example, to create and maintain a high level of trust, organizations can arrange more face-to-face meetings in which employees can have more opportunities to build up trust and share knowledge among each another (Davenport & Prusak, 1998; Soliman & Spooner, 2000; Styhre, 2008). Based on a higher level of trust, a higher level of knowledge donating and knowledge collecting will subsequently flourish throughout the organizational culture and structure. In a similar approach, the same logic applies to all other knowledge sharing enablers that are positively associated with knowledge donating and knowledge collecting.

For the direction of future research, further studies can concentrate on identifying new knowledge sharing enablers, modifying the established conceptual framework, adding new moderation or mediation effect, and applying the research to other industries and geographical locations. Based on the positivist research, future research may include interpretivism to form triangulation with positivism.
(Denzin, 1978; Bryman, 1984; Cassell et al., 2006). Since the individual factors of knowledge sharing enablers such as trust, enjoyment to help, and knowledge self-efficacy often involve the interplay of personal perceptions and behaviors, using an interpretivist approach can extend the direction of future research to discover more social phenomena, report more behavioral patterns, and delve into deeper insights (Guba & Lincoln, 1994; Draper, 2004; Bryman, 2008).

5.4 CONCLUSION
Based on replicating Lin’s (2007) study, the research successfully investigates the predictability of individual (trust, enjoyment to help, and knowledge self-efficacy), organizational (top management support and organizational reward), and technology factors (IT support) on knowledge sharing processes (knowledge donating and knowledge collecting) in the construction industry of Hong Kong. For individual factors, the research findings show that trust, enjoyment to help, and knowledge self-efficacy can significantly predict the knowledge sharing processes of both knowledge donating and knowledge collecting. For organizational factors, the research finds that top management support can significantly predict the knowledge sharing processes of both knowledge donating and knowledge collecting. However, hypothesis testing shows that organizational reward can only significantly predict knowledge donating but not knowledge collecting. For technology factors, the research findings indicate that IT support can significantly predict the knowledge sharing processes of both knowledge donating and knowledge collecting. Except for organizational reward, all individual, organizational, and technology factors can significantly predict the knowledge sharing processes in the construction industry of Hong Kong.

For hypotheses testing, data analysis from univariate linear regression confirms that all hypotheses H 1 (a), H 1 (b), H 2 (a), H 2 (b), H 3 (a), H 3 (b), H 4 (a), H 4 (b), H 5 (a), H 6 (a), and H 6 (b) are generally supported by rejecting the null
hypotheses. For all the supported hypotheses, the research discovers that a higher level of knowledge sharing enabler is generally associated with a higher level of knowledge donating and knowledge collecting, medium with medium, and lower with lower. However, for the unsupported hypothesis of H 5 (b), accepting the null hypothesis means that there is no systematic association for the relation between organizational reward and knowledge collecting. Except for organizational reward, the research confirms that all independent variables can significantly predict all dependent variables in the hypotheses testing. For theoretical contribution, the research establishes a new conceptual framework that relates the knowledge sharing enablers to the knowledge sharing processes in the construction industry of Hong Kong. Contrary to Dainty et al. (2005), the research findings indicate that the national culture of Hong Kong generally does not prevent the individual construction practitioners from sharing knowledge with their colleagues. In fact, the individual construction practitioners are more than ready to share knowledge with their colleagues.

As competitors in the construction industry of Hong Kong can easily replicate new products, services, technologies, and processes within a short period of time, many organizations face problems to create and maintain sustainable and inimitable competitive advantages. However, as Reid (2003) suggests, organizations can utilize knowledge sharing to improve their abilities and efficiencies in the aim to create and maintain more sustainable and inimitable competitive advantages. Under the recommendations of Connelly & Kelloway (2003), Lee & Choi (2003), Taylor & Wright (2004), and Lin (2007), organizations can ultimately utilize knowledge sharing enablers under the classifications of individual, organizational, and technology factors. For practical managerial implication, organizations can identify such knowledge sharing enablers and analyze their predictability in order to hasten and improve the knowledge sharing processes of knowledge donating and knowledge collecting.
throughout the organizational culture and structure. When knowledge sharing enablers can be identified, focused, cultivated, developed, and manipulated by an organization, the knowledge sharing enablers can subsequently allow the organization to create and maintain more sustainable and inimitable competitive advantages due to the advanced knowledge sharing practices.
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HKTDC (2008) *Profiles of Hong Kong Major Service Industries, Building and...*


Reid, F. (2003) Creating a knowledge sharing culture among diverse business


Appendix A

Summary of results of the 2007 Annual Survey of Building, Construction and Real Estate Sectors
## Summary results of the 2007 Annual Survey of Building, Construction and Real Estate Sectors

<table>
<thead>
<tr>
<th>Industry group</th>
<th>Number of establishments</th>
<th>Number of persons directly engaged</th>
<th>Compensation of employees</th>
<th>Consumption of materials and supplies; fuel, electricity &amp; water; &amp; maintenance services</th>
<th>Value of sub-contract works by fee sub-contractors/Payments for commission work</th>
<th>Other miscellaneous operating expenses</th>
<th>Gross operating surplus</th>
<th>Gross output</th>
<th>Value added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>19,399</td>
<td>114,294</td>
<td>34,516</td>
<td>28,378</td>
<td>65,322</td>
<td>12,106</td>
<td>7,925</td>
<td>148,247</td>
<td>42,441</td>
</tr>
<tr>
<td></td>
<td>(+1.8)</td>
<td>(+15.5)</td>
<td>(+5.1)</td>
<td>(-5.6)</td>
<td>(+5.3)</td>
<td>(+8.3)</td>
<td>(+11.0)</td>
<td>(+3.5)</td>
<td>(+6.2)</td>
</tr>
<tr>
<td>Real estate development, leasing, brokage and maintenance management</td>
<td>5,127</td>
<td>96,123</td>
<td>15,946</td>
<td>16,692</td>
<td></td>
<td>16,354</td>
<td>63,945</td>
<td>106,936</td>
<td>79,891</td>
</tr>
<tr>
<td></td>
<td>(+4.9)</td>
<td>(+2.3)</td>
<td>(+20.3)</td>
<td>(-6.6)</td>
<td></td>
<td>(+19.6)</td>
<td>(+16.7)</td>
<td>(+15.6)</td>
<td>(+17.4)</td>
</tr>
<tr>
<td>Architectural, surveying and project engineering</td>
<td>1,304</td>
<td>15,732</td>
<td>5,672</td>
<td>204</td>
<td>1,666</td>
<td>1,249</td>
<td>679</td>
<td>8,870</td>
<td>5,751</td>
</tr>
<tr>
<td></td>
<td>(+4.3)</td>
<td>(-2.4)</td>
<td>(+8.3)</td>
<td>(-0.5)</td>
<td>(+2.2)</td>
<td>(-0.8)</td>
<td>(-24.8)</td>
<td>(+2.2)</td>
<td>(+2.9)</td>
</tr>
</tbody>
</table>

Notes:

(1) All dollar figures are in nominal terms.
(2) Figures in brackets represent percentage changes in 2007 compared with 2006.
(3) For construction sector, compensation of employees includes payments to labour-only sub-contractors.

Source: Census and Statistics Department, The Government of the Hong Kong Special Administrative Region, accessed January 31, 2009,
Appendix B

Cover letter
Dear Sir or Madam

You are cordially invited to participate in an anonymous online survey about knowledge management in the construction industry of Hong Kong.

For details, please refer to the following research website:
http://www.my3q.com/home2/246/xgod/2063.phtml

In addition, please refer this online survey to your colleagues. Your participation and referrals will be kindly appreciated. Thank you.

Yours sincerely

Student: Wilson Chee
Supervisor: Dr Selvamalar Ayadurai

尊敬的先生或女士

你被誠邀參與一份關於香港建築業知識管理的網上匿名問卷。詳情請參看以下網址：http://www.my3q.com/home2/246/xgod/2063.phtml
此外，請轉介這份網上問卷給你的同事。感激你的參與和轉介，謝謝。

學生: Wilson Chee
監督: Dr Selvamalar Ayadurai

敬上
Appendix C

Translation verification
Translation Verification

This serves to confirm that the attached Chinese copy of information letter and questionnaire submitted by Mr Chee Weng Hang Wilson, (student no.: 3081263), is a true and accurate translation of the English version.

Should you have any queries, please feel free to contact Sally Chau of the local Newcastle DBA Secretariat of the Hong Kong Management Association on (852) 27748513 or by email at sallychau@hkma.org.hk.
Appendix D

Information statement
Newcastle Graduate School of Business  
Faculty of Business and Law, Level 3, University House  
Corner King and Auckland Street, Newcastle 2300, Australia

Student: Wilson Chee  
Tel: +852 95565577, Fax: +852 23811547  
Email: wilson.chee@studentmail.newcastle.edu.au

Supervisor: Dr Selvamalar Ayadurai  
Tel: +6 012 2396 547, Fax: +603 7880 7332  
Email: drmalar@cbconsultancy.com.my

**Information Statement**

The predictability of individual, organizational, and technology factors on knowledge sharing processes in the construction industry of Hong Kong

Dear Sir or Madam

I am a student undertaking the Doctor of Business Administration degree in the Newcastle Graduate School of Business, The University of Newcastle, Australia. As part of my study, I am conducting a research project that investigates the predictability of individual, organizational, and technology factors on knowledge sharing processes in the construction industry of Hong Kong. Hereby, you are cordially invited to complete an online survey of the above topic.

If you agree to participate, the research requires you to complete an online survey in about 10 minutes. Please note this letter and survey are distributed online. Your participation is entirely voluntary and respondents are anonymous. Respondents have rights to withdraw at any stage of the survey with their input destroyed accordingly. However, implied consent is confirmed once you submit the completed survey online because the survey is anonymous. If you eventually want a summary of research findings, please request by emailing the researchers.

Electronic data collected from the survey will be strictly confidential. Only researchers declared in this letter and examiners of the dissertation are allowed to access such data. Electronic data will be stored in the researcher’s personal computer with password protection. A data copy will be burned on CD as backup and locked in the researcher’s safekeeping for at least 5 years before disposal. Upon expiry of the 5 years period, electronic data will be deleted permanently and backup CD will be destroyed by a shredder.

If you have any inquiry, please contact the researchers. Thank you for your cooperation.

Yours sincerely

[Signature]

[Signature]
Complaints about this research: This project has been approved by the University’s Human Research Ethics Committee, Approval No. Bus-Law-H-2009-0022. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone +61 02 49216333, email Human-Ethics@newcastle.edu.au.

通知書

香港建築業知識分享過程中個人、組織、技術因素的可預測性

尊敬的先生或女士

本人是澳洲紐卡素大學紐卡素商業研究院的工商管理博士生。作爲研究的一部分，本人探討香港建築業知識分享過程中個人、組織、技術因素的可預測性。特此，現誠邀您完成上述題目的網上問卷。

如果您同意參與，這份網上問卷大概需時 10 分鐘。請注意本函和問卷均是在網上發佈。參與本問卷是出於自願而且您的身分將是匿名。參與者有權在任何個階段退出問卷而退出前所輸入的資料也會相應被刪除。一旦您在網上遞交已完成的匿名問卷，即表示您已默許同意參與本研究。如果你最後需要一份研究結果，請電郵研究員聯繫。

從問卷收集的電子數據將會被嚴密保管。只有本函指定的研究員和學術論文的審查員才允許訪問該電子數據。電子數據將儲存在研究員的個人電腦並以密碼保護。備用數據將燒錄為 CD 並存放在研究員的保險箱內至少 5 年。5 年後，電子數據將永久刪除而備用數據 CD 亦將被碎紙機切碎。

如有任何疑問，請與研究員聯繫。謝謝您的合作。

Wilson Chee
Dr Selvamalar Ayadurai
學生編號: 3081263
敬上

投訴條款：這項研究由大學人類研究道德委員會批准，批准編號 Bus-Law-H-2009-0022。作為一個參與者，如果在這項研究中您對您的權利有任何疑問，或對研究方式有任何投訴，您可跟研究員或以下獨立人士聯繫。Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone +61 02 49216333, email Human-Ethics@newcastle.edu.au。
Appendix E

Online questionnaire
Confidential

Knowledge Sharing Practices Survey

The statements below describe the practices of how individual construction practitioners share their knowledge within their organizations. The scope of individual construction practitioners includes employees working in building and civil engineering, architecture, surveying, project engineering, real estate development, leasing, brokerage, and maintenance management. Based on your work experience in your current organization, please mark in one of the seven boxes below to express your degree of agreement with each statement. The following seven-point scale will be used for rating:

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Neutral</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly agree</th>
<th>7</th>
</tr>
</thead>
</table>

Your participation of this online survey is completely voluntary. Implied consent is confirmed once the respondent submits the completed survey online because the survey is anonymous. If you have any inquiry regarding this study, please refer to the information statement or contact the researchers.

保密

知識分享習慣問卷

以下句子描述個人建築從業員習慣怎樣在公司內分享知識。個人建築從業員的範圍包括建築和土木工程、建築設計、測量、項目工程、地產發展、租賃、買賣經紀、物業管理。基於您在當前公司的工作經驗，請在七個方格中之一格標記來表達您對每項句子的同意程度。有以下七種程度：

<table>
<thead>
<tr>
<th>強烈不同意</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>中立</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>強烈同意</th>
<th>7</th>
</tr>
</thead>
</table>

參與這次網上問卷是出於自願。一旦您在網上遞交已完成的匿名問卷，即表示您已默許同意參與本研究。如果您對這項研究有任何疑問，請參看通知書或跟研究員聯繫。

| 1  | My colleagues are generally trustworthy.  
    | 我的同事大致上值得信賴。 |
| 2  | My colleagues have reciprocal faith in others’ intentions and behaviors.  
<pre><code>| 我的同事互相信任其他同事的 |
</code></pre>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>My colleagues have reciprocal faith in others’ abilities. 我的同事互相信任其他同事的能力。</td>
</tr>
<tr>
<td>4</td>
<td>My colleagues have reciprocal faith in others’ decisions towards organizational interests than individual interests. 我的同事互相信任其他同事的决定会以公司利益大於個人利益。</td>
</tr>
<tr>
<td>5</td>
<td>I enjoy sharing my knowledge with colleagues. 我喜歡與同事分享我的知識。</td>
</tr>
<tr>
<td>6</td>
<td>I enjoy helping colleagues by sharing my knowledge. 我喜歡分享我的知識來幫助同事。</td>
</tr>
<tr>
<td>7</td>
<td>It feels good to help someone by sharing my knowledge. 我喜歡分享我的知識來幫助別人。</td>
</tr>
<tr>
<td>8</td>
<td>Sharing my knowledge with colleagues is pleasurable. 與同事分享我的知識是一件樂事。</td>
</tr>
<tr>
<td>9</td>
<td>I am confident in my ability to provide knowledge that others in my company consider valuable. 我自信我的能力可以提供同事認為有價值的知識。</td>
</tr>
<tr>
<td>10</td>
<td>I have the expertise required to provide valuable knowledge for my company. 我有所需的專門技術來提供有價值的知識給公司。</td>
</tr>
<tr>
<td>11</td>
<td>It does not really make any difference whether I share my knowledge with colleagues. 是否跟同事分享我的知識都沒有分別。</td>
</tr>
<tr>
<td>12</td>
<td>Most other employees can</td>
</tr>
<tr>
<td></td>
<td>Provide more valuable knowledge than I can. (大部分雇员能比我提供更有价值的知识.)</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>13</td>
<td>Top managers think that encouraging knowledge sharing with colleagues is beneficial. (高層經理認為鼓勵同事間分享知識是有利的.)</td>
</tr>
<tr>
<td>14</td>
<td>Top managers always support and encourage employees to share their knowledge with colleagues. (高層經理常常支持和鼓勵雇員與同事分享知識.)</td>
</tr>
<tr>
<td>15</td>
<td>Top managers provide most of the necessary help and resources to enable employees to share knowledge. (高層經理儘量提供協助和資源來促使雇員分享知識.)</td>
</tr>
<tr>
<td>16</td>
<td>Top managers are keen to see that the employees are happy to share their knowledge with colleagues. (高層經理渴望雇員愉快地與同事分享知識.)</td>
</tr>
<tr>
<td>17</td>
<td>Sharing my knowledge with colleagues shall be rewarded with higher salary. (跟同事分享我的知識應獎勵更高的薪金.)</td>
</tr>
<tr>
<td>18</td>
<td>Sharing my knowledge with colleagues shall be rewarded with higher bonus. (跟同事分享我的知識應獎勵更高的獎金.)</td>
</tr>
<tr>
<td>19</td>
<td>Sharing my knowledge with colleagues shall be rewarded with promotion. (跟同事分享我的知識應獎勵升職.)</td>
</tr>
<tr>
<td>20</td>
<td>Sharing my knowledge with colleagues shall be rewarded</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| 21 | Employees make extensive use of electronic storage to access knowledge.  
跟同事分享我的知識應該特別高的職業保障。 |
| 22 | Employees use electronic knowledge networks to communicate with other colleagues.  
雇員使用電子知識網絡與同事聯絡。 |
| 23 | My company uses technology that allows employees to share knowledge with other persons inside the organization.  
我公司的科技能夠允許雇員與公司內的人分享知識。 |
| 24 | My company uses technology that allows employees to share knowledge with other persons outside the organization.  
我公司的科技能夠允許雇員與公司外的人分享知識。 |
| 25 | When I have learned something new, I tell my colleagues about it.  
當我學了新事物，我會把它告訴同事。 |
| 26 | When they have learned something new, my colleagues tell me about it.  
當同事學了新事物，他們會把它告訴我。 |
| 27 | Knowledge sharing among colleagues is considered normal in my company.  
同事間的知識分享在我公司是普遍的。 |
| 28 | I share information I have with colleagues when they ask for it.  
當同事問及我的資訊，我會跟他
們分享.

| 29 | I share my skills with colleagues when they ask for it.  
    | 當同事問及我的技能我會跟他們分享.  |
| 30 | My colleagues share knowledge with me when I ask them to.  
    | 當我問及同事的知識他們會跟我分享.  |
| 31 | My colleagues share their skills with me when I ask them to.  
    | 當我問及同事的技能他們會跟我分享.  |

Thank you for your participation.

謝謝你的參與。