TOTAL QUALITY MANAGEMENT AND KNOWLEDGE MANAGEMENT IN MALAYSIAN MANUFACTURING AND SERVICE FIRMS: A STRUCTURAL EQUATION MODELING APPROACH

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ABSTRACT

This thesis purports to empirically investigate the multidimensionality of total quality management (TQM) and its association with knowledge management (KM) as perceived by the middle to higher level managers (i.e. executives, managers, senior managers, managing directors and chief executive officers (CEOs)) in the manufacturing and service firms in Malaysia. Based on a thorough review of existing literature, six dimensions of TQM (i.e. leadership, strategic planning, customer focus, human resource management, process management and information and analysis) grounded in Malcolm Baldrige National Quality Award (MBNQA) criteria and three components of KM (i.e. knowledge acquisition, knowledge distribution and knowledge application) were identified.

A total of 203 usable surveys were collected from the manufacturing and service sectors that are planning for or have obtained the ISO 9001:2000 certification. They comprised of small, medium and large Malaysian firms. Structural Equation Modeling (SEM) technique was used to test the theoretical framework.

The findings of this study proposed that four dimensions of TQM are instrumental for firms to increase their efficiency in KM. They are strategic planning, human resource management, systematic process management, as well as possessing an adequate level of information and analysis, in which strategic planning is the most significant determinant for KM in both manufacturing and service firms thus filling the literature gap of TQM and KM. However, leadership and customer focus were found to have no significant relationship to KM in both the sectors surveyed. Result of this cross sectional study also reveals insignificant difference with respect to the modeling of TQM's

constructs validity between the two sectors. In other words, the chosen TQM practices in this study are equally applicable across both sectors. Furthermore, there also lies no significant difference in the relationship between TQM practices and the level of KM between both these sectors.

One of the research limitations would be that the self-reported survey might include some biased response from the target respondents and this may pose as a major concern when verifying the pervasiveness or apparentness of the respondents towards TQM practices on KM. Nevertheless, the research creates awareness among the middle to higher level managers to focus on the six MBNQA dimensions that can help attain a superior KM.

In terms of originality, this research examines the effect of six TQM practices on KM as well as presents a comparative analysis on TQM practices and KM between the two sectors from the perspective of both descriptive and structural relationships. Specifically, the construct validity and criterion validity with regards to the TQM practices is further confirmed in this thesis. Practically, this research can be used by middle to higher level managers from both the manufacturing and service side to evaluate the effectiveness of TQM practices on KM in their companies. They can focus their efforts on practices that show the most promising result for the establishment of competitive KM capabilities, by developing a deeper comprehension of the association between TQM practices and KM.

ABSTRAK

Tujuan tesis ini adalah untuk menyelidik secara empirikal Pengurusan Kualiti Menyeluruh *(Total Quality Management @ TQM)* dari berbilang dimensi dan hubungannya dengan Pengurusan Pengetahuan *(Knowledge Management @ KM)* berdasarkan anggapan pengurus lapisan pertengahan ke atas (iaitu eksekutif, pengurus, pengurus kanan, pengarah urusan dan pegawai ketua eksekutif) dari sektor pembuatan dan perkhidmatan di Malaysia. Berdasarkan satu ulasan menyeluruh tentang penyelidikan masa kini, enam dimensi TQM (iaitu kepimpinan, perancangan strategik, fokus terhadap pengguna, pengurusan sumber manusia, pengurusan proses, dan maklumat dan analisis) berdasarkan kriteria daripada hasil kerja Malcolm Baldrige National Quality Award (MBNQA) dan juga tiga komponen daripada KM (iaitu pemerolehan pengetahuan, penyebaran pengetahuan dan aplikasi pengetahuan) telah dikenalpasti.

Seramai 203 responden dari firma-firma Malaysia yang -merangkumi kategori kecil, sederhana dan besar yang telah memperolehi atau dalam proses untuk memohon pensijilan ISO 9001:2000. Kaedah Pemodelan Persamaan Struktur *(Structural Equation Modeling @ SEM)* telah digunakan untuk mengkaji rangka teori tesis ini.

Hasil penemuan kajian mengusulkan bahawa terdapat empat dimensi TQM yang memainkan peranan penting bagi firma-firma ini untuk mempertingkatkan kecekapan mereka dalam pengurusan pengetahuan. Empat dimensi tersebut adalah perancangan strategik, pengurusan sumber manusia, pengurusan proses secara sistematik, dan memiliki maklumat dan analisa pada tahap yang memadai di mana perancangan strategik merupakan faktor penentu terpenting pengurusan pengetahuan bagi kedua-dua

firma pembuatan dan perkhidmatan dan justeru itu, mampu mengurangkan jurang perbezaan kepustakaan di antara amalan TQM dan KM. Namun demikian, hasil kajian mendapati kepimpinan dan fokus terhadap pengguna tidak mempunyai hubungan yang signifikan dengan KM bagi kedua-dua sektor firma yang dikaji. Hasil penemuan penyelidikan bercorak keratan rentas ini juga menunjukkan tiada perbezaan yang signifikan dari segi kesahihan konstruk model TQM antara dua sektor tersebut. Dalam ertikata lain, amalan-amalan TQM yang dipilih untuk kajian ini merentasi dan boleh digunapakai oleh kedua-dua sektor tersebut. Tambahan pula, keputusan kajian juga menunjukkan tiada perbezaan yang signifikan dalam hubungan antara amalan-amalan TQM dengan tahap perlaksanaan KM bagi kedua-dua sektor tersebut.

Salah satu batasan kajian ini adalah kemungkinan wujud nyata anggapan berat sebelah responden disebabkan oleh penggunaan borang soal-selidik laporan kendiri di mana penentuan kesahan jawapan mereka boleh menjadi satu kebimbingan utama dalam mengesahkan keluas-sebaran atau kejelasan para responden terhadap amalan-amalan TQM atas KM. Walau bagaimanapun, kajian ini berjaya mewujudkan kesedaran pengurus lapisan pertengahan ke lapisan atas supaya menumpukan perhatian terhadap enam dimensi MBNQA yang boleh menyokong dalam mencapai perlaksanaan KM yang unggul.

Dari segi keasliannya, kajian ini telah berjaya menguji kesan enam dimensi TQM atas KM dari segi penyampaian satu analisis perbandingan amalan TQM dan KM antara dua sektor tersebut dari perspektif perihalan statistik dan hubungan struktural. Secara khususnya, kesahihan konstruk dan kriteria berkaitan dengan amalan-amalan TQM telah disahkan dengan lebih lanjut oleh tesis ini. Secara praktikalnya, kajian ini boleh digunakan oleh pengurus-pengurus lapisan pertengahan ke lapisan atas dari kedua-dua

pihak pembuatan dan perkhidmatan untuk menilai keberkesanan amalan-amalan TQM ke atas KM dalam syarikat mereka. Mereka boleh menumpukan usaha mereka dalam amalan-amalan yang menunjukkan hasil yang paling memberangsangkan demi membentuk kemampuan KM yang berdaya saing melalui pembentukan satu pemahaman yang lebih mendalam terhadap hubungan antara amalan-amalan TQM dan KM.

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ABBREVIATIONS

AGFI	Adjusted Goodness-of-Fit Index
AQA	Australian Quality Award
AVE	Average Variance Extracted
BC	Bias-corrected
CEOs	Chief Executive Officers
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CMV	Common Method Variance
CR	Composite Reliability
CSFs	Critical Success Factors
EFA	Exploratory Factor Analysis
EQA	European Quality Award
EM	Expectation Maximization
FMM	Federation of Malaysian Manufacturers
GFI	Goodness-of-Fit Index
IFI	Incremental Fit Index
KM	Knowledge Management
KMO	Kaiser-Meyer-Olkin
MBNQA	Malcolm Baldrige National Quality Award
MGA	Multiple Group Analysis
MLE	Maximum Likelihood Estimation
MQA	Malaysian Quality Award
NGOs	Non-governmental Organizations
NFI	Normed Fit Index
NNFI	Non-normed Fit Index

PCA	Principle Component Analysis
PDCA	Plan-Do-Check-Act
PMQA	Prime Minister Quality Award
QMEA	Quality Management Excellence Award
RMR	Root Mean Square Residual
RMSEA	Root Mean Square Error of Approximation
SEM	Structural Equation Modeling
SPC	Statistical Process Control
SRMR	Standardized Root Mean Square Residual
TLI	Tucker and Lewis Index
TQM	Total Quality Management

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The intensification of global competition in a borderless society today sets the pace for organizations worldwide to improve their aptitude and ability to perform well. With the mushrooming of new markets and products, existing products becomes obsolete at a faster pace. This poses a challenge for firms to churn up new products to satisfy customers (Redmond, 2002). According to Alazmi and Zairi (2003), as the life of products become shorter, technology becoming more advanced, competitors, regulations and society keep on changing, a firm's human capital and the knowledge that they carry has been considered as one important factor to gain competitive advantage.

The global economy has moved from one that is focused on the manufacturing of goods, to one that emphasizes on knowledge and services, where the main object of trade is knowledge and information (Walczak, 2005). Knowledge has become an interesting subject among firms as the managing, creating and sharing of it has become an organization's competitive asset (Nonaka & Takeuchi, 1995; von Krogh & Roos, 1995; von Krogh, Roos, & Kleine, 1998), which can help firms to gain competitive advantage (Barney, 1991; Itami, 1987; Rullani, 1992; Vicari, 1991). Since the new millennium, the information and knowledge cultivated and adopted in manufacturing firms have increased in complexity steadily and is changing rapidly ever (Molina, Montes, & Ruiz-Moreno, 2007). Knowledge is seen by many organizations as one of the main elements to be managed and applied in production as it can give rise to the success or failure of companies, and in the larger context, the country's economy itself.

Due to this, knowledge management (KM) has taken centre stage in the business world. It determines the success and failure of firms in the present day (Lim, Ahmed, & Zairi, 1999). Large firms have developed different methods to create, share and use the knowledge generated (McAdam & Reid, 2001) for the company's benefits. One of the high-tech industrialized countries – Japan, was researched by Nonaka and Takeuchi (1995) and the findings have proven that mega firms, in the likes of Canon, Honda, and Matsushita emphasized on KM to be a part of their company practices. Further, there are also firms like Anderson Consulting, Boeing, British Petroleum and many more that have been researched (Davenport & Prusak, 1998), in which they too have placed KM as their main focal point. For a firm to create value for itself, it needs to have the capability and capacity to exploit its intellectual capital, which is their human asset. The KM process plays a major role in creating value for the firm in terms of new product development (Madhavan & Grover, 1998), hence contributing to a firm's bottom line (Gloet & Berrell, 2003; Lee & Yang, 2000; Prasad, 2001) and performance.

Total quality management (TQM) is defined as the dedication and effort put in by all members of an organization towards improving the company's working processes, with the purpose of fulfilling and satisfying customers' demands and needs (Lee & Chang, 2006). Zhang (1999) provides another definition of TQM, where TQM is seen as a management approach that supports companies to enhance its performance and effectiveness as a whole, thus facilitating companies that implement TQM to attain world-class status. In the present competitive environment, the role played by TQM has been widely acknowledged as a vital driver for both manufacturing and service companies' survival and success (Claver-Cortes, Pereira-Moliner, Tari, & Molina-Azorin, 2008). Previous empirical studies have proven that when TQM is implemented effectively in an organization, it will bring about an improved company performance

(Anderson & Sohal, 1999; Flynn, Schroeder, & Sakakibara, 1994; Prajogo & Sohal, 2004; Samson & Terziovski, 1999) by lowering the cost of production and improving productivity (Garvin, 1983), enhancing employees' job satisfaction (Ooi, Bakar, Arumugam, Vellapan, & Loke, 2007), reducing role conflict among employees (Teh et al., 2009) and in return, gaining a stronger market share (Phillips, Chang, & Buzzell, 1983) and market presence. This shows that TQM, which emphasizes on the continuous improvement of products, process, and services, satisfying and anticipating customers' wants, needs and desires, looking after the employees' welfare and ensuring leadership responsibility (Dean & Bowen, 1994), is essential for firms in gaining a sustainable competitive edge (Yang, Chen, & Su, 2003). Following this argument, many companies have applied and used the quality award models such as the Malcolm Baldrige National Quality Award (MBNQA), and the European Quality Award (EQA) to signify the TQM practices to be implemented in their organizations, particularly for the western countries (Bou-Llusar, Escrig-Tena, Roca-Puig, & Beltran-Martin, 2009). Several software packages have been developed to aid in the TQM process, which changes the way managers and employees function today (Adamson, 2005). In general, TQM was and is still seen as a relevant philosophy undertaken by many firms, seeking to differentiate themselves from the rest (Terziovski, Howell, Sohal, & Morrison, 2000) to gain a competitive edge. Several studies have found that TQM served as an enabler to assist in the creation, sharing (Graham & Shiba, 1993; Grant, Shani, & Krishnan, 1994; Shiba, Graham, & Walden, 1990; Sitkin, Sutcliff, & Schroeder, 1994; Thiagarajan & Zairi, 1997a; Youssef & Zairi, 1995) and distribution of knowledge. It is thus believed that TQM can satisfy organizational needs through the acquisition of knowledge which is beyond mundane operational needs that can be used for continuous improvement in company processes and the level of innovation (Colurcio, 2009).

As can be seen in this age where competition is growing rapidly, it is vital that firms appreciate the principles of both TQM and KM and the linkage between the two. Given the significance of both TQM in the past and KM in the present, firms that are able to apply both concepts into their company processes are certain to rise above the rest to become the market leader. The idea that both TQM and KM have great effect on the strategic competency of a firm prompts several researchers to find and establish the linkage between these two concepts. For a firm's quality strategy, Lim et al. (1999) suggested Deming's Plan-Do-Check-Act (PDCA) Cycle to be the steps towards enhancing KM. Zetie (2002) emphasizes that TQM practices and KM are closely related to one another in the development of a firm. Furthermore, past researchers have found that TQM is intrinsically related to organizational learning (Colurcio & Mele, 2006; Fine, 1986), in which it encompasses KM. It is believed that TQM practices have the potential to create and share knowledge within the organization itself, hence a main source of competitive advantage (Mele, 2003; Nonaka & Takeuchi, 1995). TQM is highly regarded as a tool that can help a company to attain a higher degree of knowledge that exceeds its operation requirements and indirectly contributes to the continuous improvement for the company.

1.2 Research Gap

Despite the significance of both TQM practices and KM, little academic studies have been done to research on the link and the relationship between these two concepts. As such, it has not yet been fully build up in concrete terms (Monila, Montes, & Fuentes, 2004). Furthermore, past studies that attempted to connect TQM and KM behaviors have been inadequate and research findings are limited or inaccurate in the methodology. Moreover, qualitative techniques, such as case studies and literature review (for example, see Adamson, 2005; Hsu & Shen, 2005; Johannsen, 2000; Lim et

al., 1999; Lin & Wu, 2005), have been widely used to sum up the results in their research. It is noted that only a handful of empirical studies have applied inferential statistics, such as multivariate analysis and principal component analysis to examine their findings. Ngai and Cheng (1997) made a statement that many researchers of TQM have not made full use of the statistical methods, in particular multivariate statistical techniques, as compared with the social science researchers and marketing researchers. Stickley and Winterbottom (1994) emphasized that statistics plays a very important role for every activity that is related to the pursuit of quality. They cited a statement made by Hogg (1993) originated from Harry Roberts of the University of Chicago, that: "TQM comprises much more than statistics but without statistics it can be a lot of smoke and mirrors" (as cited in Ngai & Cheng, 1997, p. 406). In order to close the gap and supply firms with useful guidelines on how to deal with TQM's effects on KM activities, this research proposed a set of TQM dimensions, and illustrate how to apply Structural Equation Modeling (SEM), a multivariate statistical technique, as a statistical tool to investigate the manufacturing and service companies in Malaysia on TQM effects towards KM behaviors. By using this technique, it can assist quality practitioners, who are often concerned with discovering and understanding the causal association in a given set of data, to recognize problematic areas and provide possible solutions. Furthermore, a deeper insight can also be developed on how the effective adoption of TQM concepts can lead to a higher level of KM, which will then lead to improved competitiveness.

In this study, the Malaysian firms in general have become the focal point. Since its independence, Malaysia has experienced a dramatic increase in its prosperity and economic development. According to Osman, Ho, and Galang (2011), the Malaysian economy has been steadily growing from year 2002 to 2008, at a rate of 4.6 percent.

Malaysia is acknowledged in its manufacturing expertise such as computer, electrical components, and medical products, as well as in various services such as information technology, outsourcing of business processes and in healthcare (Gross & Minot, 2007). The manufacturing sector has been identified as one of the major contributions to Malaysia's economy, providing more than 25 percent to Malaysian economic growth (Economy Watch, Malaysia Economic Growth, 2008). In terms of its services, the healthcare and tourism industry have been doing considerably well, providing services to the medical tourism sector and making significant contributions. According to Daljit (2009), the medical tourism industry has contributed approximately RM540 million to the Malaysian economy in fiscal year 2010, by giving medical treatment to about 625,000 patients, with the main bulk of them coming from Indonesia. The Malaysian government has indeed invested much of its efforts, one of which is the multimedia super corridor, to increase the nation's national income and re-position itself from a "middle-income" nation to one that is well developed by the year 2020 (Jarman & Chopra, 2008). However, despite the multibillion dollar state-led project, the government has not been successful in drawing in much knowledge intensive operations to Malaysia and realizing its initial purpose of churning out a revolutionary multimedia research and development center. Instead, a blossoming business support services division was developed (Jarman & Chopra, 2008).

Besides, it is notable that the applicability and the implementation of TQM practices differ between the two sectors due mainly to the differences in the nature of their businesses. The intangibility and heterogeneity of the outputs that the service firms provide is the first notable characteristics, which is very different from the manufacturing industry where their outputs are more standardized and measurable by their specifications (Silvestro, 1998; Sureshchandar, Rajendran, & Anatharaman, 2001).

Secondly, due to the different operating systems, in which both delivery and consumption occur concurrently for the service industry, there may be a problem in the application of quality management tools and techniques (Prajogo, 2005). Hence, service providers might face quality control problems prior to delivery of service outputs to the customer, which is usually done with the manufactured products. The difference in the adoption of TQM between manufacturing and service firms have been examined and presented in a number of studies. Beaumont, Sohal, and Terziovski (1997) indicated that the service industry utilizes only a few quality management techniques, particularly statistical process control. As observed by Woon (2000), service firms implemented a lower level of TQM practices as compared to their manufacturing counterparts, particularly in the dimensions of process management, information and analysis and quality performance, but remains no different in the aspects of leadership, customer focus and human resource practices. In other words, the "soft" elements of TQM are found to be more applicable than the "hard" elements for the service firms. Furthermore, Huq and Stolen (1998) also concluded that the service firms are selective in terms of their application towards TQM practices, as oppose to their manufacturing counterparts that apply the full set of TQM practices.

This study aims to investigate how the application of TQM will improve KM in both the manufacturing and service sectors; while at the same time, the degree of TQM implementation between both these sectors will also be further examined, where the validity of TQM construct and its association with KM (i.e. construct and criterion validity) will also be compared, which is much lacking in previous empirical studies. One of such comparative studies between the manufacturing and service sectors was conducted by Prajogo (2005), where his study found insignificant difference in the association between TQM and quality performance in both sectors. In another related

study, Cheah, Ooi, Teh, Chong, and Yong (2009) also concluded that no significant difference was found in both of these sectors in Malaysia in terms of their level of TQM practices and knowledge sharing. However, such comparative studies are still much lacking and that the comparative analysis of TQM practices and KM between the manufacturing and service sectors can hardly be found in the literature, hence this research is done to fill in such literature gap.

1.3 Research Questions

With reference to the background of this research as well as the discussion of the research gap in the abovementioned sections, six (6) research questions are posited as follows:

RQ1: What are the key TQM practices that should be adopted, which are relevant for the measurement of KM?

RQ2: Do TQM practices have an influence on KM on Malaysian firms?

RQ3: Which key practices of TQM are more significant and positive towards KM in the Malaysian firms?

RQ4: Is there any significance difference between the manufacturing and service sectors in terms of TQM linkages with KM behavior?

RQ5: Is there any difference in the modeling of the constructs validity of TQM between manufacturing and service firms?

RQ6: Are there any significant difference in the predictive power of TQM practices on KM between the manufacturing and service firms?

1.4 Research Objectives

Based on the abovementioned research questions, this research thus provides an empirical study to examine six (6) objectives in our study:

RO1: To identify a set of TQM principles that is relevant for the measurement of KM.

RO2: To examine the multidimensionality of TQM that has positive influences on KM.

RO3: To identify which TQM practices are more significant and positive towards KM in the Malaysian firms.

RO4: To investigate the differences between manufacturing and service firms with regards to the linkages between TQM and KM in the Malaysian firms.

RO5: To examine the differences between the manufacturing and service firms in terms of the constructs validity of TQM.

RO6: To investigate the predictive power of TQM practices on KM between the manufacturing and service firms.

1.5 Scope of the Study

The companies in the manufacturing and service sectors that are planning to apply for or have obtained the ISO 9000 certification status within the Malaysian context will be the focus of this study. In addition, the TQM practices selected and investigated in this study are limited to only six practices based on the MBNQA framework. As this is a quantitative and cross-sectional study, questionnaire was utilized as a research instrument; while self-administered approach was used to collect the data. The middle to higher level managers (i.e. executives, managers, senior managers, managing directors and chief executive officer (CEOs)) were chosen as the analysis unit since they are equipped with ample information of the company's quality management practices as

well as having an in-depth understanding on the KM level in their firms. This sample consists of only one registered site per organization.

1.6 Research Stages

This study was conducted based on a series of research stages and each stage is well explained and clearly illustrated in Figure 1.1.

Stage 1: Preliminaries and Identification of Research Domain

Academic references were first referred to for establishing the necessity of the research required. Federation of Malaysian Manufacturers (FMM) directory was used for the establishing the sampling frame. Discussions were conducted to seek input from other experts colleagues, superior, etc to get more insights on the research subject for easier identification and development on the topic of interest. In short, the domains of TQM and KM are the main purpose of this research study.

Stage 2: Review of Literature

A systematic review on the current literature within the related areas was performed with the aim to get hold of the depth and breadth of the present knowledge in the TQM and KM areas. The variables and views which are vital for the development of the theoretical foundation for the study were also acknowledged. This is followed by determining the unknown research areas which are imperative for the development of knowledge in both the TQM and KM domains.

Stage 3: Development of Research Model and Hypotheses

A theoretical framework was constructed following a comprehensive literature review to investigate on the knowledge gaps within the research scope. As a result, six hypotheses were postulated to examine and complete the configuration of the theoretical framework.

Stage 4: Research Design and Development of Instrument

The appropriateness of the questionnaire survey design and sampling procedures were determined in this stage. Following that, a range of analytical methods and measurement magnitude for the research variables were developed to describe the parameters of the research study. These scales were utilized in the formation of the self-administered survey (i.e. questionnaire).

Stage 5: Quantitative Field Research

A total of 203 usable surveys were collected from both manufacturing and service firms in Malaysia. Several issues pertaining to the conduct of the questionnaire (i.e. how to reach out to the targeted group of respondents, where are their locations, when the collection of data should commence and conclude, etc) were taken into consideration. Apart from this, the respondents have been assured of the security and confidentiality of the data provided by them for the purpose of this research.

Stage 6: Data Analysis and Interpretation of Findings

This stage involved the compilation, coding and data entering, in which the SEM analysis was used to analyze and interpret the data collected. Numerous data analysis was engaged to assess the data. Validity and scale of reliability issues were also addressed in this stage.

Stage 7: Final Thesis Preparation

Finally, the outcomes of this research study were compiled and presented in a thesis report format. The significance of the results in the academic field of study, the theoretical and practical implications for managers, followed by limitations and suggestions for future research were also included.

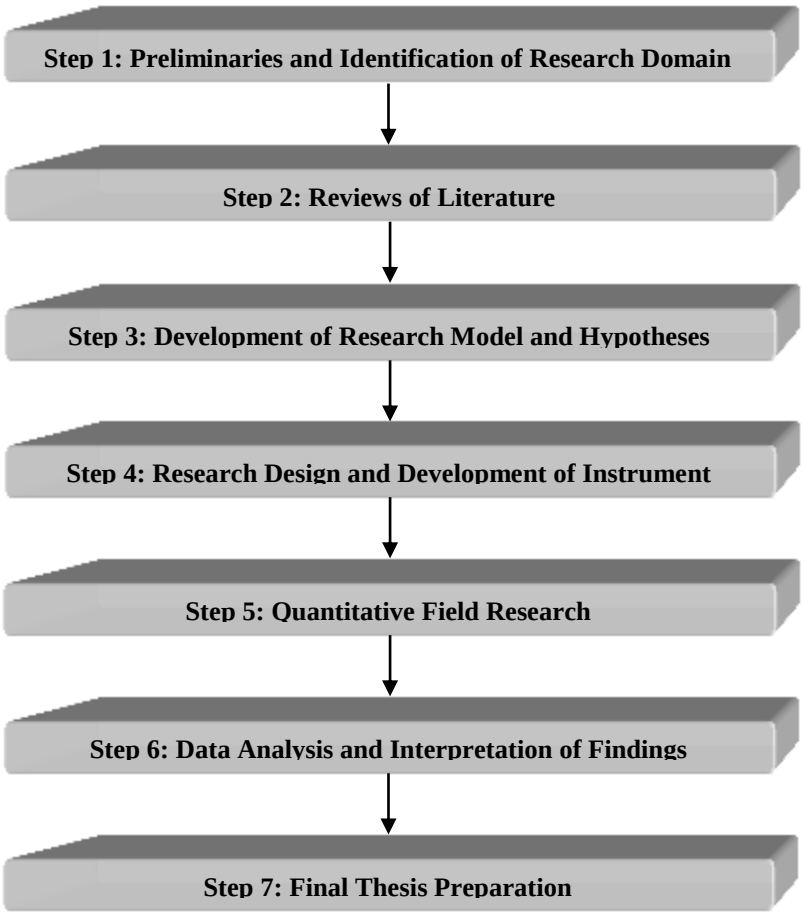


Figure 1.1: Flow Chart of Research Activities

1.7 Justification for the Research

This study has significantly contributed to the areas of theoretical and managerial implications as well as in the area of research methodology. Each area is elucidated in the following sections.

1.7.1 Managerial Implications

Good learning behavior in a workplace is an important practice that could transform a traditional firm to a developed one (Gilley & Maycunich, 2000). KM is one of the learning elements that possesses a strong implication in the future management of quality systems. Numerous companies are beginning to adopt KM activities to facilitate them in achieving a competitive advantage over their competitors (Valkokari & Helander, 2007). Indeed, the TQM dimensions have the capacity as a valued management mechanism that could contribute to KM, therefore making them important. The results and discussions shown in the previous section have demonstrated the valuable lessons for practitioners and researchers in both areas of quality management and KM. It is believed that when the importance of TQM practices is well understood and acknowledged, it can improve the success of KM processes tremendously. To ensure sustainable competitive advantages are achieved, a combination of both TQM and KM practices may prove effective for various companies. By introducing and implementing a well-designed and relevant TQM system inside the firm itself aide the creation of knowledge, an implicit understanding of the firm's knowledge can be constructed and with the participation from every employee. With the effective implementation of TQM practices, it is believed that it can boost a firm's KM activities in the business industry. As mentioned by Tseng (2008), the benefits are enormous. First of all, there will be an improvement in the company itself, when KM activities are led by TQM practices. Secondly, the company may become more diversified in its working process; thirdly, an enhancement in the overall performance are noticeable; fourthly, an innovative culture may be inculcated, which includes bringing in novel ideas and better problem solving skills among employees; and finally, employees and customers will be more satisfied with the usage of these practices.

This study has offered some practical approaches to the Malaysian organizations on the effects TQM practices that could bring to KM activities. Even though a lot of companies have utilized these practices, it is still imperative to establish the model, verify it and then examine the types of TQM constructs that could contribute to the KM accomplishment. In this study, it has been clearly illustrated that only four out of the six TQM practices, namely strategic planning, human resource management, process management and information and analysis, have a positive impact on the KM activities on Malaysian companies. Hence, middle-level to higher management will have an idea on which TQM constructs to focus on to promote the knowledge distribution activities. Obviously, human resource management and strategic planning have the highest impact on KM. Thus, it is essential for companies to look into the improvements of these constructs in their individual organizations.

1.7.2 Theoretical Implications

Many studies that used KM as a research topic have provided the understanding and support to augment the KM activities implementations. Unfortunately, there is paucity in the study of TQM and KM linkages, although previous researchers have tried to link both TQM and KM together. In this study, a model was proposed, consisting of six TQM practices based on MBNQA framework to investigate whether such practices would significantly improve the performance of KM in Malaysian companies.

From theoretical point of view, this study provides a model that combines six TQM dimensions and KM behavior. With the deployment of multivariate analysis such as SEM, it gives more accurate goodness-of-fit indices to ascertain that the model is well defined. Based on the study conducted, the model has been found to be properly defined and fits well with the data collected. Moreover, this study also provides the path for

linkages between the TQM dimensions and KM activities. Besides that, this research report has also suggested the basis for future research to take place, so that the role of TQM can be better understood and new ideas and technologies can be further developed and improvised to enhance KM performance. Thus, to verify the validity of the framework, this study may be used as a foundation for all future studies to be conducted. From the theoretical aspect, this study offers empirical evidence for the model developed by Molina et al. (2004; 2007). This study has empirically verified the recommendations provided by these researchers, who suggest quality management practices such as autonomy, teamwork, process control and cooperation with external agents do influence an individual's attitude in transferring knowledge. Furthermore, this study does not only integrate knowledge distribution but also its acquisition and application.

Lastly, besides recognizing the significant role TQM played in supporting the KM activities in the Malaysian manufacturing and service sectors, this study has also carved a mark in the literature in terms of the effects TQM constructs have on KM activities. Hence, the management team of any company may work towards modifying their TQM activities to inculcate a more conducive KM culture within their companies; while future researchers may also use this study to continuously examine the effects TQM practices have on various industries.

1.7.3 Methodological Contributions

This study undertook a rigorous statistical validation of the influence TQM practices have on KM. The relationship between these variables was strictly scrutinized for validity and reliability across sample of Malaysian firms and was found to be well fitted. Furthermore, the proposed model (i.e. connection between TQM practices and

KM) was empirically examined using Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and SEM analysis. Generally, the findings from the study have provided a strong support for the proposed relationships. These findings may contribute significantly to the Malaysian companies as they have been proven to be useful examples in measuring the levels of TQM effects on KM. Companies may also utilize this instrument as a basis of measurement for basic pre-test before returning to periodically manage and identify the changes linked with TQM initiatives.

1.8 Definition of Terms

Some of terms that are more frequently used in this study are defined as follows:

Total Quality Management: TQM is described as incorporating all inclusive business management beliefs that comprised of a set of guiding principles that explains the foundation for continuous improvement. Therefore, it can be deemed as a "holistic" strategy that is aimed for achieving sustainable organizational improvement (Lin & Ogunyemi, 1996).

Leadership: Leadership in a firm is a motivating action from the role player to provide direction or missions to their employees for achieving the organization's aims and objectives (Bounds, Yorks, Adams, & Ranney, 1994).

Strategic Planning: Strategic planning is defined as the development of strategy and policy, and how this set of strategy and policy is communicated and improved throughout the company (Bohoris, 1995).

Customer Focus: Customer focus can be defined as the level in which a firm is able to satisfy customer needs and demands on a continual basis (Zhang, Waszink, & Wijngaard, 2000).

Human Resource Management: Human resource management is being described as the integration of both quality and operational performance objectives into the company's overall human resource plans for both short and long term plans. The involvement and participation of employees are also emphasized, together with the need to provide appropriate education and training for the employees. Furthermore, employee performance, compensation, recognition and promotion in the company are emphasized, together with the wellbeing and satisfaction of employees (Bohoris, 1995).

Process Management: Process management refers to the beliefs and organized behavior that are vital for supervising the process rather than emphasizing on the end results (Anderson, Rungtusanatham, & Schroeder, 1994; Teh, Ooi, & Yong, 2008).

Information and Analysis: Information and analysis role in a firm is to ensure that data and information are processed in a timely manner and with high quality standard to be available and accessible by all users, i.e. business partners, suppliers, employees and customers (Lee, Rho, & Lee, 2003; Teh et al., 2008).

Knowledge Management: KM can be referred to as a process of enhancing the firm's methodological capability in accumulating and organizing knowledge intended for the betterment of decision making and business strategy (Hsu & Shen, 2005; Ooi, Teh, & Chong, 2009).

Knowledge Acquisition: Being the first step of KM, knowledge acquiring comprises of administrating and utilizing present information while capturing new ones (Gilbert & Codey-Hayes, 1996). As mentioned by Sternberg (1983), the knowledge acquiring process is a learning process by selecting and storing new information in the mind.

Knowledge Distribution: Knowledge distribution is defined as the management of shared information within an organization for encouraging novel and resourceful ideas; creating awareness for the previous fine practices as well as inspiring managers to employ an enhanced technique for future decision making processes (Wijnhoven, 1999).

Knowledge Application: Knowledge application is defined as the growth of the gained knowledge to increase its value and effectiveness. It assimilate the knowledge derived from both the acquisition and distribution stages (Cagarra-Navarro & Martinez-Conesa, 2007) and are then incorporated into the organization's daily business processes to improve its economic effectiveness and efficiency.

1.9 Structure of the Thesis

The research will be organized into eight chapters and the outline of each chapter is as follows:

Chapter 1 presents the background of the study, followed by the research gaps, research questions and research objectives of the study. Next, is the explanation on the research steps involved and the justification for this research.

Chapter 2 reviews the previous studies done by many researchers and scholars, specifically in the domain of TQM and KM. The concept of quality was defined, followed by an in-depth discussion of the TQM concept based on the literatures by Deming, Juran, Crosby and Ishikawa – the four eminence gurus in TQM. Subsequently, four of the notable quality models, namely MBNQA, EQA, Minister Quality Award (MQA) and Deming Prize are discussed. Additionally, the TQM practices by other researchers in similar fields were also evaluated. In this study, the key practices of TQM were identified based on the outcome of the literature review. Finally, the notion of knowledge with reference to the literatures from previous researches, the theory of KM and the three dimensions of KM (i.e. knowledge acquisition, knowledge distribution and knowledge application) are presented.

Chapter 3 explains the development of TQM's theoretical framework and its influence on KM. Based on the broad literature review of the association between TQM practices and KM, a conceptual model that links TQM practices with KM is developed and six hypotheses are proposed for this research.

Chapter 4 focuses on the identification and discussion of the methodology used in this study. In addition, the sampling procedures are discussed while the validity and reliability of the instruments used in this research including the theoretical foundations and issues pertaining to validity and reliability analysis are also presented. Finally, the definitions and details pertaining to the SEM application on the research framework are elucidated.

Chapter 5 depicts the data analysis procedures and the research findings. Descriptive analysis was also included, followed by the details of the reliability and validity tests.

Chapter 6 presents a detailed discussion of the two-step SEM approach to identify the measurement and structural model to be fitted to the data. Each of the research question as well as its respective research hypothesis is examined against a final data-fitted model so that the decision to accept or reject can be reached.

Chapter 7 describes the Multiple Group Comparison Analysis to determine the difference between TQM practices and KM among the manufacturing and service firms. This chapter also presents the Multiple Group Analysis (MGA) of Structural Model for testing whether the magnitude of the effect of each path is the same for both manufacturing and service sectors.

Chapter 8 presents the conclusive chapter of this study. It encompasses the discussion of the empirical findings of this study within the context of the six research questions as well as the six proposed hypotheses. It also presents the research limitations, suggestions for future research together with some theoretical and managerial implications.

1.10 Research Limitations

As a consequence of time constraints and deficiency of resources, the findings from this study have led to some limitations and shortcomings that need to be identified and examined in the near future. First of all, this study only focused on Malaysian companies and thus may not provide enough information needed to avoid the occurrences of biasness. Another limitation of this study is the deployment of a cross-sectional data collection procedure. As such, it is quite difficult to conclude the association between time series variables. Hence, the findings from this study should not be inferred as an evidence of a causal relationship. Besides, response bias and lack

of awareness of the subjects may still occur even though the survey method of questionnaire is assumed to be cost-effective and reliable. Indeed, the target sample of middle to higher level managers been another weakness of the study as their viewpoints on the research topic could be different from that of ordinary employees and hence creating bias. Finally, to further develop this topic, it is possible to identify the probable research areas. The TQM practices selected in this study is limited in scope as only six TQM practices were examined. Obviously, there are many more TQM practices that could affect KM (e.g. organizational culture, organizational structure, continuous improvement, corporate strategy and etc). They may play an imperative role in shaping the attitudes of the employees towards KM.

1.11 Chapter Summary

This chapter presents an overview of the thesis. The background of the study and research gap is also introduced. This is followed by the research objectives, research questions, scope of the study and the stages of research. Then, the contributions of the research methodology, theoretical and managerial implications are elucidated. Finally, the definition of terms, structure of the thesis and limitations of the study are explicated. The following chapter will presents a literature review of the TQM and KM concepts.

CHAPTER 2

REVIEW OF THE LITERATURE

2.1 Introduction

This chapter emphasizes on the identification of the concepts of TQM and KM as the foundation of the literature review. Section 2.2 identifies the concept of quality. Section 2.3 presents the TQM concept from a synthesis of past studies on quality. Section 2.4 describes the four well recognized quality award models, namely MBNQA, EQA, MQA and Deming Prize. Sections 2.5 and 2.6 present the definition of TQM and the key practices adopted in this study. Section 2.7 describes the identification of the theory of knowledge, discusses the theory of KM presents the identification and the explanation of the key dimensions of KM. Finally, this chapter is summarized in section 2.8.

2.2 Quality Defined/The Quality Concept

Competition is rising at an alarming rate, whether locally or internationally – customer expectations are getting higher and legal requirements that demands for higher quality products and services within a reasonable price are becoming more challenging for companies to meet these days (Sit, 2008). To ensure survival, quality is essential; hence it is important to understand the terminology of quality. In this section, the definition of quality by several quality scholars is discussed in details.

Quality is a multi-faceted term and is indefinite due to its intangible nature. In the past, quality gurus have different views on what quality should be, resulting to an inconclusive definition of quality, although there are a few ideas that exist when interpreting quality. According to Crosby (1979), quality is defined as conforming to the company's quality requirements. Ishikawa (1985) later adopted the term "company-

wide" as he accentuated that everyone in the organization is responsible in practicing quality control. Ishikawa (1985) interpreted quality in two ways, which are product quality when interpreted narrowly; and quality in work, service, information, process, division and people when interpreted broadly. Juran (1999) on the other hand offered two quality definitions in the opposite directions. One is that the product features meet the needs of the customers, thus providing customer satisfaction. Second is that the higher the quality, the lower the costs will be. In the meantime, quality according to Juran (1999) also meant free from deficiencies, such as errors, dissatisfied customers, increased in rework, etc. In accordance to this view, quality is associated with costs, in which higher quality usually will costs less to produce.

In essence, the definition of quality normally includes certain common characteristics, as mentioned by Goetsch and Davis (1997) and Lozano (1997). Firstly, they consist of attaining or over exceeding the expectations and desires of customers as quality to customers is related directly to their use, worthiness and usefulness it gives them. Secondly, quality is relevant and related to the products, services, the general public, processes, and the surroundings. Thirdly, the state of quality is ever-changing. The quality of today may not be the same quality for tomorrow. With these commonalities being placed together, Goetsch and Davis (1997) described quality as "a dynamic situation related with products, services, people, processes, and environments that meets or exceeds the expectations of customers".

Quality can be viewed from two perspectives, namely internally and externally. Internally quality is described as matching company's quality standards, as described by Crosby (1979) in the earlier section. Externally quality is observed from the customer perception, in which the product is free from any deficiencies, focusing on customer needs and their satisfaction (Deming, 1986; Feigenbaum, 1986; Juran, 1988). Such definition can be well applied in organizations of all sorts, be it the manufacturing, services, profit or non-profit organizations (Juran, Gryna, & Bingham, 1974).

In a survey conducted by Mckinsey and European Foundation (1989) as cited in Dale (2003, pp. 14-15) quality is perceived to be of great importance due to the following reasons: (1) it is the main motive of purchase for the definitive customers; (2) it relates to the reduction in costs; (3) it improves flexibility and enhanced responsiveness; and (4) it reduces throughput time. Two common dimensions of quality are discussed next, which are product and service quality.

2.2.1 Product Quality

Product quality, according to Dunk (2002), has become merely a competitive requirement for firms rather than a provider of competitive advantage and this has become an issue of concerns for many organizations. Without quality, an organization will lose its credibility, affecting the trustworthiness of its product, thus resulting in customers' dissatisfaction. According to Garvin (1987), there are eight dimensions in product quality. They include performance, features, reliability, conformance, durability, serviceability, aesthetics and perceived quality as shown in Table 2.1. Meanwhile, Ahire, Golhar, and Waller (1996) only utilized the characteristics of performance, reliability, and durability as indicators for product quality measurement. Russell and Taylor (2006) on the other hand claimed that there are nine dimensions of

product quality instead of eight, with the additional characteristic being safety, which is a promise and guarantee to customers that the product will inflict no harm upon the users when using it.

Table 2.1: Product Quality Dimensions

Dimensions	Descriptions
Performance	The main operating features of a product.
Features	The added characteristics that complement and enhance the basic function of a product.
Reliability	The likelihood that a product being able to function or use without failing within a particular stated time period.
Conformance	The extent to which the design and operating characteristic of the product meet the predetermined standard.
Durability	The expected amount of use of the product before it depreciates and wears out physically.
Serviceability	It reflects the speed, politeness and the capability of repair work.
Aesthetics	It refers to how a person judge product appearance, based on the five senses of smell, taste, look, touch and sound.
Perceived Quality	The perceptions of customers on the quality of a product, based on the reputation of the firm provider.

Sources: Adapted from Hitt, Hoskisson, and Ireland (2007, pp. 144-145)

2.2.2 Service Quality

Service quality is highly stressed upon in the service sector, where expectations for superior service for customers are placed upon by companies, daily (Cheah, 2008). If a firm is able to provide the quality of service that is on par with the expectations and requirements of its customers, the service firm will have an added value advantage that can position the firm well in the competitive environment (Mehta, Lalwani, & Han, 2000). Wang, Lo, and Hui (2003) described service quality as the state of difference between the expectations to receive a service and the customers' perceptions of actually receiving the service. In simple terms, the state of difference is referred to as "disconfirmation". As services are experiences that are intangible, the nature of it makes quality definition difficult. Due to its unique characteristics, many scholars and researchers have attempted to uncover a model to assess service quality.

Camison (1998) suggested the literature of service quality is divided into two schools of thoughts. One is the 'Nordic School' and the other the 'North American School'. The first school of thought is led by Gronroos (1988) and Gummesson (1988), which focus mainly on differentiating the two basic elements of service quality, which are the technical and functional quality. Derived from the concept of quality control in the manufacturing side, the technical quality mainly focused on the appropriate generation of the main benefit of service; meanwhile, focusing on the process of service delivery, the function quality emphasize primarily on how the service is transported (Gummesson, 1988).

The second school of thought, which is the 'North American School', is headed by scholars such as Parasuraman, Zeithaml, and Berry (1985; 1988). The emphasis of its service quality lies on its customers' perceptions on the delivery aspects of service. Drawing from the work of Parasuraman et al. (1988), five behavioral dimensions, which are assurance, responsiveness, reliability, tangibles and empathy were revealed. The initial report in 1985 revealed ten dimensions, which consists of tangibles, reliability, responsiveness, communication, credibility, security, competence, courtesy, understanding customers, and access (Parasuraman et al., 1985). To decrease the number of items and to enhance the credibility of the measurement, a few stages were engaged. Subsequent to the Gap Model, a 22-item instrument called the SERVQUAL model was developed (Parasuraman et al., 1988). From the time when SERVQUAL was developed, it has been used and applied by numerous scholars in many service organizations to gauge the quality of service (e.g. Dotchin & Oakland, 1994; Frost & Kumar, 2000; Yang, Jun, & Peterson, 2004).

2.3 Review of TQM Concept from Quality Scholars

A thorough review of the literature was carried out to acknowledge the TQM theory defined by quality gurus such as Crosby (1979), Deming (1986), Ishikawa (1985) and Juran and Gryna (1993). Their contributions served as a base to understand the theory of TQM. Subsequent sections present the main TQM application proposed by them.

2.3.1 TQM Approach by Deming

Quality, as defined by Deming was emphasized in an article (or book?), "*If Japan Can, Why Can't We?"* (Kruger, 2001 in NBC White Paper 1980). The main idea of Deming is to focus on creating an organizational system that learns and co-operate with top management behavior. His main purpose is to improve on a company's development system that enhances quality, leading to increased productivity, and achieving total competitive advantage in the business world. He also pointed out that high cost due to low quality may also lead to a failure in gaining a competitive status in the commercial world (Kruger, 2001).

Cheaper cost refers to minimizing resource wastage, workforce and errors, hence contributing to the organizations to differentiate through solid means when adjusting to the challenging marketplace. According to Motwani (2001), vast difference creates the unpredictability in performance, which brings about a result of low quality. Thus, minimizing the difference is essential in the theory of TQM. In order to accomplish his objectives, Deming has worked out several methods that are famously known as Deming's PDCA Cycle and 14-points programme. Goetsch and Davis (1997) pointed out that a correlation between production and consumers needs was established under Deming's PDCA Cycle in order to maintain the resources of each department to cater their needs. The following lists the Deming's PDCA Cycle (Goetsch & Davis, 1997):

1. *Plan* – Planning the goods to be produced to the consumers.
2. *Do* – Producing the goods.
3. *Check* – Assuring that the goods were manufactured based on plans.
4. *Act* – Marketing the goods.
5. *Analyze* – Examining consumer's feedback on the quality, cost, and other criteria on the goods.

Furthermore, the research society has given a favorable assessment on the Deming's 14 points. Ross (1993) argued that Deming 14-point principles are a requirement for each level in an organization. Deming's 14-point principles are summed up as follows (Bendell, Penson, & Carr, 1995; Ghobadian & Speller, 1994; Kruger, 2001):

1. Develop consistency in objectives on goods and enhancing service. Innovation and distributing resources for planning in the long-term.

2. Implementing new beliefs in which faults and flaws are uncompromised in this new economic era by studying responsibilities and applying leadership for a difference.

3. Discontinue reliance on mass inspection by enhancing on the work processes and developing good quality in products.

4. Stop the exercise of honouring business based on price. Quality materials are essential as working together with a sole supplier in the long run could assist in the reduction in cost and achieving high level of quality.

5. Continually enhances the manufacturing system and service by minimizing cost and improving both product production and quality.

6. Set up on-the-job training.

7. Assist employees, gadgets and machines to increase job productivity. Management and supervision of production workers are in need of redevelopment.

8. Remove worries for workers so that they can work more effectively and efficiently with crystal clear understanding on the task assigned.

9. Eliminate obstacles between staff. Interaction and working together amongst each department are needed for enhancement.

10. Remove mottos, exhortations and numeric goals.

11. Get rid of allocations.

12. Eliminate obstacles that restrict their privilege in their pride of workmanship.

13. Establish a vibrant education and self-improvement.

14. Changing is a portion of responsibility of each individual within the organization.

In summary, Deming approach on TQM emphasizes more on the importance of an organization system en route for quality improvement and variations reduction which probably affect an organization's productivity and management. Besides, Deming's method has also proven that an improved organization will be able to stay afloat in the ever vulnerable marketplace.

2.3.2 TQM Approach by Juran

According to Juran and Gryna (1993), TQM is a system of actions aimed at achieving employees' empowerment, costs reduction, customers' satisfactions, and profits increment. Ghobadian and Speller (1994) indicated that Juran's tactic to TQM emphasizes on both team and project work that improves quality development, supporting the interaction between both managers and employees, along with enhancing co-ordination between employees themselves. Juran also emphasized the important requirements needed by top management, which is laid out in terms of empowerment, participation, appreciation and rewards. He continues to stress that top management, instead of employees, is responsible for the main quality problems. To accomplish quality, it needs the cooperative actions from all functions within an organization.

Juran's philosophy is distinguishable from Deming's. According to Ghobadian and Speller (1994), Deming's approach to quality is not only to merely satisfy customer needs, but to exceed customer expectations; while Juran's quality approach is more focus on the fitness for purpose or use. In addition, Deming's main emphasis is on the processes of the company, in which techniques such as Statistical Process Control (SPC) is used to measure the performance in all processes; while Juran mainly emphasized on the human element, in which communication and coordination between functions are vital. Furthermore, Deming's scope of application is more holistic; while

Juran has a comprehensive programme for product life span, which incorporates designing, relationship with vendors, manufacturing control, process development, inspection, testing, distribution, customer relationships and field service.

Apart from that, Juran further clarifies his theoretical method in quality management via the quality trilogy, namely quality planning, quality control and quality improvement (Goetsch & Davis, 1997; Kelada, 1996). Each of the three qualities has been summarized as follows (Goetsch & Davis, 1997):

- ***Quality Planning***: Spotting the target market, deciding and producing products that satisfy customers' needs and execute this according to plan.

- ***Quality Control***: Assessing the quality performance by comparing the actual performance with the preset targets.

- ***Quality Improvement***: Performing consistently in quality improvement. Recognize faults and come out with answers to improve performance.

In addition to that, Juran has created the theory of quality cost that allows an organization to assess quality in the form of currency. These four costs of qualities are explained as follows (Ghobadian & Speller, 1994):

- Internal Failure Costs – All flaws identified before the product is delivered to customer, such as scrap, failure analysis, rework, etc.

- External Failure Costs – Warranty charges, return of material, allowances, etc associated with flaws which are discovered *after* product is delivered to customer.

- Appraisal Costs – Cost in deciding the requirements for quality such as testing, audits on the products' quality, inspection cost, etc.

- Prevention Costs – Cost incurred to minimize the failure and appraisal costs. These involved quality planning, product review, assessment of supplier quality, etc.

As a concluding remark, Juran focuses on all processes in making the quality management at each level within an organization a success rather than concentrating on the products specification itself. His contributions on the four quality costs have facilitated organizations to enjoy a greater improvement in the quality management process.

2.3.3 TQM Approach by Crosby

Crosby has made his work known on TQM with a few popular concepts. Two of his famous sayings are "Do it Right First Time" and "Zero Defects" (as stated by Rampersad, 2005). He emphasized that prevention is better than cure as developing solutions after the faults is discovered will result in greater cost such as prevention cost, appraisal costs, and failure costs. Crosby highlighted that causes of mistakes happens because of a lack of both knowledge and awareness. Therefore, the importance of improvement is again emphasized, in which Crosby (1979) has denoted several exercises and laws to be implemented, which comprises of both management's

commitment, and attention to every details in order to for them to be held responsible for quality management and improvement.

Similarities can be found in both Crosby and Juran's philosophy whereby both believe that the top management should take full responsibility in administering the entire operations of an organization and they also should be the one to come up with solutions when problem occurs.

Crosby clearly defines quality as "requirements conformance", the lack of quality is largely because of the existence of non-conformance (Kruger, 2001). He also suggested his four conclusive methods to manage quality (Kruger, 2001):

1. Quality is categorized as "requirements conformance" instead of goodness whereby management leads and provides clear direction for workers to abide by.

2. The quality system is meant for avoidance.

3. The benchmark of performance must be completely defective free.

4. Quality measurement indicates the non-conformance of pricing.

Nevertheless, quality improvement introduced by Crosby's 14-steps helps companies to practice quality enhancement. Such an approach is essential in enhancing the competitiveness of a firm as it focuses on the commitment of the managers, encouraging the development of an organizational culture that participates in developing quality awareness and action throughout the firm, an emphasis in preventing defects from occurring, and the continuous improvement in the quality process (Ghobadian & Speller, 1994). The 14 steps are listed as below (Ghobadian & Speller, 1994):

1) Commitment from Top Management – Elucidate the management stands for quality.

2) Quality Improvement Team – Implementing the Quality Improvement Program.

3) Quality Measurement – A list of current and possible non-conformance problems is presented, allowing for objective examination and corrective measures.

4) Quality Cost – Detailing the elements that amounts to quality cost, which is used as a tool by managers.

5) Quality Awareness – Providing a method that brings to awareness the personal concern experienced by all employees within the organization regarding the product or service conformance and the reputation of its quality.

6) Corrective Measures – Presenting a systematic way to resolve problems experienced in the previous steps.

7) Zero Defects Planning – To assess the various events that are executed to make ready for the official launching of the Zero Defects program.

8) Supervisor Training – Describing the type of training needed by supervisors in order for them to actively participate in the quality improvement program.

9) Zero Defects Day – Using personal experience, put in place an event that allows employees to be aware of the changes being made.

10) Goal Setting – Turning commitments and promises into actions by encouraging members to come up with improvement goals for themselves and their groups.

11) Error Causal Removal – Presenting individuals with a platform to communicate with the managers regarding situations that are complex for the workers to meet the promise for enhancement.

12) Recognition – Value the ones who involved themselves.

13) Quality Councils – Assemble the individuals' professional quality for regular interaction.

14) Do It Over Again – Ensuring continuous quality improvement program

Nonetheless, Crosby's 14-steps has included planning, contribution from each level in an organization, and execution which leads to Zero Defects. This has given a clear direction to the majority of the organizations. However, Crosby's approach has presented more guidance to the management team instead of the practice, namely the tools or techniques for engineers.

2.3.4 TQM Approach by Ishikawa

The quality perception by the Japanese is highly inspired by Ishikawa's work. According to Ishikawa (1985), the Japanese's belief in quality control is innovation in terms of managers creating an alternate method of thinking in management. Apart from this, quality control can be applied in the development, design, production and quality product service stages, whereby the good is reasonably priced, practical and commonly satisfies the consumers' needs. Therefore, each individual has to participate in quality control, notably the top management team (Kruger, 2001).

Ishikawa argued that the main rationale for an organization to be successful is largely dependent on quality enhancement as a non-stop mission, whilst he too emphasized that quality management goes beyond goods, and involves after-sales service; the quality of top management, each individual and the organization itself. Nevertheless, commitment to improve will enable life-long learning for workers, ensuring the success of TQM (Ishikawa, 1985; Zhang, 2000).

Ishikawa has given his attention to the technical statistical techniques that are applicable in industry (as quoted by Rampersad, 2005). He also focuses on good data collection and presentation. Therefore, Ishikawa formulated on a few quality tools that involved Histogram, Cause and Effect (Ishikawa diagram), Scatter diagram, Pareto Chart, Stratification Chart, and Check Sheet (Evans & Dean, 2000). Ghobadian and Speller (1994) have listed out Ishikawa's approach of TQM which consists of six fundamental principles:

1. Quality should be given the priority instead of revenue in the short term.

2. Customer orientation should be targeted instead of producer orientation.

3. Overcoming the barrier of customers' sectionalism.

4. Showing of facts, data and the application of statistical methods are encouraged.

5. Respect as part of management philosophy and support the full involvement in management.

6. Support the creation of cross-functional group.

Besides, the success of establishing Ishikawa's six basic principles has an effect on (Rampersad, 2005):

- Enhancing on product quality and reliability, whilst faults and mistakes will be reduced.

- Improving on products consistency.

- Cost-saving.

- Minimizing rework and wastage.

- Enlarging the sales market.

- Improving on management.

Ishikawa has been considered as one of the experts in TQM because of his emphasis on quality. Based on this reason, he has developed a few methods called quality tools such as Ishikawa diagram, etc (as listed above).

He places customer as a truly important person in the production process as he often emphasizes that one should simply concentrate on goods or services. In reality, one must include the quality control of the whole organization as operating a business is on a long-term basis. In addition, quality control should be extended beyond the provision of product, in which he argued that it should also include after-sales service, the quality of the individuals, top management and the company itself (Ishikawa, 1985). This concurs with the view of both Feigenbaum (1986) and Groocock (1986). By stressing this, it helps to preserve or even enhance on the goods and services provided. Conversely, the cost of production will minimize faults.

Besides that, Ishikawa also supports the deployment of 'quality circles'. Like all other gurus, the importance of education was also emphasized in his work. He mentioned that quality starts and ends with education. From his perspective, every employee should be educated with the seven basic techniques of quality, which are histograms, process flow chart, check sheets/tally charts, cause-and-effect analysis, Pareto analysis, control charts and scatter diagrams (Ghobadian & Speller, 1994).

2.3.5 Reviews on TQM Concepts

Although different concepts exist among the scholars, the similarity is that all of them focused on quality enhancement. Their methods and viewpoint are famous today and have obtained good evaluation by the global organizations. Though, Deming's belief has been focusing on the changes all through an organization, his objectives for enhancing quality underlines on the significance of top management taking initiatives controlling the entire operation development. His 14-points principles encouraged implementation at all levels in the organizations; it has provided a clear guidance to organizations in which they could improve on quality management.

According to Juran's methodology, he highlighted the magnitude in achieving customers' satisfaction, whilst product quality has to be put behind the perception of satisfying customers' needs which indicates that goods should be suitable to use instead of conforming to the product specifications itself. He too stressed on both team and project work. He emphasized that the management team is responsible for the key problems with quality instead of the workers, thus accomplishing quality needs actions and performances in all functions rather than the quality department alone. Besides, Juran concentrated largely on both the process of technical and managerial - quality trilogy has been a platform to guarantee quality can satisfy the customers' needs.

Crosby pointed out that his approach towards TQM focuses on achieving zero faults. He professed that avoidance is better than looking for solutions when defects take place as this will cause a higher cost of rework and wastage might be a problem to an organization. His famous 14-steps approach has been applied regularly by organizations when working towards zero defects management. Maybe to Crosby, planning has played a major part than those practical tools and techniques when compared to other scholars.

Ishikawa's opinion on quality management goes beyond goods; he considers both after-sales service and the opinion of the consumers. His focus on collecting data and the presentation of result produces a few quality tools such as his famous Cause and Effect Diagram (Ishikawa's diagram), etc. However, he also suggested six basic principles that highlight customers' orientation techniques leading towards quality management that pursues improvement.

2.4 Review of Quality Award Models

This section will review the four major quality awards which are widely recognized as the pinnacle of quality management achievement. They are MBNQA, EQA, MQA and the Deming Prize. These awards symbolize the major quality award in their respective continents. Those nominees in any of these quality awards are viewed as the greatest accomplishment in their organization (Ghobadian & Woo, 1996). National and international recognition are rewarded to the award winner for their exceptional determination in achieving excellence in quality (Ghobadian & Woo, 1996).

2.4.1 Malcolm Baldrige National Quality Award

In 1987, a law was enacted in United States of America called Malcolm Baldrige National Improvement Act which subsequently was launched as an annual award for quality management recognition (Bohoris, 1995). The annual award is aim to show appreciation to an organization in USA that has shown outstanding achievement in continuous improvement and improving customer satisfaction (Ya'acob, 2008). The model structure of this award is used to assess the quality, standard performance of organization's management against the world-class benchmarks and main competitors, and to improve the organization's management practices on quality, standard performance against world-class benchmarks and main competitors, and also to enhance the rapport between suppliers and customers. The list below is extracted from the model structure (1999) for MBNQA (Bohoris, 1995):

- Leadership: Management headship; society duties.
- Strategic Planning: Tactic progress; tactic set up.

- Customer and Market Focus: Knowledge on customer and marketplace; customer rapport and fulfillment.

- Information and Analysis: Measurement and study on accomplishment of the organization.

- Human Resource Focus: Work system; employee learning, training and development; employee welfare and fulfillment.

- Process Management: Product and service procedures; supporting procedures; supplier and partnering procedures.

- Business Results: Customer based outcomes, financial markets outcomes, manpower outcomes, and supplier and partner outcomes, organizational efficiency outcomes.

Thousands of firms used the criteria to develop business processes vigorously in their in-self-assessment and training. Various issues of quality are discussed by MBNQA to achieve a full and comprehensive TQM system. Last but not least, for training and education purposes MBNQA has examination, especially for management, as it draws out main issues concerning managers. This uniquely differentiates excellence and mediocrity (Evans & Lindsay, 1995; Lau & Idris, 2001).

2.4.2 European Quality Award

The European Foundation for Quality Management was established based on the formation of 14 leading Western European business organizations in 1900 with the objective to improve quality management in Europe. EQA was introduced after MBNQA of United States of America (Bohoris, 1995). EQA stresses on resources because it dedicates the overall part to management resources.

Bohoris (1995) explained that the model of EQA is clustered into enablers and results; where leadership, management, policy and strategy, processes and resources are indicated by the enablers whilst people satisfaction, society impact and business outcomes are stated by the results.

The nine criteria of EQA are listed below (Bohoris, 1995; Rampersad, 2005):

1. Leadership
    - Communications with customer and suppliers;
    - Make sure progress, accomplishment and enhancement in an organization;
    - Leader in total quality management;
    - Applying stability in total quality culture.

2. Policy and Strategy
    - Policy and strategy are constantly examined and enhanced;
    - Created by information via research and analysis;
    - How do they interact;
    - How are they significant to the theory of total quality.

3. People
    - Are the organization’s resources well-prepared and in order?
    - How was the enhancement development to be carried out?
    - Are the people and teams obliged to the same objectives?
    - How efficient is the interaction between top management and workers?

4. Resources
    - Partnership;
    - Finance;
    - Properties and assets;
    - Information technology.

5. Processes
    - How processes head towards enhancement?
    - How systematically organizations run?
    - How organizations encourage improvement on to the progress of enhancement?
    - How organizations handle quality and relationships with customers?

6. Impact on Customers.

7. Impacts on People.

8. Society’s Perception.

9. Business Performance.

2.4.3 Malaysian Quality Award

In 1990, the Malaysian Prime Minister's Quality Award was launched; it was renamed as the MQA sometime later. This award is presented to give recognition and appreciation to organizations in the private sector which have outstanding achievements in quality management (Ya'acob, 2008). The aim of MQA in the private sector is to boost Quality Awareness and implementation of Quality values.

There are seven criteria used by MQA which are as follows (Ya'acob, 2008, pp. 68-69):

Criteria 1: Leadership in quality management studies; which refers to the role of management team in organizing and coordinating quality management initiatives and other associated stages.

Criteria 2: The employment of Quality Data and Information; which refers to the utilization of quality information and data for quality development purposes.

Criteria 3: The process of strategic planning; which is the practice of combining quality planning within the strategic plans of the whole organization.

Criteria 4: To be human resource focused; which is to measure the effectiveness in managing staff development, management, involvement as well as the working culture in the organization.

Criteria 5: Steps taken by companies to make sure that outputs are in good quality, which can be measured in terms of quality audit, process and documentation, also known as Quality Assurance output.

Criteria 6: The Quality innovation improvement project; which is the attainment of quality programs during the existing year as compared to the past years, which is based on customer recognition, quality innovation and quality output.

Criteria 7: Being customer focused; which is to undertake activities that enhance customers' satisfaction.

The global development of national quality award has influenced the practices of national quality award in Malaysia. This section will be concluded based on the finding of the analysis conducted by Chuan and Soon (2000). The three most influential quality awards, namely the Deming Prize, MBNQA and EQA have been used as the model for most of the national quality awards. The criteria that form the national quality awards have much similarity despite there are differences found in these models (Sila & Ebrahimpour, 2002; Ya'acob, 2008).

2.4.4 The Deming Prize

The Deming Prize was launched in 1951 by the Board of Directors of the Japanese Union of Scientist and Engineers with the mission to give acknowledgement and share the quality learning to organizations which have successfully practiced statistical quality control techniques to achieve good quality control (Ghobadian & Woo, 1996).

Ten key aspects were stressed on and draw out from Deming Application Prize as the checklist that rate the achievements of top management as it emphasizes on the importance of their involvement in understanding quality management (Zhang, 2000). Eventually, this has gradually evolved into the guideline to top management to identify

what are to be executed accordingly. Ten key aspects based on Deming Application Prize (Zhang, 2000) are listed below:

- Policies – Focus on quality and also the tactic to control quality including targets, appropriate methods which come out with policies; short-term and long-term planning; and leadership of the managements.

- Organization – Explanation on function and duties as well as of arrangement which involves each worker and the association with linked companies for quality control.

- Information – Gathering and translating both external and internal information with the suitability of methods in data analysis, data processing, applying and retaining of information.

- Standardization – Develop typical system that consists of measures for adjusting and removing standards; assess actual accomplishments.

- Resources (Employees) – Training and knowledge given to workers which would mould clear opinions in the understanding of quality control and quality; suitability of guidance which inspires, encourages and establishes oneself towards the enhancement programs.

- Quality – Developing system that guaranteeing diagnosis, examine which aspect operates well in quality control, quality development and quality improvement and also in creating good customers' rapports.

- Maintenance – Applying short-term and long-term procedures; enforcing ways to work out on the level of control; cost management operating systems, quantity and the activity of PDCA series.

- Improvement – Exercising Quality control by choosing important events and precedence subjects with the application of statistical method to examine outcomes and making sure enhancement outcomes and transferring them to maintenance advancement.

- Effects – Involving both intangible and tangible (costs and revenues, quality) effects; resolving customers' requirements and employee satisfaction and as well as the consequence on organizations.

- Future plans – Comprehend the present condition, planning for errors reduction and faults. Estimating environmental variation and suitability of ways to satisfy customers' requirement. Persistently exercising quality control.

The most vital issue in Deming Prize is that an organization should fully understand the control in quality, assurance in quality and application of methods of quality control in management. The efficiency of policies is verified through the temporary and permanent plans made. On top of that, it also assesses the capability of employees and satisfaction towards the management and whether the organization is implementing the same philosophy to ensure that the organization is well organized. The status of the organization is maintained or improved by setting high priority on quality control activities. Besides this, in this highly competitive environment, the vision of organization need to be drawn out by having a good planning and set it determinedly.

2.4.5 Results from Quality Awards

After reviewing the four Quality Awards - MBNQA, EQA, MQA and Deming Prize, similar points are identified in each of the criteria or minor relationship that relate with one another. The three qualities that are stressed on and which are rated important and given credit in boosting the achievement of organizations are leadership, resources, and customers' satisfaction, whereby processes are rated as important in quality management and affect the business outcomes.

Several quality awards were reviewed and some differences were found. As reviewed above, Deming was the first quality award introduced, followed by EQA. These two awards are slightly different in the manner where MBNQA emphasizes on the customer results and continuous improvement by assessing the management practices and boost the bond with customer and suppliers through investigation; EQA recognizes the effectiveness of the TQM development and stresses more on how it affects the development to improve society and people who are related with the management team with workers. On the contrary, MQA emphasizes on the application of quality data and information and the Quality Assurance of the suppliers externally. It is also made to be understood that the importance of corporate responsibilities in building up quality management and also to acclimatize to world-wide standards. In Deming Prize, through the ten elements it is clearly stated that to achieve good quality control, an organization should have a full set of quality development from top to bottom. In view that the achievement of TQM can improve business settings, each step in developing the plan is important and should not be missed or erroneous.

2.5 Review Critical Practices of TQM from Other Researchers

The practice of TQM has been defined in many ways in the literature review of past empirical articles, even though they complement one another (Prajogo & Sohal, 2003; Terziovski & Samson, 1999). Quality gurus in the likes of Deming, Juran, Crosby, Ishikawa, Feugenbaum and Gryna came up with certain recommendations in the field of quality management. Their insightful views into quality management have provided a well thought out quality management dimensions (Zhang et al., 2000).

Furthermore, well-known quality award models, namely the Deming Prize (1992) in Japan, the EQA (1994) in Europe as well as MBNQA (1997) in the United States have provided both researchers and practitioners with a useful benchmark model in which organizations can assess their quality management techniques, the adoption of those practices as well as evaluate the end results.

There have been several attempts made by researchers to identify, study, review and assess the important factors that are found in the TQM strategy. Powell (1995) has identified leadership commitment, the adoption of philosophy, customers as well as suppliers' closeness, training and development, benchmarking, empowering employees, open organization, flexible manufacturing, zero-defects perspective, process improvement and measurement to be essential elements of a TQM framework. On the other hand, eleven TQM practices have been identified by Zhang et al. (2000) on the grounds that they are well-established and recognized practices for quality improvement from the perspective of the Chinese. Embedded in the eleven practices are top management, vision and strategic planning, assessment, process management and improvement, designing of product, improvement in quality system, employee

involvement, reward and recognition, training and education, supplier quality management and customer focus.

Review papers, such as those that have been written and published by renowned researchers such as Ahire, Landeros, and Golhar (1995), Dean and Bowen (1994), Fynes (1998), Ho and Fung (1994), Sila and Ebrahimpour (2002), Tari (2005), Thiagarajan and Zairi (1997a; 1997b; 1997c) and Yong and Wilkinson (1999) are all widely accepted to be the leading study in the TQM literature.

TQM is a management philosophy that can be categorized into many techniques and dimensions (Dean & Bowen, 1994). The three core dimensions identified mainly comprised of teamwork, continuous improvement and customer orientation. In turn, these dimensions are supported by wide-ranging techniques. In the same year itself, Ho and Fung (1994) went on to suggest that they are ten elements in TQM which comprised of top management, continuous involvement, commitment, involvement and participation, training and development, ownership, prevention of errors, rewards and recognition, teamwork and cooperation, and lastly customer satisfaction.

In Ahire et al.'s (1995), they have systematically analyzed a sum of 226, conceptual framework articles, empirical studies, case studies as well as analytical journals from the TQM related field between the years of 1970 to 1993, utilizing MBNQA as a foundational framework. They concluded that many of the TQM articles being reviewed are that of an overview, conceptual in nature and quite subjective. Therefore, the empirical studies published were far from sufficient.

Similar with Ahire et al. (1995), TQM literature that used a set of criteria similar to that of EQA and MBNQA have also been reviewed by Thiagarajan and Zairi (1997a; 1997b; 1997c). However, a huge portion of their review mainly emphasized on case studies and the recommendations of quality gurus in the likes of Deming and Feigenbaum in the various discussions related to TQM adoption.

Through a detailed review of the TQM literature, it was found that TQM can be divided into 'soft' and 'hard' elements, as suggested by Thiagarajan and Zairi (1997a; 1997b; 1997c). The soft TQM elements comprised of leadership commitment, teamwork, empowerment, effectual communication, a well-developed recognition system and an appreciation for quality efforts, as well as training and development. In contrast, the hard elements are those referred to as tools, techniques and systems used, such as benchmarking, process management, quality management systems that are documented, as well as supplier and customer management. In order have effective TQM implementation, it is believed that both soft and hard elements must co-exist.

In another comprehensive TQM review, 20 empirical studies on TQM were examined and investigated by Fynes (1998) in which the critical factors of TQM were tested and confirmed. He identified and adopted the seven critical TQM factors proposed by Flynn et al. (1994) as his conceptual framework and further examines the empirical studies associated with the seven areas. The support of quality information, top management, work management, process management, product design, supplier and customer involvement remain the seven critical factors.

In another instance, 15 articles on the benefits of TQM on organizations were critically reviewed by Yong and Wilkinson (1999). Most of the articles reviewed by them were studies conducted on the association between TQM and company performances in different countries. The conclusions were two folds. From the previous studies, some reported that TQM is positively related to performance; whereas some revealed that TQM adoption is unsuccessful and indifferent towards the company's performances. Often, it was predicted that the downfall of TQM implementation is due to the partial adoption of quality management.

At the beginning of the new millennium, Sila and Ebrahimpour (2002) conducted a comprehensive review on 347 research journals that were published between the years of 1989 to 2000 in an assortment of journals. Most of these scholarly articles have adopted the survey approach in which were conducted in various countries. In their investigation of 76 survey articles on TQM, they found that there were 25 TQM factors that are most commonly used across these studies. Moreover, by utilizing these 25 factors to construct a framework model, they concluded that leadership commitment, employee involvement, teamwork, customer focus, employee training, continuous improvement, and having quality information and performance measurement remained as the seven most often used TQM factors in the literature. Interestingly, in the 347 research papers that were reviewed and examined, only four were conducted in Malaysia, which constitutes approximately 1.2 percent.

A more recent review on the literature of TQM by Tari (2005) revealed nine critical factors pertaining to TQM practices. They are top leadership commitment, customer based perspective, continuous improvement, quality planning, management based on facts, human resource practices, process management, gaining supplier's cooperation,

and company's awareness with regards to issues relating to the social and environment. Members' participation in firms, teamwork, training and communication systems are some of the essential elements that are included in the human resource management factor.

In essence, rich information from the review papers has provided both practitioners and researchers a better understanding on the quality management area. However, as noted by Ahire et al. (1996), the review papers are lacking in empirical confirmation and a systematic scale development. Due to the significance of TQM being an essential measurement instrument, many authors have started to identify, develop and test the critical factors of TQM by utilizing the national quality award model, the in-depth review of past literatures, and the recommendations by quality gurus (e.g. Ahire et al., 1996; Black & Porter, 1996; Saraph, Benson, & Schroeder, 1989). Using meticulous statistical analysis, the strength of the TQM critical factors are being verified in a 'statistical' way. Hence, it accommodates the development of scientific research on TQM.

2.6 TQM Practices in this Study

TQM is depicted as a set of guiding values that characterizes the foundation of a firm that continuously improve itself, in which the firm is advancing consistently in every aspect of every process, level and activity and so on, it is perceived to be one of the finest objective for the firm (Chang & Sun, 2007). In order to attain such a goal, it requires the involvement of every employee in the firm, regardless of ranking or position, to please the desires and needs of customers (Deming, 1986; Feigenbaum, 1980; Juran & Gryna, 1988). Apart from that, TQM can also be portrayed as an entire company effort that includes every worker, trader and consumer, in which the firm aims

to consistently enhance the value of the goods and procedures, to satisfy and surpass the expectations of the consumers (Dean & Bowen, 1994).

Past research has been conducted and the conclusion was drawn that the adoption and implementation of TQM practices can enhance a firm's competitiveness and performance (Dow, Samson, & Ford, 1999; Hendricks & Singhal, 2001a; Powell, 1995; Terziovski & Samson, 2000). Many past studies confirmed that the application of TQM practices has a positive force on a firm's end result, such as the enhancement of product quality and other non-financial results (Choi & Eboch, 1998; Dow et al., 1999; Elmuti & AlDiab, 1995; Forker, Mendez, & Hershauer, 1997; Mohrman, Tenkasi, Lawler, & Ledford, 1995; Powell, 1995; Shetty, 1993; Terziovski & Samson, 1999; 2000), monetary results (Easton & Jarrell, 1998; Hendricks & Singhal, 2001a; Hua, Chin, Sun, & Xu, 2000) and also the value of the company's stock (Adams, McQueen, & Seawright, 1999; Easton & Jarrell, 1998; Hendricks & Singhal, 1996; 2001b). Therefore, by adopting TQM practices, company's management will reap the reward in a tremendous manner as it results in an improved performance on the organization as a whole (Adams et al., 1999; Choi & Eboch, 1998; Dow et al., 1999; Easton & Jarrell, 1998; Elmuti & AlDiab, 1995; Forker et al., 1997; Hendricks & Singhal, 1996; 2001a; 2001b; Hua et al., 2000; Martinez-Costa & Jimenez-Jimenez, 2008; Mohrman et al., 1995; Powell, 1995; Shetty, 1993; Terziovski & Samson, 1999; 2000).

The most influential constructs of TQM, according to several researchers, are those that are intangible, or cannot be seen. In other words, these dimensions can also be expressed as the behavioral aspects, as Powell (1995) emphasized. Such behavioral factors include leadership, customer and human resource focus, and they are believed to pose a greater impact on the firm's performance. In line with this statement, Flynn,

Schroeder, and Sakakibara (1995) found that leadership support, human resource management and by being customer and supplier focus can facilitate the firm to achieve an impressive results through these three behavioral function aspects as ‘enablers’ that stimulate and encourage other elements. Furthermore, the three intangible variables stated by Powell (1995), which are management support, the open-mindedness of a firm and employee empowerment, increase the competitiveness of a firm as they are one of a kind and are difficult to duplicate. Dow et al. (1999) described these intangible behavioral factors as ‘soft variables’, as these components are intangible but have a direct effect on how well a firm performs. The findings from Sun (2000) show that leadership, strategic management planning and customer focus are the most essential elements; whereas the findings of Curkovic, Vickery, and Droge (2000) portray the main elements are of the similar three, which are leadership, customer focus and employee empowerment in an automobile industry.

From the literature review, numerous researchers have been found to use the six dimensions of TQM presented by MBNQA. These consist of human resource management, leadership, customer focus, process management, strategic planning and information and analysis (Jitpaiboon & Rao, 2007; Prajogo & Sohal, 2003). Such practices are used to examine on whether the TQM constructs do have an effect on the development and improvement of a KM.

The MBNQA framework has been widely accepted by numerous academicians and researchers as being one that signifies a complete set of TQM practices. According to Garvin (1991), not only does the award make mention on the quality management principles in a well-defined way, it also provides companies with an extensive structure to assess and review their progress of managing organizations in a new way. As

mentioned by Garvin (1993), MBNQA has been a vital contribution to many United States firms, be it the private or the public sector, to develop and revolutionize their management principles, and this is set to reform and redesign the managers in their opinions and their behaviors (Terziovski et al., 2000). As the MBNQA concepts have surpassed the users' expectations, Bemowski and Stratton (1995) found that these six practices were also employed to gather knowledge on the way to attain competitive advantage. Moreover, apart from being identified as a standard target to indicate the overall TQM concepts, the MBNQA practices also supply many United States public and private companies with a complete framework, to examine and better manage their companies' management standards (Terziovski et al., 2000). These six TQM practices can be further narrowed down into two aspects, according to Yong and Wilkinson (2001), that is the "soft" and "hard" elements (Wilkinson, 1992). The "soft" aspects, which include the practices of leadership, customer focus and human resource management, can arouse employees' awareness on the consumers' requirements and encourage quality to be better handled in the firm (Yong & Wilkinson, 2001). In terms of the "hard" components, which consist of practices such as strategic planning, process management and information and analysis, it seeks to improve the production techniques and also the business processes within the organization (Yong & Wilkinson, 2001).

Furthermore, it is an established fact that numerous manufacturing companies from the developed countries, in particularly United States, Japan and Australia, have adopted the six TQM practices and concluded that they are success factors for achieving sustainable advantage (Samson & Terziovski, 1999). Apart from that, renown researchers such as Dean and Bowen (1994), Prajogo and Sohal (2003) and Samson and Terziovski (1999) have also employed these six practices in constructing their research framework to

investigate the link between TQM and other variables. As for its applicability in developing country, academicians such as Hoang, Igel, and Laosirihongthong (2006) have adopted these TQM dimensions to measure its influence on the innovation performance of the Vietnamese firm. From the Malaysian context, several researchers, such as Sit, Ooi, Lin, and Chong (2009), Teh et al. (2008) and Teh, Yong, Arumugam, and Ooi (2009) have also used this six TQM practices to conduct their research and found that TQM does have a positive impact on the morale, behavior and attitudes of company employees.

Six TQM constructs were chosen after a thorough review of the literature. As can be seen in Table 2.2, leadership, strategic planning, customer focus, human resource management, process management, and information and analysis (Motwani, 2001; Powell, 1995; Saraph et al., 1989; Teh et al., 2008) are chosen for three essential reasons (Hoang et al., 2006):

a) The TQM dimensions integrated in our research framework originate from well-acclaimed quality awards such as MBNQA, EQA and Australian Quality Award (AQA).

b) Both soft (i.e. leadership, customer focus and human resource management) and hard (i.e. process management, strategic planning and information and analysis) elements of TQM as accorded in the literature that are incorporated into the research model.

c) The TQM practices selected are well recognized by previous researchers and scholars for being the key TQM practices in both manufacturing and service sectors (Hoang et al., 2006; Powell, 1995; Prajogo & Sohal, 2003; Samson & Terziovski, 1999).

Table 2.2: The Six Dimensions of TQM with Their Explanations

Constructs	Related studies	Explanations
Leadership	Ahire et al. (1996); Dean and Bowen (1994); Powell (1995); Prajogo and Sohal (2003; 2004); Saraph et al. (1989)	The extent of support top management gives when creating a total quality culture, which is important to the success of TQM adoption.
Strategic Planning	Anderson (2000); Motwani (2001); Powell (1995); Prajogo and Sohal (2003; 2004); Saraph et al. (1989)	The extent to which a clear mission, vision, a long run strategic plan and quality policy exist in a company.
Customer Focus	Black and Porter (1996); Evans and Lindsay (1995); Flynn et al. (1994); Hoang et al. (2006); Powell (1995); Prajogo and Sohal (2003); Samson and Terziovski (1999)	It remains vital to keep the customers satisfied, by developing and managing a strong customer relationship for a longer period. It is also important to understand the current needs and future expectations of the customers.
Human Resource Management	Black and Porter (1996); Flynn et al. (1994); Samson and Terziovski (1999); Wilson and Collier (2000)	The extent of creating a wide-ranging management process to be incorporated in a firm's strategy.
Process Management	Ahire et al. (1996); Flynn et al. (1994); Juran (1995); Motwani (2001); Powell (1995); Samson and Terziovski (1999); Teh et al. (2008); Zairi (1997)	Adding value to processes, enhancing quality levels and coming up with programmes that decreases wasted time and costs in all internal processes are emphasized.
Information and Analysis	Hackman and Wageman (1995); Prajogo and Sohal (2003; 2004); Samson and Terziovski (1999); Sila and Ebrahimpour (2003)	The extent to which data and information is gathered and examined for the purpose of attaining quality improvement.

Sources: Adapted from Hoang et al. (2006); Ooi (2009)

2.7 Review of KM Concept

In this section, we provide a review on the literature of theory of knowledge, theory of KM and the dimensions of KM.

2.7.1 Theory of Knowledge

Knowledge, in its simplest form, is defined as an intangible asset which is difficult to duplicate and is viewed as a competitive tool that should be managed effectively (Lim et al., 1999). Through the proper management of knowledge, it could help a company to

create value (Lin & Tseng, 2005) and drive the firm to become more effective in its organization, hence increasing its competitiveness (Hlupic, Pouloudi, & Rzevski, 2002). According to Lim et al. (1999), knowledge originates from raw data that are pooled together to create information. Such information will then be shared to create knowledge (Lim et al., 1999). Knowledge basically derives from an individual's capability to use sensibly the available information obtained from the surrounding environment, be it the social or workplace surroundings (Bentley, 1999; Broadbent, 1998). Mauro (1999) further pointed out that knowledge is obtained by experiencing, seeing and reporting; and such knowledge can be explained with data and theories. Two major components of knowledge are explicit and tacit.

2.7.1.1 Explicit Knowledge

According to Lin and Tseng (2005), explicit knowledge is defined as tangible knowledge, which is clear and can be captured easily. Furthermore, such knowledge can be transmitted to an external party by encoding it into a media of some form, such as paper documents, electronic records, leaflets, advertising materials, brochures etc. In other words, it can be distributed and replicated without much difficulty (Linderman, Schroeder, Zaheer, Liedtke, & Choo, 2004). A company's mission and vision statements, as well as business objectives and goals are some of the explicit knowledge that is seen within a workplace (Waddell & Stewart, 2008).

2.7.1.2 Tacit Knowledge

Tacit knowledge is knowledge that is accumulated inside a person. As such, it is not easily seen and is harder to formalize and communicate to another party (Lin & Tseng, 2005). Such knowledge comprises of cognitive learning and mental models (Walczak, 2005). Waddell and Stewart (2008) concluded that it is a technical know-how that is

possessed by an individual within him/herself and that it cannot be transferred to another individual explicitly or documented on paper or electronic form.

Previous research has illustrated that both tacit and explicit knowledge are mutually exclusive. Nonaka (1994) develop a theory suggesting that knowledge can be created through a continuous interaction through the epistemological and ontological constructs of knowledge. The four interaction of tacit and explicit knowledge includes tacit to tacit (socialization), tacit to explicit (externalization), explicit to explicit (combination) and explicit to tacit (internalization). With such interaction, new knowledge can be created through existing knowledge.

2.7.2 Theory of KM

According to Yang (2008), one of the most adequate definitions of KM is to transform tacit into explicit knowledge, so that knowledge can flow throughout the whole organization, to different department and units (Lubit, 2001; Schulz & Jobe, 2001). KM is not something new according to some researchers, as it has been applied for several years without being defined precisely (DiMattia & Scott, 1999; Hansen, Nohria, & Tierney, 1999). KM is referred to as a process of managing, controlling and effectively using the knowledge systematically within a firm (Laudon & Laudon, 2001). The purpose of KM is to steer clear of reinvention within the organization itself and decrease idleness in firms' knowledge activities by exploiting the current knowledge assets (Hsu & Shen, 2005). It is essential to be used in an unpredictable marketplace as KM is needed to invent and improve on how individuals perform their tasks (Brown & Duguid, 2000). It is used widely in organizations to help control the intellectual competencies and skills of workers (Adamson, 2005). To add on to this, to be able to manage different types of information, firms have the advantage of using it to meet the needs of the

market, as they are better able at recognizing and developing existing acquired knowledge to take advantage of the unexploited business opportunities (Quintas, Lefrere, & Jones, 1997). Therefore, by managing knowledge well in an organization, it helps the firm to create value and generate a competitive edge (Tiwana, 2001).

2.7.3 Dimensions of KM

The process of KM consists of five stages, which are knowledge acquisition, knowledge codification, knowledge dissemination, knowledge development and knowledge application, all of which are essential and unique on its own (Van Zolingen, Streumer, & Stooker, 2001). Shin, Holden, and Schmidt (2001) on the other hand suggested a simple four activities for KM value chain – creating, storing, distributing and the application of knowledge. In this research paper, only three activities of knowledge management are looked upon – knowledge acquisition, knowledge distribution and knowledge application. These specific aspects are considered for three reasons. Firstly, in order to be continuously improving in the quality of products and services, it is essential that organizations acquire knowledge from employees, customers and suppliers consistently. This can be done through the continuous interaction and getting feedback from this group of people (Yang, 2008). By doing so, firms will have a better understanding of their employees' skills and experiences, customers' preferred choices of products (Yang, 2008), the financial status of their firms, the latest trends and technological developments in the market and so on (Darroch, 2003). This in turn facilitates the firm to store up tacit knowledge that is within these people, therefore meeting quality assurance in each aspect is essential. Secondly, employees' involvement in disseminating knowledge is essential to ensure that quality is maintained within a company (Yang, 2008). According to Hsu and Shen (2005), only through the participation and contribution from employees can the quality improvement be

maximized in a firm. Thirdly, knowledge application goes along with the line of responding to the knowledge that has been acquired and shared (Darroch, 2003). For example, organization responds to the knowledge acquired from customers by producing products with their preferred features or applying knowledge that has been shared by employees to improve the overall company processes. The required respond time to such knowledge is seen to be vital as knowledge that is applied quickly enhance the competitiveness of the firm (Darroch, 2003).

2.7.3.1 Knowledge Acquisition

Acquiring knowledge is the first step of KM, which consists of managing and using existing information and capturing new ones (Gilbert & Codey-Hayes, 1996). The process of acquiring knowledge, according to Sternberg (1983) is a learning process, sifting out new information and accumulating them in the mind. Hence, knowledge acquisition is an important process for both learning for the individual as well as the organization stage (Hergenhahn & Olson, 1997; Nonaka, 1994). Furthermore, it is identified as a process of recognizing knowledge in the external environment and converts the knowledge to be used within the company, also known as externalization (Holsapple & Singh, 2001). Both Zahra and George (2002) opined that knowledge acquisition is the paramount to a firm to recognize and obtain information for the efficiency of its operations.

Knowledge can be acquired from numerous sources. For SMEs that have limited resources, they are likely to obtain knowledge from secondary data such as research articles, trade journals and professional business magazines (Cegarra-Navarro, 2007). It is believed that through the continuous acquisition of knowledge, firms' technological innovation will inevitably increase (Darroch & McNaughton, 2002; Gilbert & Codey-

Hayes, 1996). The ability of a firm to retain and acquire knowledge in a society that changes rapidly everyday will prosper and survive (Egbu, Hari, & Renukappa, 2005).

2.7.3.2 Knowledge Distribution

According to Egbu et al. (2005), the sharing and transferring of knowledge is part and parcel of knowledge dissemination. Knowledge dissemination/distribution refers to managing the sharing of information in an organization, to prompt innovative and creative ideas, make aware of previous good practices and inspire managers to take on more improved methods for future decision making processes (Wijnhoven, 1999). It incorporates the passing of information from one individual to another individual within a firm (Almond, 2001). Hence, knowledge sharing can be fostered among employees within an organization as this is seen to be beneficial for the long term sustainability of the firm (Lin, 2007; Ruhi, 2003; Wang, 2009).

Lin and Lee (2005) found that the sharing of knowledge can help to improve the firm's performance. Through knowledge distribution, employees will be more aware of the changes that are taking place in the firm itself, the marketplace, and the economy as a whole, thus increasing firms' ability to better handle the relationships with business partners (Ruhi, 2003). In addition, an environment that supports knowledge sharing encourages the staff to be more open in their sharing, thus allowing existing knowledge to be shared during meetings, group discussions and informal conversations, which will indirectly make rooms for new knowledge to be created (Fernie, Green, Weller, & Newcombe, 2003; Ho, 2009; Yang, Moon, & Rowley, 2009), therefore enhancing the firm's ability to make high-quality decisions (Kearns & Lederer, 2001).

Knowledge distribution focuses on the process of knowledge sharing among members who are involved in the business process (Molapo, 2007) and passing on of knowledge among individuals within a firm (Almond, 2001). According to Yang (2004), the sharing of knowledge is defined as information being disseminated and transferred to every department and company. In other words, it is transferred from one member to another (Lin, 2007). Similarly, Darr, Argote, and Epple (1995) also defined knowledge sharing as a process where members share and learn from each other's experiences. According to Molina et al. (2007), internal knowledge transfer indicates the sharing of knowledge among members within a company itself. When the employees in an organization are equipped with the relevant knowledge, it determines the course of success for the company, giving the company a competitive advantage over the rest (Han & Anantatmula, 2007). Hence, proper training should be provided to the freshly joined workers to enable them to perform the job well with relevant knowledge. Knowledge distribution is vital for any individuals in any organization. The concerns of knowledge distribution are that there may be a lack of communication skills among the employees, coupled with the rapid change of information and communication technologies due to the lack of investment and the systematic use in such technologies (Chong, Darmawan, Ooi, & Lin, 2010). However, the advantages of effective knowledge sharing, in which knowledge is being disseminated throughout the whole organization, is that it promotes creativity and innovation among the members (Apostolou, Menttzas, & Abecker, 2008; Hong, Doll, Nahm, & Li, 2004), provides additional information for effective decision making (Kearns & Lederer, 2001) as knowledge is shared and disseminated through discussion and meetings (Fernie et al., 2003; Ho, 2009; Yang et al., 2009), hence improving the competitive advantage of a company in the long run (Lin, 2007; Ruhi, 2003; Wang, 2009). By cultivating an environment that shares and transfers knowledge, it will transform the attitudes of the

employees so that they will be more willing to share and deliver their information among each other for the benefit of the company (Connelly & Kelloway, 2003). As the advantages of knowledge sharing are numerous, whereby knowledge can be shared through distributing to one another in the firm, it is suggested that such motivational activities be conducted often to promote the distribution of knowledge in the company (Ardichvili, Page, & Wentling, 2002).

2.7.3.3 Knowledge Application

Knowledge application is defined as the development of existing knowledge acquired, in order to make knowledge more effective and to increase its worth. It integrates the knowledge obtained from both the acquisition and distribution stages (Cagarra-Navarro & Martinez-Conesa, 2007) to enhance the firm's efficiency and effectiveness by integrating them into daily business processes.

To enhance the technological capabilities of the firm, according to Zahra, Neubaum, and Larrañeta (2007), the transferring, sharing and application of knowledge all play an important role. Firms which have e-business systems in place and increasingly coming out with new IT-enabled innovations are firms that consistently improved on their knowledge application skills (Cagarra-Navarro & Martinez-Conesa, 2007). In Lin and Lee's (2005) study, they also found that workers applying existing knowledge to produce new information facilitate businesses that adopt the e-business concept. Therefore, it can be well concluded that companies that emphasizes in enhancing their knowledge application methods are firms that are more likely to take on new and radical technology such as the internet-based businesses.

2.8 Chapter Summary

This chapter begins with reviewing quality concept. The TQM concept from quality gurus such as Deming, Juran, Crosby and Ishikawa were also reviewed followed by three quality award models. These three awards are: the Deming Prize in Japan, the European Model for TQM in Europe, and the MBNQA in the United States of America. In addition, some past works on TQM from other scholars were also studied. Based on the results of the literature review, the key practices of TQM were identified. Subsequently the theory of KM was reviewed. Lastly, the three key dimensions of KM (i.e. knowledge acquisition, knowledge distribution and knowledge application) within TQM were identified as important for the firms in Malaysia. These constructs were also explained in greater details. The next chapter presents the model of the relationship between TQM practices and KM. This model is then operationalized by using the methodology described in Chapter 4.

CHAPTER 3

RESEARCH FRAMEWORK AND HYPOTHESES DEVELOPMENT

3.1 Introduction

This chapter presents the development of a theoretical framework involving TQM and its association with KM. Section 3.2 elucidates the theoretical framework whereas section 3.3 presents the hypotheses related to the TQM practices and KM model. This is followed by section 3.4 which illustrates the research model of the TQM and KM constructs. A summary for this chapter is included in section 3.5.

3.2 Research Framework

This study aims to investigate the influence of TQM practices on KM using SEM approach. As depicted in Figure 3.1, the research framework engages the latent variables of TQM and KM. Six observed variables, namely leadership, strategic planning, customer focus, human resource management, process management, and information and analysis were used as the indicators for the TQM construct and have been discussed thoroughly in section 2.5 and shown as a summary in Table 2.2. On the other hand, three observed variables, explicitly knowledge acquisition is presented in section 2.7.3.1, knowledge distribution in section 2.7.3.2 and knowledge application in 2.7.3.3 were engaged as the indicators for KM construct. All of these constructs were obtained through a comprehensive literature review as presented in Chapter 2.

3.3 Relationship between TQM and KM[1]

For an organization to experience improvement, the work processes must incorporate both TQM and KM (Janpen, Praneetpolgrang, & Horadal, 2006). The similarities and differences between TQM and KM have been compiled by Hsu and Shen (2005), in which the similar characteristics consist of results orientation, human resource focus, top management support and customers satisfaction; whereas the differences include continuous improvement and improvement based on fact, as KM stresses on cultivating a culture to amplify knowledge creation and sharing. Hsu and Shen (2005) further argued that TQM can complement KM and vice versa, given proper planning by the company. Janpen et al. (2006) conducted a study on the Thai communities and confirmed that TQM model is important for the KM systems, as TQM could enhance the transferring and creation of knowledge in a community.

Good management of knowledge within an organization has always been one of the major concerns of every organization (Ju, Lin, Lin, & Kuo, 2006). It was found that both TQM and KM approaches are compatible and may tremendously augment an organization's competitive advantages (Lee & Asllani, 1997). Many scholars (e.g. Ju et al., 2006; Molina et al., 2004; Yang, 2004) have conceded this statement and tried to seek for commonality between the two variables and the connection between them. As an imperative component of an organization's quality strategy, Lim et al. (1999) recommended the use of Deming's PDCA Cycle as the key KM procedures. Obviously, TQM and KM are strongly associated and in fact, they are both features of the development of an organization (Zetie, 2002). Through the connection of TQM and KM, it is believed that more explanatory models, theoretical and practical implications as well as implementation options will be available for organizations which are longing for

[1] Part of this section was published in Ooi (2009).

a change within the organizations (Zetie, 2002). Unfortunately, the scarcity of empirical evidence to support the theoretical viewpoint of the linkage between TQM and KM has been a major limitation in these studies.

In spite of the paucity in the above mentioned past empirical studies, there were several empirical studies done on this subject matter. For example, a qualitative case study followed by a quantitative case study on the linkage between TQM and KM revealed that the Taiwanese manufacturing firms have devoted their attention on the Critical Success Factors (CSFs) of TQM, as they realized the importance of KM in sustaining growth through competition and thus began to introduce both TQM and KM in their business operations (Ju et al., 2006). They further asserted that the nine TQM CSFs, namely leadership support, benchmarking, process management, philosophy adoption, measurement of quality, customer focus, product design, training and empowerment, may act as a direction of KM implementation and a combination of both TQM and KM can be considered as one of the management approaches in order to sustain competitive advantages. This finding was also supported by the study done by Wong (2005), who found that a set of CSFs which resembles TQM practices (e.g. leadership support, measurement, organizational culture, strategic planning, training and development, motivational aids, process management, company infrastructure and human resource focus) may suit the small and medium enterprises in the implementation of KM activities. Furthermore, a case study conducted by Colurcio (2009) also revealed that TQM tools such as teamwork, feedback system, employee involvement and organizational communication may serve as an effective knowledge enabler to generate and disseminate new knowledge across the organization.

The ideas that both TQM and KM have an important control on an organization's strategic competence and that TQM facilitates in the KM of a company, have been proven by numerous past studies. However, empirical research is limited in Malaysia and the objective of this study is to explore the six TQM practices and their associations with the KM processes of a company.

With the theoretical review on TQM practices and KM in the previous chapter, we now review in more details of the relationship between them. The discussion below supports our proposed model in using the six TQM practices that we have identified; leadership, strategic planning, customer focus, human resource management, process management and information and analysis to have some effect on a firm's KM.

3.3.1 Leadership and KM

Leadership may be defined as the measures taken by senior managers in order to direct an organization and to evaluate the performance of this organization (Kerr, Schriesheim, Murphy, & Stogdill, 1974). In a nutshell, leadership refers to the capability of the leader to influence his or her subordinates to follow and abide by the instructions that have been given to them so as to attain the goals and objectives set by the organization (Bounds et al., 1994; Goh, 2006; Robbins, 2003). "Leadership in the context of TQM is not about power, authority and control, it is more about empowerment, recognition, coaching and developing others" as observed by Zairi (1994, p. 10). Hence, according to Ahmed (1998), to boost the strength of a group, one of the most powerful techniques is for leaders to be ingenious in allowing innovation to take place in the group.

Nowadays, for firms that focus mainly on KM, TQM has to be changed in the main organizational rudiments, particularly in the leadership approaches (Powell, 1995). In addition, MacNeil (2001) asserted that leadership in management could drastically add to the competencies and skills enhancements in a workplace of a learning organization, especially in creating a KM atmosphere whereby workers are encouraged to apply their inferred and tacit knowledge in their problems solving. It has been recognized by several researchers (e.g. Bryant, 2003; Davenport & Volpel, 2001; MacNeil, 2001) that *leaders* play a prominent role in cultivating a healthy KM environment, ensuring that KM initiatives are successfully implemented (e.g. Holsapple & Joshi, 2000; Pan & Scarbrough, 1998; Ribiere & Sitar, 2003). On the other hand, Bryant (2003) pointed out that for a company that contributes the ways to trade knowledge, its mission, motivation, systems and structures design for various company activities should be derived from the leadership of the management.

Approximately 40 percent of companies that are in the Fortune 1000 have a chief knowledge officer in their workplace (Roberts, 1996). Top management should understand that they are in a position to influence. They have the capability and the power to implement and move forward the KM activities in their companies. This can be done by incorporating KM as part of company mission and vision, and by being a good example themselves. Hence, it is highly encouraged that they involve themselves in the knowledge acquisition, transfer and application activities to demonstrate their strong support for the KM programme and policies in their organizations (Greengard, 1998; Guns & Valikangas, 1998). Furthermore, top management also plays a significant role in sustaining workers' morale throughout the difficult changing period when KM activities are being introduced (Salleh & Goh, 2002). With the changes coming from the KM initiative programmes, the support and commitment from top management are

crucial in contributing to the success of KM (e.g. Davenport, De Long, & Beers, 1998; Martensson, 2000; Sharp, 2003).

In this perspective, vital role is played by leaders to ensure that knowledge sharing does occur in their organizations (Ellinger & Bostrom, 1999) and that the relevant knowledge is being disseminated effectively to each and every member in the organizations. Leaders are considered as facilitators in promoting the exchange of knowledge which can eventually lead an organization towards achieving its competitive edge (Bryant, 2003; Lin & Lee, 2004). MacNeil (2003) opined that leaders act as facilitators in instilling KM culture within an organization through incorporation of knowledge distribution, as it is believed that such an environment would enhance the core competencies of the organization whereby workers are encouraged to apply and share their explicit and tacit knowledge in dealing with various problems. As a result, it would eventually lead to improvement in expertise and skills.

Similarly, senior managers have always played an imperative role in affecting the success rate of the knowledge improvement and distribution (Omerzel & Antoncic, 2008; Wong, 2005), especially in the organization's process management (Bryant, 2003). The role of senior managers to support the application of KM in teams, specifically in knowledge acquisition, knowledge distribution and knowledge sharing is important for the organizations' growth and improvement in collective learning aptitude (Ellinger & Bostrom, 1999; Ooi, 2009). Moreover, as suggested by Wong (2005), the management leadership ought to lead by good examples by contributing their knowledge generously, emphasizes the importance of KM to other employees and nurturing the society towards the sharing and creation of knowledge. In a nutshell, management leadership is essential for creating an environment that enables KM to be

effective (Holsapple & Joshi, 2000; Ooi, 2009; Wong, 2005). Furthermore, both the researchers and practitioners are aware and recognized that leaders are playing imperative role in constructing and sustaining a conducive environment for KM (Bryant, 2003; Ellinger & Bostrom, 1999; Gupta, Iyer, & Aronson, 2000; MacNeil, 2001; Ooi, 2009). Storey and Barnett (2000) through their studies revealed that continual support conveyed sensibly by management leadership can then be transformed into concerted efforts and subsequently contributing towards KM success.

In addition, leaders may also encourage their workers to attend weekly meetings as a channel for them to contribute their ideas freely while participating in the decision making processes of the company (Arnold, Arad, Rhoades, & Drasgow, 2000). By doing this, it would catalyze the desire to share and transfer knowledge among workers, hence, inculcating a culture which encourages knowledge distribution (Wong, 2005). Various past studies have shown that leaders who gave their support in instilling a knowledge delivery environment have emerged as successful leaders (Bryant, 2003; Davenport & Volpel, 2001; MacNeil, 2001). From the above discussion, a hypothesis is developed:

H1: Leadership has a significant positive impact on KM.

3.3.2 Strategic Planning and KM

Calantone, Garcia, and Droge (2003) have categorized strategic planning as tasks that are executed both socially and cognitively to gain success and maintain its competitiveness in all sectors. Organizations, whether or not they are of not-for-profit or profit organizations, are involved in the strategic planning process (Ketokivi & Castaner, 2004). Through a suitable strategic plan, organizations are able to alter their plans in accordance with the changes in the market needs while focusing on the

organizational planning process in order to integrate the organizations' ultimate objectives into their plans and performance assessments (Brah & Lim, 2006). As a matter of fact, organizations, regardless of their sizes, may obtain substantial advantages with proper strategic planning (Miller & Cardinal, 1994). Based on the research performed by Anderson (2000), strategic planning under some specific conditions and circumstances has contributed to the elevated performance of an organization. The focus of this measure is in the strategic planning and utilization of an organization's plan with the integration of the organization's focus on core consumers and operational performance requirements (Evans & Lindsay, 1995; Samson & Terziovski, 1999). Carayannis, Alexander, and Loannidis (2000) and Grant (1996) asserted that the degree of a firm competitiveness comes primarily from the special knowledge of its employees, the capability of a firm to build new knowledge and be innovative as well as the strategic actions taken by the firm. A firm is led by its strategy where it will show the target destination and the direction the firm in the future (Beijerse, 2000; Ooi, 2009).

Possessing a good strategic planning within an organization is important for driving KM success (Liebowitz, 1999) since a well-structured business plan may serve as a guidance on employability and application of an organization's resources and capabilities to achieve the KM goals. Closely associated with this is the establishment and development of a shared vision that is clearly laid down and easily comprehended in tandem with the hope of building passion among management and workers to pursue KM (Wong, 2005). The integration of KM with strategic planning has significant influence to increase competitiveness in all firms (Chong, Chong, & Yeow, 2006; Ooi, 2009). The practice of KM activities is closely associated with the strategy that emphasizes in the creation of a shared and convincing vision. The employee's support in sharing and trusting this vision will function is vital to make it happen (Ooi, 2009;

Wong, 2005). Wong (2005) further emphasized that a clearly defined direction is important to ensure the passion among management and employees to achieve the vision is established.

In a nutshell, all the above-mentioned fundamentals need to be cautiously developed before a significant investment is made to initiate a KM effort. The American Productivity and Quality Centre (1999) carried out a research and their finding is that firms can use different KM strategies, of which strategies that could yield a more fruitful result are those deployed to be aligned to their business strategic plan. Based on this finding, it is crucial for firms that wish to practice KM activities to ensure that their knowledge programs are in line with the company's mission (Ooi, 2009).

Besides that, benchmarking, which is a systematic and organized technique to excavate the best practices across industry has been found to assist organization to attain superior performance (Camp, 1989). In fact, benchmarking in the study of O'Dell (1996) has played an imperative role in the success of KM adoption especially for large organizations. Once organizations benchmarked themselves against the industry's best practices, knowledge strategy (e.g. knowledge acquisition, sharing and management) would be easier to develop and apply within and around the organizations (Davis, 1996; Day & Wendler, 1998). Benchmarking does not constrain an organization to just process improvement but it further encourages the reception and extension of a learning atmosphere across the organization. Integrating the knowledge sharing and transfer strategy into the corporate strategy will lift an organization's performance as well as competitive advantage (Carlucci & Schiuma, 2006). For knowledge distribution to function a strategy needs to be first in place and members of the organization must be passionate to plan and offer their full support (Pieris, David, & William, 2003).

Findings by Liebowitz (1999) revealed that a well thought-out strategic plan is one of the key determinants for knowledge sharing to be successfully disseminated as it guides organizations on how to organize and use its resources efficiently in order to obtain its knowledge distribution goals with minimal wastage. Hence, a suitable strategy should be well fitted to the environment and perspective of the organization so that knowledge distribution may function effectively. Simply put, the strategy to achieve knowledge sharing must be in line with the corporate business strategy (Cook, 1999; Lang, 2001; Maier & Remus, 2002; Zack, 1999).

Another key factor to improve knowledge distribution is establishing a shared vision By setting a clear vision and goal, it will help to create an environment for active participation among members (Arthur Andersen Business Consulting and APQC, 1996) whereby each member is sure of the relevant knowledge to be distributed to attain the organization's objectives. Thus, the objectives, visions and goals set by the organization need to be in easily understandable language as well as attainable by everyone involved (Wong, 2005). It is also imperative for employees to offer their undivided support for the organization's vision and trust that it will work (Wong, 2005). In conclusion, it is better to devise a good strategic plan and at the same time outlining the value proposition of the knowledge distribution to inculcate passion among the employees before making a huge investment to initialize such effort (Wong, 2005). Thus, the following hypothesis is made:

H2: Strategic planning has a significant positive impact on KM.

3.3.3 Customer Focus and KM

Customer focus refers to the satisfaction of customers' needs and requirements in a continuous mode (Philips Quality, 1995). The act of putting customers first in all decisions made has been a common practice in successful organizations (Zhang, Waszink, & Wijngaard, 2000). Its main objective is to instill close relationships with the customers by considering their suggestions and complaints as well as utilizing such knowledge to satisfy their needs and enhance customer satisfaction (Ju et al., 2006).

Organizations have realized that customers' needs and wants are changing drastically every day. It is indeed a necessity for organizations to acquire information from their customers in order to clearly understand their expectations and hence produce the goods that conform to their desires (Waddell & Stewart, 2008). As mentioned by Lee, Yang, and Yu (2001), by being customer oriented, organizations will be able to establish intimate ties with their customers and by constantly acquiring information regarding their products through customers' feedbacks and responses, the organizations are likely to improve the products' quality. In other words, *customer focus* as a dimension of TQM emphasizes the competency of an organization to acquire information and use the knowledge to better understand customers' needs. An organization that tackles customers' complaints in no time (O'Dell, Wiig, & Odem, 1999) and satisfy more customers will lead to continual improvement and success of the organization (Zairi, 1995).

Customer focus concerns about collecting information on customers, understanding their needs and implementing strategy in the company in response to fulfill customer needs (O'Dell et al., 1999). Liao (2006) opined that knowledge sharing on customers' requirements through customers' feedback, comments and sales purchase figures is vital for any company and hence should be distributed among employees as it offers the essential information about the desired goods to be delivered in order to satisfy the customers. It is an advantage if such knowledge is swiftly transferred to satisfy customers' expectations (Pfister, 2002). For example, Philips, a Holland electrical company with the mission of placing customers first, has taken into consideration customers' suggestions (e.g. customers' complaints or review) in their decision making process to fulfill their needs and wants. When customers' requirements are known to the employees, the company will be able to attain customers' satisfaction (Ju et al., 2006; Wei, Van Der Ende, & Lin, 2009). The study by O'Dell et al. (1999) further revealed that a sophisticated customer feedback system has assisted the USAA Company to uplift the knowledge about their customers via knowledge distribution. As a consequence, they emerged as a leader among the insurance companies in their country. Besides that, it is a bonus mark for any company that implements a business process which focuses on customers' knowledge (Bassi & Van Buren, 1999; Ooi, 2009). In fact, Liao (2006) stressed that knowledge sharing and distribution on customers' requirements provide sustainable competitive edge to any company. In fact, it is of paramount importance to understand the needs and problems faced by customers as these are the core factors for on-going enhancements and innovations in any company (Stankosky & Baldanza, 2001). Therefore, the following hypothesis is posited:

H3: Customer focus has a significant positive impact on KM.

3.3.4 Human Resource Management and KM

People are most vital asset for the growth of today's knowledge-based economy (Fang, Tsai, & Chang, 2005; Ooi, 2009). From the TQM perspective, it is commonly recognized in the literature the importance of human facets, such as provision of training and compensation plans (Tari, Molina, & Castejon, 2007). Oltra (2005, p. 71) asserted that "both knowledge and human resources are being increasingly regarded as key levers of competitive advantage in today's global, dynamic and complex business environment". Moreover, Alvesson (1993) argued that people are the supreme knowledge inventor and possessors. This argument was supported by Davenport and Volpel (2001) as cited in Wong (2005, p. 273) as they stated that "managing knowledge is managing people; managing people is managing knowledge" .

Effective human resource management has been verified to elevate the speed of knowledge transfer especially in the form of technology know-how (Sparkes & Miyake, 2000; Zander & Kogut, 1995). Organizations that have structured their members to work in teams have enabled these members to coordinate better on the tasks assigned to them (Grant et al., 1994). In fact, it is more effective to work in teams as quality goals can be achieved in a timely way while strengthening the relationships among team members within the organization (Dean & Evans, 1994). Therefore, it is crucial to improve the search for information and knowledge transfer to ensure that working in teams do function properly (Molina et al., 2007).

Human resource management is also believed to be closely related to knowledge distribution, especially in the transferring of tacit knowledge (Sparkes & Miyake, 2000). Teamwork provides an organization the flexibility to organize their human capital and cluster them into temporary work groups in which communication is the foremost success factor (Hedlund, 1994). This would enhance the knowledge transfer among team members as they are given a chance to share their experiences (Crossan, Lane, & White, 1999). When related knowledge is transferred from one member to the other within the work groups, new knowledge will emerge and lead to group knowledge whereby skills of the team members are united to attain the goals and missions set (Wright, McMahan, & McWilliams, 1994).

Moreover, Cabrera and Cabrera (2002) concurred that knowledge sharing and distribution of information in a team is beneficial to each member regardless of whether they have contributed in the team dynamic or not and hence a rewarding system should be established to reward those who are willing to share. Grant (1997) also concurred that working in teams is preferable since it enhances the transient of knowledge within the organizations. Brown and Duguid (1991) have coined the term "communities of practice" to refer to work teams which are formed to perform the same task. As stated in Brown and Duguid (2001, p. 202), "these groups of interdependent participants provide the work context within which members construct both shared identities and the social context that helps those identities to be shared". Likewise, Orlikowski (2002) also opined that for teams to work in an organized way, it is essential that knowledge acquired through practice be conveyed to members who perform the same task.

Besides, by forming work teams, it can flatten the organizations' hierarchy, shorten the communication chains as well as boosting the speed of knowledge transfer between the consumers and the decision makers (Hansen, 2002; Teece, 2000). In fact, it is believed that work teams can determine the success or failure of an organization (Leonard-Barton, 1992). Unfortunately, Molina et al. (2007) could not confirm the positive association between teamwork and knowledge distribution. This may be justified by the fact that strong ties need to be established first between two parties before knowledge transfer can happen. It indicates that a significant portion of the resources need to be devoted (Hansen, 1999) within groups as well as among organizational units and the formation of a common language should be present for knowledge transfer to happen (Molina et al., 2007). According to Dougherty (2001), teamwork enhances knowledge transfer by developing an image of work sharing within a firm.

To manage knowledge is to manage people and vice versa. This statement was given by Davenport and Volpel (2001) and the relationship between human resource management and KM activities has been hotly discussed by many researchers (e.g. Brelade & Harman, 2000; Garavan, Gunnigle, & Morley, 2000; Robertson & O'Malley Hammersley, 2000; Soliman & Spooner, 2000). Soliman and Spooner (2000) asserted that *effective human resource practices* may facilitate the employees' creation, acquisition and distribution of new knowledge. For instance, applicants with the propensity to create and shared knowledge besides having the required knowledge and expertise should be recruited in order to fill the knowledge gaps (Wong, 2005). Once recruited, they should be further developed. Human resource department plays an imperative role to change the mindset of the employees so that they are more willing to create and share knowledge (Garavan et al., 2000). In other words, employees need to be trained to identify valuable knowledge that is worth sharing (Greco, 1999). This is a

way to develop human resources that can sustain value depreciation while contributing to the organization's performance. Brelade and Harman (2000) further emphasized the need to retain talent and knowledge of the existing workers through inception of human resource policies that offer opportunities for workers to achieve their personal aspirations. With this approach, it is believed that a lot of company-wide impediments can be addressed (Bhatt, 2000) to ensure continuous process of innovation and enhancement (Crauise O'Brien, 1995).

As asserted by Robertson and O'Malley Hammersley (2000), training and development are crucial for knowledge workers in any profession. Training refers to "planned and systematic effort to develop knowledge through learning experience in order to achieve effective performance in an activity or range of KM activities" (Buckley & Caple, 1992 as cited in Ooi et al., 2009, p. 483) and is imperative in providing an opportunity for knowledge creation and distribution to occur (Pangil & Nasurdin, 2005). Training and development are provided to employees to enhance their skills and knowledge. For example, formal training programs such as e-learning programs, in-house as well as attaining external training program may be provided to the employees. After completing these formal programs, the trainees are requested to give their feedbacks and suggestions, therefore offering an opportunity for them to share and deliver their knowledge to others while improving them (Lamoureux, 2006). In addition, these training and development programs may also assist employees to solve problems through knowledge sharing (Goh, 2002) and distribution. By using comprehensive training programs, it is believed that the self-efficacy level of the organizational members can be further improved, resulting in an increase level of competency and ability in exchanging knowledge with others (Cabrera & Cabrera, 2005).

Furthermore, for knowledge distribution to occur in an organization, workers' autonomy is vital. Decision made should be clear on where information is placed and what tacit knowledge that is not easily transferable is held by the organization's workers or subordinates. Hence, autonomy should be granted to the workers (Grant, 1997). Without a doubt, many managers perceive that employee's participation and autonomy are crucial since these employees are involved in the decision making processes and thus have the relevant knowledge on how things are carried out (Dean & Evans, 1994). Thus, it is important for knowledge transfer to take place between employees and top management of an organization so that germane changes can be performed to ensure organization's success (Hoopes & Postrel, 1999; Lessard & Zaheer, 1996). Nevertheless, if there is a deficiency in the autonomy among workers, it may end up with a highly ineffective decision being made since timely information is not disseminated and this can be disastrous to the organization's future (Kogut & Zander, 1992). Therefore, when workers' autonomy is raised, they need to be more accountable in their work (O'Dell & Grayson, 1998). With a strong belief that they will obtain greater reward in future by acquiring the relevant knowledge, these workers will embark in quest of new knowledge and hence leading to knowledge sharing (Arias & Molina, 2002) and knowledge distribution. In fact, workers' autonomy was found positively related to internal knowledge transfer since it gives the work teams freedom in arranging their task and as they themselves own the best information pertaining to their job scopes, they will be able to effectively search for the relevant information and hence ensuring the exchange of knowledge via knowledge distribution (Molina et al., 2007). Many researches were carried out to investigate the connections between human resources and KM where one of these is Zupan and Kase (2007). By studying line managers and human resource specialists and their structural positions in knowledge formation and sharing, they have managed to explore the inferences for devising and

implementing human resource practices in knowledge intensive firms. The findings revealed that line managers and not human resource specialists, are not the only prime source to the knowledge networks, but also act as knowledge actors. From this study, it may be concluded that decentralization is a more preferable method for human resource management practices in a knowledge intensive firm. Hence, it is suggested that attention on line managers in human resource practices can bring better impact on creating and sharing of knowledge (Ooi, 2009). Hence, the following hypothesis can be suggested:

H4: Human resource management has a significant positive impact on KM.

3.3.5 Process Management and KM

Anderson et al. (1994) defined process management as the means of actions, the methods and the behavioural practices that manage the processes of an organization rather than the result itself. Process management emphasizes on the appropriate management of organizational processes so to attain higher level of innovation, production and performances for the organization (Brah & Lim, 2006). Among the benefits of a comprehensive process management are a set of improvised methods for the work center and development of an operator-controlled process that can reduce the unit cost incurred, lessen the duties of an operator handling the materials, help the work design of a manufacturing program and attain a compressed process flow (Kasul & Motwani, 1995). Molina et al. (2007) also concurred that the use of a systematic and standardized process control such as SPC can reduce transfer costs. To lower the probability of operation errors from occurring, Zhang et al. (2000) suggested that a good process management such as documentation of the process procedures as well as providing detailed instructions to the equipment operators should be put in place.

Many researchers have suggested a number of processes that are linked to KM. These encompass knowledge distribution (Alavi & Leidner, 2001; Bhatt, 2000; Demarest, 1997; Despres & Chauvel, 1999; Marshall, Prusak, & Shpillberg, 1997; Nissen, Kamel, & Sengupta, 2000; Wong & Aspinwall, 2003) such as the processes of knowledge creation, transfer, application and storage/retrieval which are recommended by Alavi and Leidner (2001). In order to create a successful knowledge-based company and also to ensure that knowledge distribution processes are implemented effectively, application from a process-based viewpoint to KM is indeed imperative (Wong, 2005).

The fundamental requirements of process management are to enhance efficiency and reduce costs and cycle-time, all of which can be applied to KM activities (Ju et al., 2006). Several processes and performances that embody the KM discipline (Wong, 2005) and literature emphasized a number of processes which are related to KM (Al-Mabrouk, 2006). Indeed, sufficient measures are required to be ready in order to ensure that KM processes are handled in a structured and organized manner. Thus, the way KM processes are implemented is imperative (Al-Mabrouk, 2006; Holsapple & Joshi, 2000). According to Clarke (2006), process management accomplishes the execution of process capabilities to ensure steady outcomes in meeting customers' expectations and needs. In fact, both structures of quality and KM are presumed to be matters that can be addressed and controlled by the organization. In view of this, it is assumed that firms implementing the process management approach will execute the structural approach to KM concurrently. Ju et al. (2006) conducted a study on the connection between TQM critical factors and KM value chain activities in Taiwan, where they discovered that in ASE Inc., knowledge storage can reduce engineering time. From the perspective of knowledge distribution, when company rearranges documents systematically, searching time can be reduced while problem solving skills can be further enhanced. Meanwhile,

in order to apply process management in terms of knowledge applications, a company's project reports must be accessible to every employee who needs them. Lee et al. (2001) opined that an effective process management is likely to be associated with quality performance. This can be achieved by alleviating process variation where quality performance is acquired, disseminated and shared. As such, the likelihood to produce defective parts will be lowered when there is a reduction in process variance.

According to Molina et al. (2004), *process control* such as application of SPC in the TQM literature, has an influence on the scale of knowledge transfer as it enhances the KM of the company. This statement was supported previously by Rungtusanatham, Anderson, and Dooley (1997), as SPC reviews and updates the changes in knowledge processes. Moreover, to ensure that the process of KM is handled in an organized and systematic way, it is crucial to put in place proper interferences and instruments. For instance, technical networking devices should be complemented with face-to-face interaction since the latter provides a stronger means for knowledge transfer to happen. This practice should be integrated into the workers' everyday work routine so that they will become a common practice across the company (Wong, 2005).

As previously mentioned, process management focuses on ensuring all processes are easily understood by employees who execute them (Saraph et al., 1989) and also assists companies in identifying and minimizing error occurrences (Ahire & Dreyfus, 2000). Fundamental tool such as SPC is used to provide valuable information pertaining to major processes that are carried out within the company (Ahire & Dreyfus, 2000; Rungtusanatham, 2000). Through installation of a systematic control process in the company, the search and transfer of knowledge would be made simple (Molina et al., 2007). SPC encodes the tacit knowledge used in the processes. This information is then

applied and transferred from one unit to another unit within the company to enhance its performance. Without the encoding of knowledge, it could result in a lot of advantage for the company itself (Winter, 1987).

Usage of related information on company processes can help the company in recognizing errors and problems. With the continuous effort of process improvement, companies will be able to utilize and identify the required knowledge for their own improvements (Dean & Bowen, 1994). In fact, Molina et al. (2007) suggested that process management is positively linked to knowledge distribution since the process control assists in problem solving of the company, draws attention to the discrepancies in the various process efficiencies carried out by the company and helps in the quest for more efficient processes while uplifting the encoding level of the company's knowledge. Hence, the following hypothesis is formulated:

H5: Process management has a significant positive impact on KM.

3.3.6 Information and Analysis and KM

Nowadays, the capability to manage information and knowledge of a company is crucial for a company to compete effectively in the global scenario (Hsu, Ju, Yen, & Chang, 2007). Due to the keen competition among companies, there is an increase importance of information technology system that acts as a platform for customers to express their demands for superior products and services (Phusavat, Kanchana, & Helo, 2007; Teh et al., 2008). Hence, it is essential for a company to acquire ample information pertaining to their customers' requirements and the competitors' latest strategy and products in order to succeed and survive.

Undeniably, information technology remains as one of the major enablers to arouse the accomplishment of knowledge distribution within an organization. Historically, information technology acted as a tool to store information. However, as time passes, it evolved into a tool to connect people to information and people to people (Alavi & Leidner, 2001; Lee & Hong, 2002). Examples of information technology such as database system, knowledge platform, performance evaluation management system, combined performance support system etc., have eased the search, access, retrieval and delivery of information and assisted in the coordination of knowledge distribution (Beckman, 1999). In short, the major aim of any company is to utilize the latest technology advancement to perform an appropriate knowledge transfer (Alavi & Leidner, 2001; McDermott, 1999; Skyrme & Amidon, 1997). Thus, it is believed that information technology and KM that integrate knowledge distribution are indeed closely connected.

In the current society, *information technology* is vital to support the KM processes of a company (Alavi & Leidner, 2001; Lee & Hong, 2002) since it facilitates searches, access and retrieval of information for the benefit of the company (Wong, 2005). Actually, there is a wide variety of modern technologies such as business intelligence, knowledge base, data mining, workflow and e-learning, to name a few, that support the KM processes and may be integrated into the company's technological platform (Luan & Serban, 2002). Although these technologies are essential for the success of KM implementation, companies must still recognize the importance of information system enablers to KM. Alternatively, a user friendly system is preferable to a complicated software application in inducing knowledge sharing (Hendriks, 1999; King, 1996). It is unfortunate that many companies still think that KM system is expensive and therefore are reluctant to adopt or configure one. KPMG (1999) has reported that only an

insignificant 16 percent of the 423 companies in United States and the Europe continent have a unique system configured to KM. In fact, Tiwana (2000) recommended that organizations should make full use of their existing technologies by incorporating them with their KM activities to form a unique KM system. Hence, a well-equipped information technology infrastructure that is put in place will provide an edge for organization to harvest on knowledge.

Information and analysis play an important role in KM activities' and provide support to KM processes (Hussain, Lucas, & Ali, 2004; Wong, 2005). In fact, Stenmark (2002) recommended a multi-perspective view of intranet that comprises of information, awareness and communication perspectives to support an effective KM culture. Indeed, information and analysis facilitates a faster information search and recovery while enabling communication among employees and thus permitting the establishment and transferring of KM processes within the firm (Al-Mabrouk, 2006).

Information plays an imperative role as a reflection mechanism, as information viewpoint on the intranet is extremely relevant and applicable for tasks that require knowledge (Hussain et al., 2004). Hence, it is recommended that explicit information should be utilized to attain awareness and to connect a firm's employee and other relevant individuals to avoid being deprived from information. Hung et al. (2005) have conducted a study on discussing the critical success factors in implementing a KM system for the pharmaceutical industry in Taiwan. The findings revealed that information system infrastructures are important in KM adoption. It indicates that large organizations are more inclined to be aware that an information system's success depends mainly on the quality of the information structure and the aptitude of its maintenance staff. From the communication viewpoint, Hussain et al. (2004) asserted

that information and analysis allows accessible information for interpretation, discussion and negotiations in various forms and thus transforming of knowledge among employees over the firm.

Wong (2005) asserts that there are a lot of information technology tools that support knowledge transfer. They can be grouped into business intelligence, knowledge platform, portals, consumer relationship arrangement, content and document arrangement, data mining, work charts and e-learning (Luan & Serban, 2002). To form an efficient KM system that supports knowledge transfer; the technology used should be accessible effortlessly and user friendly (Lin & Tseng, 2005). Similarly, King (1996) also concurred that organizations should consider the ease of use of the applications and not just focusing on the comprehensiveness of the systems or the software itself for knowledge to be easily disseminated and productively applied.

Information technology was found to have direct and indirect impacts in encouraging employees to share and distribute their knowledge since it can eliminate barriers, act as a medium for knowledge acquisition and rectify the workflow processes. Findings from the study carried out in the city of Saint Louis by Smith, Campbell, Subramanian, Bird, and Nelson (2001) revealed that advanced information technology allows knowledge sharing and transfer across various platforms. Therefore, with the use of advanced technological systems, information costs may be reduced while increasing the speed of knowledge flow (Davenport et al., 1998; Demarest, 1997), leading to faster distribution of knowledge. Thus, the following hypothesis is formulated:

H6: Information and analysis has a significant positive impact on KM.

3.4 Model Formulation

Figure 3.1 illustrates the research model of the TQM and KM constructs which is formulated based on the above hypotheses. In this model, TQM constructs are classified as the independent variables while knowledge acquisition, distribution and application are regarded as dependent variables. To best knowledge of the author from all the literature research conducted, as it is, there isn't any researcher who has empirically examined the influence of TQM practices on knowledge acquisition, distribution and application in a single model. Meanwhile a research model is proposed below based on the six hypotheses that were presented above:

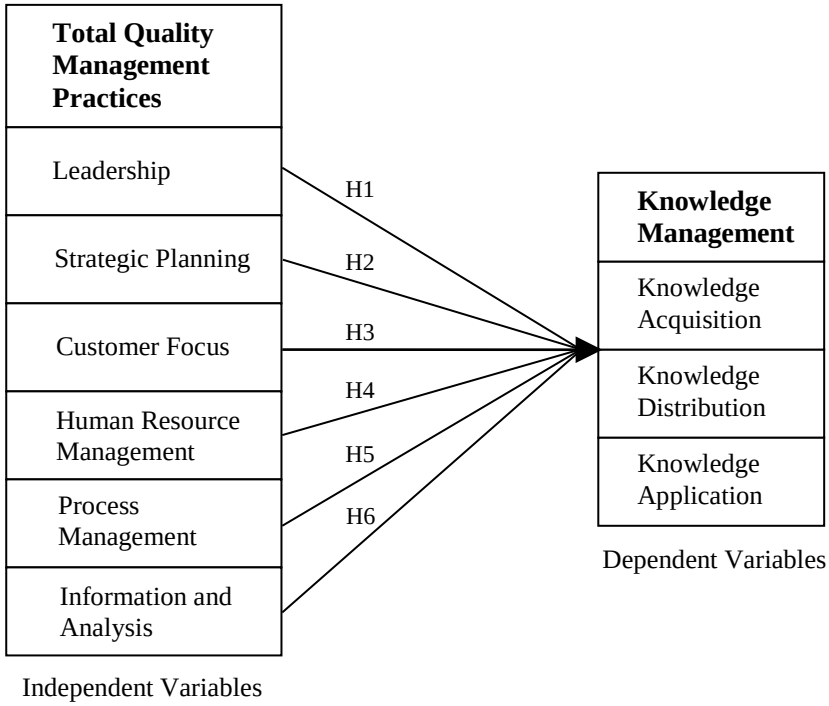


Figure 3.1: Relationship of TQM Practices and KM Processes

3.5 Chapter Summary

As a summary, this chapter starts with the development of a model consisting of TQM and KM constructs with six hypotheses. The purpose of this model is to investigate the impact of six TQM practices on KM processes. Hence, it is possible to examine empirically the theoretical model which is hypothesized in this research. The following chapter will explain the methodology of the research that is used to investigate the six proposed hypotheses.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

In this chapter, we will cover the major areas of research method in this study in which it includes the research design developed to examine the research questions and the theoretical framework is incorporated. In particular, it encompasses three major parts which are as follows: (1) issues on research design; (2) survey instrument and operationalized research constructs and (3) methods of statistical analysis. The following sections discussed each of these major parts comprehensively.

4.2 Research Design

Punch (2000) mentioned that research design is part of the elementary plan for experimental research which covers main ideas such as sample; approach and the measures taken to gather and assess empirical data. On the other hand, Zhang (2000) opined that the purpose for research design is to relate and demonstrate how the research questions can be associated to the data and also the instruments and measures to be utilized in answering them. Perry (1994) recommended that in a PhD thesis "there will usually be only one major methodology which suits the research problem and associated research gaps ….." (p. 15). As such, the research design must be derived from the research questions and can fit the data collected (Zhang, 2000). Thus, a questionnaire survey was employed in this study as the major methodology as it could provide quantifiable data which were required for the development of a TQM model to measure its impact on KM. The questionnaire survey approach and research sample are discussed in the following sections.

4.2.1 Questionnaire Survey

A research model was developed to investigate the six research questions which are more towards validating the existing theories. This is supported by Punch (2000) who opined that a theory confirmation study was aimed at examining the research hypotheses based on the existing theory. Thus, the research questions are best answered through a questionnaire survey whereby the cost is relatively lower compared to other methods in terms of geographical distance, larger sample size and also a broader scope of sample population (Zhang, 2000). On a cautionary note, the survey questionnaire can be practical only when the research objective of the particular study is straightforward and unambiguous, as elucidated by Bourque and Fielder (1995). In particular, various studies in the areas of TQM adoption have been performed using questionnaire surveys for data and information collection (e.g. Anderson, Rungtusanatham, Schroeder, & Devaraj, 1995; Choi & Eboch, 1998; Ooi, Lee, Chong, & Lin, 2011; Prajogo, 2005). Generally, survey questionnaire was deployed to obtain a large database of TQM information with low degree of details. In this study, the survey questionnaire was applied to obtain information regarding TQM and KM from a wide range of manufacturing and service firms. This data can be used to examine the influence of TQM on the overall KM in these firms.

Since this study purports to investigate the effect of TQM on KM in the Malaysian manufacturing and service firms, quantitative method via survey questionnaire is considered to be the most suitable research strategy for this study. This is due to the fact that there are many existing models in the literature on the TQM theories and with the strong theoretical foundation for identification of variables and their relationships, a causal design using survey questionnaire is considered suitable (Chew, 2007; Chong,

2008). The methodological process adopted in this study is illustrated in Figure 4.1. The complete methodology entails two major stages, namely:

1) Development of instrument
2) Data collection and analysis

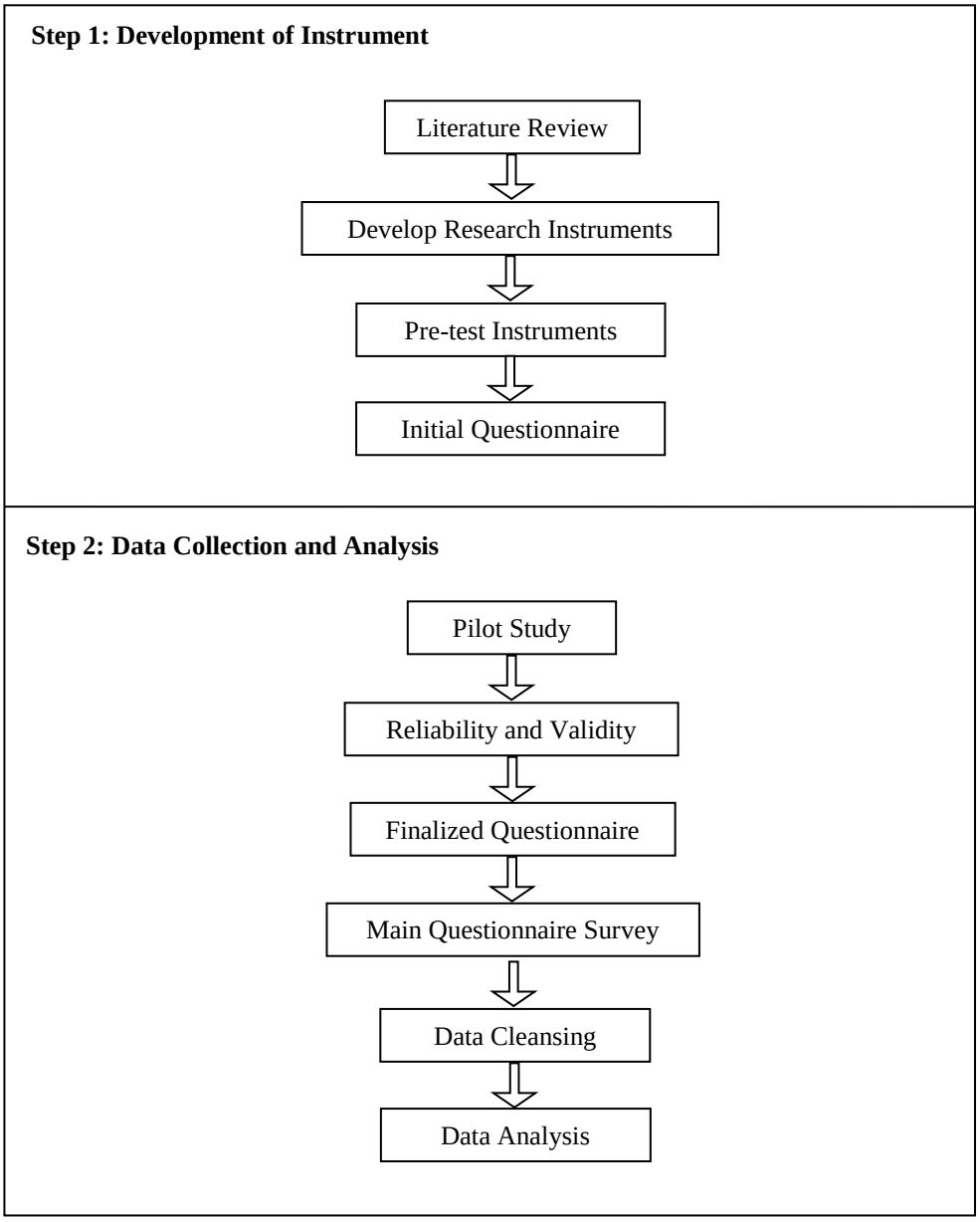


Figure 4.1: Research Procedures

Source: Adapted from Xie (2011, p. 110)

During the preliminary stage, an initial questionnaire was developed and sent to two ISO certified firms (i.e. one is service firm and another one is manufacturing firm) for pre-testing (this important part is elaborated in section 4.3.3). The manufacturing firm was chosen since it is a large TQM prize-winning semiconductor firm (i.e. Quality Management Excellence Award) and had implemented TQM practices over 20 years. While the service firm, one of the largest universities, was chosen as the university is one of the ISO 9001 Quality Management System certified higher education institutions. Both of these firms were situated in the state of Perak, Malaysia. A structured interview with the senior managers of these firms was carried out to obtain the feedback on the survey questionnaire so that refinements can be done on the variables in the questionnaire. Besides that, about one week was spent on informal interview with these managers via telephone calls. Subsequently, in the second stage of the questionnaire survey methodology, an evaluation of the data and information collected followed by recommendations based on the results obtained was performed.

4.2.2 Unit of Analysis

Unit of analysis is defined as the degree of exploration the study focuses on and the kind of analysis including individuals, groups and dyads (Zikmund, 2000). Prior to the commencement of this study, it is a necessity to disclose the unit of analysis since all variables are encompassed in the conceptual model, the data gathering method and sample size are affected by this measurement (Wong, 2002; Zikmund, 2000). The main unit of analysis investigated in this study was the middle to higher level managers (i.e. executives, managers, senior managers, managing directors and CEOs) from both the service and manufacturing firms in Malaysia. Middle to higher levels managers are selected as the unit of analysis as they have the essential information regarding quality of management practices within their companies. They play a pivotal role as traffic

police who bear the responsibility to disseminate information to the employees in their respective department (Ishikawa, 1985). Besides that middle to higher level managers play a critical role to ensure a successful quality improvement process if they are allowed to effectively utilize their years of experience to improve the product, manufacturing processes, management systems, and working environment, processes and organization will thrive (Roth, 1998).

4.2.3 Sampling Size

Adequacy of sample size should be ascertained based on the data analysis that was conducted in this study. Several suggestions on the minimum sample size needed for SEM have been recommended by various researchers. Williams and Holahan (1994) opined that generally a minimum sample size of 100 is adequate for an SEM analysis. On the other hand, Kelloway (1998) and Marsh, Balla, and McDonald (1988) asserted that a sample size of 200 may be required in order to obtain valid goodness-of-fit measures.

To perform the SEM analysis, it is recommended that "an optimal sample is between 100 and 200" for it to be considered as adequate and satisfactory (Hair, Anderson, Tatham, & Black, 1992, p. 10 as cited by Forza & Filippini, 1998). A total of 1,000 middle to higher level managers were contacted for the survey and the response rate was 20.3% (see further discussion below). Since the number of firms which responded to the survey for this study (N=203) falls within the acceptable range, it is concluded that the sample size is therefore considered to be adequate.

4.2.4 Questionnaire Pretesting

The aim of the pretest was to ensure that all questions are relevant and easy to comprehend. It serves as the foundation for amendment of the language structure in a particular question when needed (Wong, 2002). Through this process, researchers will be able to determine the relevancy of the research question (Bradburn, Sudman, & Wansink, 2004). During pretest, researchers will be able to ascertain whether the language structure, the length and flow of the survey are appropriate and whether the time allocated to complete the questionnaire is well-managed (Xie, 2011). During the pretest process, the instrument used is recommended to examine only the content and constructs. In order to evaluate the content validity of the survey questionnaire, a draft version of the survey was pre-tested by both academicians and TQM practitioners. The participants were asked to assess the quality of the survey questionnaire in terms of its wording, relevancy and clarity.

Even though the items were adapted from a thorough review of the past studies, consideration on items chosen is in terms of accuracy from the perspective of Malaysian manufacturing and service sectors. Several items in the pretest have been perceived by the respondents as not in proper order. Hence, the order of these items was rearranged according to their relevance. Otherwise irrelevant items would jeopardize the motivation of the target respondents in answering the questions (Ya'acob, 2008).

4.2.5 Pilot Test

Following the pretest, a pilot study is performed before the collection of primary data. The procedure of data collection is conducted in the similar way to the main study with the author as the data collector. The details of the data gathering procedures are outlined in section 4.2.6. In order to measure the psychometric soundness of the scales, initial findings from the pilot study were subjected to various types of reliability and validity tests as discussed in the subsequent sections.

4.2.6 Sampling and Data Collection Procedures

A self-administered survey questionnaire was employed in this study with the sample selected from the manufacturing and service sectors that are planning to apply for or have obtained the ISO 9001:2000 certification from the Federation of Malaysian Manufacturers (FMM) Directory (2009). ISO certified firms have been selected as the certification of ISO 9000 quality management system is a vital international indicator and evidence that TQM is the focus of the organization (Kirchenstein & Blake, 1999; Teh et al., 2009). Meanwhile, FMM is the biggest trade organization in Malaysia because it includes a total number of above 2,000 companies of both manufacturing and industrial service of different sizes (Federation of Malaysian Manufacturers (FMM) Directory, 2009). Given the strict regulations that control the full membership of the FMM, 47 percent of the 2,135 FMM members have been awarded ISO certification (Federation of Malaysian Manufacturers (FMM) Directory, 2010; Teh et al., 2009). Besides that, FMM is a well-established and renowned representation of the Malaysian manufacturing and service industries for more than 38 years. Thus, the chosen sample is deemed to be a legitimate representation of the population.

The unit of analysis for this study consists of middle level to higher level managers (i.e. executives, managers, senior managers, managing directors and CEOs) coming from both manufacturing and service firms in Malaysia. They were chosen as the target group for this study as they possess the essential knowledge regarding the quality management practices, at the same time having in depth information on the KM level of their companies. Furthermore, they also play an important role as traffic polices who are responsible in disseminating information to the employees in their respective departments (Ishikawa, 1985). Apart from that, they also play an essential role in ensuring a successful quality improvement process, if they are given an opportunity to use their years of experience of improving their companies' manufacturing processes, management systems, and working environment (Roth. 1998). In fact, numerous researchers in the likes of Cheah et al. (2009), Samat, Ramayah, and Mat Saad (2006), Tavana, Mohebbi, and Kennedy (2003) and Vermeulen (1996) also have selected this sample group as their target population in relation to TQM empirical studies. They postulated that a commitment towards quality management was mainly initiated by the management team as they are more familiar with the basic principles and terminology of quality management. Hence, middle to higher level managers was chosen as the sample group for this study.

Survey questionnaire was used to collect empirical data. In order to ensure content validity, both academicians and practitioners were invited for a pretest to evaluate the survey questionnaire on its wording, relevancy and clarity. Respondents were selected from organizations located in different regions of Malaysia, namely Selangor, Kuala Lumpur, Penang, Perak and Melaka. A selection of respondents who work in the above-mentioned five states were made because these states are among the most industrialized states in Malaysia (Federation of Malaysian Manufacturers (FMM) Directory, 2008;

Kuala Lumpur Structure Plan 2020, 2008; Teh et al., 2009). In addition, many of the world's leading electronics firms with manufacturing operations and manufacturing services are located in these states (Malaysian Industrial Development Authority, 2008; Teh et al., 2009). All the organizations in these five states that are listed in the FMM Directory 2009 with ISO certification as indicated in the directory were selected for the survey.

The final version of the questionnaire was distributed to 1000 workers at the executive or higher levels from the Malaysian manufacturing and service companies that are planning to apply for or have obtained ISO certification to participate in the investigation. From the total of 1,000 questionnaires distributed, only 203 were returned with complete answers. Hence, the overall response rate is 20.3%. According to Sekaran (2003), the low response rate from the main survey is considered acceptable, as a general low response rate is expected for such type of correlation study in Malaysia. When comparing with other similar studies, such as Ahmad and Yusof (2010), who recorded a response rate of 21.9% in his study of TQM practices between Japanese and non-Japanese electrical and electronics firms in Malaysia as well as Lam, Lee, Ooi, and Phusavat (2012), whose response rate was reported at 20% in his study of TQM in Malaysia, the response rate found in this study is considered acceptable.

To check the representativeness of the sample, the demographics obtained from the early respondents were compared with the late respondents, as suggested by Lin and Schaeffer (1995). Chi-square was the inferential statistics used to determine if there is any statistical difference between the early and late responses. It was found that there is no significant difference ($p > 0.05$) when comparing the demographic profile between the early and late responses in terms of ownership, industry sector and organization size

(Jayasingam, Ansari, & Jantan, 2010). Besides that, the common method variance test which may pose potential danger as a result of the application of a single informant when data was collected in an organization was also performed (Martinez-Costa & Jimenez-Jimenez, 2009; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). This type of error is non-significant in the absence of a unique factor with eigenvalue more than one (Martinez-Costa & Jimenez-Jimenez, 2009).

4.2.7 Statistical Power

Statistical power means "the probability of finding statistical relationships among variables" (Malhotra & Grover, 1998 as cited in Wong, 2002, p. 111). As a way to ensure the validity of the multivariate statistical methods, in this context, the SEM approach, the number of cases required to have adequate statistical power is preferably around 200 cases (Kline, 2010). Therefore, the 203 cases obtained for this study offers reasonable statistical power for SEM analysis.

4.3 Survey Instruments and Operationalization of Research Constructs

Following the presentation of the research strategies, the subsequent stage is to determine the research constructs and elucidate how they were operationalized into the scaled items. Indeed, the prime purpose of the study is to investigate the six research questions and the six research hypotheses as proposed in the earlier chapter. Thus, the following subsections will justify the design of a survey instrument in order to meet this objective. This entails the discussion on the kind of scale adopted in the questionnaire, the structure of the questionnaire and the measures deployed in the variables of interest.

4.3.1 Questionnaire Design

The questionnaire has been designed with conciseness and simplicity in mind with double negative statements avoided. The questions are designed to be self-explanatory in nature and respondents may complete them by themselves. In order to raise the validity of the questionnaire, several adaptations from other researches were performed. The final set of questionnaire is presented in Appendix B.

4.3.2 Questionnaire Scaling

Based on the discourse in the preceding section, the questionnaire was comprehensively pre-examined to alleviate the length needed to measure all the constructs satisfactorily and to modify any items that may make the survey difficult to the respondents. As an effort to enhance the reliability of the questionnaire measures, majority of the items in the questionnaire were given in the form of statements via Likert-type scales (Churchill & Peter, 1984; Wong, 2002). Likert-type scales are comparatively easy to establish and administer as well as easy to comprehend by the respondents.

As asserted by Churchill and Peter (1984) and Wong (2002), a seven-point scale should be used in the endeavor to augment the reliability of the scales. The seven-point scale was recommended with the intention of discouraging the respondents from choosing the midpoint by making it less obvious than a five-point scale. With a midpoint on the scale offered for respondents who were neutral, it will alleviate any uneasiness and anxieties which may have been caused by compelling respondents to choose a predisposition. As an outcome, seven-point numerical scales are suggested for SEM “as a sufficient range of score values introduces variance” (Schumacker & Lomax, 1996 as cited in Wong, 2002, p. 114). Hence, a consistent scoring procedure was retained throughout the questionnaire.

4.3.3 Questionnaire Structure

The utmost purpose of this questionnaire was to collect information pertaining to the constructs of the TQM and KM. The questionnaire comprises of ten (10) pages, including an explanatory front cover, the detailed objectives and procedures of this study, as well as the assurance of voluntary participation and the anonymity of the respondents. The questionnaire was divided into several sections with each section separated from the others by using important heading. Clear and precise instructions were given prior to each section in order to reduce confusion (Wong, 2002). These sections were presented in a logical order to ensure that they are easily comprehended in completing the questionnaire.

4.3.4 Questionnaire Section

The first section entails demographics of the respondents such as gender, age, marital status, education background, length of service, job scope and job position. The second section involves details of the organization such as category of the organization (i.e. manufacturing or service), number of employees, status of the organization (i.e. ISO certification) and the ownership. Third section encompasses 30 questions linking the six dimensions of the key TQM practices. The six dimensions understudied in this research were: leadership (five items), strategic planning (four items), customer focus (six items), human resource management (five items), process management (six items), information and analysis (four items). Meanwhile, each of these TQM practices was measured through a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Last but not the least, the KM section consists of 19 questions related to the three dimensions of knowledge management. The three dimensions of knowledge management used in this study were knowledge acquisition (8 items), knowledge distribution (6 items) and knowledge application (5 items). The items in this section

were also measured on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

4.3.5 Measurement of Variables

This section elaborates on the development of the research instrument used in this study. Closed ended questions were adopted to get the required data of the variables under study. All questions are presented though a seven-point Likert scale. Mean score was computed for each construct based on the respective items. Higher mean score will reflect a higher level of TQM and KM practices.

4.3.5.1 Operationalization of TQM Practices

Many previous researches (e.g. Ahire et al., 1996; Anderson et al., 1994; Dean & Bowen, 1994; Prajogo, 2005; Saraph et al., 1989) have verified the multidimensionality of the TQM constructs. Six TQM dimensions were adopted from the previous studies done by Prajogo (2006) and Prajogo and Sohal (2006). These measures have a well-established theoretical basis and have demonstrated strong construct validity and reliability (Prajogo & Cooper, 2010). The six scales utilized in this study include: leadership, strategic planning, customer focus, human resource management, process management and information and analysis. Each of these TQM practices was gauged via a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The six TQM dimensions are treated as reflective in nature, similar to many prior TQM studies by Demirbag, Koh, Tatoglu, and Zaim (2006), Lee, Ooi, Tan, and Chong (2010), Prajogo and Cooper (2010) and Santos-Vijande and Ălvarez-González (2007), whereby the TQM construct in this study is measured as a whole as the construct itself is made out of the six MBNQA dimensions.

4.3.5.1.1 Leadership

The leadership construct was measured with five items. These items were derived from a thorough literature review. They were measured based on a seven-point Likert scale with values ranging from 1 (strongly disagree) to 7 (strongly agree). The mean score of the responses of these five items was calculated. A higher mean score implies higher level of leadership practice of TQM. Table 4.1 shows the five items used in measuring leadership practices of a firm.

Table 4.1: Operationalization of Leadership

No.	Items
LD1	Senior executives share similar beliefs about the future direction of this organization.
LD2	Senior managers actively encourage change and implement a culture of improvement, learning, and innovation towards 'excellence'.
LD3	Senior managers actively participate in quality management and improvement process.
LD4	Senior managers strongly encourage employee involvement in quality management and improvement activities.
LD5	Senior managers arrange adequate resources for employee education and training.

Note: LD = Leadership
Source: Prajogo and Sohal (2006, p. 308)

4.3.5.1.2 Strategic Planning

The level to which a firm practices strategic planning was gauged with four items as portrayed in Table 4.2. These items were measured using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The mean of the responses of these four items was calculated whereby a higher score will indicate higher practice of strategic planning in TQM.

Table 4.2: Operationalization of Strategic Planning

No.	Items
SP1	We know our company mission.
SP2	We have a comprehensive and structured planning process which regularly sets and reviews short and long-term goals.
SP3	When we develop our plans, policies and objectives, we always incorporate the needs of all stakeholders.
SP4	We have a written statement of strategy covering all business operations which is articulated and agreed by our senior managers

Note: SP = Strategic Planning
Source: Prajogo and Sohal (2006, p. 308)

4.3.5.1.3 Customer Focus

The level of customer focus was measured with six items. Respondents were requested to give their responses using a seven-point Likert scale with values ranging from 1 (strongly disagree) to 7 (strongly agree). The level of customer focus practices in the firm was computed with the mean value of these responses based on the six items listed in Table 4.3.

Table 4.3: Operationalization of Customer Focus

No.	Items
CF1	We actively and regularly seek customer input to identify their needs and expectations.
CF2	Customer needs and expectations are effectively disseminated and understood throughout the workforce.
CF3	We involve customers in our product design processes.
CF4	We always maintain a close relationship with our customers.
CF5	We have an effective process for resolving customers' complaints.
CF6	We systematically and regularly measure customer satisfaction.

Note: CF = Customer Focus
Source: Prajogo and Sohal (2006, pp. 308-309)

4.3.5.1.4 Human Resource Management

This construct is characterized by the implementations of employee training, communication and the well-being of the employees. Five items were deployed to measure this construct. Respondents were requested to response to the subsequent seven-point Likert scale with values ranging from 1 (strongly disagree) to 7 (strongly agree). The level of human resource management practices in the firm was calculated with the mean of the responses based on the five items listed in Table 4.4.

Table 4.4: Operationalization of Human Resource Management

No.	Items
HR1	We have an organization-wide training and development process, including career path planning, for all our employees.
HR2	Our company practices two-way communication between management and staff.
HR3	Employee satisfaction is formally and regularly measured.
HR4	Employee flexibility, multi-skilling and training are actively used to support performance improvement.
HR5	We always maintain a work environment that contributes to the health, safety and well-being of all employees.

Note: HR = Human Resource Management
Source: Prajogo and Sohal (2006, p. 309)

4.3.5.1.5 Process Management

The level to which a firm emphasizes process management was measured by a six-item construct. Respondents were requested to respond to the subsequent seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The score for the level of process management is calculated based on the mean value of these responses. A list of these items was shown in Table 4.5.

Table 4.5: Operationalization of Process Management

No.	Items
PM1	The concept of the 'internal customer' (i.e. the next process down the line) is well understood in our company.
PM2	We design processes in our plant to be "fool-proof" (preventive-oriented).
PM3	We have clear, standardized and documented process instructions which are well-understood by employees.
PM4	We make an extensive use of statistical techniques (e.g. SPC) to improve the processes and to reduce variation.
PM5	We strive to establish long-term relationships with suppliers.
PM6	We use a supplier rating system to select our suppliers and monitor their performance.

Note: PM = Process Management
Source: Prajogo and Sohal (2006, p. 309)

4.3.5.1.6 Information and Analysis

The level to which a firm has demonstrated good quality related to data and application of information and analysis was measured with four items. A seven-point Likert scale with score ranging from 1 (strongly disagree) to 7 (strongly agree) was utilized to collect responses from the respondents. The level of having good quality related to data as well as information and analysis was assessed by calculating the mean score of the responses based on the four items of this variable as shown in Table 4.6.

Table 4.6: Operationalization of Information and Analysis

No.	Items
IA1	Our company has an effective performance measurement system to track overall organizational performance.
IA2	Up-to-date data and information of company's performance are always readily available for those who need it.
IA3	Senior management regularly holds meeting to review company's performance and uses it as a basis for decision-making.
IA4	We engage in an active competitive benchmarking program to measure our performance against the 'best practice' in the industry.

Note: IA = Information and Analysis
Source: Prajogo and Sohal (2006, p. 309)

4.3.5.2 Operationalization of KM

Empirical research in KM has attained its maturity level. Knowledge acquisition, distribution and interpretation have been discussed in the literature section of KM (Darroch, 2003; Lopez, Peon, & Ordas, 2006). For this study, the measures of KM were adapted from the studies by Lopez et al. (2006) and Nonaka, Byosiere, Borucki, & Konno (1994). Three measures of KM were chosen, namely knowledge acquisition (eight items), knowledge distribution (six items) and knowledge application (five items) based on their suitability with the aim of this study. Respondents were requested to give their responses on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

4.3.5.2.1 Knowledge Acquisition

"Knowledge may be acquired from the experience of others or through direct experience" (Lopez et al., 2006, p. 223). Learning from others can be in the form of common practices such as networking, strategic alliances or benchmarking (Lopez et al., 2006). Operationalizations of knowledge acquisition were adopted from Goh and Richards (1997), Lopez et al. (2006) and Nonaka et al. (1994). The scale raises questions on the level to which new work methods and innovative processes are supported and promoted. Eight items were employed to gauge this variable. Respondents were requested to response to the seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The level of knowledge acquisition practices in a firm was then calculated based on the mean score of the respondents according to the eight items listed in Table 4.7.

Table 4.7: Operationalization of Knowledge Acquisition

No.	Items
KA1	We have a system that allows us to learn successful practices from other organizations.
KA2	The company is in touch with professionals and expert technicians.
KA3	The organization encourages the employees to join formal or informal networking made up by people from outside the organization.
KA4	We often ask our customers what they want or need.
KA5	The employees attend fairs and exhibitions regularly.
KA6	There is a consolidated and resourceful R & D policy.
KA7	New ideas and approaches on work performance are experienced continuously.
KA8	The organizational systems and procedures support innovation.

Note: KA = Knowledge Acquisition
Sources: Goh and Richards (1997); Lopez et al. (2006, p. 238); Nonaka et al. (1994)

4.3.5.2.2 Knowledge Distribution

Knowledge distribution can take place through role integration, the position of liaison, face-to-face contact in meeting or usage of information and analysis to establish an organizational bulletin board (Lopez et al., 2006). A seven-point Likert scale ranging from 1 (strong disagree) to 7 (strongly agree) was utilized to collect responses from the respondents. The level of knowledge distribution practices of the firm was calculated by taking the mean score of the respondents using the six items as listed in Table 4.8.

Table 4.8: Operationalization of Knowledge Distribution

No.	Items
KD1	All employees are informed about the aims of the company.
KD2	Meetings are periodically held to inform all the employees about the latest innovations in the company.
KD3	The company has formal mechanisms to guarantee the sharing of the best practices among the different fields of the activity.
KD4	Information technology is used to improve the flow of information and to encourage communication between individuals within the company.
KD5	There are individuals within the organization who take part in several teams or divisions and act as links between them.
KD6	There are individuals responsible for collecting, assembling and distributing internally employees' suggestions.

Note: KD = Knowledge Distribution
Source: Lopez et al. (2006, p. 238)

4.3.5.2.3 Knowledge Application

Five items were used to measure this construct. They were derived and adapted from Bontis, Crossan, and Hulland (2002), Hult and Ferrel (1997), Lopez et al. (2006) and Nonaka et al. (1994). The scale evaluates elements such as effective conflict resolution, working in team and enactive liaison activities. A seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) was employed to collect responses from the respondents. The level of knowledge application practices in the firm was calculated by taking the mean score of the respondents based on the five items listed in Table 4.9.

Table 4.9: Operationalization of Knowledge Application

No.	Items
KAP1	Our organization always apply the latest technology in the market/or our organization is always up-to-date in technology application.
KAP2	Our employees are well trained in the latest knowledge in their respective position for better job performance.
KAP3	Our training process is relevant and effective to improve performance and productivity.
KAP4	Our organization has processes for applying experimental knowledge.
KAP5	Our organization has processes for applying knowledge to solve new problems.

Note: KAP = Knowledge Application
Sources: Bontis et al. (2002); Hult and Ferrel (1997); Lopez et al. (2006); Nonaka et al. (1994)

4.4 Methods of Statistical Analysis

The procedures applied to analyze the data with the objective of tackling and answering research questions and hypotheses in this study range from correlation analysis to an advanced analysis using SEM. Univariate statistical analysis was conducted to screen the data whereas the initial statistical analysis was carried out via SPSS version 18 (Coakes & Steed, 2010) to examine the reliability and validity of the scales used in this study. Eventually, SEM via AMOS version 18 was engaged to examine the research questions and test the proposed hypotheses. These methods of statistical analysis will be further described in the subsequent sections.

4.4.1 Data Screening

Data screening is performed to enhance the collected data and to obtain high quality of data set using univariate statistical analysis (Xie, 2011). Data is screened to ensure that all responses that have been entered do make sense besides detecting the existence of outliers while ensuring the distribution of the responses does not violate the normality assumptions needed for multivariate analysis (Wong, 2002). Hair, Anderson, Tatham, and Black (1998) highlighted that outliers should be identified from the univariate, bivariate and multivariate perspective whereby the most commonly used method to detect outliers are scatter plots and the Mahalanobis D^2 measures (Xie, 2011). Moreover, evaluations of skewness and kurtosis statistics were performed as outlined in the procedures recommended by Hair et al. (1998).

4.4.2 Refinement and Validation of Instrument

A comprehensive analysis of measurement of the research instrument utilized in this empirical research is imperative for a number of reasons. First of all, empirical validated scales can be deployed directly in other studies in this field on diverse populations. Secondly, it offers "confidence that the empirical findings accurately reflect the proposed constructs" (Flynn et al., 1994 as cited in Wong, 2002, p. 129). In fact, various forms of reliability and validity can serve as a criterion for assessing the soundness of a psychometric scale. In this study, Cronbach's alpha, composite reliability as well as content, construct and criterion validity (Malhotra, Hall, Shaw, & Crisp, 1996) and other forms of reliability and validity were assessed for the scale used in this study.

4.4.2.1 Reliability

Reliability relates to the level whether the same results can be obtained when using the instruments to measure repeated thing (Bernard, 2000). Before evaluation of the scale reliability is performed, unidimensionality should be examined first, since the lack of unidimensionality may lead to the occurrence of correlation between artificial constructs. Therefore, checks on the unidimensionality and reliability analysis were carried out on each of the scales adopted in this study (Wong, 2002).

4.4.2.1.1 Unidimensionality Analysis

As mentioned by Anderson and Gerbing (1991), unidimensionality is a crucial condition for the analysis of reliability and construct validity. Without unidimensionality, a single number cannot be utilized to stand for the value of the scale, since items in a unidimensionality scale can only estimate a single construct (Wong, 2002). In this study, exploratory and confirmatory factor analyses were conducted to examine the unidimensionality of the scales.

4.4.2.1.2 Reliability Analysis

Cronbach's alpha is used to examine the reliability of the internal consistency of the constructs. A cut-off point of 0.60 in the alpha's value indicates an acceptable degree of reliability of the construct (Hair et al., 1998). Hence, internal consistency method was engaged in assessing the reliability of the survey instruments in this study.

4.4.3 Validity

Validity refers to "the degree to which any instrument measures what it is intended to measure" (Zhang et al., 2000, p. 742). Among the methods of assessing the validity of a measurement instrument are construct validity, content validity, criterion-related validity, discriminant validity and convergent validity (Carmines & Zeller, 1979; Zhang et al., 2000). These methods were adopted in this study in order to assess the measurement instruments.

4.4.3.1 Content Validity

Content validity is defined as how extensive a particular domain of content is reflected by empirical measurement (Zhang et al., 2000). It offers a strong foundation to establish comprehensive evaluation of the validity of the survey instrument methodologically (Zhang et al., 2000). To accomplish content validity, inter-item correlations should be moderate. High loading (> 0.90) and high inter-item correlation (> 0.80) should be avoided since high inter-item correlation implies that each item contributes minimal information to clarify the factors (Choi, 2010). In this study, correlation analysis was performed as a mean of evaluation of the content validity.

4.4.3.2 Convergent Validity

Convergent validity is a type of construct validity. It is the extent to which scale items are presumed to be representing a construct based on a range of facts on the same constructs (Parasuraman, Zeithaml, & Berry, 1991). To examine the convergent validity of the scales adopted in this study, factor loadings of the observed items on the latent construct were scrutinized (Wong, 2002). Therefore, confirmatory factor analysis was engaged in order to assess the convergent validity of the constructs in this study (Churchill, 1979).

4.4.3.3 Discriminant Validity

Discriminant validity is "theoretical based way of thinking about the ability of a measure to estimate the underlying truth in a given area" (Litwin, 1995 cited in Wong, 2002, p. 133). In order to accomplish discriminant validity, it must be shown that the measures are not to be strongly correlated with similar but distinct concepts (Wong, 2002). In this study, correlation analysis was deployed to examine the discriminant validity.

4.4.3.4 Criterion Validity

Criterion validity measures the extent to which scale performed as anticipated in connection to other variables (Malhotra et al., 1996; Wong, 2002). Basically, there are two kinds of criterion validity, namely concurrent and predictive validity. Concurrent validity was examined in this study to evaluate the criterion validity of the measures. In order to establish concurrent validity, the magnitude and direction of the correlation coefficients between the components in this study should be consistent with the anticipated outcomes (Wong, 2002).

4.4.4 Statistical Procedure

In order to establish the relationships between the variables in this study, several multivariate analyses were carried out. Among these are EFA, CFA and SEM. All of these analyses will be elaborated in the next few sections.

4.4.4.1 Exploratory Factor Analysis

The key application of factor analysis is the use of factor scores as input for the succeeding stages of analysis (Aaker, 1971; Wong, 2002). EFA was performed prior to the SEM analysis. In particular, the principle component method with varimax rotation was chosen as it is the most popular type of rotation and is commonly used in operation management researches for simplifying factors rather than variables (Wells & Jagdish, 1971; Wong, 2002).

4.4.4.2 Confirmatory Factor Analysis

CFA techniques normally attempt to determine which sets of the observed variables that share the characteristics of covariance or common variables can best describe the constructs (Schumacker & Lomax, 1996). CFA is very much alike to EFA with the exception that constraints derived from the hypotheses are embedded in the analysis. These constraints may exist in the form of the number of factors hypothesized, the nature of the connections between the factors and the magnitude of the factor loading for every variable (Schumacker & Lomax, 1996). In this study, CFA was conducted to evaluate the unidimensionality of the latent variables, convergent validity as well as the discriminant validity (Hair et al., 1998).

4.4.4.3 Structural Equation Modeling

SEM has been widely adopted in social science research using quantitative study since it permits modification and assessment of the theoretical models (Bentler, 1983; Xie, 2011). Indeed, SEM is very useful in examining the inter-dependent relationship among some latent variables (Hair et al., 1998). It is designed to assess how good a proposed conceptual model can fit the data collected and also to ascertain the structural relationships between the sets of latent variables (Byrne, 2001). The modeling process

was accomplished by deploying the covariance matrix and this procedure involved Maximum Likelihood Estimation (MLE). MLE is one of the most universally used approaches and is efficient when the multivariate normality assumptions are met (Choi, 2010; Hair et al., 1998).

SEM was adopted in this study to examine the proposed hypotheses on the relationship between TQM and KM model as stated in Chapter 3. According to Anderson and Gerbing (1988), this structural test involves a two-stage process. The initial stage is to ascertain good measurement of the constructs and the latter stage requires an evaluation of the structural relationships. In this study, the measurement and structural models were generated and estimated using SPSS 18 and AMOS 18.

4.4.4.4 Overall Goodness-of-Fit Measures

There is no single statistical test that the best describes the predictive power of a structural model (Hair et al., 1998). Byrne (2009, p. 83) opined that determination of which indices are acceptable estimators of goodness-of-fit is quite complex as "particular indices have been shown to operate somewhat differently given the sample size, estimation procedure, model complexity and/or violation of the underlying assumptions of multivariate normality and variable independence" (as cited in Ulrich, 2009, p. 87). Hence, assessment of goodness-of-fit remains subjective whereby researchers, armed with their own understandings of the various indices, the model and the data, will decide on which indices should be utilized to best describe the model fit and to what degree the described fit is considered good (Ulrich, 2009). As an alternative, a combination of measures may be adopted to evaluate the overall goodness-of-fit of a structural model and among the measures deployed in this study

include the absolute fit measures, the incremental fit measures and the parsimonious fit measures (Jöreskog & Sörbom, 1998).

4.4.4.5 Absolute Fit Measures

Absolute fit measures determine the extent of the overall model (i.e. measurement and structural models) in predicting the observed covariance (Hair et al., 1998). Some of the examples of absolute fit measures which are widely used in SEM are likelihood-ratio chi-square statistics, the goodness-of-fit index and the root mean square residual (Wong, 2002).

4.4.4.5.1 Likelihood-ratio Chi-square Statistics

According to Hair et al. (1998), this is the most fundamental measure of overall fit and is the only statistically based measure of goodness-of-fit available in SEM. Assessment of the model fit is based on the chi-square significance since a low chi-square statistics implies less difference between the hypothesized and the estimated models. Nevertheless, usage of chi-square in goodness-of-fit analysis in SEM has been problematic due to the propensity to reject the fitted model (Schumacker & Lomax, 1996; Ulrich, 2009). These errors happen as a result of non-normality in the dataset and are anticipated to be appearing when sample size increases (Byrne, 2009; Ulrich, 2009). Hence, the chi-square measure is sensitive to large sample size and also very sensitive to the deviation from multivariate normality of the observed variables (Wong, 2002).

4.4.4.5.2 Goodness-of-Fit Index

Goodness-of-Fit Index (GFI) estimates the goodness-of-fit of a model against a totally non-fit of the data (Ho, 2006; Ulrich, 2009). The index ranges from zero (poor fit) to one (perfect fit) and the higher the index, the better the goodness-of-fit of the model. It is a universal consensus that a minimum value of 0.90 is required to indicate a good fit (Hair et al., 1998).

4.4.4.5.3 Root Mean Square Residual

Root Mean Square Residual (RMR) is the square root of the mean of the squared residuals which is the mean of the residuals between the observed and the estimated input matrices (Hair et al., 1998). RMR ranges from zero (perfect fit) to one (poor fit) and the lower the value, the better the goodness-of-fit (Hair et al., 1998).

4.4.4.6 Incremental Fit Measures

Incremental fit measures compare the estimated model to the baseline model or frequently referred as the null model (Wong, 2002), which is a practical model that all other models should be anticipated to surpass (Hair et al., 1998). Among the examples are Normed Fit Index (NFI), Adjusted Goodness-of-Fit Index (AGFI) and Comparative Fit Index (CFI).

4.4.4.6.1 Adjusted Goodness-of-Fit Index

AGFI is extended from GFI by adjusting the “degrees of freedom for the null model” (Wong, 2002, p. 143). The index ranges from zero (poor fit) to one (perfect fit) and the higher the index, the better the goodness-of-fit. A minimum value of 0.90 is generally accepted as the standard of a good fit (Hair et al., 1998).

4.4.4.6.2 Normed Fit Index

NFI indicates the percentage of increment in fitness over the baseline independent model (Bentler & Bonett, 1980). Even though NFI is widely used, it has been proven to underestimate the goodness-of-fit of a model in small samples. The NFI index ranges from zero (poor fit) to one (perfect fit), with the higher the index, the better the goodness-of-fit. The common accord is to take the minimum value of 0.90 as a benchmark for a good fit (Byrne, 2009; Hair et al., 1998).

4.4.4.6.3 Comparative Fit Index

CFI refers to the "comparisons between the estimated model and a null or independence model" (Wong, 2002, p. 143). The index ranges from zero (poor fit) to one (perfect fit) whereby the higher the index, the better the level of goodness-of-fit. The common agreement is a minimum value of 0.90 to represent a good fit (Byrne, 2009; Hair et al., 1998).

4.4.4.7 Parsimonious Fit Measures

Parsimonious fit measures refer to the goodness-of-fit of the model with regards to the number of estimations required to obtain a proper level of fit (Hair et al. 1998). Smaller values of Root Mean Square Error of Approximation (RMSEA), which is considered as a parsimonious index, imply a better fit. According to Ho (2006), values ranging "from 0.05 to 0.08 indicate an acceptable fit, 0.08 to 0.10 represent a mediocre fit, and any result greater than 0.10 suggest a poor fit" (as cited in Ulrich, 2009, p. 89).

4.5 Chapter Summary

This chapter has elaborated on the main issues with respect to the research methodology and strategies adopted in the study. The first section explains the quantitative research design which consists of the unit of analysis, sampling size, pilot study and procedures for data collection. Meanwhile, the second section was about survey instrument and operationalization of research constructs which explained the questionnaire scaling and its structure as well as the operationalization of these constructs. The last section that delved into methods of statistical analysis has discussed the data purification process, scale refinement and validation procedures as well as statistical techniques such as EFA, CFA, SEM and goodness-of-fit measures.

The preceding chapters and this chapter have focused on giving an elucidation of the background of the research as well as the theoretical basis for the research questions, hypotheses and methodology. The subsequent chapters will present and discuss the results of the study and deal with each of the research questions and hypotheses respectively.

CHAPTER 5

VALIDITY TESTS AND RELIABILITY ANALYSIS

5.1 Introduction

In the previous chapters, the theoretical framework and the literature for its development, field study for survey, research questions, hypotheses to be tested and the methodology adopted for analyzing them have been duly elucidated. For this chapter, details and discussion about the findings of the validity and reliability analyses will be presented. Based on the instruments derived from a pilot study, the main survey has succeeded in gathering a new dataset to examine the research instruments. It is only based on the scales of measurement that are reliable and valid that hypotheses testing can be carried out.

This chapter is divided into seven sections. It starts with an explanation of the data cleaning process and the respondents' demographics details which entails their gender, age, marital status, education level, length of service within the organization, job designation and job scope. Whereas in the second section, the organizations' details such as their products and service levels, number of employees, status and ownership were presented. This is followed by a detailed description of the analyses undertaken to test the reliability and validity of the measures. In particular, the reliability of the measures was examined with Cronbach's alpha values, scale composite reliability, EFA as well as CFA.

A summary of the data screening procedures consists of the missing value exclusion and common method variance test is presented in section 5.2. On the other hand, respondents' demographic details and the organizations' characteristics are included in sections 5.3 and 5.4 respectively. This is followed by the discussion on scale development and validity test on the dimensions of the construct in section 5.6. Finally, summary of the whole chapter is provided in section 5.7.

5.2 Data Screening

Analysis of data starts with the data screening techniques whereby result of the survey for every item was extracted from the survey program into the SPSS software for data cleaning and further analyses. Creswell (2005), Ulrich (2009) and Xie (2011) asserted that data cleaning can be carried out using frequency distributions, histograms and box plots to visually evaluate out-of-range data, missing values or input errors. No input errors were anticipated or seen since the data were inputs from the survey and hence human-generated errors can be avoided. The data were then imported into AMOS version 18 for preliminary analysis of measurement modality (Ulrich, 2009). No cases were identified as outliers based on the non-existence of substantial gaps in the Mahalanobis D^2 distances and hence none were discarded (Byrne, 2009).

5.2.1 Missing Value Exclusion

According to Xie (2011), missing data can be a consequence of any systematic external activity from the respondents such as errors in data entry, data collection or the reluctance in answering some questions which lead to missing values. Enders (2006) stressed that a lot of past studies have employed various methods to examine structural equation models which have missing data but the beliefs on the missing data mechanism were different. Researchers such as Enders (2006), Olinsky, Chen, and Harlow (2003) and Xie (2011) stated that missing data approaches can be done in two ways, namely by elimination such as *pairwise* deletion and *listwise* deletion or imputation such as regression imputation and mean imputation.

Among the approaches to treat the missing data, the deletion technique is not recommended for it could lead to significant bias in the chi-square statistics (Xie, 2011) whereas in the imputation technique, missing values are forecasted. In AMOS, maximum likelihood imputation technique is adopted and many researchers concurred that this technique has the minimum bias in comparison with the deletion technique (Byrne, 2006). Another technique is the Expectation Maximization (EM) imputation algorithm which is a method to determine the maximum likelihood predictive capability in models for missing data (Dempster, Laird, & Rubin, 1977). Furthermore, Xie (2011) opined that EM is less stringent in the missing data mechanism and performs well under the random missing data mechanism. Dempster et al. (1977) and Xie (2011) justified this by using the fact of EM's ability in linking the missing data with the results in the complete dataset which is used as the input dataset for SEM analysis as well as other multivariate analyses. Hence, in this study, SEM technique is adopted to deal with missing data in the current sample of the main survey. The missing values of six cases

are relatively small as compared to the study sample size, and the sample size did not reduce significantly hence this has not led to any biases.

5.2.2 Common Method Variance Test

The problem of Common Method Variance (CMV) bias occurs when both dependent and independent variables are measured from the same respondents (Delerue & Lejeune, 2010; Teh & Yong, 2011). The Harman's one-factor test can be utilized to examine CMV bias. The result shows that a single factor contributed 35.629% (i.e. < 50%) of the total variance, implying the non-existence of a sole dominant factor. Hence, CMV bias in the dataset is not significant (Delerue & Lejeune, 2010).

5.3 Demographic Profile and Other Characteristics

The employee profile of the 203 respondents is illustrated in Table 5.1. It shows that there are more males employees (64.5%) than their female counterparts (35.5%). 55.7% of the total respondents are married and the rest of them remain single. In terms of age, a majority with 23.6% of the total respondents is below 25 years old followed by 18.7% aged above 45 years old. The other age groups are almost evenly distributed as follows: 26-30 (16.3%), 31-35 (13.3%), 36-40 (13.3%), and 41-45 (14.8%). Majority of the respondents (38.4%) are Bachelor degree holders, 29.1% Diploma holders, 23.1% with high school education or lower level, 8.4% Master holders and only 1% are PhD/doctoral graduates. From the perspective of the positions hold by the respondents in the organization, 42.4% are executives, 26.6% are managers/head of departments, 18.7% are senior managers such as general managers, directors and CEOs, and the remaining 12.3% are section heads, section managers, engineer, supervisors, etc. The respondents represent various job functions in the organization which include finance, information and technology, human resource management and procurement

departments. 31.1% of the total respondents have at least 10 years of working experience in the present organization. Based on the information collected, this study is able to identify several key characteristics of the respondents, namely relatively young and with some reasonable good education background and prefer to look at both TQM and KM practices.

Table 5.1: Demographic Profile of Respondents

Demographic Variables	Frequency	Percentage
Gender		
Male	131	64.5
Female	72	35.5
Age		
Below 25 years old	48	23.6
26 - 30 years old	33	16.3
31 - 35 years old	27	13.3
36 - 40 years old	27	13.3
41 - 45 years old	30	14.8
Above 45 years old	38	18.7
Marital Status		
Single	90	44.3
Married	113	55.7
Education		
No College Degree	47	23.1
Diploma/Advance Diploma	59	29.1
Bachelor Degree/Professional Qualification	78	38.4
Master Degree	17	8.4
PhD Degree	2	1.0
Length of Service		
Less than 1 year	29	14.3
1 - 2 years	31	15.2
3 - 5 years	41	20.2
6 - 10 years	39	19.2
11 - 20 years	45	22.2
Above 20 years	18	8.9
Primary Job Scope		
Research & Development	18	8.9
Finance	10	4.9
Production	28	13.8
Human Resource	7	3.4
Marketing	33	16.2
Information Technology	11	5.4
Administration	45	22.2
Procurement	4	2.0
Others	47	23.2

5.4 Characteristics of Organizations' Profile

The collected data is divided into three sample groups according to the number of employees a firm has. Firms with less than 50 employees are classified as small firms, firms having between 50 to 200 employees are categorized as medium sized firms and firms having more than 200 employees are grouped as large firms (Hoang et al., 2006). Based on the gathered data, there are 43.3%, 29.6% and 27.1% small, medium sized and large firms. Furthermore, Table 5.2 also demonstrated that 84.2% of the firms have ISO certified status and the rest of 15.8% are intending to secure the ISO certification. The respondents come from two groups, namely the manufacturing firms (62.6%) and the service industries (37.4%). The sample manufacturing firms are from sectors such as electrical and electronic (12.8%), food (8.4%), chemical (3.9%), rubber and plastic (5.4%), textile (5.4%), machinery (9.4%) and other manufacturing firms (17.3%). Whereas the service sectors encompass higher education (5.9%), healthcare (6.4%), travel and tourism (2.0%), finance (3.0%), insurance (3.0%), entertainment (1.5%) and other types of service firms (15.6%). With regard to ownership, 60.6% of the firms are local private owned (i.e. owned by the Chinese (55.2%) and non-Chinese (5.4%)). Besides that, 21.2% are foreign owned and 18.2% are owned by state/government.

Table 5.2: Profile of Organizations

Demographic Variables	Frequency	Percentage
Category of Organizations		
Manufacturing	127	62.6
Service	76	37.4
Number of employees		
Less than 50	88	43.3
50 - 200	60	29.6
Above 200	55	27.1
Status of organization		
ISO certified	171	84.2
Planning to ISO certification	32	15.8
Ownership		
Foreign Owned Company	43	21.2
State Owned Company	37	18.2
Local Private Family Owned Company		
(i) Chinese	112	55.2
(ii) Non-Chinese	11	5.4

5.5 Descriptive Analysis of the Constructs

In order to understand the overall scenario with regard to TQM practices of the middle to higher level management understudied, a descriptive analysis was performed. The mean, standard deviation, minimum and maximum score of each construct are listed in Table 5.3. Based on the value of the mean score, the level of implementation of each TQM construct is labeled as either high or low degree in TQM practices. Similarly, the KM adoption is also labeled as either high or low degree in KM processes.

Table 5.3 also reveals that the mean score for customer focus is the highest among the TQM constructs. This implies that the firms understudied have made customer focus as their top priority and deeply appreciate the feedbacks and recommendations from the customers while striving to maintain a close relationship with them. These firms would be able to produce goods and services that are beyond the customers' expectations.

The minimum and maximum values of the customer focus construct are 2.00 and 7.00 accordingly with standard deviation of 1.043. The mean value of leadership ($\bar{x} = 4.829$) is the lowest among all the TQM constructs, it may imply that top management needs to be more dedicated in the implementation of both TQM and KM practices within their organizations.

Table 5.3: Descriptive Statistics of the Constructs

Constructs	Mean	Standard Deviation	Minimum	Maximum
Total Quality Management				
Strategic Planning	5.012	1.086	2.00	7.00
Leadership	4.829	1.152	1.80	7.00
Customer Focus	5.194	1.043	2.00	7.00
Human Resource Management	5.059	0.976	2.25	7.00
Process Management	4.905	1.035	2.33	7.00
Information and Analysis	5.018	1.015	2.67	7.00
Knowledge Management				
Knowledge Acquisition	4.911	1.029	2.00	7.00
Knowledge Distribution	4.812	0.916	1.67	7.00
Knowledge Application	5.015	0.973	2.00	7.00

5.6 Reliability and Validity Test

Choi (2010) has emphasized the importance of both reliability and validity in the data collection and instrument development stages. He also opined that reliability is the degree to which constructs are free from random errors. On the other hand, Litwin (1995) asserted that reliability can be utilized to ascertain whether an instrument's data is reproducible. In fact, Sekaran (2003) has stated that four methods can be used to estimate the reliability of measurements, namely test-retest method, split half method, parallel or alternate form method and Cronbach's alpha coefficient method.

Nevertheless, the first three methods have been criticized for their limitations (Davis, 2000). The alternative form method is impractical and costly as researchers need to develop a different but equivalent form of scales. Ya'acob (2008, p. 208) pointed out that "the test-retest reliability may generate a lower reliability over time because of the changes in the subject form periodically". Whereas the split half method of reliability assessment will yield different coefficients of reliability depending on the way the elements divided. Fortunately, these limitations can be resolved by using Cronbach's alpha coefficient method. As asserted by Davis (2000) and Ya'acob (2008), the practicality of this method has been used by various researchers in the field of social science compared to the other three methods. Due to this practicality, the reliability in this study is measured by Cronbach's alpha, one of the most commonly used coefficient methods to assess the internal consistency within the items. Hair et al. (1998) suggests that as a rule of thumb, the cut-off value of Cronbach's alpha is 0.60 while a value of 0.80 is considered to be good. Choi (2010) has defined validity as the degree to which a measurement assesses what it is supposed to measure. In the subsequent sections, discussions on the various tests conducted to examine the seven dimensions of the construct validity (i.e. unidimensionality, reliability, convergent validity, discriminant

validity, nomological validity, content validity and criterion related validity) will be presented.

To ensure construct validity in this study, EFA was first conducted on the TQM practices to confirm the underlying latent variables. As recommended by several researchers (Choi, 2010; Morgan, Gliner, & Robert, 2005), items with factor loading below 0.40 should be either discarded or refined. After the identification of latent and observed variables was done and EFA, the measurement constructs were further verified using CFA to examine whether the indicators are loaded on the chosen latent variables (Choi, 2010).

5.6.1 Exploratory Factor Analysis

Basically, there are two major forms of factor analysis approaches, namely EFA and CFA (Schumacker & Lomax, 1996). In previous literature, there were significant arguments about the appropriateness of these two approaches. For example, Hurley et al. (1997) opined that only a single approach should be used with respect to any given dataset or research questions. Besides that, Nunnally and Bernstein (1994) argued that the adoption of EFA "in the absence of strong theoretical construct is 'shotgun empiricism" (Wong, 2002, p. 191). This argument is further supported by Schriesheim's statement in Hurley et al. (1997, p. 672) that theoretically EFA is less demanding in comparison to CFA as a priori theory is needed by CFA (Wong, 2002).

Chong (2008) stated that most of the researchers have considered factor analysis as exploratory and is effective in studying the structure of a set of variables. Although the questionnaire developed in this study was adapted from prior studies, part of it was integrated with new items which were developed to describe every factor based on a comprehensive theoretical rationale. Furthermore, the adapted survey has not been adopted in the context Malaysian firms. Therefore, factor analysis in this study was exploratory instead of confirmatory. EFA was used to examine the unidimensionality of the constructs rather than exploring the underlying dimensions of the factors. Hence, it was used in this study. Furthermore, according to Wong (2002), CFA was also carried out in order to provide greater support for the reliability and validity of the factors.

Principle Component Analysis (PCA) and common factor analysis are two methods of implementing EFA. Chong (2008) and Zhang et al. (2000) concurred that common factor analysis is appropriate if the aim is to identify the constructs indicated in the original set of items. Conversely, Chong (2008), Hair et al. (2006) and Zhang et al. (2000) mentioned that PCA is commonly preferred if the researchers are concern primarily about the minimum number of constructs needed to describe the maximum portion of the variance indicated in the original set of items. As a result, PCA was chosen for this study as the main intention of performing the factor analysis was to determine how and to what extent the items were correlated to their underlying factors (Byrne, 1998; Chong, 2008). Zhang et al. (2000) asserted that PCA technique can help a researcher in deciding whether the selected items cluster on one or more than one factor. In fact, Chong (2008) and Zhang et al. (2000) further emphasized that this is crucial if there are three or more items which are chosen for evaluating one construct.

5.6.1.1 Exploratory Factor Analysis for TQM Constructs

In the preliminary stage, a PCA with Varimax rotation was conducted to validate the underlying structure of the TQM dimensions. This study proposes six key dimensions in the examination of the core practices of TQM, namely leadership, strategic planning, customer focus, human resource management, process management, information and analysis.

Multiple indicators were derived from the past literature in order to describe the comprehensive and rich meaning of each dimension especially leadership and human resource management with five elements each; strategic planning and information and analysis with four elements each; customer focus and process management with six elements each. All together, the TQM construct consists of 30 elements. Hence, it is imperative to identify the more significant indicative items to represent these dimensions. Xie (2011, p. 198) stated that "in order to reduce redundant information, extract the most meaningful information, establish the factorial dimensionality, and confirm the validity of the factorial dimensionality". Thus, EFA was employed to reveal the basic factor structure of the TQM and then validated with CFA.

EFA was performed on the 30 items of TQM. To justify the factor, only factor loading of at least 0.50 on the factor and at most 0.35 on the other factors was considered. In the path of the validation process, 9 items (i.e. SP3, CF1, CF3, CF4, HR1, PM2, PM5, PM6 and IA4) with poor factor loadings of less than 0.50 on their respective unobserved or latent variable were discarded (Hoang et al., 2006; Sit et al., 2009). The results of the Varimax rotated EFA showed the existence of six significant factors with eigenvalues more than one on all of the constructs' items, have significant factor loadings on their single factor. Besides that, the Kaiser-Meyer-Olkin (KMO) measure of sampling

adequacy value for all items was greater than 0.60, with most of the analyses in the range of 0.675 to 0.837, indicating adequate inter-correlations while the Bartlett's test of sphericity was large and significant for all of the factors analyses, with value ranging from 121.891 to 578.256. Therefore, it can be concluded that the factor loadings are deemed robust in enhancing the construct validity of the scales (Churchill, 1979; Xie, 2011). In short, it is undisputable that all the items are reliable measures of the constructs. Finally, the internal consistency of the measures was evaluated using Cronbach's alpha and all values were found to be greater than the recommended threshold of 0.60 (i.e. leadership = 0.891; strategic planning = 0.812; customer focus = 0.778; human resource management = 0.786; process management = 0.760; information and analysis = 0.747). Table 5.4 illustrates the EFA results.

5.6.1.2 Exploratory Factor Analysis for KM

Similarly, EFA was performed on 19 items of KM by using the PCA with Varimax rotation to examine their unidimensionality. In the validation process of EFA, several items (i.e. KD1, KD2, KD4, KA1, KA4, KA5, KA7, KA8 and KAP4) in the KM construct were dropped due to poor factor loadings of less than 0.50 on their respective unobserved or latent variable (Hoang et al., 2006; Sit et al., 2009). The results of the EFA for the KM dimensions are presented in Table 5.4. The KMO and Bartlett's test (chi-square) values are adequate and significant at 0.000 levels and therefore support the appropriateness of factor analysis on the data (Xie, 2011). The factor loadings are significantly robust to support the construct validity of the scales (Churchill, 1979). All factors of KM have acceptable reliability with alpha value ranging from 0.698 to 0.771.

Table 5.4: Exploratory Factor Analysis for TQM and KM

Constructs	No. of Items	Indicators	Factor Loadings	KMO	Eigen-value	% of Variance	Cronbach's Alpha
Total Quality Management							
Leadership (LD)	5	LD2	0.864	0.837	3.480	69.608	0.891
		LD3	0.857				
		LD4	0.850				
		LD1	0.826				
		LD5	0.772				
Strategic Planning (SP)	3	SP1	0.893	0.675	2.180	72.664	0.812
		SP2	0.881				
		SP4	0.779				
Customer Focus (CF)	3	CF6	0.874	0.675	2.078	69.259	0.778
		CF5	0.841				
		CF2	0.779				
Human Resource Management (HR)	4	HR2	0.771	0.771	2.440	60.997	0.786
		HR3	0.743				
		HR4	0.841				
		HR5	0.765				
Process Management (PM)	3	PM1	0.818	0.693	2.033	67.754	0.760
		PM3	0.841				
		PM4	0.811				
Information and Analysis (IA)	3	IA1	0.813	0.685	1.993	66.424	0.747
		IA2	0.838				
		IA3	0.794				
Knowledge Management							
Knowledge Acquisition (KA)	3	KA3	0.850	0.675	1.994	66.482	0.746
		KA2	0.819				
		KA6	0.775				
Knowledge Distribution (KD)	3	KD3	0.771	0.671	1.872	62.388	0.698
		KD5	0.804				
		KD6	0.794				
Knowledge Application (KAP)	4	KAP5	0.787	0.688	2.378	59.457	0.771
		KAP1	0.777				
		KAP3	0.764				
		KAP2	0.757				

5.6.2 Confirmatory Factor Analysis

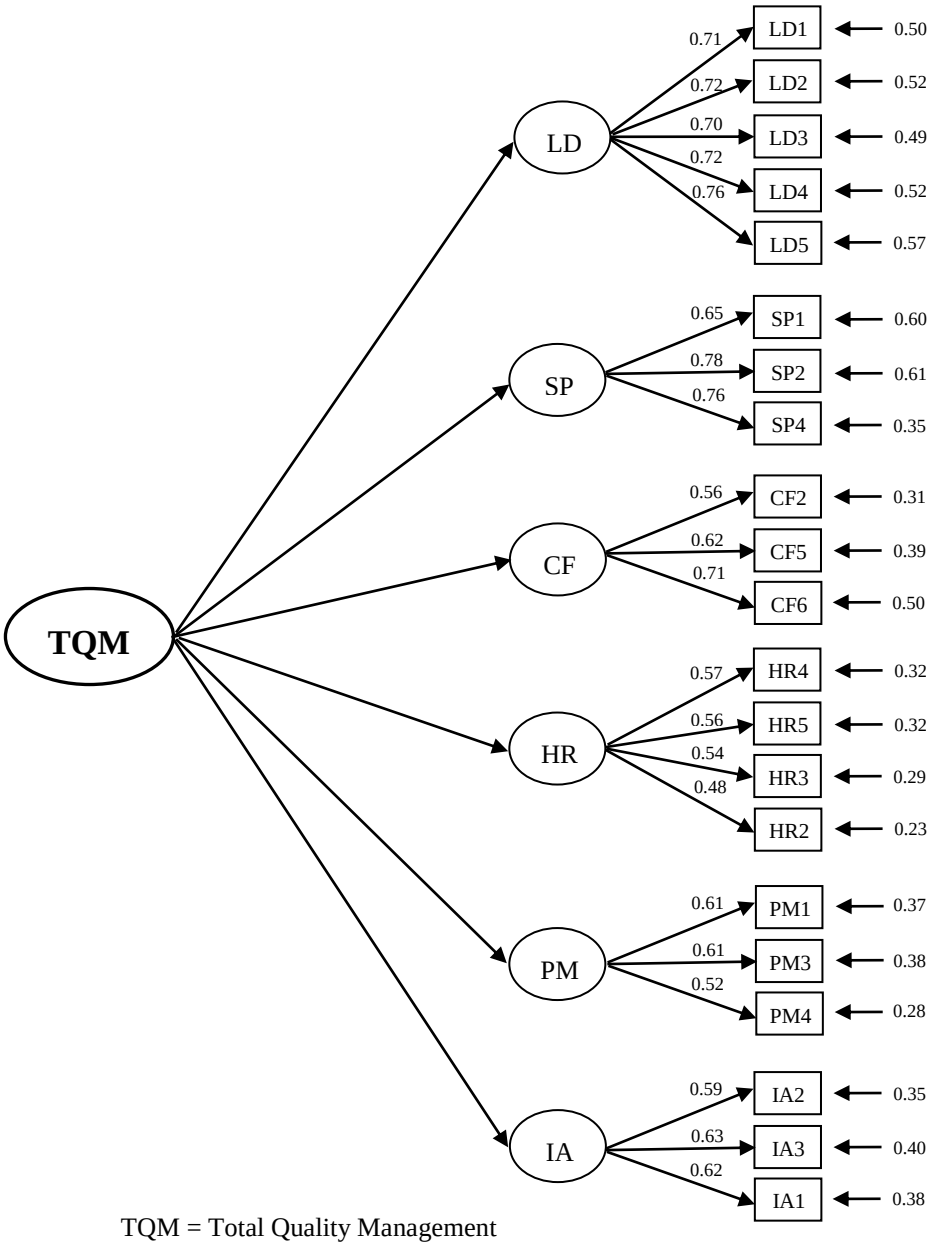
According to Anderson and Gerbing (1988) and Wong (2002), CFA model recognizes the relationship between the observed variables and the fundamental constructs with factors allowed to inter-correlate freely.

In this study, the confirmatory measurement model was utilized to assess unidimensionality, convergent validity and construct reliability. Therefore, measurement model was performed on both independent and dependent variables (Wong, 2002) to evaluate how good the observed variables are linked to a set of latent variables (Choi, 2002). In fact, all measurement models were established based on theoretical and empirical backgrounds suggested in previous studies (Choi, 2010). The goodness-of-fit of the measurement models determines how good the item in examining the intended constructs (Choi, 2010). The goodness-of-fit indices that assess the measurement model encompass the normed chi-square test, the Standardized Root Mean Square Residual (SRMR), the Non-normed Fit Index (NNFI), the CFI, the GFI, the AGFI and the RMSEA.

5.6.2.1 Measurement Model: Independent Variables (TQM Practices)

To examine the measurement characteristics of the scale, this study has taken the indicators of the six-factor correlated model as a second-order factor of TQM practices. In order to set the scales for the six dimensions, the variance of each dimension was fixed at 1.0. Hence, the fundamental conditions of plausibility and identification have been met and Figure 5.1 shows the standardized solution of the measurement model.

The goodness-of-fit indices for the measurement model are as follows: normed chi-square value (χ^2/df) of 0.966, SRMR = 0.043, GFI = 0.939, AGFI = 0.901, NFI = 0.943, CFI = 1.000 and RMSEA = 0.000. Significant result of the normed chi-square test indicated that the model fits well with the dataset. The values of NFI and CFI which are near to 1 imply a good fit and index value over 0.90 are considered as acceptable (Choi, 2010; Steenkamp & van Trijp, 1991). Generally, these statistics have given evidence of a reasonably good fit of data.



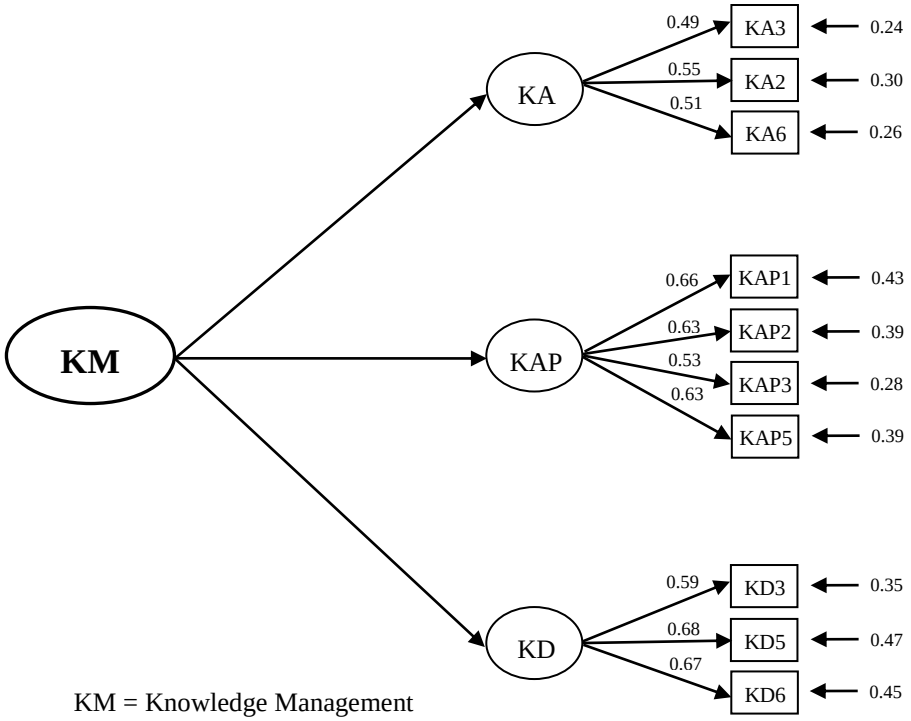
TQM = Total Quality Management
LD = Leadership
SP = Strategic Planning
CF = Customer Focus
HR = Human Resource Management
PM = Process Management
IA = Information and Analysis

Note: The standardized solution to the second-order CFA model of TQM displaying loadings of 21 items of six underlying latent factors. All standardized coefficients of the estimates are significant at 5% level.

Figure 5.1: Second-order CFA Model of TQM

5.6.2.2 Measurement Model: Dependent Variables (KM Dimensions)

CFA was performed on KM dimensions (i.e. second-order determinant) in order to examine the structure of the factors of other dependent variables. Figure 5.2 illustrates the standardized solution of the final measurement model. The goodness-of-fit indices for this research framework are as follows: normed chi-square (χ^2/df) value of 1.355, SRMR = 0.036, GFI = 0.977, AGFI = 0.926, NFI = 0.968, CFI = 0.991 and RMSEA = 0.042. All the fit indices have met the suggested threshold value of a good fit and therefore the data has been successfully verify to fit the model well (Browne & Cudeck, 1993; MacCallum, Browne, & Sugawara, 1996; Steenkamp & van Trijp, 1991).



Note: The standardized solution to the second-order CFA model of KM displaying loadings of 10 items of three underlying latent factors. All standardized coefficients of the estimates are significant at 0.05 level (Choi, 2010).

Figure 5.2: Second-order CFA Model of KM

5.6.3 Content Validity

Content validity refers to the extent to which the measurement unveils the specific aimed domain of the content (Carmines & Zeller, 1991). In order to obtain content validity, the inter-item correlations must be moderate. As asserted by Choi (2010), high loadings (> 0.90) and high inter-item correlation (> 0.80) should be avoided as high inter-item correlation implies that each item adds minimal information to describe the factor. Table 5.6 indicates that leadership and strategic planning have the highest correlation coefficient value of 0.747 which is still under the 0.90 threshold.

5.6.4 Unidimensionality

Unidimensionality indicates the existence of sole factor underlying a set of items (Dunn, Seaker, & Waller, 1994). Lopez et al. (2006, p. 226) stated that two approaches can be applied to examine the unidimensionality hypothesis as follows: "(1) the significance of the factor loading; that is the estimated correlation between specific items and the latent construct it signifies and (2) the acceptance of the overall measurement model based on the model's fit to the data". In this study, the first-order measurement model of TQM practices (i.e. χ^2/df = 0.923; *p*-value = 0.731 > 0.05; CFI = 1.000; NFI = 0.948; RMR = 0.053 and RMSEA = 0.000) and the dimensions of KM (i.e. χ^2/df = 0.637; *p*-value = 0.836 > 0.05; CFI = 1.000; NFI = 0.987; RMR = 0.032 and RMSEA = 0.000) have shown an acceptable model fit (Anderson & Gerbing, 1988; Bagozzi & Yi, 1988; Browne & Cudeck, 1993) while all item-to-construct loadings are statistically significant, supporting the unidimensionality of the scale utilized (Lopez et al., 2006). The results of the standardized factor loadings are shown in Table 5.5.

Furthermore, to evaluate the components of the measurement model, the researcher should also check the direction, magnitude and the statistical importance of the parameter estimates between the latent and indicator variables (Steenkamp & van Trijp, 1991). Ya'acob (2008, p. 235) stated that "there are three major conditions that are applied to study the unidimensionality of construct", namely:

1) The parameter estimate's magnitude should be a minimum of 0.70.

2) The sign [i.e. positive (+), negative (-)] of the parameter estimates should be consistent with the theory.

3) For every parameter estimate, the value should be statistically significant (*p*-value < 0.05) with critical ratio (value) being a minimum of 2.00 ($\geqslant$ 2.00).

Table 5.5 depicts that most of the parameter estimates' magnitudes were above the cut-off value of 0.70. Moreover, all of them were positive and therefore are consistent with the theory and literature. Last but not the least, all of them also has a critical ratio exceeding 2.00, thus providing support for unidimensionality of the constructs.

Table 5.5: Measures and Test for Unidimensionality for First-order Factor

Measures	Standardized Factor Loadings (CR)[a]
Total Quality Management Practices	
First Order Measurement Model	
LD5 ← LD	0.760 (N/A)
LD4 ← LD	0.775 (10.813**)
LD3 ← LD	0.782 (10.382**)
LD2 ← LD	0.796 (11.212**)
LD1 ← LD	0.764 (10.542**)
SP4 ← SP	0.629 (N/A)
SP2 ← SP	0.827 (9.391**)
SP1 ← SP	0.854 (9.570**)
CF6 ← CF	0.848 (N/A)
CF5 ← CF	0.725 (10.835**)
CF2 ← CF	0.651 (9.552**)
PM4 ← PM	0.681(N/A)
PM3 ← PM	0.765 (9.023**)
PM1 ← PM	0.720 (8.623**)
IA3 ← IA	0.680 (N/A)
IA2 ← IA	0.709 (8.599**)
IA1 ← IA	0.733 (9.089**)
HR5 ← HR	0.727 (N/A)
HR4 ← HR	0.756 (9.416**)
HR3 ← HR	0.703 (8.048**)
HR2 ← HR	0.643 (8.227**)
Knowledge Management	
First Order Measurement Model	
KA2 ← KA	0.736 (N/A)
KA3 ← KA	0.754 (6.644**)
KA6 ← KA	0.743 (6.028**)
KAP1 ← KAP	0.690 (N/A)
KAP2 ← KAP	0.720 (6.654**)
KAP3 ← KAP	0.734 (6.886**)
KAP5 ← KAP	0.702 (7.987**)
KD5 ← KD	0.824 (N/A)
KD3 ← KD	0.712 (7.879**)
KD6 ← KD	0.570 (6.279**)

Notes: ** p-value < 0.01 (All standardized loadings are significant at p< 0.01); [a] Values in parentheses refer to critical ratio; N/A = Not applicable; LD = Leadership; SP = Strategic Planning; CF = Customer Focus; PM = Process Management; IA = Information and Analysis; HR = Human Resource Management; KA = Knowledge Acquisition; KAP = Knowledge Application; KD = Knowledge Distribution

5.6.5 Construct Validity

Hair et al. (2006) as cited in Chong (2008, p. 144) defined construct validity as "the degree to which a set of measure items actually assess the identical construct". In this study, factor analysis with PCA and Varimax rotation was performed independently on the core practices of TQM and KM in order to attain the dimensions of each construct as well as to examine the construct validity (Hair et al., 2006). As indicated by the findings in Table 5.6, all items have factor loadings exceeding the 0.50 recommended cut-off value, further supporting the evidence of the factorability of the items and hence the

construct validity was duly determined (Hair et al., 1998). Similarly, construct validity can also be unveiled by the Composite Reliability (CR) of the latent variable. Chau and Hu (2001, p. 709) concurred that CR can be calculated by using the formula of "(Square of the summation of the factor loadings)/{(Square of the summation of the factor loadings) + (Summation of error variances)}". Molina et al. (2007) has suggested that the minimum value for CR is 0.70. Table 5.6 demonstrated that all CR values are in the acceptable range. This is further emphasized by Nunnally (1978) and thus it may be concluded that the measurement is reasonable.

5.6.6 Convergent Validity

Byrne (1994) as cited in Xie (2011, p. 194) stated that "convergent validity assesses the degree to which dimensional measures of the same concept are correlated". High correlations indicate that the scale instrument is evaluating its proposed construct. Byrne (1994) and Xie (2011) also stressed that items of the scale instrument should load strongly on their common construct. Besides that CFA was also conducted to evaluate the convergent validity of the measurement model based on three conditions recommended by Fornell and Larcker (1981) as follows:

(1) All indicator factor loadings (λ) should be significant;

(2) CR is notated as ρ, with the criteria that composite reliability which is the internal consistency of the indicator measuring the given factor, should exceed 0.60 (Bagozzi & Yi, 1988); and

(3) Average Variance Extracted (AVE) of every construct should be above 0.50 based on Kline (1998).

CR can be computed by the following formula: "(Square of summation of factor loadings)/{(Square of summation of factor loadings) + (Summation of error variances)}" (Chau and Hu, 2001, p. 709). Furthermore, AVE which "evaluates the total of variance that is gained by the construct about the total of variance due to the measurement error" (Xie, 2011, p. 195), can also be computed with the formula of (Summation of squared factor loadings)/(Summation of squared factor loadings) + (Summation of error variances) (Fornell & Larcker, 1981). The findings showed that all λ values were well above the recommended value of 0.50 (Kline, 1998) whereas the CR of each factor was: leadership = 0.883; strategic planning = 0.818; customer focus = 0.788; human resource management = 0.801; process management = 0.766 and information and analysis = 0.750. As recommended by Molina et al. (2007) and shown in Table 5.6, not only all scales are within the acceptable limits, but CR of all latent constructs also exceeded the 0.7 cut-off value which implied that the measures are good, hence, ensuring strong convergent validity. Moreover, AVE of each factor has exceeded 0.5, an indication that convergent validity and reliability are good (Table 5.6).

5.6.7 Discriminant Validity

According to Hair, Black, Babin, and Anderson (2010, p. 710), discriminant validity is "the extent to which a construct is truly distinct from other constructs". To evaluate the discriminant validity test, the estimated correlations of the construct which highlight sets of indicators anticipated to evaluate different constructs should not be too high (> 0.90) or low (< 0.10) (Hair et al., 1998; Lu, Yao, & Yu, 2005; Ooi et al., 2011). The correlations estimated between the related constructs were shown in Table 5.6. As seen in Table 5.6, the highest correlation coefficient value is 0.747 (strategic planning and leadership) which is less than 0.90. Hence, it is confirmed that the discriminant validity is acceptable (Jun, Cai, & Shin, 2006; Lin and Lee, 2004; Ooi et al., 2011).

For this study, discriminant validity is also examined through the comparison of the square root of the AVE with the correlation coefficients between the constructs. Byrne (1994) opined that discriminant validity is unveiled if the AVE of both constructs' values are higher than the square of the correlation. As presented in Table 5.6, all unobserved variable's square root of AVE was larger than its correlation between every pair of the latent variables. Hence, discriminant validity of all latent variables under study was well recognized and acceptable (Fornell & Larcker, 1981; Kuo, Wu, & Deng, 2009; Schaupp, Carter, & McBride, 2010).

Table 5.6: Latent Constructs Correlation

	LD	CF	IA	PM	HR	SP	KAP	KA	KD
LD	**0.776**								
CF	0.632**	**0.746**							
IA	0.584**	0.550**	**0.708**						
PM	0.528**	0.557**	0.635**	**0.723**					
HR	0.537**	0.509**	0.609**	0.556**	**0.708**				
SP	0.747**	0.627**	0.568**	0.531**	0.518**	**0.777**			
KAP	0.447**	0.472**	0.502**	0.485**	0.520**	0.534**	**0.712**		
KA	0.386**	0.255**	0.444**	0.459**	0.448**	0.498**	0.464**	**0.744**	
KD	0.415**	0.429**	0.494**	0.481**	0.475**	0.479**	0.659**	0.538**	**0.710**
AVE[a]	0.601	0.556	0.501	0.523	0.502	0.603	0.507	0.554	0.504
CR[b]	0.883	0.788	0.750	0.766	0.801	0.818	0.804	0.789	0.749

Notes: [a]AVE = (summation of squared factor loadings) / (Summation of squared factor loadings) + (summation of error variances) (Fornell & Larcker, 1981); [b]CR = (square of summation of factor loadings) / (square of summation of factor loadings) + (summation of error variances) (Fornell & Larcker, 1981); ***p*<0.01; N = 203; LD = Leadership; CF = Customer Focus; IA = Information and Analysis; PM = Process Management; HR = Human Resource Management; SP = Strategic Planning; KAP = Knowledge Application; KA = Knowledge Acquisition; KD = Knowledge Distribution; Diagonal elements (bold) are the square root of the AVE for each construct. Off-diagonal factors demonstrate the inter-correlations

5.6.8 Nomological Validity

The aim of nomological validity is to seek and establish the associations between theoretical constructs (Malhotra et al., 1996; Wong, 2002). Correlation matrix was employed in order to examine the theoretically predicted correlations between the research constructs (i.e. both independent and dependent variables) in the model. As shown in Table 5.6, the correlation matrix has presented evidence of the nomological validity for the research constructs of both independent and dependent variables respectively. As can be seen, most of the constructs were significantly correlated at *p*-value < 0.01. Therefore, these constructs were also deployed to examine the

multicollinearity problems. Since there were no factors with correlation values exceeding 0.90 in Table 5.6, it can be concluded that there is no serious problem of multicollinearity (Hair et al., 1998).

5.6.9 Criterion Validity

Criterion validity evaluates the extent to which the scale was conducted as expected with respect to other variables (Malhotra et al., 1996; Wong, 2002). This kind of validity can be evaluated in two ways, namely the concurrent and predictive validities. However, predictive validity cannot be evaluated in this study since the data for the measurement scale and criterion variable were gathered concurrently. Hence, concurrent validity was examined and the findings in Table 5.6 clearly show the evidence of concurrent validity for the research constructs of both independent and dependent variables respectively since the direction and magnitude of the correlations between the constructs were consistent to the expectations (Wong, 2002). In addition, all correlation coefficients were significant at $p < 0.01$ level which are in accordance with the predicted outcomes.

5.7 Chapter Summary

In summary, this chapter has presented the results of the reliability analysis and validity tests. After the reliability analysis, factor analysis, and validity analysis had been conducted, it was concluded that the TQM instruments and the instruments for measuring KM are reliable and valid. The data obtained through these instruments can be used for subsequent data analysis to test the theoretical model hypothesized and research questions in this study.

CHAPTER 6

THE RELATIONSHIP BETWEEN TOTAL QUALITY MANAGEMENT AND KNOWLEDGE MANAGEMENT

6.1 Introduction

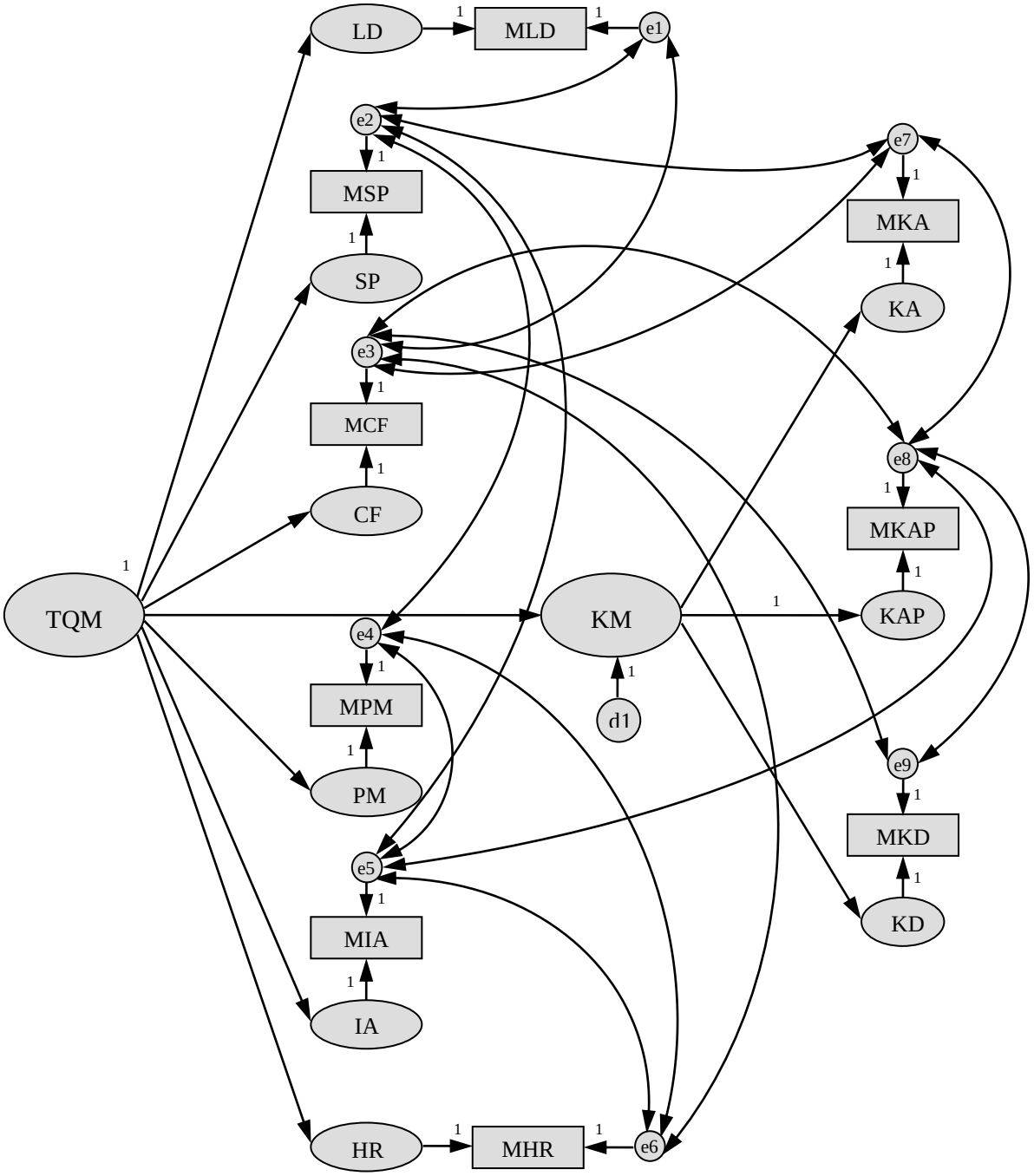
This chapter describes the findings for the testing of the theoretical model hypothesized in this study. Section 6.2 describes the SEM analysis for the model testing. Section 6.3 reports the overall fit of the structural equation model. Section 6.4 provides the results for the testing of the association between TQM and KM. The relationships between specific TQM practices and KM are given in section 6.5. Finally, Section 6.6 summarizes the findings of this chapter.

6.2 Structural Equation Modeling Analysis

Figure 6.1 depicts the research model that was examined using SEM. The SEM was conducted by using the MLE procedure. MLE is one of the most popular methods and is effective when the multivariate normality assumption has been fulfilled (Choi, 2010; Hair et al., 1998).

In order to perform SEM, many researchers (Hair et al., 1998; Lin & Lee, 2004; 2005; Sit et al., 2009) have recommended the two-stage process of modeling, whereby CFA is tested before the testing of the structural model. There are three advantages of SEM. Firstly, it provides a direct approach to manage relationships simultaneously; hence it is able to provide statistical efficiency concurrently. This is not applicable in multiple regression analysis. Secondly, SEM is able to examine comprehensively the relationships between the observed and latent variables (Hoyle, 1995; Schaupp et al., 2010). Therefore, it is able to shift from exploratory to confirmatory factor analysis.

Finally, SEM is also able to exhibit the concepts that are not observed through these associations and justify the measurement error in the estimation process (Kline, 2001; Prajogo and Cooper, 2010), which are not achievable in the multiple regression analysis. Furthermore, by utilizing the SEM approach, it is able to provide full information on the extent to which the research model is assisted by the data beyond the regression approach. The conclusion is that a more accurate analysis of the proposed research framework can be done and more often, it serves as a means of providing better methodological evaluation (Bollen, 1989; Jimenez-Jimenez & Martinez-Costa, 2009; Jöreskog & Sörbom, 1993). All of these are tasks that could be performed by SEM approach. As recommended by several researchers (Lee et al., 2010; Lin & Lee, 2004; 2005), the assumptions of multivariate analysis should be first investigated before conducting the SEM analysis, and this is followed by the examination of the structural model. All these steps will be discussed in the following subsections.



TQM = Total Quality Management
LD = Leadership
SP = Strategic Planning
CF = Customer Focus
HR = Human Resource Management
PM = Process Management
IA = Information and Analysis

KM = Knowledge Management
KA = Knowledge Acquisition
KAP = Knowledge Application
KD = Knowledge Distribution

MLD = Mean of Leadership
MSP = Mean of Strategic Planning
MCF = Mean of Customer Focus
MPM = Mean of Process Management
MIA = Mean of Information and Analysis
MHR = Mean of Human Resource Management
MKA = Mean of Knowledge Acquisition
MKAP = Mean of Knowledge Application
MKD = Mean of Knowledge Distribution

Figure 6.1: Relationship of TQM Practices and KM

6.2.1 Testing the Assumptions of Multivariate Analysis

Prior to the data analysis, both statistical assumptions as well as assumptions related to the SEM sample size should be analyzed first (Fotopoulos & Psomas, 2009; Hair et al., 2006; Lee et al., 2010; Lu et al., 2005). Hair et al. (1992) as cited by Forza and Filippini (1998) had suggested a sample size of between 100 to 200 for SEM analysis. The sample size of this study (N = 203) is within the acceptable range and hence can be considered as sufficient and adequate.

Zhang (2000, p. 102) mentioned that SEM is "more sensitive to the distributional characteristics of the data, particularly the departure from multivariate normality or a strong kurtosis or skewness in the data". On the other hand, Hair et al. (1992) as cited by Zhang (2000) asserted that a lack of multivariate normality is particularly perturbing since it can considerably inflate the chi-square statistics and yield an upward bias in the critical values when determining significance of the coefficients. In this study, normality test was performed using AMOS by integrating the Mahalanobis D^2 distances and also skewness and kurtosis. Generally, there are three indices to be adopted in studying variable distribution (Finney & DiStefano, 2006; Xie, 2011). These include univariate skewness, univariate kurtosis and multivariate kurtosis.

Even though there is no conventional cut-off values for univariate normality, Kline (2005) has suggested that the absolute values of standardized skewness which are more than 3 could be considered as highly skewed while absolute values of standardized kurtosis which are greater than 8 may be problematic (Xie, 2011). As can be seen from Table 6.1, majority of the variables are negatively skewed. In fact, the absolute value of the skewness for the individual variable lies within the range of $\pm$ 1 which is less than 3. Furthermore, from the univariate and multivariate perspective (i.e. Mahalanobis

D^2/number of independent variables < 3), the outliers were identified and removed from the dataset. These basic assumptions of the multivariate model indicate that there were no significant statistical violations. In general, it can be summarized that the univariate normality test is satisfactory (Xie, 2011).

Another normality assumption of SEM is the need of continuous data with multivariate normality. Small-sized sample or non-normally distributed variables may violate these crucial assumptions. In fact, violations of multivariate normality can inflate the computed chi-square statistics and also deflate the standard errors from a moderate to severe degree (Xie, 2011). Despite of its significance, many prior studies have failed to relate themselves with this assumption (Xie, 2011). In this study, the Bollen-Stine bootstrap which was used as a multivariate normality test with *p*-value below 0.05 is taken as the indicator of a non-normally distributed dataset. Table 6.1 demonstrated that the *p*-value of the Bollen-Stine bootstrap is 0.935, which has exceeded the cut-off value of 0.05. Thus, it implies that the model is of reasonably fit and without doubt, the dataset is normally distributed (Byrne, 2001). Based on the above results, it can be concluded that there is no statistically significant violations of the assumptions in this model.

Table 6.1: Univariate Normality - Skewness and Kurtosis of Constructs

Variables	Skewness	Kurtosis
Leadership	-0.544	-0.351
Customer Focus	-0.384	-0.254
Information and Analysis	-0.152	-0.581
Process Management	-0.225	-0.408
Human Resource Management	-0.437	0.229
Strategic Planning	-0.319	-0.411
Knowledge Acquisition	-0.407	-0.040
Knowledge Distribution	-0.245	0.689
Knowledge Application	-0.329	0.365

Note: *p*-value of Bollen-Stine bootstrap = 0.935 > 0.05

6.3 Overall Model Fit

The major issue in examining the theoretical framework is whether it is in conflict with the reality as seen in the sample, i.e. how good is the theoretical model in fitting the dataset (De Jong, 1999; Zhang, 2000). There are several indicators which are computed by AMOS version 18 that can be utilized to examine the goodness of the model fit. As suggested by Byrne (1998), Hair et al. (1992) and Jöreskog and Sörbom (1996), generally, there are five measures to determine the goodness-of-fit. These include chi-square statistics, the GFI, the AGFI, the RMSEA and the RMR.

The most fundamental measure of overall fit in a structural equation model is the likelihood-ratio chi-square statistics. As suggested by Bagozzi and Yi (1988), a *p*-value exceeding 0.05 and a normed chi-square value (χ^2/df) that is below 3, are normally considered as acceptable. They further asserted that goodness-of-fit indices such as GFI, AGFI, CFI and NFI should be at least 0.90 to be considered as acceptable and to indicate a good fit. While Byrne (1998) and De Jong (1999) mentioned that a RMSEA value below 0.05 is considered as a good fit, values between 0.05 to 0.08 indicate a fair fit. Finally, Browne and Cudeck (1993) suggested that a RMR value of not more than 0.08 implies a good fit.

6.4 The Relationship between TQM and KM

For this study, TQM is an abstract variable with six latent constructs whereby each construct has several items associated to it (i.e. from three to five items for each construct). Hence, with regard to RQ2, a CFA model with a second-order factor (Figure 6.1) was developed to examine the connections between the latent constructs in the model (i.e. TQM and KM).

Several researchers (Hoang et al., 2006; Kaynak, 2003; Kline, 1998; Segars & Grover, 1998) concurred that besides the ratio of chi-square statistics to the degree of freedom (χ^2/df), there are five other goodness-of-fit measures to be used in evaluating the CFA's model fit. These include the CFI, AGFI, GFI, NFI, RMSEA and the SRMR. It is recommended that the χ^2/df ratio should be less than 3 while the values for GFI, AGFI, NFI and CFI should be at least 0.90. Moreover, the SRMR should be less than 0.10 and RMSEA below 0.08. Based on the standardized estimates of the CFA model shown in Figure 6.1 and the fit indices listed in Table 6.2, it is obvious that all of the abovementioned requirements are fulfilled for both the measurement model and structural relationship. In fact, to evaluate the latent constructs, all variables have high factor loadings on their respective constructs and are statistically very significant (i.e. all *p*-value < 0.01) (Hoang et al., 2006).

The standardized estimates of the structural model depicted in Figure 6.1 indicate that TQM has a strong and positive impact on KM. Hence, with regard to RQ2, the findings revealed that TQM as a latent construct has a positive relationship with KM.

Table 6.2: The Results of SEM on the Relationship between TQM Practices and KM

Second-order Latent Variable	**First-order Latent Variables**	**Standardized Factor Loading**
TQM	Leadership	0.833
	Strategic Planning	0.838
	Customer Focus	0.800
	Human Resource Management	0.703
	Process Management	0.760
	Information and Analysis	0.758
Exogenous Variable	**Endogenous Variable**	**Structural Path**
TQM	KM	0.660
χ^2/df = 1.156, *p*-value = 0.312; GFI = 0.987; AGFI = 0.946; NFI = 0.987; CFI = 0.998; RMSEA = 0.028; SRMR = 0.0189		

Notes: TQM = Total Quality Management; KM = Knowledge Management; GFI = Goodness-of-Fit Index; AGFI = Adjusted Goodness-of-Fit Index; NFI = Normed Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual

6.5 The Relationship between Specific TQM Practices and KM

SEM analysis was adopted to address RQ3 which is concerned with the influence of specific TQM practices on KM. To achieve this, the hypotheses were tested. This study allows the analysis of the effect of each TQM practices on KM. One approach that was used in the previous studies has been adapted in this study (Lopez et al., 2006; Ooi et al., 2011; Spreng, MacKenzie, & Olshavsky, 1996) i.e. where multidimensional variables with many items were incorporated into the models. On the other hand, each element of the KM factor was combined into one index. These indices are used as the average score of the indicators from the result of the confirmatory measurement framework. Every KM dimension, which was mentioned in the SEM as a factor with an element, was also the index linking with this dimension. Lopez et al. (2006, p. 229) mentioned "the error term of the items were set equal to the scale variance times 1 minus the reliability; thus the reliability of the construct is fixed at the value of the composite reliability coefficients calculated in the previous confirmatory factor analysis". Alternatively, the constructs examining the TQM practices were operationalized in the structural equation framework together with their indicators as they were in the confirmatory measurement framework. The exact framework shown in Figure 6.2 also provides the fit indices and the standardized path coefficient β.

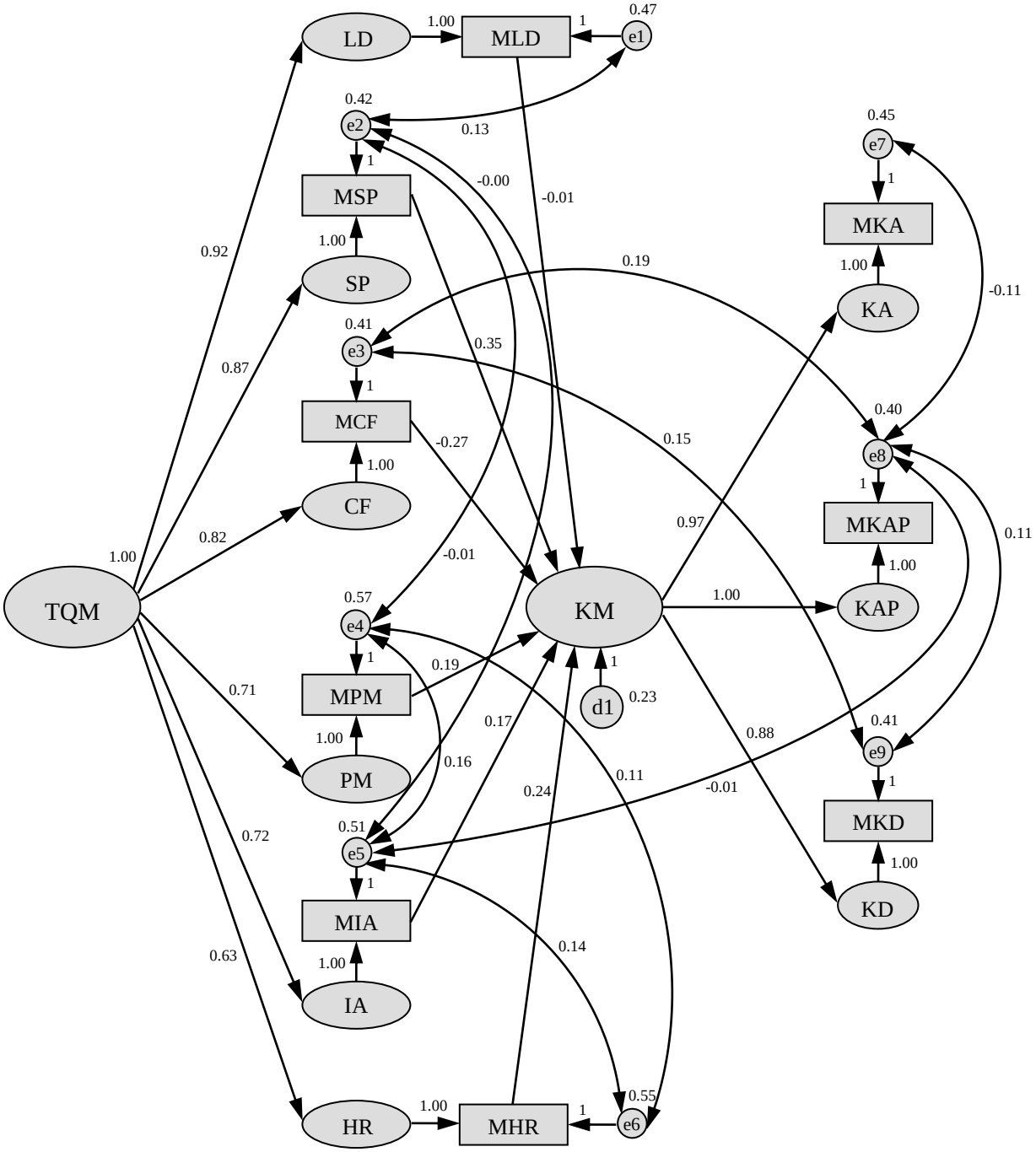


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Figure 6.2: Structural Model of the Relationship between TQM Practices and KM

6.5.1 The Structural Model

Table 6.3 shows the overall result of the structural model study. Based on the chi-square ratio (ratio of χ^2 statistic to the degree of freedom (df) = 0.474; *p*-value = 0.908 > 0.05) that is less than 3.0 as recommended by Bagozzi and Yi (1988) and other fit indices (GFI = 0.995; AGFI = 0.976; CFI = 1.000; NFI = 0.995), the recommended cut-off value of 0.90 has been exceeded (Anderson & Gerbing, 1988). Moreover, the RMSEA = 0.000 is below 0.08 and RMR = 0.010 is below 0.1 as suggested by Browne and Cudeck (1993). This indicates that the model has a good fit to the dataset. Since all fit indices have met their individual common acceptable values, this verifies that an acceptable fit of the structural model with the dataset (Bagozzi & Yi, 1988; Browne & Cudeck, 1993; Hoang et al., 2006; Lin & Lee, 2005; Sit et al., 2009).

Table 6.3: Measures of the Model Fit

Goodness of Fit Measures	χ^2 test statistics/df	*p*-value	GFI	AGFI	CFI	NFI	RMSEA	RMR
Recommended Value	$\leqslant 3.00^a$	$> 0.05^a$	$\geqslant 0.90^a$	$\geqslant 0.90^a$	$\geqslant 0.90^a$	$\geqslant 0.90^a$	$\leqslant 0.08^b$	$\leqslant 0.1^c$
Structural Model	0.474	0.908	0.995	0.976	1.000	0.995	0.000	0.010

Note: N = 203; GFI = Goodness-of-Fit Index; AGFI = Adjusted Goodness-of-Fit Index; CFI = Comparative Fit Index; NFI = Normed Fit Index; RMSEA = Root Mean Square Error of Approximation; RMR = Root Mean Square Residual
Sources: [a]Bagozzi and Yi (1988); Anderson and Gerbing (1988); [b]Browne and Cudeck (1993); [c]Hoang et al. (2006)

6.5.2 Testing Research Hypotheses

In the stage of hypotheses testing, validity of the hypothesized path is verified by evaluating the statistical significance of each structural parameter value. Based on the set of result (Table 6.4), it was verified that strategic planning ($\beta = 0.351$, $p < 0.01$), human resource management ($\beta = 0.236$, $p < 0.01$), process management ($\beta = 0.192$, $p < 0.01$) and information and analysis ($\beta = 0.170$, $p < 0.05$), were found to be significant and positively associated to KM. Hence, hypotheses H2, H4, H5 and H6 were accepted. On the other hand, customer focus ($\beta = -0.268$, $p < 0.01$) was found negatively related to KM. However, leadership ($\beta = -0.010$, $p > 0.05$) was found to have insignificant

relationship with KM, and therefore, H1 and H3 were not supported. The results of the hypothesis testing are shown in Table 6.4. Thus, with regard to RQ3, the findings of the study revealed that H2 (strategic planning), H4 (human resource management), H5 (process management) and H6 (information and analysis) were found to have strong and positive influence on KM. Meanwhile, H3 (customer focus) was found to have strong and negative effect on KM. The findings also unveiled that strategic planning and human resource management are the most imperative predictors of KM.

Table 6.4: Hypothesis Testing Results

Hypothesis	Path	Estimate	Std. Error	Critical Ratio	*p*-value	Remarks
H1	LD→ KM	-0.010	0.063	-0.162	0.871	Not supported
H2	SP→ KM	0.351	0.069	5.059	0.000**	Supported
H3	CF→ KM	-0.268	0.088	-3.034	0.002**	Not supported
H4	HR→ KM	0.236	0.063	3.771	0.000**	Supported
H5	PM→ KM	0.192	0.060	3.178	0.001**	Supported
H6	IA → KM	0.170	0.075	2.282	0.022*	Supported

Notes: N = 203; ** $p < 0.01$; *$p < 0.05$; LD = Leadership; SP = Strategic Planning; CF = Customer Focus; HR = Human Resource Management; PM = Process Management; IA = Information and Analysis; KM = Knowledge Management

6.5.3 Indirect Effects of Individual TQM Dimensions on Each KM Practices

In order to examine the effects of individual TQM dimensions on the KM practices, the standardized indirect effects were estimated. The significance of the indirect effect is determined using the Bias-corrected (BC) two-tailed percentile method with bootstrapping. As shown in Table 6.5, customer focus, process management, human resource management, strategic planning, information and analysis have significant indirect effects on knowledge acquisition, knowledge application and knowledge distribution. However, the result shows that there is no significant indirect effect of leadership on all the KM practices (knowledge acquisition, knowledge distribution and knowledge application). In terms of the effect on knowledge application, strategic planning has the strongest effect followed by customer focus, human resource management, process management and information and analysis. Hence, when more effort is given to strategic planning, this will trigger more endeavors to adopt knowledge application. A unit of increase in strategic planning will bring about an increment of

0.392 units in knowledge application practices. Interestingly, the result reveals that customer focus has a negative significant effect on knowledge application. This may happen as a result of less effort being put in knowledge application when the attention is given in sustaining customer focus. The more time and effort spent on customer focus, will lead to less concentration in applying the knowledge due to the constraints of time and resources. From the knowledge acquisition perspective, strategic planning has the strongest indirect effect followed by customer focus, human resource management, process management and information and analysis. In fact, a unit of increment in strategic planning will lead to an increase of 0.358 in the knowledge acquisition practices. Surprisingly, customer focus was found to have a negative significant indirect effect on knowledge acquisition. The justification may be that when more time and attention are given to customer focus, the momentum to strive for knowledge acquisition tends to slow down due to the lack of time and resources. Finally, from the viewpoint of knowledge distribution, the result reveals that strategic planning also has the strongest indirect effect on knowledge distribution and this is trailed by customer focus, human resource management, process management and information and analysis. Basically, a unit of increment in strategic planning will generate 0.365 increments in knowledge distribution practices. Similarly, customer focus was found to have a negative significant indirect effect on knowledge distribution. The argument may be the lack of time and resource due to the vast attention and focus given to customer focus.

Generally, the impact of the indirect effects of the TQM dimensions on the KM practices follows the order of strategic planning, human resource management, process management and information and analysis (in descending order). Therefore, more attention and consideration should be given to strategic planning in order to raise the adoption of KM practices.

Table 6.5: Standardized Indirect Effects

	MLD	MCF	MIA	MPM	MHR	MSP
MKAP	-0.012	-0.286*	0.178*	0.204**	0.237*	0.392**
	(0.949)	(0.026)	(0.015)	(0.007)	(0.011)	(0.006)
MKA	-0.011	-0.261*	0.162*	0.187**	0.216*	0.358**
	(0.929)	(0.020)	(0.020)	(0.008)	(0.012)	(0.008)
MKD	-0.011	-0.267*	0.165*	0.190**	0.220**	0.365**
	(0.969)	(0.023)	(0.019)	(0.006)	(0.008)	(0.007)

Notes: *****$p < 0.05$; ******$p < 0.01$; Bias-corrected (BC) two-tailed significance is shown in bracket; MLD = Mean of Leadership; MCF = Mean of Customer Focus; MIA = Mean of Information and Analysis; MPM = Mean of Process Management; MHR = Mean of Human Resource Management; MSP = Mean of Strategic Planning; MKAP = Mean of Knowledge Application; MKA = Mean of Knowledge Acquisition; MKD = Mean of Knowledge Distribution

6.6 Chapter Summary

This chapter has presented the results of the data analysis and research findings of the relationship between TQM practices and KM. Multivariate analyses such as CFA and SEM analysis were performed in order to answer the second (RQ2) and third (RQ3) proposed research questions and six hypotheses. The findings revealed that TQM has a strong and significant positive impact on KM. A one unit increase in TQM dimensions will contribute 0.660 unit of increase in the KM practices (Table 6.2). However, not all dimensions of TQM were equally important as the findings showed that strategic planning ($\beta = 0.351$, $p < 0.01$) has the greatest impact on KM followed by human resource management ($\beta = 0.236$, $p < 0.01$), process management ($\beta = 0.192$, $p < 0.01$) and of the least importance is information and analysis ($\beta = 0.170$, $p < 0.05$). Therefore, H2 (strategic planning), H4 (human resource management), H5 (process management) and H6 (information and analysis) were all statistically supported and the dimensions related to the hypotheses were found to have significant and positive effect on improving KM. However, H1 was not supported and leadership was found to have insignificant impact on KM. Customer focus (H3) was found negatively related to KM and thus H3 was not supported.

CHAPTER 7

COMPARATIVE ANALYSIS ON MANUFACTURING AND SERVICE FIRMS

7.1 Introduction

This chapter presents a comparative analysis on the multidimensionality of TQM practices, and the structural relationship of these practices with KM between the manufacturing and service sectors.

Section 7.2 describes the Multiple Group Comparison Analysis to determine the difference in the relationship of TQM practices and KM between the manufacturing and service sectors. Section 7.3 presents the MGA for testing whether the effect of each path of the relationship is the same for both manufacturing and service sectors, while the last section elucidates the multiple group structural modeling analysis conducted to address the predictive power of the TQM practices on KM.

7.2 Multiple Group Comparison

Multiple group comparison analysis was performed to determine whether there is any significant statistical difference in the relationship of TQM practices and KM among the firms in the manufacturing and service sectors as stated in the research question, RQ4: "*Is there any significance difference between the manufacturing and service sectors in terms of TQM linkages with KM behavior?"*

7.2.1 Comparison of TQM Practices and KM

In order to compare the mean difference between the two sectors, latent mean scores were utilized when conducting the t-test. As shown in Table 7.1, significant differences at $p < 0.05$ level exist in the leadership, customer focus, human resource management and process management of the TQM dimensions whereby the service sector has outperformed the manufacturing sector. On the other hand, there were no significant differences for all the indicators of KM construct in both sectors statistically. Hence, in response to RQ4, the result implies that there is a significant difference between manufacturing and service firms in terms of TQM practices except for strategic planning and information and analysis. Nevertheless, the results from this analysis is inconsistent with the findings by previous researchers such as Beaumont et al. (1997), Cheah et al. (2009) and Prajogo (2005) who found that there was no significant difference in the TQM practices between the manufacturing and service firms. This analysis also found that there is no significant difference in knowledge acquisition, knowledge distribution and knowledge application between manufacturing and service firms. The results are consistent with the findings from the previous study conducted by Cheah et al. (2009) in which no difference was found in terms of knowledge sharing between the two sectors.

Table 7.1: Group Statistics for Manufacturing and Service Sector with the Latent Mean Comparison Results

Variables	Manufacturing Sector (N=127)		Service Sector (N=76)		Difference of Latent Mean
	Mean	SD	Mean	SD	
SP	4.92	1.04	5.16	1.15	0.24
LD	4.71	1.10	5.03	1.21	0.32*
CF	5.05	0.98	5.44	1.10	0.39*
HR	4.94	0.95	5.26	0.99	0.32*
PM	4.76	1.01	5.15	1.04	0.39*
IA	4.92	1.00	5.18	1.03	0.26
KA	4.81	0.98	5.08	1.09	0.27
KAP	5.00	0.96	5.04	0.99	0.04
KD	4.73	0.93	4.95	0.87	0.22

Notes: N = 203; * significant at $p < 0.05$; LD = Leadership; SP = Strategic Planning; CF = Customer Focus; HR = Human Resource Management; PM = Process Management; IA = Information and Analysis; KA = Knowledge Acquisition; KAP = Knowledge Application; KD = Knowledge Distribution

7.3 Test of Sector-invariance of the Measurement Model

MGA was performed to investigate research question five, RQ5: *"Is there any difference in the modeling of the constructs validity of TQM between manufacturing and service firms?"* in order to determine whether there is any significant difference in the modeling of TQM's constructs validity between manufacturing and service firms.

The procedure of MGA was developed by Jöreskog and Sörbom (1993). In general, the steps include determining whether the two groups of manufacturing and service sectors, when subjected to similar model of relationship are indeed invariant (identical). This is followed by the identification of differences, if any, from three perspectives, namely the measurement model, structural relationships and error variances.

In fact, MGA with SEM is able to provide a stronger basis for cross-validation in order to examine the size of the effect of each path for both sectors. The chi-square difference (χ^2) between the equality constrained model (where all factor loading were constrained as equal) and the original model which is unconstrained will determine whether invariance exists. If the difference in chi-square statistics ($\Delta\chi^2$) between the original and the constrained models is less than the critical value ($\chi^2_{0.05}$) based on the difference in degree of freedom (Δdf) of the chi-square test then it can be confirmed that there is no group variance and the model is robust across both groups of manufacturing and service sectors. Moreover, as depicted in Table 7.2, the MGA of the measurement model has unveiled that there is no significant difference between both groups. Therefore, most of the TQM constructs measured in this study are applicable in both sectors. It also provides a good basis for further group-invariant analysis of the structural model (Feng, Prajogo, Tan, & Sohal, 2006).

Table 7.2: Summary of Group-invariance Test of Measurement Model of Manufacturing and Service Sectors

Original model without imposing equality constrains				Model with equality constrains imposed		Difference between original and constrained models		$\chi^2_{0.05}$ critical value	Group variance
$\chi^2_{Manufacturing}$ (df)	$\chi^2_{Service}$ (df)	$\sum\chi^2$	$\sum df$	χ^2	df	$\Delta\chi^2$	Δdf		
5.371(5)	2.217(4)	7.588	9	23.85	20	16.262	11	19.675	NS

Note: NS = Not Significant

7.4 Multiple Group Analysis of Structural Model

To investigate research question six, RQ6: *"Are there any significance difference in the predictive power of TQM practices on KM between the manufacturing and service sectors?"*, the multiple group SEM approach was also conducted in order to determine the overall differences in the predictor power of TQM practices on KM between the manufacturing and service sectors. The SEM model entails two parts i.e. the measurement and structural relationship model. The measurement model consists of six dimensions of the TQM practices which are measured by six observed variables i.e. leadership, strategic planning, customer focus, human resource management, process management and information and analysis whereas KM was measured by three observed variables i.e. knowledge acquisition, knowledge distribution and knowledge application.

7.4.1 Multiple Group Measurement Model Test

In order to determine the goodness-of-fit of the measurement model, eight fit indices were calculated in the SEM analysis, namely the normed chi-square, *p*-value, GFI, CFI, Incremental Fit Index (IFI), Tucker and Lewis Index (TLI), RMSEA and SRMR. As demonstrated in Table 7.3, all of these fit indices (i.e. GFI, CFI, IFI and TLI) for both groups were well above the cut-off values of 0.90 as recommended by Bagozzi and Yi (1988) and Arbuckle (2008), whereas the χ^2 test statistic/df, RMSEA and SRMR were well below the suggested cut-off values of 3 (Bagozzi & Yi, 1988), 0.08 (Browne &

Cudeck, 1993) and 0.1 (Hoang et al., 2006) respectively, thus implying that the data of the manufacturing and service sectors fitted well with the measurement model.

Table 7.3: Goodness-of-Fit for Measurement Models of the Manufacturing and Service Sectors

Goodness of fit measures	χ^2 test statistics/df	*p*-value	GFI	CFI	IFI	TLI	RMSEA	SRMR
Recommended Value	$\leqslant 3.00^{a}$	$> 0.05^{a}$	$\geqslant 0.90^{a}$	$\geqslant 0.90^{a}$	$\geqslant 0.90^{b}$	$\geqslant 0.90^{b}$	$\leqslant 0.08^{c}$	$\leqslant 0.1^{d}$
CFA/Measurement Model (Manufacturing)	1.074	0.372	0.986	0.999	0.999	0.997	0.024	0.0183
CFA/Measurement Model (Service)	0.554	0.696	0.990	1.000	1.000	1.000	0.000	0.0162

Notes: GFI = Goodness-of-Fit Index; CFI = Comparative Fit Index; IFI = Incremental Fit Index; TLI = Tucker and Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual

Sources: [a]Bagozzi and Yi (1988); [b]Arbuckle (2008); [c]Browne and Cudeck (1993); [d]Hoang et al. (2006)

7.4.2 Multiple Group Structural Model Test

Similarly, eight fit indices were also employed to measure the goodness-of-fit of the structural model. Table 7.4 portrays that all fit indices (i.e. GFI, CFI, IFI and TLI) were well above the threshold of 0.90 as recommended by Bagozzi and Yi (1988) and Arbuckle (2008), whereas the χ^2 test statistics/df, RMSEA and SRMR were well below the suggested cut-off values of 3 (Bagozzi & Yi, 1988), 0.08 (Browne & Cudeck, 1993) and 0.1 (Hoang et al., 2006) respectively and thus the data fit the structural model very well for both manufacturing and service sectors. The factor loadings for both sectors were shown in Table 7.5 and Table 7.6 respectively. The significance of the TQM dimensions as well as the KM practices were tested and the results revealed that all regression weight was statistically significant at $p < 0.001$. Based on these results, the dimensions of the TQM and KM constructs have been successfully verified.

Table 7.4: Goodness-of-Fit for Structural Models of the Manufacturing and Service Sectors

Goodness of fit measures	χ^2 test statistics/df	*p*-value	GFI	CFI	IFI	TLI	RMSEA	SRMR
Recommended Value	$\leqslant 3.00^{a}$	$> 0.05^{a}$	$\geqslant 0.90^{a}$	$\geqslant 0.90^{a}$	$\geqslant 0.90^{b}$	$\geqslant 0.90^{b}$	$\leqslant 0.08^{c}$	$\leqslant 0.1^{d}$
Structural Model (Manufacturing)	0.921	0.535	0.978	1.000	1.000	1.000	0.000	0.0215
Structural Model (Service)	1.140	0.316	0.951	0.995	0.995	0.987	0.043	0.0340

Notes: GFI = Goodness-of-Fit Index; CFI = Comparative Fit Index; IFI = Incremental Fit Index; TLI = Tucker and Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual

Sources: [a]Bagozzi and Yi (1988); [b]Arbuckle (2008); [c]Browne and Cudeck (1993); [d]Hoang et al. (2006)

Table 7.5: Regression Weights (Manufacturing Sector)

	Estimate	S.E.	C.R.	*p*
TQM→LD	0.922	0.082	11.180	0.000
TQM→SP	0.967	0.074	13.121	0.000
TQM→CF	0.703	0.078	8.996	0.000
TQM→PM	0.573	0.086	6.692	0.000
TQM→HR	0.545	0.080	6.772	0.000
TQM→IA	0.619	0.083	7.491	0.000
KM→ KA	1.000	N/A	N/A	N/A
KM→ KAP	1.079	0.141	7.761	0.000
KM→ KD	1.035	0.133	7.762	0.000

Notes: A→B indicates regression weight of B on A; S.E. = Standard error, C.R. = Critical ratio; N/A = Not Applicable; TQM = Total Quality Management; LD = Leadership; SP = Strategic Planning; CF = Customer Focus; PM = Process Management; HR = Human Resource Management; IA = Information and Analysis; KM = Knowledge Management; KA = Knowledge Acquisition; KAP = Knowledge Application; KD = Knowledge Distribution

Table 7.6: Regression Weights (Service Sector)

	Estimate	S. E.	C. R.	*p*
TQM→LD	1.039	0.116	8.937	0.000
TQM→SP	0.854	0.117	7.275	0.000
TQM→CF	0.861	0.109	7.923	0.000
TQM→PM	0.747	0.110	6.782	0.000
TQM→HR	0.700	0.104	6.705	0.000
TQM→IA	0.768	0.107	7.203	0.000
KM→ KA	1.000	N/A	N/A	N/A
KM→ KAP	1.220	0.255	4.788	0.000
KM→ KD	0.924	0.202	4.579	0.000

Notes: A→B indicates regression weight of B on A; S.E. = Standard error, C.R. = Critical ratio; N/A = Not Applicable; TQM = Total Quality Management; LD = Leadership; SP = Strategic Planning; CF = Customer Focus; HR = Human Resource Management; PM = Process Management; IA = Information and Analysis; KM = Knowledge Management; KA = Knowledge Acquisition; KAP = Knowledge Application; KD = Knowledge Distribution

7.4.3 Multiple Group Invariance Analysis of the Structural Model

The final structural model was examined for its group-invariance by constraining all paths to be equal across both groups of manufacturing and service sectors. By comparison of the chi-square statistics (χ^2) for the original and the constrained structural model (Table 7.7), the findings revealed that there were no significant differences. Thus, the final structural model is indeed group-invariant across both sectors.

Table 7.7: Summary of Group-invariant Test of Structural Model of Manufacturing and Service Sectors

Original model without imposing equality constrains				**Model with equality constrains imposed**		**Difference between original and constrained models**		$\chi^2_{0.05}$ **critical value**	**Group variance**
$\chi^2_{Manufacturing}$ (df)	$\chi^2_{Service}$ (df)	$\sum\chi^2$	$\sum df$	χ^2	df	$\Delta\chi^2$	Δdf		
12.896(14)	15.961(14)	38.792	28	56.871	48	18.079	20	31.410	NS

Note: NS = Not Significant

Based on the SEM results, two essential findings were derived. Firstly, the two groups of manufacturing and service sectors did not demonstrate any significant differences in their measurement models. Therefore, with respect to RQ5, there is no significant differences between the two groups' construct validity of the TQM practices. Secondly, the structural relationship models for both groups also depicted no significant differences thus supporting the criterion validity of the relationship between TQM and KM in both sectors. Besides, the results also verified the content of MBNQA conditions which signify the TQM construct across industries, i.e. manufacturing and service sectors in this study. The findings of this study are in agreement with the work of Prajogo (2005).

Hence, with respect to RQ6, the findings have indicated that there were no significant differences between the manufacturing and service sectors in terms of the causal relationships between TQM and KM practices. Generally, this study has confirmed that the TQM-KM model is robust across different sectors. The robustness is not only limited to its content, but also its significance and deep impact on KM practices in organizations.

7.5 Chapter Summary

In this chapter, MGA was performed in order to answer the remaining three proposed research questions, namely RQ4, RQ5 and RQ6. The measurement and structural models have been statistically verified to be invariant across both manufacturing and service sectors through the use of the MGA. The relationships among the items and their respective constructs were also found to be stable or consistent among the two groups. The fit of both measurement and structural models were also found to be very good based on the goodness-of-fit indices. The thorough discussion of the outcomes obtained in this chapter and their impact on the research questions and implications, limitations and future research will be further explained in the final chapter of this thesis, which is Chapter 8.

CHAPTER 8

CONCLUSIONS AND IMPLICATIONS OF STUDY

8.1 Introduction

In this final chapter, discussion on the findings of the research is provided. This research focused on the field of TQM and the implications of both theoretical and managerial perspectives were gathered. The contribution to the body of knowledge in terms of theory is highlighted. The practical usefulness of the results is presented under the discussion of managerial implications in section 8.3. The research shortcomings in this study are explained and cautioned. Future studies to further improve the knowledge on TQM and KM are also proposed.

8.2 Discussion of the Findings

According to the analysis in Chapter 5, the sections below will discuss the findings on the six research questions and the six research hypotheses. The findings of each hypothesis and research questions are summarized from Chapters 5 to 7.

8.2.1 Discussion of Findings – Research Question One

The first question (RQ1) – "*What are the key TQM practices that should be adopted, which are relevant for the measurement of KM?*" requires a detailed analysis of practices in different industries within the same country, Malaysia. With the purpose of responding to the above question, an extensive literature review has identified the key practices of TQM that have helped to provide an in-depth understanding of TQM practices. The framework adopted by Samson and Terziovski (1999) as cited by Prajogo (2005) was adapted to signify the main TQM constructs in this research especially for the reason that it was applied in the largest study of Australian companies to date.

Furthermore, Samson and Terziovski argue that their framework contains the conditions of the MBNQA characteristics that are identified as shown by a few scholars including Ahire et al. (1995), Curkovic et al. (2000), Evans and Lindsay (1999), Juran (1995) and Prajogo (2005). Additionally, the MBNQA framework is suitable for the industries of manufacturing and services. The difference of the level of TQM practices in the organizations between these two industries is likely to be compared (Curkovic et al., 2000; Prajogo, 2005). TQM in this research was formulated as six constructs, in which it is a set of independent or also known as exogenous variables, and they were derived from the MBNQA framework. The MBNQA model comprised of six dimensions of organizational practices and one criterion of organizational performance. MBNQA possesses many characteristics that other quality awards such as Prime Minister Quality Award (PMQA) and Quality Management Excellence Award (QMEA) try to emulate (Ministry of International Trade and Industry, 1998; National Productivity Centre, 1993). Furthermore, the MBNQA framework also includes both soft and hard elements of TQM (Vouzas & Psychogios, 2007). They are also used in both developing and developed countries in their management practices (Samson & Terziovski, 1999) and by many famous researchers to justify the selected TQM practices in their respective model framework (Choi & Eboch, 1998; Samson & Terziovski, 1999). To apply TQM could be just an adoption of these six practices via a set relevant technique.

8.2.2 Discussion of Findings – Research Question Two

With regard to the second research question (RQ2) – "*Do TQM practices have an influence on KM on Malaysian firms?*". Our findings for Malaysia indicate that TQM significantly and positively influence the level of KM. The arguments from the literature were clearly supported by our findings of a positive relationship between TQM and KM. The result confirms findings from the studies in the past (Hsu & Shen, 2005; Janpan et al., 2006; Lee & Asllani, 1997; Molina et al., 2004). In summary, the TQM practices, based on the MBNQA framework, have portrayed a positive association with KM. Using SEM analysis, this study shows that strategic planning has the strongest association with KM.

8.2.3 Discussion of Findings – Research Question Three

In response to RQ3 – "*Which key practices of TQM are more significant and positive towards KM in the Malaysian firms",* six hypotheses were established to examine whether the dimensions of TQM, i.e. customer focus, information and analysis, process management, human resource management, leadership and strategic planning were significantly related to KM within the organizations in Malaysia. The overall hypotheses testing results obtained from the structural analysis have shown that four of the six dimensions have a positive effect on KM in Malaysian firms, while the remaining practice, leadership and customer focus do not have a significant impact on KM. The findings of each hypothesis of RQ3 are discussed in the following subsections.

8.2.3.1 Hypothesis 1 – Relationship of Leadership and KM

The initial conclusion that can be derived from this research is that leadership, being one of the TQM constructs, has demonstrated an insignificant impact on KM among the companies within Malaysia. This result indicates that top management has not dynamically taken part in the knowledge management and worse, they even deterred attempts to participate in the KM activities. Our research outcomes are inconsistent with the results of Martinez-Costa and Jimenez-Jimenez (2008). Their study offers an obvious signal which suggests leadership does promote learning in a company for the organizations in Spain. Furthermore, this finding does not correspond with the works carried out by Bryant (2003), Davenport and Volpel (2001) and Lin and Lee (2004), in which leaders are portrayed as the drivers of knowledge exchange among workers in a company, which can guide a company to develop further. This result is also inconsistent with Greengard (1998) and Guns and Valikangas (1998) in which a strong support and involvement from the top management is needed to initiate the KM programme and to ensure its success. Furthermore, MacNeil (2001) believes that managers have the capability to cultivate a knowledge sharing culture in which employees are not constrained to share their explicit and implicit knowledge with others. Through such cultivation, it is alleged that employees can thrive in both their skills and expertise, benefiting the organization as a whole. In addition, a leader who encourages distribution of knowledge amongst staff via various media platforms, teleconferencing, weekly meetings, and official or unofficial chats, gives confidence and forums for workers to join and share their ideas more openly. Besides, knowledge sharing assists a firm to make better decisions, thus having an upper hand over other organizations. Our findings contradict with the results of Arnold et al. (2000) which suggest lack of commitment from leaders in cultivating a KM culture will build communication barriers among employees and departments. This would prevent knowledge from flowing among the

various organizational units and levels, resulting in an inability to produce goods and providing services that is of superior quality. As can be seen from the literature, senior managers need to actively be involved in quality management and improvement process, amidst encouraging change and implementation of KM activities. Managers of the sampled firms need to ensure that sufficient resources are to be provided to the staff for training and education purposes to show that they share the same belief about the future direction of the company. By doing so, only then can the acquisition, distribution as well as application of knowledge be properly executed to ensure the success of KM.

8.2.3.2 Hypothesis 2 – Relationship of Strategic Planning and KM

Strategic planning has been illustrated to affect KM among the companies in Malaysia. Consistent to our result, Wong (2005) who studied on the small medium enterprises discovered that strategic planning has demonstrated to be one of the critical success determinants for KM to occur within a company. The author shared the view that a vision that is simply comprehended and accomplished provides confidence to the employees to be more involved in assisting the organization to accomplish its goals and objectives. The result is also in line with Liebowitz's (1999) study, whereby the writer suggested with a complete strategic planning that features sufficient KM, it leads the organization to distribute its scarce resources and wastage could be reduced. This result stressed on the fact that a clear mission statement communicated to all in the organization can stimulate the partaking among workers to cultivate the practice of KM, and this ultimately assists in the accomplishment of company set goals, objectives and visions. This finding is in line with Carlucci and Schiuma (2006), whereby knowledge sharing is best incorporated in an organization's strategy. In contrast with Safa, Shakir, and Ooi's (2006) study, whereby the management of knowledge is not greatly considered as a vital determinant in strategy implementation for the non-governmental

organizations (NGOs) in Maldives, the finding of their research implied that there is no apparent strategy for these companies to keep their knowledge or a set vision to handle knowledge at their workplace. As concluded from the findings given in this study, when the vision of a company integrates with the activities of KM, coupled with a structured plan that permits workers to obtain new ideas, share the best practices among various departments, and transfer knowledge will allow knowledge to move freely among various levels within the organization and provides the organization the capability to churn out products and services that are of top quality.

8.2.3.3 Hypothesis 3 – Relationship of Customer Focus and KM

It was revealed in our results that customer focus has a negative influence in improving the KM activities among workers in Malaysian companies. Interestingly, the result reveals that customer focus has a negative significant effect on KM. In other words, the more time and effort being focused on customers' needs, the less it will be in managing the knowledge due to the constraints of time and resources. In addition, this phenomenon may be caused by the continuous change in the customers' demands due to the 'law of dynamism' which occurred in recent years. As customers' wants and desires are rapidly changing, companies are finding it hard to keep track of every customer's demand as each is unique and one of kind. The surmountable requests made by the customers in turn may deter many firms from learning their customers as this requires extra time, efforts and resources from the firm itself, hence having a negative effect on knowledge management. Our research result has been found to be inconsistent with the study of Waddell and Stewart (2008), where they concluded that organizations are encouraged to obtain information from customer so as to manufacture products that are in line with customers' desires. Previous research by Lee et al. (2001) also validates the findings from Waddell and Stewart (2008), where stronger relationships are required to

be developed between organizations and customers so that the information about customers liking can be obtained to build better quality goods. Our research findings also contradicts with the research conducted by Ju et al. (2006) that indicated the spread of customers' feedbacks among the staff provides a chance for the organization to obtain a competitive edge. Through the review of past literatures, the studies have shown that by making customer focus their main concern, companies value the feedbacks and suggestions provided by the customers, and in striving to retain a close relationship with them, these companies will manufacture products and render services that exceed customer expectations. Hence, managers of the Malaysian ISO firms should look into allocating their resources wisely to take advantage of managing their customers' needs in order to improve their management of knowledge within the company. With that, competitive advantage can be achieved. In order to accomplish this, members in a company, especially the front liners who deal with the customers every day, are required to constantly obtain information from consumers, and from there, distribute the knowledge to the various levels of the company. By doing so, they will be able to manufacture products that fulfill the specifications of the users and emerge as leaders in their own industry.

8.2.3.4 Hypothesis 4 – Relationship of Human Resource Management and KM

The finding from this empirical research study also shows that human resource management is also a vital determinant of KM. This signified that company-wide training programs for all workers working in Malaysian companies encourage the distribution of knowledge within the company itself, in which it gives an opportunity for staff to acquire new insights that can be shared together. This finding in this study is similar to the results of Soliman and Spooner (2000) in which effective human resource practices assist in obtaining, distributing and producing new knowledge. Our findings

also support those of Goh (2002), whereby training and development programs can assist extensively in problem solving via the sharing and exchanging of knowledge amongst workers. Ooi et al. (2009), in their conceptual paper also stressed that more training and development programs will lead to greater KM activities among members in the organization. As a result of its enormous benefits, such training programs should be given on a constant and regular emphasis to improve the success of KM. Besides, giving workers the flexibility and dividing them into teams have been discovered to have a positive impact on KM activities. This showed that information sharing will happen amongst workers as they work in teams, merging individual knowledge and developing new skills to boost the competency of the company. In a research carried out by Chong et al. (2010), the writers strongly stressed that teamwork and employee empowerment is one of the most important decisive determinants that would allow KM to successfully occur in a knowledge-based society. Our findings also supported the works of Garavan et al. (2000) and Greco (1999) that suggested workers required training and education so that they will be keener on developing and sharing knowledge. Our finding showed that the sampled companies give solid emphasis on human resource management practices, where appropriate company-wide trainings are given to workers at all levels. When such a working environment is present, it allows workers to obtain and share information easily via the training sessions and use such knowledge into problem solving. This seems to be one of the most efficient methods to build human resources so that they can continue to stay valuable in the improvement of company performance. Moreover, our result also supported the research completed by Grant (1997) and Hedlund (1994), where working in teams is deemed to give the company more flexibility to coordinate their human capital, providing workers the opportunity to spread and share knowledge, and raising the success rate of each task performed as a team. This, to some extent raises the competitive advantage of a company.

8.2.3.5 Hypothesis 5 – Relationship of Process Management and KM

When workers are led by clear objectives and they comprehend their respective tasks well, this is when KM is begun. The finding in our research has revealed it is as such. With an appropriate and well-developed process management, the firms are able to build a better process for KM activities to happen. Therefore, the empirical finding from this research concluded that process management is ranked as the main priority among the sampled companies, as process management certainly influences KM. Similarly, the application of statistical control for process controlling, also popularly called SPC, has a positive effect on the transmitting of knowledge, indirectly enhancing KM (Molina et al., 2004). In line with this, Rungtusanatham et al. (1997) also encouraged SPC analysis and to update the changes of knowledge process. When the workers are working together in teams, and are led by clear objectives, they can better comprehend their duties and responsibilities. This is when knowledge acquisition takes place, both internally and externally. When knowledge is disseminated among organizational members via periodic meetings or the application of information technology for problem solving, the practice will rid itself of outdated knowledge and provides the opportunity to look for newer options. Our finding also supported those of Ahire and Dreyfus (2000), where they found that a process that is easily comprehended by workers and carried out tasks in the process makes knowledge transfer easier, especially with the application of basic SPC tools. In addition, Wong (2005) in his research on SMEs supported the notion that processes and activities continue as one of the critical success factors that aids KM. It was noted in Wong (2005) that appropriate and sufficient interferences can improve the ways for knowledge transfer to happen in a company. Furthermore, Molina et al. (2007) who performed a test on a sample of 197 companies in Spain discovered that via an effective process control, the transfer of knowledge within a company is able to emphasize the problems and issues faced by a company,

bringing to the firm's knowledge the discrepancies in the efficiency of various processes based on the data generated rather than on management's own perception. This comes to illustrate that process management and transferring of knowledge within a company is extensively encouraged and should not be taken lightly by the companies in Malaysia if they want to thrive and succeed.

8.2.3.6 Hypothesis 6 – Relationship of Information and Analysis and KM

The outcome of this research illustrates that information and analysis are significantly linked to KM in Malaysian companies. This result is similar to those of Alavi and Leidner (2001) and Lee and Hong (2002) where they found most recent technology advancement plays a main function to connect people with information as well as connect people with people via different media sources, platforms and databases. Wong (2005) stated that together with easy-to-use technological devices and software, information and knowledge can be shared with a simple click of a button. With the rapid of advancement of technology, goods as well as processes could turn obsolete. Thus, it is imperative for companies to obtain the most updated information and technology to compete with the latest products and services offered by competitors especially for companies in Malaysia. With the use of greatly improved technology, not only does it boosts the speed of getting and distributing knowledge, the cost of spreading information can also be reduced, hence encouraging appropriate KM. A case study carried out by Yeh, Lai, and Ho (2006) on both Advanced Semiconductor Engineering, Inc (ASE) and VIA Technologies, Inc. (VIA) situated in the region of Asia, validated that information technology helps in the speedy exploration for information and this has become ever more important for both firms in their management of knowledge. Chong et al. (2010) based on the results of previous research, recognized information analysis as one of its critical success factors that can assist KM in a company, whereby it has the

component of knowledge distribution. As stated in the article of Chong et al. (2010), several researchers have supported the idea that with a complete information system infrastructure, knowledge can be handled and executed efficiently and effectively. This statement was also supported by Hasanali (2002) who suggested that a company inevitably prevents its staff to have knowledge sharing on a greater scope if a solid information technology infrastructure is absent. Another research by Luan and Serban (2002) pointed out that practices on business intelligence, knowledge and data mining support the KM processes, is in conflict with our study outcomes. Given such result, it is advisable and important for the Malaysian companies to incorporate an exceptional KM system, so that the most updated information about the latest trends, products, and services offered by competitors and commanded by customers can be obtained in the fastest time possible. Therefore, firms should identify the significance of information systems as a stimulator of KM and such system should be easy to apply to improve its productivity. Only through the application of the most advanced technology can the speed of obtaining, distributing and using of knowledge can occur. In summary, information and analysis are important in supporting a company's KM process and it is closely connected with KM.

8.2.4 Discussion of Findings – Research Question Four

The next research question, RQ4 in this study asked "*Is there any significance difference between the manufacturing and service sectors in terms of TQM linkages with KM behavior?"*. The results shown in Table 7.1 indicate that four out of six factors, namely leadership, customer focus, human resource management and process management show a positive relationship and significantly difference between these two sectors. Hence, in response to RQ4, the finding recommends that, with the exception of strategic planning and information and analysis, there is a significant difference between

manufacturing and service firms in terms of TQM practices and KM. The result of these findings are inconsistent with past studies such as Beaumont et al. (1997), Cheah et al. (2009) and Prajogo (2005) that found no significant difference in the TQM adoption between manufacturing and service firms. The results also illustrated that generally service firms score more than manufacturing firms with respect to TQM practices and KM. As service firms require more knowledge based abilities (i.e. soft skills) compared to the manufacturing that demands more mechanical (i.e. machinery) skills, a stronger emphasis should be placed on practicing TQM and KM for the service sector.

8.2.5 Discussion of Findings – Research Question Five

The fifth research question, RQ5 in this research enquired "*Is there any difference in the modeling of the constructs validity of TQM between manufacturing and service firms?*". The main findings can be drawn from SEM results. The measurement frameworks of the two groups were not significantly different. Therefore, in response to RQ5, the findings revealed that there was no significant difference between manufacturing and service firms in terms of construct validity of TQM. Besides, these results also confirm that the contents of MBNQA criteria adopted for TQM constructs in both manufacturing and service sectors are valid. The above results are in line with the outcomes from past studies performed by Prajogo (2003; 2005). In other words, the MBNQA-TQM elements could be conceptualized as one of the predictors that govern the occurrence and effectiveness of KM among the middle to higher level managers in both the manufacturing and service firms. Personnel from these two sectors will find this useful as it may aid them in re-assessing and re-examining ways to improve their TQM practices effectively so that they can improve the level of KM in their organizations. As proven in the study by Cheah et al. (2009), it is also proven likewise that the relationship between TQM practices (i.e. leadership, customer focus, training and

development, reward systems, teamwork, and organizational culture) and knowledge sharing also showed insignificant difference between the manufacturing and service sectors. Such result was also in line with Beaumont et al. (1997) as well as Prajogo (2005) who also did not find significant difference in TQM adoption between the manufacturing and service industries.

8.2.6 Discussion of Findings – Research Question Six

The sixth research question (RQ6) in this study asks – "*Are there any significant difference in the predictive power of TQM practices on KM between the manufacturing and service firms?"*. The result shows that the structural relationship models between the manufacturing and service groups do not pose any significant differences. This supports the criterion validity of the relationships between TQM and KM in both manufacturing and service firms (Prajogo, 2005). Thus, in response to RQ6, these findings suggest that in terms of the key practices of TQM and KM, there is no significant difference between manufacturing and service firms. In general, this study has demonstrated that the TQM model applied in this research is robust across different sectors not only in terms of content (i.e. criterion) but also in terms of its significant and strong effect on KM in Malaysian firms.

8.3 Research Implications

This research further advances the contemporary study in the area of TQM and the implications of both theoretical and managerial perspectives are brought together in this section. These implications will be further explained as follows:

8.3.1 Managerial Implications

In the place of work, learning is an important component to change a conservative company to a developing one (Gilley & Maycunich, 2000). KM, that is an essential part of learning, holds great connotation in the future management of quality systems. Many businesses are starting to apply the KM activities; as such activities aid companies to accomplish a sustainable competitive edge over their rivals (Valkokari & Helander, 2007). Moreover, the dimensions of TQM are found to be useful mechanisms for management as they contribute to the distribution of knowledge. The findings and discussion presented in the past sections revealed valuable lessons for practitioners, as well as researchers in both quality and KM fields. It is deemed that if the significance of TQM practices is well understood and valued, it can really improve the success of KM processes.

To ensure sustainable competitive advantage, a combination of both TQM and KM can be used as management practices for many firms. By introducing and executing a well-designed and applicable TQM system within the company, an implicit understanding of the company's knowledge can be built and worked towards by each worker within the company itself. The benefits of TQM practices on KM are discussed by Tseng (2008). Firstly, there will be a change in the company itself when KM activities are guided by TQM practices. Secondly, TQM practices should identify the mission, objectives and goals of the firm. Thirdly, the company may become more diversified in its working process. Fourthly, an enhancement in the overall performance is noticeable. Finally, an innovative culture can be encouraged, which involves getting new ideas and better problem-solving skills among workers.

This study has provided some practical approaches to organizations, especially in the Malaysian manufacturing and service companies, on whether TQM practices are able to enhance KM activities. Although many companies have used such practices, it is still important to build a framework, test it, and then study the TQM constructs that can contribute towards the implementation of KM activities. This research clearly exhibits that four out of six TQM practices, namely strategic planning, human resource management, process management and information and analysis have a positive impact on the KM activities in the manufacturing and service companies of Malaysia. As such, the middle to higher level managers of these companies will have an idea on which TQM constructs to concentrate on in order to improve the activities of KM. More exclusively, strategic planning and human resource management emerged to be the two most decisive TQM dimensions that are linked to KM. Hence, it is critical to enhance both these two constructs in all organizations.

Due to the direct impact of strategic planning, human resource management, process management and information and analysis, on KM, Malaysian companies should study their workers' feedback, so that the overall KM activities can be enhanced. Besides, a formal introductory program should also be carried out for new workers together with the wide specifications of formal on-the-job training for the existing workers, with mentoring programs put in place in order to increase the employees' dedication. Process management can be further enhanced through the support of an appropriate communication system. This will allow process flow information to be smoothly disseminated all over the firm and easily understood by staff from all levels. Additionally, middle to higher level managers should know the fact that there is a need to study objectively the performance of their subordinates, so that staff will have a sense of fair play and reliability, and this will promote higher KM. By using the results of this

study as a guide, middle to higher level managers will have a better understanding on each TQM practice to be used when it comes to self-examination and further enhance their TQM practices in order to improve the distribution of knowledge in their firms. Information and analysis can be further enhanced via the application of appropriate communication system. This will allow information to be distributed smoothly throughout the firm, and comprehended easily by workers at all levels. By applying this research result as a guideline, managers in the manufacturing and service sectors will have a better understanding on the respective TQM practices especially in the reviewing and revising of their TQM practices to enhance KM within the organization. Lastly, the results also verify the adoption of TQM practices in both manufacturing and service sectors and the validity of the MBNQA conditions in operationalizing TQM practices into a set of organizational practices.

This empirical research holds strong significance for practitioners from the management side. One of the main practical contributions is to create awareness among the middle to higher level managers from both the manufacturing and services sectors on the multidimensionality of TQM, and to bring their attention on how to devote more attention on the six MBNQA elements that bring an equal effect to both sectors in terms of attaining a higher level of KM. In other words, practitioners from both industries should be aware of the importance of the MBNQA criteria in churning out a healthy KM culture. Apart from that, appropriate measures, such as regular assessment of the TQM practices implemented in firms, at the same time the introduction of suitable programmes that can help boost the KM level can also be adopted by managers from both sectors. Furthermore, both soft and hard TQM elements should be emphasized in today's competitive and fast changing environment as both types of elements are believed to be essential for company survival.

8.3.2 Theoretical Implications

By using KM as a research topic, a lot of studies strived to find the most consistent and reliable ways to improve the KM activities. Unfortunately, there is still insufficient research conducted in the area of TQM and KM relationships, even though studies in the past have tried to accomplish this. In this research, we recommend a model that incorporated the six TQM practices based on MBNQA framework to examine whether such a practice would enhance the performance of KM in Malaysian companies. Although past study such as Cheah et al. (2009) did a comparison between the manufacturing and service sectors in Malaysia, it only compared the relationship between TQM practices and knowledge sharing from the perspective of middle to higher level managers. Furthermore, the TQM dimensions used in their study were not of MBNQA criteria. On top of that, only the multiple linear regression technique was used to analyze the relationship between the TQM principles and knowledge sharing. Another study by Feng et al. (2006) compared the relationship of TQM on quality performance between Australian and Singaporean firms. However, the said study is an inter-country comparative study that focuses on organization performance (e.g. product quality and product innovation) as a whole, but not on KM. Therefore, this study is believed to contribute to the knowledge on TQM in the literature where a comparative research was conducted on two major sectors in Malaysia - manufacturing and services. Furthermore, a more comprehensive multivariate analysis technique, SEM was used to test the relationships between the TQM dimensions with the KM constructs, so to deepen the comprehension of the role of TQM plays in KM and also to prove the validity of the model framework.

From the theoretical viewpoint, this research study offers a model where six dimensions of TQM and KM behavior were combined. With the application of multivariate analysis, namely SEM, the index fit were assessed comprehensively to ensure whether it is a properly defined model. Based on the analysis, the model is suitable for the data collected. In addition, this research also illustrates the links between the dimensions of TQM and KM activities. This research has offered the foundation for future research to be carried out, to inspect the link between TQM and KM dimensions, so the role of TQM can be better understood and developed into new ideas and technologies. Hence, to prove the validity of the framework, this research may be used as the base and principles for future studies.

Finally, besides concluding TQM practices play an important role in supporting KM activities in both manufacturing and service companies in Malaysia, this study also contributes to the literature by highlighting the effects of the individual TQM constructs on KM behaviors. From these findings, the management team of each firm can work on the modification of their TQM activities to develop a more encouraging KM culture in their own company and that future researchers can also consistently test on the impact of different TQM practices on the different sectors.

Despite the wide spread attention and the countless papers written about TQM, research comparing the relationship between TQM and KM in both the manufacturing and service sectors is still limited. We believe this study has provided further insights into the broader view of TQM dimensions, to investigate the effects the six MBNQA dimensions have on KM for both the sectors. This study is one of the few that brings out the idea of TQM being an influential predictor for KM. By using this idea, a comparison study was done between the two sectors. From the research perspective, such an

examination is vital as there is a lack of empirical research which compares the two major sectors in Malaysia in terms of the association between TQM and KM. As indicated in the findings, no difference was found between the two sectors and that the MBNQA practices are essential to both. With the validity of the TQM variables, and its relationship with KM being demonstrated in both sectors, this study differs from others in the literature that limit their investigation to comparing the differences in the level of TQM implementation between the manufacturing and service sectors. Apart from that, the constructed research model can be used by future researchers, within or outside Malaysia, for further testing of its validity and applicability.

8.3.3 Methodological Implications

From the aspects of research methodology, this research embarked on a thorough statistical validation of the influence of TQM practices on KM in the setting of Malaysian companies. The relationship between the variables was rigorously studied for consistency and validity and was discovered to perform well. In addition, the proposed model (i.e. association between TQM practices and KM) was empirically tested using EFA, CFA and SEM analysis. Overall, the findings provided strong support for the proposed relationships. One major contribution from this study is that a measurement system of TQM practices and KM has been developed, which is believed to prompt and facilitate more of such research to be conducted in the developing countries in future. These findings also contribute significantly as a benchmark methodology that can be used to track the level of TQM effects on KM. Firms can apply this instrument to conduct measurements of the basic pre-test, and then return to manage regularly to identify changes linked with TQM efforts.

8.4 Research Limitations and Future Research Directions

Because of the resources and time constraints, the results in this thesis leave several weaknesses which required acknowledgement and study further. This research focuses on both manufacturing and service companies in Malaysia, in which a comparison was made between both these industries. The first limitation identified here is that only the Malaysian firms were being investigated. It is suggested that the study be broadened to compare our findings with other countries, such as those from the Asia Pacific region or with the developed countries, in the likes of the European countries, the United States and Japan in the investigation of the differences in the relationship of TQM and KM. Such studies are believed to contribute significantly across different nations.

One other weakness is the data used are cross-sectional, not longitudinal. Because of this, the time sequence of the links among the variables cannot be determined. Only through the application of data collected at different point of time can the causality between variables be tested. Therefore, future research should include longitudinal research designs so that a clearer picture of causation can be obtained.

Next, questionnaire survey is a way that is widely applied by many researchers as it is a cost-effective and consistent for data collection. It is self-administered questionnaire and the questions asked in survey may be unclear to some respondents and thus can be affected by response biases. Hence, it is suggested that a field observation be performed as to get a clearer picture from the respective respondents themselves. Additional limitation is that the data is collected from middle to higher level managers. Their views about the research topic could be different from that of the ordinary workers. Hereafter, it is suggested to perform future surveys on the different management levels.

Despite the overall findings presented in this research, the MBNQA framework, which comprises of six constructs, remains the only focus of the study. There is a possibility that they are other factors which can be incorporated into the research model as the operating nature between manufacturing and service is significantly different. For example, the hard elements of TQM apply more to the manufacturing industry, whereas the soft elements of TQM are more applicable to the service firms. Apart from that, the dimensions in other Quality Award models, such as the EQA or the PMQA can also be used as predictors in future studies.

The TQM practices selected in this research is limited in scope, as six TQM practices were studied. Obviously, there are other broader factors governing TQM practices that could have an effect on KM. Some examples are organizational culture, organizational structure, corporate strategy and the practice of continuous improvement. They may play an essential part to shape the workers' attitudes towards KM activities. Such dimensions may as well be included into future research, as every organizational aspect is interlinked.

8.5 Conclusions

In conclusion, the purpose of this study was to assess the influence of TQM practices on KM, as perceived by middle to higher level managers in Malaysian companies. The results have indicated that TQM practices posed a significant and positive impact on the KM of Malaysian companies. Besides, it was discovered that the dimensions of TQM, such as process management, strategic planning, information and analysis and human resource management, having positive effect on KM. Strategic planning and human resource management are main items of TQM which are strongly linked with KM in Malaysian companies.

With the rapid progression of technological changes, combined with economic globalization, ‘knowledge’ has been regarded as a competitive asset by many enterprises in order to be competitive. As human capital is the primary resource for the production of knowledge, a lot of firms have started to involve themselves actively in activities which encourage the generation of new knowledge. Therefore, if companies can guarantee the critical practices that inspire the production of new knowledge and the improvement of the present ones, it will boost the competency of KM.

From the study presented, we can conclude that TQM practices are essentially linked to KM. The companies in Malaysia are aware of the significance of KM activities hence have started to employ and include them into their day to day business processes. This research evidently suggests KM to be more than merely conveying data. The different types of information shared among workers from different departments and different levels, and the speed in sharing knowledge within a company, institute the capability of the company to succeed. It is undoubtedly that KM among workers is imperative and an important method for companies to accomplish a competitive edge. KM certainly offers many benefits to different types of firms, in this case, both the manufacturing and service firms. It is important that organizations fit their TQM constructs to encourage KM activities to take place within the company. In this thesis, it is recommended that the four TQM practices (i.e. strategic planning, human resource management, process management and information and analysis) to be used in both the manufacturing and service companies in Malaysia, as they have exhibited a “fit” between the workers and the company itself, and this can assist in the development of attitudes and behaviors that are positive towards KM implementation.

According to Liebowitz (1999), the utmost precious resource of a company that needs to be controlled and handled with care is knowledge. It is essential that companies do not take too lightly the importance of KM. To survive and thrive in this competitive business environment, enterprises need to consistently improve on their existing knowledge and search for new ones. In order for them to do so, the proposed TQM practices in supporting the KM process are especially significant, so that firms can compete successfully in the marketplace and gain growth. Through the effective distribution of knowledge, firms will have the ability to harvest the benefits and become successful in the competitive surroundings.

This study also offered an empirical assessment on the differences in the link between TQM and KM for both the manufacturing and service sectors. The results show that the level of TQM practices and KM are not significantly difference between these two sectors except for leadership, customer focus, human resource management and process management where service companies illustrate scores that are significantly higher. Through the application of SEM approach, this research has shown that the proposed TQM constructs are valid and applicable to both manufacturing and service sectors and their association with KM is also similar between the two. Therefore, this study encourages the adoption of TQM practices in the manufacturing and service companies. In particular, this research has verified the applicability of the MBNQA conditions as named by Samson and Terziovski (1999) cited by Prajogo (2003; 2005) in both the manufacturing and service companies. This research also adds to the literature by demonstrating the validity of TQM construct and its relationship with KM in both manufacturing and service firms. This varies from past works (e.g. Prajogo, 2003; 2005) in areas that are normally limited to study the difference between the two industries in the adoption of TQM.

In summary, this thesis has presented an empirical study examining the differences in the relationship between TQM and KM from the perspective of both manufacturing and service sectors. Firstly, no significant difference was found in terms of TQM practices affecting KM level between both sectors. Secondly, it has also been proven that the TQM model used in this study, which adopted the MBNQA criteria, is valid and applicable across both sectors with the use of SEM analysis. Hence, the TQM principles selected for this study can be concluded as equally applicable to both sectors. As a general conclusion, it was successfully proven in this research that the MBNQA criteria used to establish the TQM framework could be useful in conceptualizing the factors that govern the occurrence and effectiveness of KM. For both the manufacturing and service sectors, to improve KM within a firm can pose as a huge challenge. Therefore, both sectors might find this study beneficial as this study provides the basic guideline for re-evaluating the methods to enhance their TQM practices in a relatively inexpensive and practical way, so that a higher KM can be attained. From the research perspective, a more thorough understanding on how MBNQA-TQM concepts can affect the behaviors of KM can be achieved by studying the multidimentionality of TQM practices, contributing to the ever important TQM studies.

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APPENDIX A

UNIVERSITY OF MALAYA

5 January 2011

Dear Sir/Madam,

Re: Data Collection through Survey on Malaysian Firms – Mr. Ooi Keng Boon

I hereby confirm that Mr. Ooi Keng Boon is a PhD candidate in the Department of Applied Statistics, Faculty of Economics & Administration, University of Malaya under my supervision.

His field of research is Industrial Statistics and he is examining the impact of total quality management practices on knowledge management in firms in Malaysia. To complete his research, he needs to collect data primarily from firms through a survey. He shall be contacting your organization for this purpose.

Please be assured that Mr. Ooi shall comply with all aspects of the Code of Research Ethics. All responses will be kept strictly confidential and only aggregated data will be used for analysis.

We seek your support and cooperation in allowing Mr. Ooi to conduct his survey at your organization. Please do not hesitate to contact me if you need further clarification on his survey.

Thank you very much.

Yours sincerely,

PROFESSOR DR. GOH KIM LENG
Deputy Dean (Postgraduate & International)

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Explanatory Letter

My name is Ooi Keng Boon and I am a PhD candidate in the Department of Applied Statistics, Faculty of Economics and Administration, University of Malaya.

As part of my studies towards a PhD in Applied Statistics at UM, I am presently conducting a survey for my PhD thesis under the supervision of Professor Dr. Goh Kim Leng, Deputy Dean (Postgraduate & International) of the Faculty. This research is entitled "A Linear Structural Equation Modelling of Total Quality Management (TQM) and Its Impact on Knowledge Management (KM)".

The aim of my research is to examine the impact of TQM practices on Knowledge Management in Malaysia's firms. The total quality management and knowledge management are becoming a major part of business practice from the middle to higher level managers' perspective. I believe that the findings of this research project will be useful in contributing to knowledge in the areas of TQM and KM.

Therefore, I am writing to seek your permission to request a person holding an executive position or above (i.e. executives, managers, senior managers, general managers and managing directors or CEOs) to fill up the survey form. Please complete the questionnaire and return it using the attached address and post-paid envelop within two weeks from the above date mentioned. The questionnaire will take you approximately 15-20 minutes to complete.

Your opinion and co-operation in answering the enclosed questionnaire will be of utmost value and importance. Please be assured that your responses will be kept strictly confidential. Only aggregated data will be used for statistical analysis solely for the purpose of this study. I will be happy to send you a summary of my findings once completed.

I look forward to your responses as soon as possible.

Thank you in advance for your support.

Yours sincerely,

Ooi Keng Boon
PhD Candidate
Student ID: EHA070004
University of Malaya

APPENDIX B

A Linear Structural Equation Modelling of TQM Practices and its Impact on Knowledge Management

Survey Questionnaire

The purpose of this survey is pertaining to your organization's Total Quality Management (TQM) adoption and Knowledge Management Behavior. Please answer all questions to the best of your knowledge. There are no wrong responses to any of these statements. All responses are completely confidential.

Thank you for your participation.

Instructions:

1) There are **FOUR** (4) sections in this questionnaire. Please answer ALL questions in ALL sections.

2) Completion of this form will take you approximately 20 to 30 minutes.

3) Please feel free to share your comment in the space provided. The contents of this questionnaire will be kept **strictly confidential**.

Section A: Demographic Profile

In this section, we are interested in your company background in brief. Please tick your answer and your answers will be kept strictly confidential.

QA1: Gender: ❑ Female ❑ Male

QA2: Age: ❑ Below 25 Years Old ❑ 26-30 Years Old ❑ 31-35 Years Old
❑ 36-40 Years Old ❑ 41-45 Years Old ❑ Above 45 Years Old

QA3: Marital status: ❑ Single ❑ Married

QA4: Highest education completed:

- ❑ No College Degree
- ❑ Diploma/Advance Diploma
- ❑ Bachelor Degree/Professional Qualification
- ❑ Master Degree
- ❑ PhD Degree

QA5: Length of time with your organization:

- ❑ Less than 1 Year
- ❑ 1 - 2 Years
- ❑ 3 - 5 Years
- ❑ 5 - 10 Years
- ❑ 10 - 20 Years
- ❑ Above 20 Years

QA6: Your job position:

- ❑ Executive (e.g. Assistant Manager, System Analyst, Engineer etc)
- ❑ Manager/Head of Department
- ❑ General Manager/Director/Chief Executive Officer
- ❑ Other (please specify): _____

QA7: Your primary job scope:

- ❑ Research & Development
- ❑ Production
- ❑ Marketing
- ❑ Administration
- ❑ Other (please specify): _____
- ❑ Finance
- ❑ Human Resource
- ❑ Information Technology
- ❑ Procurement

Section B: Details of Organization

In this section, we are interested in your company background in brief. Please tick your answer and your answers will be kept strictly confidential.

QB1: Category of your organization's product or services:

- ❑ Manufacturing (please specify):
  - ❑ Electrical & electronics products
  - ❑ Food products
  - ❑ Chemical & chemical products
  - ❑ Rubber & plastic products
  - ❑ Textiles & textile products
  - ❑ Machinery & hardware
  - ❑ Other (please specify):_____
- ❑ Services (please specify):
  - ❑ Education
  - ❑ Healthcare
  - ❑ Travel & tourism
  - ❑ Finance
  - ❑ Insurance
  - ❑ Entertainment
  - ❑ Other (please specify):_____

QB2: Number of employees in your organization:

- ❑ Less than 50
- ❑ 50 - 200
- ❑ Above 200

QB3: Status of your organization:

- ❑ ISO Certified.
  If yes, how long has your organization been committed to the certification?
  Please specify: _____
- ❑ Planning to ISO Certification
- ❑ Non-ISO Certified

QB4: Ownership:

- ❑ Foreign owned company
- ❑ State owned company
- ❑ Local private family owned company
  - ❑ Chinese
  - ❑ Non-Chinese

Section C: Total Quality Management Practices

This section is seeking your opinion regarding the Total Quality Management (TQM) practices in your company. Respondents are asked to indicate the extent to which they agreed or disagreed with each statement using a 7-point Likert scale [(1) to (4) = strongly disagree; (5) to (7) = strongly agree] response framework. *Please circle one number per line to indicate the extent to which you agree or disagree with the following statements.*

No.	Questions	Strongly Disagree				Strongly Agree		
C1	**Leadership**							
LD1	Senior executives share similar beliefs about the future direction of this organization.	1	2	3	4	5	6	7
LD2	Senior managers actively encourage change and implement a culture of improvement, learning, and innovation towards 'excellence'.	1	2	3	4	5	6	7
LD3	Senior managers actively participate in quality management and improvement process.	1	2	3	4	5	6	7
LD4	Senior managers strongly encourage employee involvement in quality management and improvement activities.	1	2	3	4	5	6	7
LD5	Senior managers arrange adequate resources for employee education and training.	1	2	3	4	5	6	7
No.	**Questions**	**Strongly Disagree**				**Strongly Agree**		
C2	**Strategic Planning**							
SP1	We know our company mission.	1	2	3	4	5	6	7
SP2	We have a comprehensive and structured planning process which regularly sets and reviews short and long-term goals.	1	2	3	4	5	6	7
SP3	When we develop our plans, policies and objectives, we always incorporate the needs of all stakeholders.	1	2	3	4	5	6	7
SP4	We have a written statement of strategy covering all business operations which is articulated and agreed by our senior managers.	1	2	3	4	5	6	7

No.	Questions	Strongly Disagree						Strongly Agree
C3	**Customer focus**							
CF1	We actively and regularly seek customer input to identify their needs and expectations.	1	2	3	4	5	6	7
CF2	Customer needs and expectations are effectively disseminated and understood throughout the workforce.	1	2	3	4	5	6	7
CF3	We involve customers in our product design processes.	1	2	3	4	5	6	7
CF4	We always maintain a close relationship with our customers.	1	2	3	4	5	6	7
CF5	We have an effective process for resolving customers' complaints.	1	2	3	4	5	6	7
CF6	We systematically and regularly measure customer satisfaction.	1	2	3	4	5	6	7
No.	**Questions**	**Strongly Disagree**						**Strongly Agree**
C4	**Process Management**							
PM1	The concept of the 'internal customer' (i.e. the next process down the line) is well understood in our company.	1	2	3	4	5	6	7
PM2	We design processes in our plant to be "fool-proof" (preventive-oriented).	1	2	3	4	5	6	7
PM3	We have clear, standardized and documented process instructions which are well-understood by employees.	1	2	3	4	5	6	7
PM4	We make an extensive use of statistical techniques (e.g. SPC) to improve the processes and to reduce variation.	1	2	3	4	5	6	7
PM5	We strive to establish long-term relationships with suppliers.	1	2	3	4	5	6	7
PM6	We use a supplier rating system to select our suppliers and monitor their performance.	1	2	3	4	5	6	7

No.	Questions	Strongly Disagree				Strongly Agree		
C5	**Information and Analysis**							
IA1	Our company has an effective performance measurement system to track overall organizational performance.	1	2	3	4	5	6	7
IA2	Up-to-date data and information of company's performance are always readily available for those who need it.	1	2	3	4	5	6	7
IA3	Senior management regularly holds meeting to review company's performance and uses it as a basis for decision-making.	1	2	3	4	5	6	7
IA4	We engage in an active competitive benchmarking program to measure our performance against the 'best practice' in the industry.	1	2	3	4	5	6	7
No.	**Questions**	**Strongly Disagree**				**Strongly Agree**		
C6	**Human Resource Management**							
HR1	We have an organization-wide training and development process, including career path planning, for all our employees.	1	2	3	4	5	6	7
HR2	Our company practices two-way communication between management and staff.	1	2	3	4	5	6	7
HR3	Employee satisfaction is formally and regularly measured.	1	2	3	4	5	6	7
HR4	Employee flexibility, multi-skilling and training are actively used to support performance improvement.	1	2	3	4	5	6	7
HR5	We always maintain a work environment that contributes to the health, safety and well-being of all employees.	1	2	3	4	5	6	7

Section D: Knowledge Management Behavior

This section is seeking your opinion regarding the Knowledge Management (KM) Behavior in your company. Respondents are asked to indicate the extent to which they agreed or disagreed with each statement using a 7-point Likert scale [(1) to (4) = strongly disagree; (5) to (7) = strongly agree] response framework. *Please circle one number per line to indicate the extent to which you agree or disagree with the following statements.*

No.	Questions	Strongly Disagree				Strongly Agree		
D1	**Knowledge Acquisition**							
KA1	We have a system that allows us to learn successful practices from other organizations.	1	2	3	4	5	6	7
KA2	The company is in touch with professionals and expert technicians.	1	2	3	4	5	6	7
KA3	The organization encourages the employees to join formal or informal networking made up by people from outside the organization.	1	2	3	4	5	6	7
KA4	We often ask our customers what they want or need.	1	2	3	4	5	6	7
KA5	The employees attend fairs and exhibitions regularly.	1	2	3	4	5	6	7
KA6	There is a consolidated and resourceful R & D policy.	1	2	3	4	5	6	7
KA7	New ideas and approaches on work performance are experienced continuously.	1	2	3	4	5	6	7
KA8	The organizational systems and procedures support innovation.	1	2	3	4	5	6	7

No.	Questions	Strongly Disagree				Strongly Agree		
D2	**Knowledge Distribution**							
KD1	All employees are informed about the aims of the company.	1	2	3	4	5	6	7
KD2	Meetings are periodically held to inform all the employees about the latest innovations in the company.	1	2	3	4	5	6	7
KD3	The company has formal mechanisms to guarantee the sharing of the best practices among the different fields of the activity.	1	2	3	4	5	6	7
KD4	Information technology is used to improve the flow of information and to encourage communication between individuals within the company.	1	2	3	4	5	6	7
KD5	There are individuals within the organization who take part in several teams or divisions and act as links between them.	1	2	3	4	5	6	7
KD6	There are individuals responsible for collecting, assembling and distributing internally employees' suggestions.	1	2	3	4	5	6	7
No.	**Questions**	**Strongly Disagree**				**Strongly Agree**		
D3	**Knowledge Application**							
KAP1	Our organization always apply the latest technology in the market/or our organization is always up-to-date in technology application.	1	2	3	4	5	6	7
KAP2	Our employees are well trained in the latest knowledge in their respective position for better job performance.	1	2	3	4	5	6	7
KAP3	Our training process is relevant and effective to improve performance and productivity.	1	2	3	4	5	6	7
KAP4	Our organization has processes for applying experimental knowledge.	1	2	3	4	5	6	7
KAP5	Our organization has processes for applying knowledge to solve new problems.	1	2	3	4	5	6	7

Thank you for your time, opinions and comments.
~ The End ~