IMPROVING PERFORMANCE THROUGH LINKING IT AND TQM IN VIETNAMESE ORGANIZATIONS

Thesis

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To my parents, husband and daughter

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ABSTRACT

Total quality management (TQM) and information technology (IT) have significantly impacted on most organizations. The objective of this study is to develop a conceptual framework for studying the critical dimensions of TQM and the support of IT application to TQM that can improve the organizational performance. The study then makes managerial recommendations for linking IT and TQM in business strategies aiming at enhancing Vietnamese organizations' performance.

The study surveyed 146 Vietnamese organizations in Ho Chi Minh City (HCMC) and the suburban provinces of HCMC. The findings indicate that most dimensions of TQM are significantly correlated to the organizational performance. The critical dimensions of TQM are leadership, customer focus, employee involvement, information management, process management, continuous improvement, and supplier relationship. The findings also present that the support of IT application to the critical dimensions of TQM are significantly correlated to the organizational performance. This implies that pursuing TQM is a good way to improve the organizational performance. In addition, IT can be one of the effective means to improve TQM aiming at getting better performance. Thus, the organizations should use of IT as strategic tool for improving TQM.

Moreover, the findings evaluate the practices of Vietnamese organizations about the seven dimensions of TQM and the support of IT application to their TQM. In general, the evaluation results are at an above average level. This means that Vietnamese organizations need to improve their activities relating quality management and to better integrate TQM and IT application.

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CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

1.1.1 Overview of TQM Applications

TQM is an approach their organizations use to serve their ever-changing customer needs, and generate profits for their stakeholders. A growing number of organizations use quality management as a strategic foundation for achieving a competitive advantage (Reed, *et al.* 2000), improving business performance (Robson, *et al*. 2002; Brah, *et al.* 2002; Samson and Terziovski, 1999), and increasing business growth (Robson, *et al*. 2002).

TQM is a set of guiding principles and practices, as well as a philosophy, that addresses not only the management of quality but also the quality of management. Many studies have established a positive association between the introduction of TQM and improved performance. Effectively implemented TQM firms outperform their non-TQM peers on measures such as profitability, revenues, costs, capital expenditure, total assets and number of employees (Hendricks and Singhal, 1997). However, some studies have indicated that TQM implementation does not result in a significant improvement of performance. In some cases it has made a worse performance. The success and the eventual benefits due to TQM very much depend on the organizational context, such as the organizational culture, the firm's size, the nature of its products, and the industry characteristics (Brah, *et al.* 2002).

Many TQM practice studies have been conducted to understand and assess the effectiveness of the ISO 9000 standard (Rahman, 2001). The findings suggested that many companies use the ISO 9000 certification genuinely as a stepping-stone toward TQM (Gotzamani and Tsiotras, 2002). In reality, the application of a quality management system (QMS) and ISO 9000 by a certification body has become a requirement from customers and consumers as proof of the commitment and capability of an organization.

The success of the ISO 9000 standard is still growing, and the number of countries where ISO 9000 is being implemented has increased. Up to the end of December 2003, at least 500,125 ISO 9000:2000 certificates had been issued in 149 countries and economies. The 2003 total represents an increase of 332,915 ISO 9000:2000 certificates (+200%) over 2002, when the total was 167,210 in 134 countries. The worldwide total of ISO 9000 certificates (old and new versions) shows an apparent increase from 561,747 to 567,985. The 2003 total represents an increase of 455,737 ISO 9000:2000 – more than ten times higher than in 2001, the first year for which the survey recorded ISO 9000:2000 certifications, when the total was 44,388 in 98 countries and economies.

With 96,715 and 64,120 new ISO 9000 certificates respectively, China and Italy showed the highest growth in the year 2003 (Appendix 1.1). Japan with 38,751 new certificates comes in fourth position and the Republic of Korea showed 12,846 new certificates. The Far East is displaying very consistent growth in ISO 9000. Looking at the different regions of the world (Appendix 1.2 and 1.3), Europe has the biggest share of certificates awarded (47.14%), while the Far East has the second biggest share of certificates awarded (33.06%).

There are two main reasons to explain why Europe has the biggest share of ISO 9000 certificates. Firstly, ISO certification started in Europe and was spread to North America, Japan and the rest of the world. In fact, several organizations in Europe are representatives in the International Organization for Standardization developing ISO system. Secondly, in Europe there is a potential policy in which the registration of ISO 9000 in one European country will be recognized throughout the European Union. The growth of ISO certificates and countries of other continents involved ISO quality system in recent years provides evidence for the important role of quality management system in organizations' strategic business.

TQM in the Vietnamese Context

Vietnamese companies are facing big challenges as Vietnam integrates into the regional and world economies, such as stronger international competition and higher customer demands. Thus, enhancing product/service quality and increasing competitiveness in the local, as well as global marketplace, are survival requirements for Vietnamese companies.

In fact, Vietnamese companies will be accepted in free exchange processes if only their products/services meet the market requirements. They need to increase their product/service quality as well as reduce the quality gap between Vietnamese products/services and international products/services. Vietnamese companies need to build systems of quality management. TQM application is one of best approaches to meet them.

The practices of the QMS toward TQM are undertaken by Vietnamese companies include ISO 9000, ISO 14000, 5S, HACCP, GMP (See Glossary), and the Vietnam Quality Awards. The application of ISO 9000 is at the highest rate. The quality management system ISO 9000 first began in Vietnam in 1996 (with two organizations certified). Since then, ISO 9000 has become more extensive (Figure 1.1). As of 7/2004 there were 1895 certificates, in which there were 1275 certificates of ISO 9000:2000, 495 certificates of ISO 9000:1994, 61 certificates of ISO 14000 and 64 certificates related to other quality systems such as GMP, HACCP, OHSAS, SA 8000, SQF 2000^{CM}, QS 9000 (Vietnam Productivity Center, 2004).

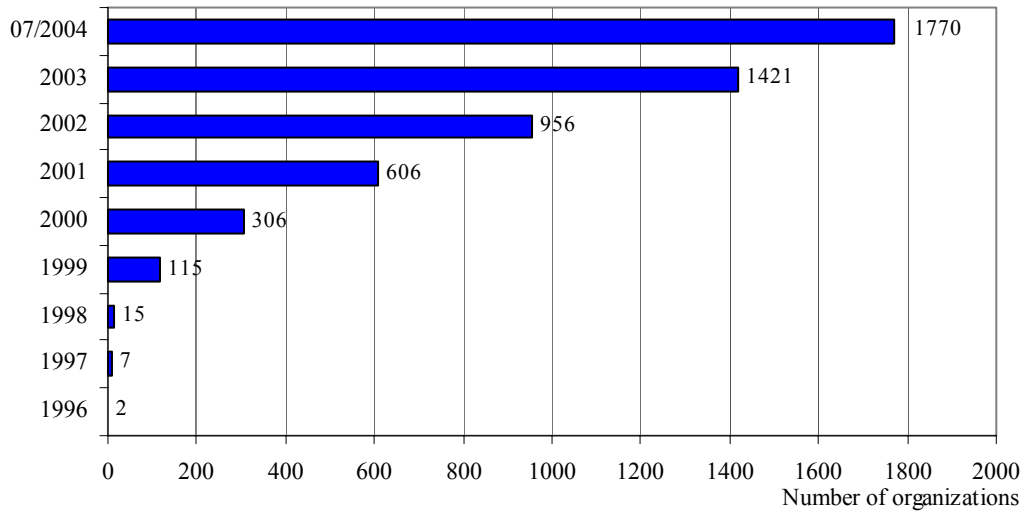


Figure 1.1 Growth of ISO 9000 certificates in Vietnam
(Source: Vietnam Productivity Center, 2004)

However, this level is much lower than other ISO 9000 certified organizations throughout the world and in the Far East. In fact, compared to the top-three Far East countries, such as Chinese, Japan, and Korea, the number of ISO 9000 certificates in Vietnam only accounted for about 3.1%, 6.5%, and 10% of their total respectively at the end of the year 2001.

The growth rate of ISO 9000 certificates shows that Vietnamese companies, especially in southern provinces and Ho Chi Minh City, have started to use QMS toward TQM. The companies in the South have a 54% rate of ISO certification which indicates more commitment to quality (Figure 1.2). This is most dynamically growing region in Vietnam.

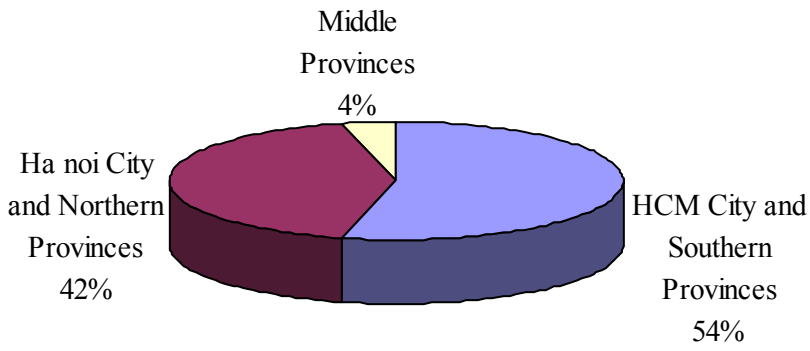


Figure 1.2 Structure of ISO 9000 certificates in Vietnam
(Source: QUACERT, 2001)

ISO 9000 has been implemented in 18 manufacturing fields (i.e. arts and crafts, printing, seafood, petro-chemistry, packing, wood, shoe, rubber, transportation instruments, plastics, consumer goods, glass-ceramic, chemical, pharmacy, textile-garment, mechanical-metallurgy, electric-electronic, and food-agriculture), 6 trading/service fields (i.e. construction, trading, transportation, information, engineering, and other services), and it has recently expanded to other fields such as administration, health, training and education. The fast expansion of ISO 9000 in state-owned firms is a remarkable event. During the period 1996 – 1998, most ISO certified firms were related to foreign investment. State-owned firms accounted for 60% in 2000, growing to 75% in 2001. It is evident that ISO 9000 is considered as an effective management tool for all organizations to improve their product/service quality and business performance.

Manufacturers and service providers seeking continuous improvements in business performance consider TQM as a means for improving quality, reducing cost and increasing productivity. TQM relies on information technology (IT), since IT provides a feedback mechanism to the users, more accurate information, improved communication links, and facilitates the implementation of advanced technology (Dewhurst *et al*., 1999). IT also offers the potential to responding to customer needs, saving costs, and the like (Fok, *et al*.,

2000). Thus, the next section will present a general overview of IT application before focusing on Vietnam in particular.

1.1.2 Overview of Information Technology Applications

At the end of the 20th century and the beginning of the 21st century, we witnessed the growing importance of computerized information systems. The number of computers increased rapidly, as did their applications in business, education, government, the military, medicine, and at home. Computerized systems can be found today in even the smallest businesses. In most cases it is impossible to run a competitive business without a computerized information system.

The growth and worldwide business acceptance of the Internet is unprecedented in the history of technology. Table 1.1 gives an overview of how the Internet is changing business (Hannon, 1998). Thus, Internet technology can provide better opportunities for companies to establish distinctive positioning than did previous generations of IT (Porter, 2001).

Table 1.1 Business uses of the Internet

Who is using the Internet?	*How are they using the Internet?*
Marketing	Creating company image, selling product
Finance	Distributing financial information on intranets
Human Resource	Procedure manuals, benefit changes, company events
President	Communication with all employees
Engineering	Remote meeting, sharing files
Manufacturing	On-line product specifications
Quality	Supplier verification, benchmarking
Information Technology	Client-server networks connects to the Internet
Retail	Remote access to inventory records, sales

According to the Statistics Bureau (2002), the number of Internet users and PCs of countries in Europe and Canada/USA were much higher than of countries in Asia (Appendix 1.4 and 1.5).

As of September 2002, the worldwide population of Internet users was estimated to be in excess of 605 million. The breakdown of Internet users worldwide is shown in Figure 1.3. The growth of Internet users in the Europe (190.91 million), Asia/Pacific (187.24 million), and Canada/USA (182.67 million) is huge. They increased 165.29, 157.37, and 95.85 million respectively over the end of September 1998 (NUA Survey, 2002).

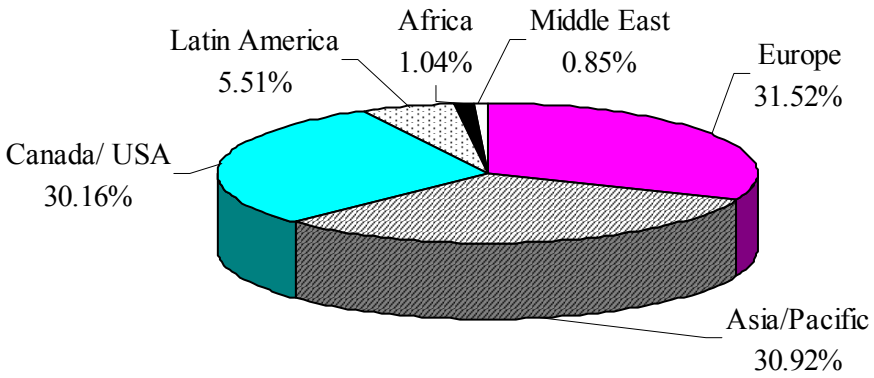


Figure 1.3 Worldwide Internet users (605.60 Million Total) - September 2002
(Source: NUA Surveys, 2002)

IT Application in the Vietnamese Context

Over the past decade, the continuing global boom in IT has dramatically changed the world's social and economic life. Internet based information superhighways have helped the instantaneous transfer of, and access to a huge amount of information from all spheres. However, some important telecommunication indices of Vietnam still have a big gap compared to the world (Table 1.2). Compared to the average indices of Africa, Vietnam has a higher number of telephone and Internet users, but a lower number of mobile phones and computers. It is not easy for Vietnam to match the average indices of the world. However, if the currently fast growth rate of Internet users in Vietnam is maintained, an average number of Internet users equal to other Asia countries will be reached after 1-2 years.

In a recent survey conducted by Asean member countries, Vietnam's IT development was ranked at 7 out of 10 Asean members. It is about 10 years behind Thailand's. The computer usage in Vietnamese business organizations is mostly document compiling and accounting (Table 1.3).

Table 1.2 Average telecommunication indices in year 2003

	Number of telephones/ 100 persons	Number of mobile phones/ 100 persons	Number of internet users/ 10,000 persons	Number of computers/ 100 persons	GDP/person (USD)
The world	**18.76**	**21.91**	**1107.08**	**9.91**	**5.383**
America	34.12	33.80	2592.71	28.95	15.633
Oceania	40.76	54.45	3763.99	42.40	15.174
Europe	41.00	55.40	2373.14	21.44	12.822
Asia	13.64	15.03	647.25	4.45	2.313
Africa	3.01	6.16	147.93	1.38	663
Vietnam	**5.41**	**3.37**	**430.10**	**0.98**	**429**

Source: VACETS (2004)

Table 1.3 Computer usages in business

Purpose	Share in %
Internet access	21%
Email	45%
Project management	48%
Inventory	49%
Accounting	94%
Document compiling	100%

(Source: MPDF)

Industry experts point out that e-commerce is essential to the existence of any enterprises in the 21st century. However, Vietnamese enterprises are just beginning to effect such preparation. After 3 years of net connecting there are about 122,600 subscribers countrywide, 0.15% of the country's population, which is much lower than some Asian countries (Table 1.4). Only a few local enterprises develop their own websites. There are about 600 Vietnamese business websites on the Internet. It appears that Vietnamese companies are still unfamiliar with using the Internet in order to deal with the world even though it is a relatively cheap form of communication. There are some reasons of this situation. The most important one is the high cost for the access and the lack of support policies and management. Another reason is the slow development of Vietnam's Internet

industry and all its related services, which has retarded high growth in the computer service industry.

Table 1.4 Internet usage of Vietnam and Asian countries (by 31-03-2001)

Country	No. of users (million)	Internet users/Population (%)
Japan	40.82	32.24
China	21.40	1.69
India	4.57	0.45
South Korea	15.68	32.96
Singapore	2.34	55.90
Malaysia	2.14	9.78
Thailand	0.94	1.53
Indonesia	0.21	0.09
Philippine	0.53	0.65
Vietnam	0.12	0.15

(Source: VNNIC – Vietnam Internet Network Information Center)

Vietnam's ambitious target of reaching the world's average standard of IT would require major and comprehensive efforts in of all its sectors. One of the most important advantages in Vietnam for the authorities of developing the IT industry is to pay attention to the IT role in development, a policy highlighted by the Instruction of the Government dated 17th October 2000, to boost IT application and development.

1.2 RATIONALE OF THE STUDY

Many articles about TQM have been published over the past decade. According to a review of TQM surveys, by analyzing each of the 347 articles between the period of 1989 – 2000 Sila and Ebrahimpour (2002) identified five major categories of objectives. These objectives were defined as (1) the identification of the critical factors of TQM, (2) issues in the implementation of TQM, (3) the links between TQM factors and performance, (4) human resource management within a TQM context, and (5) relationship between TQM and ISO 9000. Sila and Ebrahimpour (2002) also suggested new ideas for further studies of TQM. One possibility is the link of the Internet with TQM. The use of the Internet is considered as a vehicle to conduct business and communicate with employees, customers

and suppliers, and the positive impact of this technology on the TQM system and activities of companies. Increasingly, the Internet is affecting not only the nature of business transactions but the collection, sharing and communication of data and information as well.

Currently, IT influences all business activities. It is frequently argued that IT is the most important factor in increasing productivity, reducing costs, and improving quality (Sohal *et al*., 2001). To understand the role of information and IT in the TQM environments, specific IT application in various aspects of TQM have been reviewed by Counsell (1997) and Sohal *et al*. (2001). Torkzadeh and Doll (1999) devised and applied a construct to measure the perceived impact of IT on work, which relates to only one of the TQM dimensions.

How IT influences TQM was considered in a model developed by Forza (1995a). This model links TQM practices, information systems and quality performance through empirical research. However, using this model and associated measures, Forza (1995b) did not succeed in empirically establishing a link between TQM practices and IT. Only the use of IT in the quality assurance aspect of TQM was explored. Forze (1995b) proposed that the contribution of IT should be further investigated by developing adequate measures especially with reference to use of IT.

Ang *et al*. (2000) measured the impact of IT on quality management, with the purpose to understand how IT supports quality management. However, these authors only focused on the quality process rather than quality performance. Thus, they suggested further studies to research the role of IT in supporting quality management practices in order to achieve better quality performance.

By employing a multiple case study methodology, Dewhurt *et al*. (2003) established the initial assessment of the influence of IT on TQM. The results of this study showed that the effect of IT on TQM could happen in two ways: (1) the use of IT as an everyday enabler mechanism with TQM, and (2) a negative impact of IT introduction in employees' motivation. However, the conclusions drawn from this study were limited by the relative small sample size.

In the Vietnamese context, both TQM and IT application seem to be in the beginning period. It is not clear in TQM, whether IT application can support its development

effectively and quickly in order that Vietnamese companies can compete regionally and globally. In practice, there is a scarcity of research on practices of TQM, IT application, and the relationships between IT and TQM in Vietnamese companies. Moreover, it is unclear if the findings of previous studies are appropriate to Vietnam. This leads to the following research questions of this study:

(1) What are TQM practices in Vietnamese companies?
(2) What is the status of IT application in Vietnamese companies?
(3) What is the support of IT application to the TQM dimensions?
(4) What are the effects of IT and TQM on organizational performance?
(5) What is the strategy for linking IT and TQM in the business operations of Vietnamese companies?

An empirical study will contribute to a deeper understanding of the roles of TQM dimensions and the potential support of IT application. This would help managers with the allocation of resources to emphasize applications that have the most significant effect on organizational performance.

1.3 THE OBJECTIVES OF THE STUDY

Based on the research questions mentioned above, the objectives of the study are as follows:

(1) To develop a conceptual framework to survey and evaluate:
- The TQM practices in Vietnamese organizations
- The current status of IT application in Vietnamese organizations
- The support of IT application to TQM dimensions in Vietnamese organizations
- The relationships between TQM and organizational performances
- The relationships between the support of IT application to TQM dimensions and organizational performances

(2) To suggest the managerial recommendations for linking IT and TQM in business strategies aiming at enhancing Vietnamese organizations' performance.

1.4 THE SCOPE AND LIMITATIONS OF THE STUDY

Based on the previous literature, the study focuses on the seven dimensions of TQM, namely leadership, customer focus, employee involvement, information management, process management, continuous improvement, and supplier relationship. Those TQM dimensions will be used to evaluate the practices of quality management systems and the support of IT application to TQM.

A notion is that this study considered quality management system (QMS) with certifications such as ISO 9000, GMP, HACCAP and so on, being the first step of TQM implementation. Moreover, it is recognized that TQM terminology is not yet familiar with many Vietnamese organizations. The study hence uses QMS instead of TQM terminology.

The quality management systems refer to two categories: QMS with and QMS without certification. This study focuses on Vietnamese organizations getting the QMS certification, especially ISO 9000 certificates. However, this study also compares organizations without QMS certification to identify the perceptions and results between those with QMS certification and those without.

Based on the high rate of the organizations getting QMS certificate in Ho Chi Minh City (HCMC) and the suburban provinces of HCMC (about 46% of total certificates in Vietnam), the study will only investigate organizations with QMS certification in these areas. The study will send questionnaire to them based on a list published on the Internet. The study will only survey the organizations without QMS certification in HCMC based on a convenience sampling approach.

In this study, samples will include different industrial sectors (e.g. manufacturing, service, trading), enterprise ownership (such as state-owned, private, and foreign capital), and company size (based on number of employees). A limitation of the study, however, is that these different characteristics are only used to describe the general information of the organizations surveyed, but not used as control variables to compare among groups. Only 'QMS certification' will be a control variable to compare between the organizations with QMS certification and those without.

1.5 THE SIGNIFICANCE OF THE STUDY

The study will bring theoretical and practical significance aspects. For theory, the study provides a conceptual framework to evaluate the practices of QMS, the supports of IT application to QMS, and organizational performance. This framework may be a valuable reference for further research and for organizations in general and Vietnamese organizations in particular to manage QMS and IT application.

For practice, the study provides a general picture of the practices of Vietnamese organizations in some of the following areas:

- The effectiveness of the current quality management system
- The effectiveness of the support of IT application to QMS
- The organizational performance achieved in the recent years

Based on these results, the organizations themselves can recognize their strong and weak points in managing QMS, applying IT in QMS, and achieving better performance. They can also benchmark their activities with the average levels of the total sample to know their position in the organizations surveyed. Moreover, based on the relationship between QMS and performance, and between the support of IT application to QMS and performance, the organizations can develop appropriate strategies and policies for themselves.

Academically, the study helps the consultants or training centers in designing relevant training courses about quality management and IT application for Vietnamese organizations.

From the governmental institutions' point of view, this study is a useful reference to provide appropriate support for the organizations getting QMS certification and applying IT in their business.

1.6 THE ORGANIZATION OF THE STUDY

The study is divided into nine chapters. Three chapters are dedicated to the foundation of the study. The following five chapters show the results of the study. The last chapter

contains the summary of findings, the managerial recommendations and some recommendations. The following is a brief review of these chapters.

Chapter 1, 'Introduction', introduces general information of TQM and IT application, especially in the Vietnamese context. It also covers the rationale of the study. This is followed by a description of the objectives of the study, which is the most important section of this chapter. In addition, the scope, limitations, and the significance of the study are described.

Chapter 2, 'Literature Review', presents the state of the art of TQM and IT application. This chapter also reviews previous research which summarizes the relationships between IT and TQM. The review is the foundation for developing a conceptual framework in the next chapter.

Chapter 3, 'Conceptual Framework and Research Methodology', is an important chapter of this study. This chapter describes the conceptual framework that was the basis for designing a questionnaire to conduct an empirical study. Research methodology is also shown in this chapter.

Chapter 4, 'Overview of Surveyed Vietnamese Organizations', presents general information of the organizations surveyed, such as industry type, enterprise ownership, the number of employees, revenue, QMS certifications, and the strengths of the organizations.

Chapter 5, 'The QMS Practices of Vietnamese Organizations', describes the evaluation results of the seven QMS dimensions of Vietnamese organizations. It also covers the comparison of the QMS practices between the organizations with and without certification.

Chapter 6, 'The Relationship between QMS Dimensions and Organizational Performance', shows reliability and validity of the survey instrument. This is followed by the test of the relationships between QMS dimensions and organizational performance. This chapter concludes with a section of major importance to managers: 'discussion and implication' about such relationships.

Chapter 7, 'IT Application and Their Impacts on QMS Dimensions', consists of three main parts. Firstly, it shows IT application in Vietnamese organizations. Secondly, the support of IT application to QMS Dimensions is described. Finally, a comparison of the support of IT application on QMS dimensions between the organizations with and without certification is presented.

Chapter 8, 'The Relationship between the Support of IT Application on QMS and Organizational Performance', firstly shows the reliability and validity of the survey instrument. The second part of this chapter is about the relationships between the support of IT applications on QMS and organizational performance. The remaining section is discussion and implication about the relationships tested.

Chapter 9, 'Conclusions', summarizes the main results and provides the contributions of the study. Moreover, it presents the managerial implications for linking IT application and TQM in business strategies for Vietnamese organizations to improve organizational performances. This chapter shows the limitations of the study and then recommends further studies.

CHAPTER 2
LITERATURE REVIEW

2.1 THE STATE OF THE ART TQM

2.1.1 What Is TQM?

The widespread practice of quality management has preceded the development of total quality management theory. Much of the quality management practitioner literature has its origins in the prescriptive principles of quality gurus including Crosby, Feigenbaum, Ishikawa, Deming, and Juran. Thanks to such quality gurus, quality is not determined by the worker on the shop floor, nor is it determined by the service technician working at the customer's site. Quality is determined by the senior managers of an organization, who by virtue of the positions they hold, are responsible to customers, employees, suppliers, and shareholders for the success of the business. These senior managers allocate resources, decide which markets the firm will enter, select and implement the management processes that will enable the firm to fulfill their mission and, eventually, their vision (Tenner and DeToro, 1992).

True Total Quality Management (TQM) is the key to success for world-class companies in manufacturing and service. To achieve this success, TQM practitioners have created a mix of tools and practices. According to Rao *et al.* (1996), the concepts undergirding these tools are:

- *Customer focus*: the notion that all work is performed for a 'customer' and it is the customer who determines its value. Customer in this context is defined in a broad sense. In some cases, it is a person who pays for the goods and services. It may also be the next person in the chain of operations that culminates with a customer external to the organization.
- *Total participation*: the idea that work has an additional dimension. In traditional organizations, the worker expects to be told what to do and how satisfactory

performance will be measured. Others – managers, supervisors, trainers, and engineers – tell him/her what has to be done and how to do it. The concept of total participation implies that the person closet to the task is most qualified to suggest improved ways of doing the job. So, part of a worker's responsibility is to suggest ways to make improvements aimed at enhancing productivity and value to the customer. Total participation (Tenner and DeToro, 1992) is also described by the involvement from the CEO to the newest employee to ensure customer focus and process improvement. Employees at all levels are empowered to improve their outputs by coming together in new and flexible work structures to solve problems, improve processes, and satisfy customers. Suppliers are also included and, over time, become partners by working with empowered employees.

- *Continuous improvement*: the notion that the performance standard is to reach perfection. Phillip Crosby states this as zero defects. This theme also assumes the existence of a methodology to make incremental improvements and breakthroughs. Once the improvements have been devised, they are made part of the daily work process and a mechanism for monitoring is provided to stabilize the improvement.

The British Quality Association (BQA) offered three alternative definitions of TQM (Wilkinson, *et al*. 1998). The first focuses on the so called "soft" qualitative characteristics, found in the work of US consultants such as customer orientation, culture of excellence, removal of performance barriers, teamwork, training and employee participation. From this perspective, TQM is seen as consistent with open management styles, delegated responsibility and increased autonomy to staff. The second BQA definition emphasizes the production aspects such as systematic measurement and control of work, setting standards of performance and using statistical procedures to assess quality. This is the "hard" production/operations management type of view, which arguably involves less discretion for employees. The third definition is a mixture of "hard" and "soft", comprising three features: an obsession with quality; the need for a scientific approach; and the view that all employees are to be involved in this process.

2.1.2 Phases of TQM implementation

According to Chin *et al*. (2000), the phases of TQM implementation include five levels (Figure 2.1): (1) unaware, (2) uncommitted, (3) initiator, (4) improver, and (5) achiever.

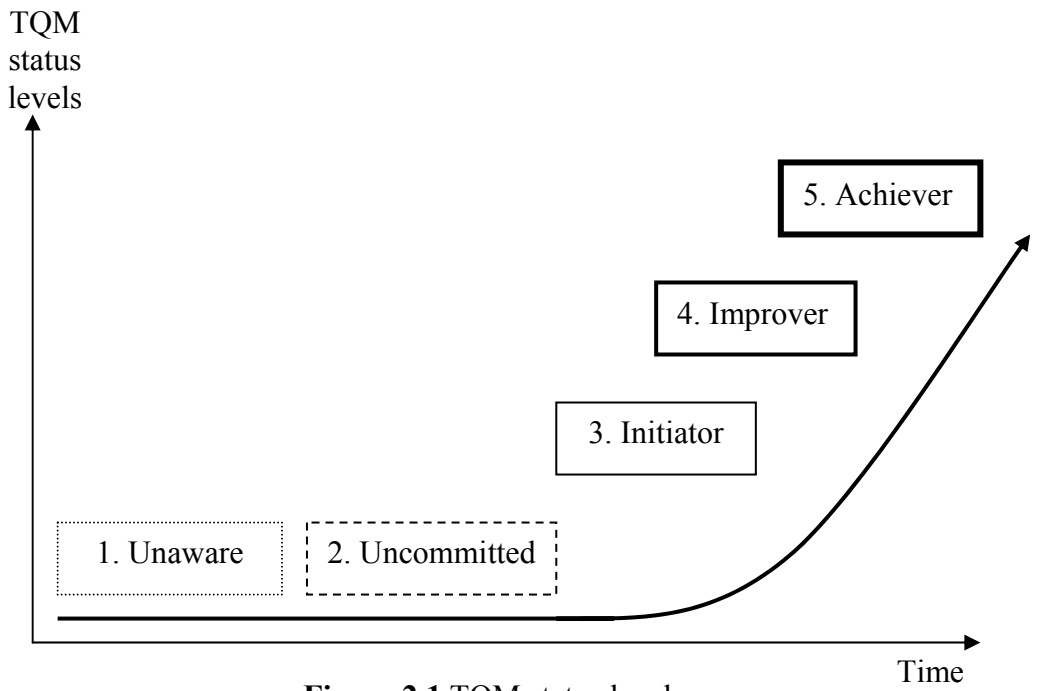


Figure 2.1 TQM status levels

The description of TQM status is as follows:

- ***Level 1: Unaware*** organizations are those not familiar with the concept, practices, tools and technique of continuous improvement. Some may be registered to ISO 9000, but they are unaware of the wider issues and mechanism of continuous improvement and TQM.
- ***Level 2: Uncommitted*** organizations are those with some understanding of TQM and have decided that the principles and practices underpinning the concept are not for them. For instance, they may give an impression that they have adopted TQM, but no real changes have been made.
- ***Level 3: Initiator*** organizations are those who have become aware of continuous improvement within their organizations, but they are still in the earlier stages of putting the basic elements of TQM in place. These organizations still need clear guidance of what to do in order to facilitate the TQM adoption process.
- ***Level 4: Improver*** organizations are those who are moving in the right direction and have made real progress, but they have still a long way to go. The process of improvement is typically not self-sustaining, and the TQM efforts may not be internalized throughout the organization. These organizations are often vulnerable to short-term pressures and unexpected difficulties.

- ***Level 5: Achiever*** organizations have reached a point of TQM maturity. The kind of culture, values, trust, capacities, relationship and employee involvement required to attain the internationally recognized standards or specific quality excellence awards have been developed. Continuous improvement has become total in nature.

In practices, several studies (Escanciano e*t al.,* 2001) indicate that ISO 9000 is a beginning step of TQM. Table 2.1 reviews main findings of the empirical researches that supported ISO 9000 as a first step of TQM implementation.

Table 2.1 Main findings of the studies supported ISO 9000 certification as a first step of TQM implementation

Study (year)	Sample	Main findings
Brown *et al.* (1998)	160 certified Western Australian companies	The majority of respondents see ISO 9000 certification as preceding TQM and as a relevant step in implementing a TQM program
Quazi and Padibjo (1998)	300 certified companies from Singapore	ISO 9000 certification provides a stepping stone toward TQM practices
Lee *et al.* (1999)	383 Certified Hong Kong companies	TQM is the most important quality management concept to many ISO certified companies
Lipovatz *et al.* (1999)	111 certified Greek companies	Greek firms consider ISO 9000 as a basis for achievement of continuous quality improvement
Al-khalifa and Aspinwall (2000)	143 certified and non-certified companies from Qatar	ISO 9000 certification is only the beginning of a continuous improvement process rather than the end, and could be a useful stepping stone for TQM
Sun (2000)	363 certified Norwegian companies	TQM and ISO must be completely and systematically implemented and integrated

2.1.3 ISO 9000 standards – A beginning step of TQM implementation

As a starting point, Technical Committee 176, Quality Assurance of the International Organization for Standardization (ISO), has defined a set of standards for quality management systems, ISO 9000:1994. Its core module, ISO 9001, provides quality

management systems for design, development, production, installation and services. It is a comprehensive model of quality systems. Other modules are ISO 9002 that is the lack of design requirement and ISO 9003 that focuses on the inspection and test function. The ISO 9000 series of standards have been written in general terms and are intended to be relevant to all types of businesses and industries.

ISO 9000 was published in 1987, revised for the first time in 1994 and revised a second time in 2000. Following the 15 December 2003 deadline for transition from 1994 versions of ISO 9001, ISO 9002, and ISO 9003, ISO 9001:2000 became the only ISO 9000 standard for accredited certification by ISO and the International Accreditation Forum (IAF) (ISO, 2004). Major changes in the revised ISO 9000:2000 include the increased focus on top management commitment; customer satisfaction; the emphasis on processes within the organization; and the introduction of continuous improvement concepts (Chan *et al*., 2002).

ISO certification is said to give certain benefits for organizations that can be divided into internal and external benefits (Singels *et al*., 2001). *Internal benefits* are related to the internal functioning of organizations. These benefits are related to the process and structure of the organization. These are, for example, increase in productivity, improvement in efficiency, reduction in costs and waste, better management control, clearly-defined organizational task structure and responsibilities, improved co-ordination structure, support in decision making, and increase in personnel motivation. *External benefits* are benefits concerning the organization in relation to its environment. Examples of external benefits are: competitive advantage, increased sales and market share, the possibility for entering new markets, keeping customer relations, finding new customers, increased customer satisfaction, increased company reliability and reputation, which can result in better possibilities for establishing partnerships, co-makerships and mergers.

Beside the ISO 9000 system, there are several other practices of TQM applied by companies in the world. Examples are ISO 14000 system, HACCP (Hazard Analysis and Critical Control Points), GMP (Good Manufacturing Practices), QS 9000, 5S (Sort – Set in order – Shine – Standardize – Sustain, that translated from Japanese words such as Seiri – Seiton – Seiso – Seiketsu – Shitsuke), SA 8000 (Social Accountability), OHSAS

(Occupational Health & Safety), Malcolm Baldrige Award of United States, European Quality Award, Deming Award of Japan, Vietnam Quality Awards and so on.

2.1.4 Critical dimensions of TQM

Although there are always going to be debates about how to define critical dimensions of TQM, it is necessary to decompose it in some way to an analysis. According to Brah *et al*. (2002), a set of seven factors presents critical dimension of TQM, that is, corporate planning, top management leadership, customer focus, human resource focus, process focus, quality focus, and information and analysis. In the research of Montes *et al*. (2003), the critical dimensions of TQM include five large blocks: managerial leadership and commitment, human resource management, the relationship with customers and suppliers, the internal culture of the organization, and process management.

It is believed that ISO 9000:2000 is closer to TQM concepts because this new version adopts the TQM philosophy with stronger emphasis on customer satisfaction and effective connection of quality management system to organizational processes. The aim is towards improved organizational performance in all aspects (Chan *et al.,* 2002). The revisions of ISO 9000:2000 are based on the following eight principles that reflect best quality management practices (ISO, 2000): (1) customer focus, (2) leadership, (3) involvement of people, (4) process approach, (5) system approach to management, (6) continual improvement, (7) factual approach to decision making, and (8) mutually beneficial supplier relationships. The eight principles (ISO, 2000) are described in Appendix 2.1.

2.1.5 TQM and performance

In practice, in order to identify the motivations for implementing TQM in the organizations, many researchers have examined the relationship between TQM and organizational performances. Table 2.2 reviews the main findings of the studies supported by the relationships between the critical dimensions of TQM and organizational performances.

Table 2.2 Main findings of the studies supported the relationships between TQM and performances

Study (year)	Sample	Main findings
Forza (1995b)	34 plants and 646 respondents	The contribution of both quality management practices and information flows in obtaining high quality performance is very high. Information flows seem to play a primary role in obtaining low defectiveness while quality management practices seem to play a primary role in influencing the competitive position on quality
Samson and Terziovski (1999)	1200 Australian and New Zealand manufacturing organizations	Three of the elements of TQM, leadership, people management, and customer focus have a significantly positive effect to organizational performance, but the other three elements such as strategic quality planning, information and analysis, and process management did not.
Prabhu *et al*. (2000)	290 large-scale UK manufacturing companies (including 75 non-ISO companies, 142 ISO 9000 companies, and 73 beyond ISO 9000 companies)	74 percent of TQM (beyond ISO 9000) companies and 28 percent of ISO companies have achieved potential winner or world-class status. The companies that systematically adopt best practice starting with ISO 9000 and continuing with TQM are achieving significantly higher performance levels.
Singles *et al.* (2000)	192 companies of the North of Holland	ISO certification in itself does not lead to an improvement in the performance of organizations. Most organizations still seem to pursue certification out of external pressures which often results in a hollow achievement. Only when an organization is internally motivated for an improvement of its organizational processes, will certification result in improvement of its performance.

Table 2.2 Main findings of the studies supported the relationships between TQM and performances (cont.)

Study (year)	Sample	Main findings
Sun (2000)	316 private companies in Norway	TQM criteria such as quality leadership, human resource development, and quality information are predominant in terms of contribution to the improvement of customer satisfaction and business performance. ISO standards are partially related to the implementation of TQM and the improvement of business performance. Thus, TQM and ISO 9000 standards must be completely and systematically implemented and integrated.
Terziovski and Samson (2000)	962 Australian and 379 New Zealand manufacturing organizations	A typical manufacturing organization is more likely to achieve high organizational performance with TQM than without TQM, particularly if the company is large, that is, over 100 employees.
Lee *et al*. (2001)	304 companies in the People's Republic of China (including 38 companies with ISO 9000 and 266 companies without ISO 9000)	Quality and productivity improvement factors, such as management knowledge, strategic quality planning, employee involvement, and customer satisfaction, lead to better quality, operating, and financial performance.
Rahman (2001)	49 small and medium enterprises (SMEs)	Except for the factor 'process control', other factors, such as leadership, information and analysis strategy and planning, are no significant differences between the impacts of TQM on organizational performance for firms with and without ISO 9000 certification.

2.1.6 The Difficulties of TQM Implementation

In the decade of the 1990s, TQM received considerable criticism (Harari, 1997). As a consequence, many management theorists in the West have rejected this management style, even though it contributed to the global competitiveness of many Japanese organizations. A possible reason for this rejection is that TQM has been very difficult to implement in European and US organizations. Harari (1997) postulates only 20 percent of companies that implement TQM did so successfully. On the other extreme, Yandrick (1994) was more positive and claimed that about two-thirds are successful. However, in the companies that TQM has been implemented successfully, it has often provided significant benefits.

There are a number of reasons why TQM has presented a significant implementation challenge. A problem that arises from the definition of TQM is that it is very broad and vague. Tamimi and Sebastianelli (1998) found several factors working against TQM implementation in their study. The major barriers cited by samples included not linking management's compensation to achieving quality goals and lack of training in areas such as group discussions, communication techniques, quality improvement skills, problem identification and problem-solving techniques. The other factor is inadequate resources to employ quality management. Likewise, Adebanjo and Kehoe (1998), who studied TQM implementation in UK manufacturing organizations, identified quality problems as list below:

- Upper management does not insist on systematic measuring of customer satisfaction level and training programs.
- Lack of training programs to enhance workers' skills and involvement in quality improvement activities.
- Organizations do not place enough importance on cases of goods returned nor relate such cases to customers.
- Many organizations do not involve suppliers when making improvements to products and in general suppliers have difficulties in meeting the organizations' requirements.
- Insufficient teamwork facilitators and team building techniques.
- Worker evaluation lacks a systematic approach and hence salary adjustments are not commensurate with job functions. Appreciation for contribution by workers is not apparent.

In the USA, Salegna and Fazel (2000) surveyed the obstacles faced by TQM and non-TQM organizations. The results showed three major obstacles facing TQM organizations. These are insufficient time, poor communication and lack of real employee empowerment. For non-TQM organizations, the obstacles include lack of motivation, insufficient time and lack of strategic planning for change.

A survey of Al-Zamany *et al*. (2002) showed that the difficulties of implementing quality management in Yemen are inappropriate managerial traditions, lacking of knowledge on process management and data collection. According to Amar and Zain (2002), the linkages of the barriers to the ISO 9001:2000 are:

- Support quality
  - Lack of leadership commitment
  - High turnover of management level
  - Company work culture is not synergistic with company mission and objectives
  - Difficult to change employee mindset regarding quality
  - Lack of information regarding quality
- Support internal communications
  - Lack of coordination between departments
- Provide quality resources
  - Lack of sufficient funds to mobilize TQM driven activities
- Use competent personnel
  - Insufficient levels of education of workers
  - Low worker morale (absenteeism, industrial action, etc.)
  - Lack of skill of workers
  - High worker turnover
  - Indiscipline (non-conformances with procedures)
- Support competence
  - Insufficient training in quality
  - Management related training is not achieving organizational training targets
- Provide quality infrastructure
  - Poor condition of machines
  - Ineffective maintenance programs
  - Poor coordination of equipment spare part procurement

- Control purchasing process
  - Raw material does not conform to the specification
  - Unscheduled delivery of raw materials
  - Difficult to procure imported raw materials

Table 2.3 reviews the reasons (signal 'X') to explain why TQM implementation can fail. Leadership, human resource, training, information management and resources are main reasons for TQM failure in many organizations.

Table 2.3 Reasons explaining the failure of TQM implementation

Study (year)	Tamimi and Sebastianelli (1998)	Adebanjo and Kehoe (1998)	Salegna and Fazel (2000)	Al-Zamany *et al*. (2002)	Amar and Zain (2002)
Leadership	X	X	X	X	X
Human resource		X	X	X	X
Information management			X		X
Process management					X
Supplier relationship		X			
Resources	X				X
Training	X	X			X
Motivations			X		
Recognitions and awards		X			
Time			X		

2.1.7 The Steps of TQM Implementation

How to implement TQM? Each organization must tailor its approach to exploit their strengths and concentrate on improving their weaknesses. Chin and Pun (2002) have developed a 22-step implementation guideline of TQM adoption shown in Appendix 2.2.

2.2 THE STATE OF THE ART OF IT APPLICATION

2.2.1 Types of IT Application in Business Activities

Today's dynamic business environment is driving a new extended organization, which competes globally focusing on low prices and customer customization of products and services. As a key success factor for effective competing one could identify the management of core business processes, which deliver value to their customers, suppliers and internal staff. Thus, by focusing on automating, optimizing, and continuously improving the core business processes, organizations can make commitments to those customers, employees, partners, and suppliers establishing a solid competitive advantage. Since the 1980's, Information Technology (IT) has provided a wide range of applications supporting automation and management of business processes (Mentzas, 2001).

Information technology, in its narrow definition, refers to the technological side of an information system. It includes the hardware, database, software, networks, and other devices (Turban *et al*., 1999). Seen in this way, IT assumes an important role in the act of communication and creation of information. The IT industry includes computer hardware and software, communications equipment and services (Choi and Whinston, 2000). The growth of IT largely impacts on the rest of the industries, which use information technologies to streamline operations, lower labor and inventory costs, accelerate the product development cycle and to implement responsive marketing and pricing.

IT application have by now entered almost all the companies with department-wide coverage such as design/engineering, production planning and control, production, quality assurance and quality control (QA/QC), finance and accounting, stores, purchasing/vendor development, marketing, distribution, human resource management, and projects (Saxena and Sahay, 2000).

Lee *et al*. (2002) made a list of software tools widely used in everyday activities by the companies, that is, electronic mail (e-mail), word processing, Internet access, presentation graphics, project management, spreadsheet, local area network (LAN), client-server-based databases, electronic data interchange (EDI), web pages, decision support systems, enterprise resource planning (ERP), data warehouses, and statistical tools. Dewhurst *et al*.

(2003) added some other uses of IT, that is, accounting programs, invoicing and stock management, payroll management, database management systems (DBMS), computer numerical control (CNC), computer-aided design (CAD), computer-aided manufacturing (CAM), robots, automatic identification systems (AIS), flexible manufacturing systems (FMS), computer-integrated manufacturing (CIM), programmable logic controller (PLC), materials requirement planning (MRP), data analysis, forecasting, and storage automated systems.

Forza (1995a) defined IT for quality being computerization of seven tools for quality. In particular, the computerized use of flow charts, Pareto charts, run charts, histograms, control charts, scatter diagrams, and online quality control.

The development of electronic commerce provides unprecedented opportunities to integrate various types of communication networks (Figure 2.2*)*, including the three primary types (Shaw *et al*., 2000): (1) the Intranet/ LAN for process, knowledge, and internal communication management, (2) the Extranet for external coordination and information sharing with channel partners such as suppliers, distributors, and dealers, (3) the Internet for setting up electronic storefronts, providing customer service, and collecting market intelligence. These types of communication networks provide the infrastructure for collecting, distributing and sharing information. They serve as new channels for making sales, promoting products, and delivering services. Finally, they integrate the information organization for managing activities on all levels of the company and provide new electronic links for reaching out to the customers and supply-chain partners.

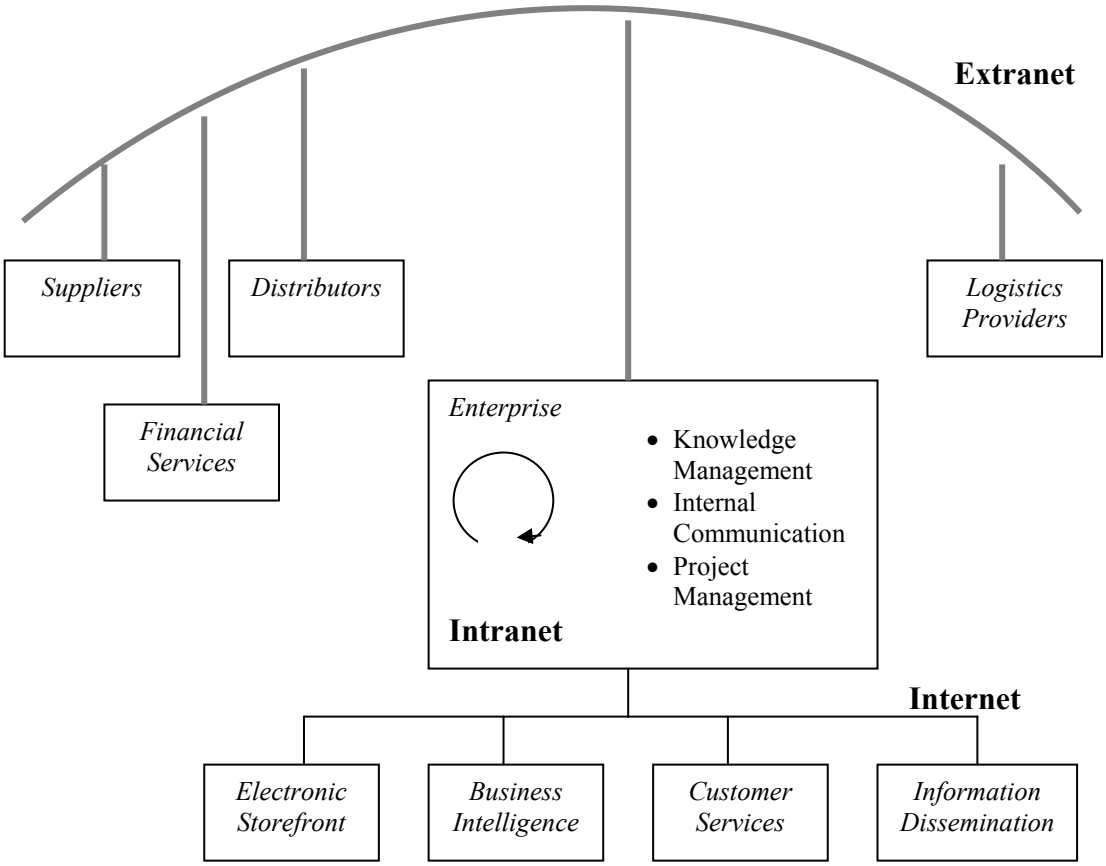


Figure 2.2 The web centric enterprise
(Source: Shaw *et al*., 2000)

2.2.2 Critical Factors of IT Application

Several studies independently developed factors critical to the successful implementation of IT application. Teo and Ang (1999) identified 18 critical factors for aligning IT application to the business of companies:

(1) Top management is commitment to the strategic use of IT
(2) Information system (IS) management is knowledgeable about business
(3) Top management has confidence in the IT department
(4) The IS department provides efficient and reliable services to user departments
(5) There is frequent communication between user and IS departments
(6) The IS staff are able to keep up with advances in IT
(7) Business and IS management work together in partnership in prioritizing application development
(8) Business goals and objectives are made known to IS management

(9) The IS department is responsive to user needs
(10) Top management is knowledgeable about IT
(11) The IS department often comes up with creative ideas on how to use IT strategically
(12) The corporate business plan is made available to IS management
(13) There is a set of organizational goals and objectives for the IS department
(14) User departments view IS staff as competent
(15) The IS management actively participates in business planning
(16) Top management actively participates in IS planning
(17) The planning horizons for business and IS plans are similar
(18) Users actively participate in IS planning

For electronic business, the most important success factors are respect for data confidentiality, the setting up of reliable solutions in IT, and the efforts made with business partners to assure a high level of acceptance. In addition, factors such as integration into business processes, acceptance within own company, meeting the needs of customers, integration into IS, visionary and strategic approaches, time-to-market, and technical know-how also impact on the success of electronic business (Meier *et al*., 2001).

According to Sohal *et al*. (2001), the important factors to the successful implementation of IT are:

(1) Monitoring and planning

- Precise quantification of costs and benefits
- Quality control of specification processes
- Minimum change to specification during development
- Strict project control
- Precision definition of requirements

(2) Support from higher levels

- Use of high level steering committee
- Middle management awareness/support
- Senior management awareness/support

(3) Quality of the production system

- Training of users
- System planning
- System design/analysis
- System development
- System testing
- System implementation
- Equipment performance
- Hardware support
- Software support

2.2.3 IT Application and performances

To survive in the current business environment, many organizations have found it necessary to look for ways to enhance productivity and responsiveness in order to restore their competitiveness and to improve their financial performance. Many have looked to IT as a panacea. IT has been used as a means to increase productivity, improve quality, and reduce costs (Sohal, 2001).

Many organizations have developed IS in their business activities with both technical and social goals (For *et al*., 2001).

The technical goals

- Increasing work efficiency and effectiveness
- Increasing control of resources and operating activities
- Increasing output
- Reducing operating costs
- Reducing manpower
- Increasing skills of workers

The social goals

- Increasing quality of working life
- Improving overall "quality" of work/ service
- Increasing job satisfaction
- Increasing morale
- Making the job easier

The study of Sohal *et al.* (2001) gave evidence on the impacts of IT implementation on the performances of Australian companies. These impacts were described in five aspects, such as, scarcity of stocks, productivity, costs, value of products/services, and quality principles:

(1) Scarcity of stocks

- Improve order cycle time
- Improve stock available
- Control inventory costs

(2) Productivity

- Improve labor productivity
- Improve staff productivity
- Improve management productivity

(3) Costs

- Control other capital costs
- Control staff costs

(4) Value of products/services

- Increase sales/market share
- Increase margin by adding value
- Develop new products/services
- Improve product/service development time scale

(5) Quality principles

- Improve product/service quality
- Increase responsiveness to market needs
- Improve corporate image
- Exploit advantage of new technology

With the development of Internet technology, many organizations have jointed e-commerce. As a result, the organizations have formed new business activities like purchasing/ selling online, enhanced reputations through marketing and advertising on the Internet (Soh, *et. al*., 1997), and built customer and supplier relationship (Meier *et al*., 2001; Timmers, 2000).

2.2.4 The Difficulties of IT Application

Besides largely positive perception of the use of the computer-based technology, there are several difficulties for applying IT in business. Sohal *et al.* (2001) presented a list of 13 potential sources of obstacles:

- Economic factors
- Insufficient top management support
- Difficult to justify cost
- The need to integrate current hardware/ systems
- Unsuitable or immature equipment

- Controversial benefits
- Insufficient middle management support
- Negative staff reaction
- Inter-department conflicts
- Fear of better technology tomorrow
- Difficult to see where to use IT
- Restrictions imposed by parent organization
- Trade union opposition

Companies are increasingly relying on information technology (IT) to remain profitable in markets which are increasingly more competitive. However, developing an information systems (IS) plan is not an easy task. A sound, effective information systems plan is important because it shapes and changes the way a company does its business. Understanding the nature of IS planning problems so that IS planners can handle them effectively enhances the probability of a successful outcome. IS planning is a complex process and its success depends on paying attention to details, especially to problems that could surface. Teo and Ang (2001) argued three aspects of IS planning problems are: launching an IS planning effort, developing an IS plan, and implementing an IS plan.

Problems in launching an IS planning effort

- Failing to get top management support for the planning effort
- Not having free communication and commitment to change throughout the organization
- Being unable to obtain sufficiently qualified personnel to do a good job
- Delegating the planning responsibility to an individual without sufficient experience, influence, or time to do a thorough job
- Not investing sufficient ‘‘front-end’’ time to ensure that all planning tasks and individual responsibilities are well understood
- Not having a steering committee that is highly committed
- Not having a clear-cut corporate plan to guide an information systems planning effort
- Failing to anticipate new developments in information technologies (IT) which might affect a strategic IS plan
- Ignoring the people and political side of planning

- Not being in sufficient control of systems development and computer operations performance to have credibility with users
- Deciding on too long a planning horizon
- Underestimating the need for a clear, concise, formal planning procedure
- Not viewing planning as a learning process for users

Problems in developing a strategic IS plan

- Failing to sufficiently involve top management
- Ignoring business goals
- Failing to translate goals and strategies into action plans
- Failing to sufficiently involve users
- Relying exclusively on user ‘‘wish lists’’ for application ideas
- Neglecting to realistically assess the internal weaknesses of an IS group when determining their capabilities to carry out the recommended strategy
- Not performing a top–down analysis to identify critical functional areas that an IS plan has to support
- Failing to consider and explicitly evaluate alternative IS strategies in order to give top management a meaningful choice
- Failing to review a strategic IS plan with all managers concerned so as to obtain support and cooperation for its implementation
- Requiring too much formality so as to restrain creativity on the part of the planners and users in defining information requirements

Problems in using a strategic IS plan

- Difficult to secure top management commitment to implement an IS plan
- Neglecting to adjust an IS plan to reflect major environmental changes
- Ignoring an IS plan once it has been developed
- Consistently making intuitive decisions which conflict with an approved strategy
- Not using an IS plan as a standard for measuring managerial performance
- An IS plan may not be comprehensive

With Internet for business, experienced and anticipated difficulties are security problems (Sathye, 1999), rising costs of utilizing the Internet (Meier *et al.*, 2001; Sathye, 1999), lack

of human resources and of technical know-how (Meier *et al*., 2001), problems with locating desired information (Soh *et al*., 1997), rapid environmental changes and technological advances (Soh *et al.,* 1997; Meier *et al*., 2001), lack of awareness about e-service and its benefits (Sathye, 1999), and satisfaction with physical transactions or activities (Littlefield *et al*., 2000).

2.2.5 The Implementation of IT Application

In order to implement IT application effectively, an IS plan becomes necessary, but how to do an appropriate IS planning process. Some researchers recommend a comprehensive process, while others have suggested that an incremental and informal process best ensures the achievement of IS planning objectives.

In comprehensive planning, managers attempt to be exhaustive in making and integrating strategic decisions (Lederer and Salmela, 1996). They involve large group of people from different organizational levels in the decision-making process. The organization forms committees of users and IS specialists and carries out a procedure of several steps, the study usually takes several weeks or months (Lederer and Sethi, 1992). As part of this procedure they do extensive analyses (Raghunathan and Raghunathan, 1991; Bergeron, Buteau, and Raymond, 1991). To manage a large planning group and diverse analyses, at least some degree of formality is needed in the planning process. Because of the large visibility of decisions, they use documented criteria in making the decisions. Table 2.2 summarizes practices that are typically used in comprehensive planning (Salmela and Spil, 2002).

In contrast to comprehensive planning, some organizations practice a more incremental approach. For them, planning focuses on a few or perhaps just one theme and IS decisions are made on a one-by-one basis (Earl, 1993). This focused agenda keeps the planning team small and enables planning to be based on informal contacts among team members. It also allows the use of personal experiences and experimentation with new and innovative ideas, sometimes at relatively low levels in the organization (Ciborra, 1994). The incremental approach does not provide similar explicit step-by-step methods for IS planning, as was the case with comprehensive approaches. This process is informal and rests very much on the

ability of key managers to include the right people and conduct the right analyses (see table 2.2).

Table 2.4 Comprehensive and incremental views about an IS planning process

Planning characteristics	Comprehensive practices	Incremental practices
Plan comprehen-siveness	Plans are complicated and highly integrated with overall strategy	Plans are simple and loosely integrated with overall strategy
Approach to analysis	Formal, multiple analyses are used to derive plans	Personal experiences and judgments are used to derive plans
Planning organization	Planning is based on formal representation from many different organizational groups	Planning is based on an informal network of a few key individuals
Basis for decisions	Formal methods and criteria are the basis for decisions	Shared group understanding of a few key individuals is the basis for decisions
Plan control	IS plans are periodically reviewed to adapt to changed circumstances	IS plans are continuously reviewed to adapt to changed circumstances

2.3 THE RELATIONSHIPS BETWEEN IT APPLICATION AND TQM

Much has been written about how IT might be used to enhance TQM. Some remarkable research studies are reviewed below to better understand the relationship between TQM and IT application.

Empirical evidence from Forza (1995b) provided the claim that quality management practices are closely linked to supporting quality information flows. The contribution of information flows in obtaining high quality performances is very high. It is interesting to note the high specificity of linkages between the presence of information technology and quality information flows.

In a survey of 110 public organizations getting the Malaysian Prime Mister's Quality Award, Ang *et al.* (2000) successes in developing QMSIT construct that can be used to evaluate the QM-IT relationships. The nine dimensions of quality management system supported by IT are leadership, strategic planning process, output quality assurance, important innovations, information and analysis, human resource utilization, customer satisfaction, and quality results.

Fok *et al.* (2001) surveyed 221 managers in the Southern United States. Where TQM (including three major variables such as use of TQM programs, perceived influence/involvement on quality issues, and understanding of TQM techniques/ concepts) is adopted more fully, there will be a significant impact on four areas of IS development: system goals; system design philosophy/concepts; assumptions made by IS professionals about system users and user involvement in system development. Both TQM and IT may require similar organizational culture.

Dewhurst *et al.* (2003) investigated 14 Spanish companies, in which 13 companies with ISO 9000 certificate and one without, which obeyed strict governmental norms. Their findings found that IT supported several dimensions of TQM as follows.

Improving customer relationships

Companies can offer their products through the Internet, including explanations of the characteristics of the products, and clients can procure products and services through this means and feedback opinions about the characteristics of the products/services through the e-mail system (Chandler, 1998; Finch and Luebbe, 1997).

Companies can use IT to undertake customer surveys. The results can be saved in electronic databases and be used for targeting specific consumers and products. IT systems also allow sophisticated analyses of consumer needs, expectations and behaviors. All the surveyed companies used the Internet to interchange information with customers. The Internet was used to sell products, to receive customer requirements, to receive customer complaints and to undertake customer surveys. Industrial companies made an intensive use of e-mail to communicate with clients but consumer goods companies did not use the Internet in an extensive way, although they had plans to do it. Companies used statistical

software to analyze data obtained from customer surveys. Companies experienced improvements in their relationships with customers due to the investment and use of IT. The use of electronic data interchange (EDI), Internet, and intranet with customers allowed them to maintain effective communications with respect to product specifications, maps, complaints, surveys and general information. Special attention should be given to the influence of IT on quality information sharing with customers.

Improving supplier relationships

As with customers, IT systems can help to develop improved communication links with suppliers through EDI systems. All the companies considered that IT contributed to improving the management of suppliers and used IT to communicate with their suppliers. Companies used EDI for placing orders and sending product specifications and design details, ten of which also paid invoices and nine of which confirmed invoices electronically. It is considered that IT contributed to the more efficient management of a smaller number of suppliers and that IT helped in the process of supplier evaluation.

Increasing process control

IT was found useful in the task of process flow management. IT can assist maintenance through the use of automated systems to detect the need for machine maintenance and diagnose what needs to be done. This can be carried out at a location remote from the machine (Dilger, 1997).

Automation helps to reduce process variance, because machines usually demonstrate less variability than workers and results in an increased speed of production processes with a significant quality enhancement (Freund *et al.*, 1997). All the companies achieved improved process control through the use of IT.

Both electronic detection and signaling devices also help to reduce process variance. These types of applications lead to the reduction and eventual elimination of a number of inspection type activities (Litsikas, 1997). Classical inspection has been reduced in companies. They have reduced the number of inspectors but have increased both the inspection points and the number of products inspected using automated systems.

The design of processes to ensure that outcomes conform to quality requirements is a key issue along with the control of processes in which transactions are conducted on-line. It could be that a new generation of quality control and improvement tools is required in this type of environment. Patterson *et al.* (1997) provides an example of the need for new quality control and improvement tools to be created as a consequence of the use of computer numerically controlled (CNC) machinery. In relation to this, there is a need to develop appropriate algorithms and software interfaces to evaluate the effects of process interfaces and changes to processes and systems, prior to their implementation.

Facilitating teamwork

Companies considered that IT facilitated teamwork because of better communications and reduced physical presence in meetings (e.g. e-mail).

Facilitating inter-departmental information flow

A positive effect of IT is the sharing of information between department and functions. Most companies perceived that IT improved inter-departmental information flow. However, the implementation of IT does not mean that people will be more disposed to share information. If they believe that this will not be in their best interests then this does not happen.

Improving design process and skill

Computer-aided design (CAD) technologies are a fundamental aid in the design process because of faster response to consumer needs and greater innovation. An effective new product design and development process requires information from different departments (production, marketing and R&D) and IT may aid the effective and speedy transmission of this information. Companies use IT to interchange information on product design issues among different departments.

The study of Dewhaurst, *et al*. (2003) also showed that IT is useful in the design of experiments (Mezgar *et al*., 1997) and quality function deployment (Rangaswamy and Lilien, 1997; Zhang *et al*., 1996). In all these cases, IT does not change the way that these

quality tools and techniques are applied but it helps to facilitate their application and open up new ideas.

Measuring quality costs

Companies recognized that information on quality costs could be gathered and processed with the help of IT.

Improving the decision process in quality department

The role of quality departments does not have to change with the introduction of IT. The work of the quality department can be made easier because IT assists in the collection and analysis of data and the transfer of information to other departments. The quality department in conjunction with senior management will be responsible for providing answers to questions which arise from the implementation of IT in a TQM environment.

Tasks such as data collection, data analysis, SPC and paperwork of ISO should be improved through the use of IT. Most of the quality managers considered that, although more data implied more work and responsibility, decisions were better informed and tasks had been simplified. However some quality managers considered that their work was now more difficult, mainly due to the increase in information and they felt under increased pressure to take decisions about a large quantity of data, which had not previously been necessary.

Their findings showed that IT support to TQM helped in applying preventative maintenance and in introducing ISO 9000. However, they indicated that there are some negative effects from IT implementation to some aspects of workflow management.

It can be said that IT plays a key role in the process of applying TQM in organization and can affect several TQM dimensions. On balance, IT facilitates the application of TQM and in the main acts as an enabler. This indicates the motivations for linking TQM and IT in organizations.

In summary, both TQM and IT are often considered by organizations in the world because it is stated that both TQM and IT positively impact on organizational performance.

However, several researches indicated that the TQM implementation and IT application are costly and difficult to implement and in some cases they do not increase organizational performance.

Due to the benefits of TQM and IT application, several researchers have recently studied the relationship between TQM and IT. This research indicates the relationship between IT and TQM increases business performances. However, some researches have recently developed constructs for studying the relationship between TQM and IT. Some were exploration surveys, and some have been in surveying and data processing. Moreover, most research was done in developed countries. It is argued whether the results of the research studies in developed countries are similar in context to developing countries, such as Vietnam. This question is a big consideration for the author in conducting this study. Thus, the review of the literature in this chapter is the foundation for developing a conceptual framework of chapter 3.

CHAPTER 3

CONCEPTUAL FRAMEWORK AND METHODOLOGY

3.1 CONCEPTUAL FRAMEWORK AND PROPOSITIONS

In order to develop a measurement construct, it is critical to first establish the theoretical framework, providing the validity.

As the objective of this study is to develop a valid instrument to measure TQM practices and the support of IT application to TQM dimensions, the focus therefore is on the quality processes rather than the quality performance. Therefore, two models have been developed: (1) a quality management system (QMS) model to evaluate the practices of QMS of the organizations surveyed, and (2) an IT application support to QMS (ITQMS) model to measure IT application of the organizations in a QMS environment. These models are shown below.

3.1.1 QMS Model

TQM provides a generic concept for continuous improvement in quality and other performances. Several authors agree that TQM is a philosophy that stresses a systematic, integrated, and consistent perspective involving everyone and everything. However, the definitions of TQM elements vary a lot. For examples, ISO 9000 refers to eight principles of quality management, the Malcolm Baldrige National Quality Award (MBNQA) shows seven dimensions, and the Vietnam National Quality Awards also provide seven dimensions for a framework of quality management. In this study seven dimensions of TQM are used to evaluate the TQM practices in the Vietnamese context, namely, leadership, customer focus, employee involvement, process management, information management, continuous improvement, and supplier relationship. In fact, the dimensions of the TQM model of this study have much in common with quality management principles of ISO 9000 (ISO, 2000) because most surveyed Vietnamese organizations have attained ISO 9000 certificates. Seven quality management dimensions (or criteria) and their critical attributes for investigating the TQM practices are shown in Table 3.1. It is

noted that TQM terminology is not really familiar with many Vietnamese organizations, so we use quality management system (QMS) rather than TQM terminology in this study.

Based on the QMS model, the author designed several questions in the questionnaire (Appendix 3.1) for the survey, namely, Q15, Q17, Q19, Q21, Q23, Q25, and Q27.

3.1.2 Support of IT Application to QMS

3.1.2.1 IT Application in Business Activities

The ubiquitous nature of IT and its ever-increasing rate of change have meant that businesses cannot compete on technology alone. Sohal *et al*. (2001) presented the extent to which IT had been adopted in various areas by Australian companies in manufacturing and service industries, such as EDI (Electronic Data Interchange), CAD/CAM/CAE, manufacturing, distribution/wholesale, office automation, LAN/intranet/Internet, order processing management, inventory logistics, accounting/finance, and human resource/ payroll. Lee e*t al*. (2002) define various software tools that can support academics and practitioners, such as, e-mail, Internet, databases, spreadsheets, word processing, web pages, graphics, and so on. Based on such literature and previous empirical research about some IT application for quality improvement in the Vietnamese context (Nguyen, 2004), this study divides the application of computers into three categories of business activities, namely, office automation, manufacturing and communication networks. The various attributes of the three categories of IT application are shown in Table 3.2.

Table 3.1 The seven dimensions of the QMS model and the critical attributes

QM dimensions	Descriptions	Critical attributes
Leadership	Leaders are persons who establish the visions and goals of the organization. Their commitment is one of the critical determinants of successful TQM implementation. Leadership practices that promote quality and high performance through creating and maintaining the involvement of both internal (staff) and external (customers and suppliers) people to achieve the organization's goals.	- Creating clear vision and quality values - Considering the needs of customers, employees, and suppliers - Providing freedom, required resources, and training to employees to act with responsibility and accountability - Encouraging and recognizing employee's contributions
Customer focus	The organization is driven by customer's needs. It is necessary to identify these needs and their level of satisfaction. The establishment and maintenance of customer relationships are very important missions to organization today.	- Researching and understanding customer's needs and feedback on products/ services provided - Linking customer's needs and feedback on products/ services provided to design, production and delivery processes - Communicating customer's needs and feedback on products/ services provided - Systematically managing customer relationships - Measuring customer's satisfaction
Employee involvement	Employee involvement is of crucial importance to TQM as a vital means to achieve customer satisfaction, delight and commitment through continuous quality improvement. Employee involvement shows the participants and contributions of all people in the organization, from top to bottom direction.	- Employees understand the importance of their contribution and role in the organization - Employees identify constraints to their performance - Employees establish work teams or groups for improving quality or solving problems - Employees openly discuss problems and issues - Employees freely share their knowledge and experience - Employees actively seek opportunities to enhance their competence, knowledge and experience

Table 3.1 The seven dimensions of the QMS model and the critical attributes (cont.)

QM dimensions	Descriptions	Critical attributes
Information management	Reliable and appropriate data and information drive quality excellence and improve operational and competitive performance.	- Developing a comprehensive set of performance indicators which reflect internal and external customer requirements and the key factors that drive the business - Ensuring that data and information are sufficiently accurate and reliable - Making data accessible to those who need it - Analyzing data and information to use appropriate and scientific methods - Making decisions and taking actions based on factual analysis, balanced with experience and intuition - Maintaining database - Continuously refining information sources and their uses within the organization
Process management	A desired result is achieved more efficiently when activities and related resources are managed as a process. Process focus deals with how an organization designs and introduces products and services, integrates production and delivery requirements and manages performance of suppliers. This is judged based on the information on supplier quality management, process flow management, product/service design, and benchmarking.	- Establishing clear responsibility and accountability for managing key activities - Controlling the quality and operational performance of key processes used to produce and deliver products and services - Identifying and analyzing significant variations in process and output, determining root causes, making corrections and verifying results - Measuring the capability of key activities - Identifying the interfaces of key activities within and between the functions of the organization - Focusing on the factors such as resources, methods and materials that will improve key activities of the organizations.

Table 3.1 The seven dimensions of the QMS model and the critical attributes (cont.)

QM dimensions	Descriptions	Critical attributes
Continuous improvement	Continuous improvement is a permanent objective of the organization.	- Establishing goals to guide continuous improvement and measure the results of improvement - Training employees with the methods and tools for continuous improvement - Making continuous improvement of products/services, process, and system in the organization - Recognizing and informing about improvements
Supplier relationship	Quality is a more important factor than price in selecting suppliers. Long-term relationship with suppliers has to be established and the company has to collaborate with suppliers to help improve the quality of products/ services	- Identifying and selecting key suppliers - Establishing relationships with long-term considerations - Clear and open communications - Sharing information and future plans - Establishing joint development and improvement activities

Source: Adapted from ISO (2000)

Table 3.2 IT application in business activities

Categories of IT application	*Attributes*	
Office automation	- Word processing - Spreadsheet	- Data management - Graphics
Manufacturing	- CNC - CAD - CAM - CIM	- FMS - AIS - PLC
Communication (networking)	- LAN - Intranet - Extranet - Email - Website - Purchasing online	- Selling online - Accessing internet - Invoicing system - Stock control system - Decision support system

Source: Adapted from Dewhurst et al. (2003)

The perceptions of computer-based technology usage have been studied by many researchers (For, *et al*., 2001; Sohal, 2001). It is an important variable in IT acceptance by individual users and organizations to gauge the effective deployment of IT resources. In this study the computer-based technology usage has been motivated by employees as follows.

- Increasing work efficiency and effectiveness
- Making job easier
- Reducing manpower
- Increasing morale of employees
- Increasing enjoyment in work
- Increasing control of activities

The questions relating to IT application in business activities were designed in the questionnaire from Q8 to Q14 (Appendix 3.1).

3.1.2.2 Support of IT Application on QMS

Recently, research efforts in the TQM area have also included the question of how TQM can be used in conjunction with other organizational improvement efforts. From the

perspective of this study, it appears reasonable to expect that there may be important linkages and synergies when TQM and IT are considered together. It is expected that most managers will also agree that in order to develop quality management systems successfully, organizations need to have the appropriate infrastructure in place. Most importantly, the information system has to be effective. For example, in order to satisfy the organization's customers, information on their needs and preferences must be collected, the use of IT can be crucial.

We believe there are many areas where IT application and TQM may potentially have synergies if used in concert. The seven dimensions provide a foundation for research on QMS practices (Table 3.1). They were used to guide the development of a reliable and valid measurement instrument for assessing the impact of IT application on quality management processes. The seven dimensions of TQM describe the main activities of quality management processes. Thus, the support of IT application to QMS (called the ITQMS model) is also developed based on those seven dimensions. Table 3.3 shows particular items operationalized from the seven dimensions of the ITQMS model.

Table 3.3 The ITQMS model

QMS dimensions	Support of IT application to QMS
Leadership	- Communicating quality value to all employees
	- Facilitating communication between top management and employees
	- Increasing the control of top management to employees and processes
	- Encouraging employee involvement and create their initiative in improving work processes
	- Facilitating communication of top management, customers and suppliers
Customer focus	- Researching/ surveying customer's information and needs
	- Receiving and responding to customer's feedback on products/services quickly
	- Improving communication between the organization and its customers
	- Creating selling online
	- Reducing the time to deliver products/ services to customers

Table 3.3 The ITQMS model (cont.)

QMS dimensions	Support of IT application to QMS
Employee involvement	- Making information available to employees to carry out their responsibilities - Forming work teams or groups for quality improvement - Facilitating teamwork to solve problems - Getting suggestions from employees for quality improvement - Providing feedback to employees on quality performance - Enabling employees to share task-related information - Recognizing employee's contributions to quality improvement
Information management	- Collecting data about customers - Collecting data about suppliers - Collecting data about employees - Collecting data about work/ production processes - Maintaining databases - Maintaining quality information systems which are easily to update and access - Providing relevant information to meet employee's requirements - Analyzing data and producing comprehensive information for different levels of needs - Improving information accuracy - Allowing employees to access information for decision making
Process management	- Controlling the quality and operational performance of key processes automatically or semi-automatically - Identifying and analyzing significant variations in processes and output quickly and easily - Measuring the capability of key activities - Reducing production time
Continuous improvement	- Making continuous improvement of products - Making continuous improvement of processes - Making continuous improvement of systems - Tracking improvement activities - Providing the methods and tools for continuous improvement
Supplier relationships	- Researching and selecting suppliers - Improving communication between the organization and suppliers - Creating online purchasing - Reducing order time - Sharing information and future plans

Source: Adapted from Ang et al. (2000) and ISO (2000)

From the ITQMS model, the study designed seven questions about the support of IT application to QMS, namely, Q16, Q18, Q20, Q22, Q24, Q26, and Q28 (Appendix 3.1).

3.1.3 Organizational Performance

The effective application of the above models leads to an improvement in the performance of an organization. Literature on TQM and IT application suggests various measures of performance, for instance, quality performance (Brah *et al*., 2002; Forza, 1995a), organizational performance (Rahman, 2001; Terziovski and Samson, 2000), stock price performance (Hendricks and Singhal, 2001), business performance (Brah *et al*., 2000, Zhang and McCullough, 2001), financial performance (Agus and Hassan, 2000), and operational performance (Samson and Terziovski, 1999). Each of these measures focuses on a different aspect of the benefits due to TQM and IT application. This study measures the improvement in performance through organizational performance. Organizational performance is a composite measure of the twenty-one indicators (adapted from Escanciano *et al*., 2001) as follows.

- Product/service quality
- Complexity and wordiness of internal process and procedures
- Defectives/ defects
- Wastes
- Operating costs per unit
- Inventory control
- Order time of customers
- Order time to suppliers
- Productivity
- Capacity
- Revenue and profits
- Sales
- Market share
- New market/ new customers
- Competitive advantages
- Long-term relationship with customers
- Customer satisfaction
- Customer’s complaints
- Employee’s income
- Employee's job satisfaction
- Involvement of employees in organization

The indicators of the organizational performance are shown in question Q29 of the questionnaire (Appendix 3.1).

3.1.4 Propositions

In order to examine the relationship between TQM and organizational performance, and between the support of IT application to TQM dimensions and organizational performance, two propositions are developed below.

Although TQM has been widely regarded as a tool for improving quality and performance such as profit and market share, the success rate is not high (Harari, 1997). To understand the success of TQM, many studies have been conducted to investigate the impact of TQM on performance. However, most researches have used data collected from developed countries. It is not clear whether it applies to less developed or developing countries as well, particularly Vietnam. The purpose of this study is to understand how the organizational performance of Vietnamese organizations is related to the dimensions of QMS. Thus, proposition 1 is presented as follows:

Proposition 1 (P1): Organizational performance is correlated to the dimensions of QMS.

Apart from QMS, IT is another approach for improving performance. In practice, much research was conducted to study the relationship between IT and performance (Sohal, 2001; For, *et al*., 2001; Timmers, 2000). However, little attention has been paid to the link of TQM with IT to improve performance. In other words, the study emphasizes the relationship between the support of IT application to QMS and performance. Thus, the study suggests proposition 2 as follows:

Proposition 2 (P2): Organizational performance is correlated to the support of IT application to QMS.

3.1.5 The Characteristics of the Surveyed Organizations

Apart from the five main aspects of the conceptual framework, general information of the organizations is also studied. In this study, the general information of the organizations are described by seven factors such as industry, enterprise ownership, amount of employees, main kinds of products and services, revenues, quality management systems, and competitive advantage. Such information is the foundation to describe the overview of the

organizations surveyed and it is shown from question 1 (Q1) to question 7 (Q7) in the questionnaire (Appendix 3.1). Moreover, with the purpose of more clearly understanding the roles of QMS only one factor 'quality management system' is used to compare between organizations with and without QMS certifications about QMS practices, IT applications and performances.

Figure 3.1 summarizes a conceptual framework based on the above discussions. This framework refers to six major aspects: (1) characteristics of organizations, (2) QMS practices, (3) organizational performance, (4) testing the relationship between QMS and organizational performance, (5) support of IT application to QMS, and (6) testing the relationship between the support of IT application to QMS and organizational performance. This framework will structure the following chapters. Chapter 4 will overview the characteristics of the organizations, chapter 5 will present QMS practices and organizational performance, chapter 6 will test the relationship between QMS and organizational performance, chapter 7 will present the support of IT application to QMS, and chapter 8 will examine the relationship between the support of IT application to QMS and organizational performance.

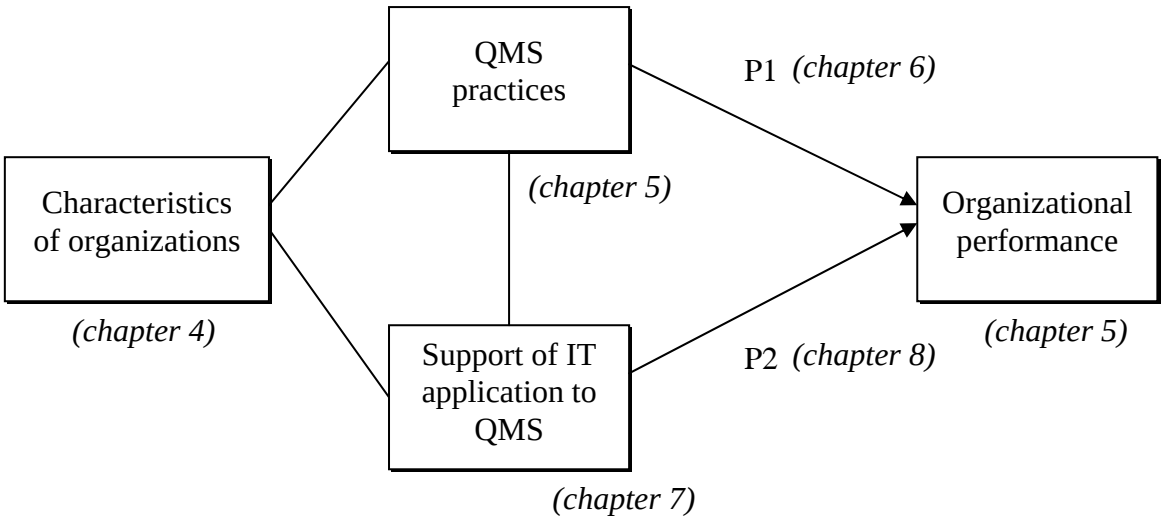


Figure 3.1 A conceptual framework of the study

3.2 RESEARCH METHODOLOGY

Based on the contents of the conceptual framework, a questionnaire was developed to investigate information of organizations about QMS practices, IT application and

organizational performance achieved. Given the investigative nature of the research objectives, an empirical survey research seems appropriate. Survey research is aimed at understanding the relevance of a certain phenomenon and describing the distribution of the phenomenon in a population (description) and looking for causes and reasons (explanation).

3.2.1 Sample

Population frame

In order to achieve the objectives of the study, within the wider analysis mentioned in the conceptual framework in section 3.1, the population for this study is those Vietnamese organizations carrying out their activities in Ho Chi Minh City and the surrounding provinces like Dong Nai, Binh Duong provinces. Those organizations have received certificates of quality management systems (QMS) like ISO 9000, ISO 14000, HACCP, GMP, Vietnam National Awards, and so forth. The reason why this study selected certified organizations is because we want to study organizations with some kind of quality system. In this respect, organizations with ISO 9000 series registration as well other QMS registrated firms would be a first level of TQM (Dale and Lascelles, 1999; Van der Wiele *et al*., 2000). This is an objective criterion guaranteeing that these organizations do possess a quality system. Also, the ISO 9000 quality management system is the excellence model, which is improving the understanding of concepts and practices associated with TQM (Van der Wiele *et al*., 2000).

As per February 2003 (Vietnam Productivity Center, 2003), there were about 400 Vietnamese organizations in Ho Chi Minh City and the surrounding provinces which have obtained certificates of QMS, mostly ISO 9000 certificates (over 90%). Thus, the population of this study is 400. The organizations with QMS certification are labeled as *"group 1"*.

Besides the above, some organizations who have not yet received certification are investigated, which is aimed at comparing their organizational performance to certified organizations to prove the benefits of QMS. These organizations are carrying out their activities in Ho Chi Minh City. They are labeled as *"group 2"* or "*comparative group*".

Sample size

The question of sample size can be addressed in two ways. One is to make assumptions about the population and use statistical equations about random sampling process (Neuman, 2000). The assumptions of this survey are below:

- Confidence level of 95%, that is 1 - α = 95%, so Z = 1.96 (followed by normal distribution)
- With five-point Likert scale, so the mean value of scale is E = 3
- Error is e = 5% x E = 5% x 3 = 0.15
- Standard deviation is S = (Max – Min)/6 = (5 – 1)/6 = 0.67

Thus, the sample size of this survey (n) is:

$$n = \frac{(Z \times S)^2}{e^2} = \frac{(1.96 \times 0.67)^2}{0.15^2} = 77$$

A second and more frequently used method is the rule of thumb – a conventional or accepted amount. Researchers use it because they rarely have the information required by the statistical method and because it gives sample sizes close to those of the statistical method. Rules of thumb are not arbitrary but are based on past experiences with samples which have met the requirements of that statistical method (Neuman, 2000). One rough rule of thumb commonly cited is that about 30 observations are needed to obtain moderately reliable statistics (Holbert and Speech, 1993). But the rule of thumb may have to be adjusted upwards if the population has a high variance. One principle of sample size is, the smaller the population, the bigger the sampling ratio has to be for an accurate sample. Larger populations permit smaller sampling ratios for equally good samples (Neuman, 2000). For small populations (under 1,000), a researcher needs a large sampling ratio (about 20 – 30%). For larger populations (over 150,000), a smaller sampling ratio (1%) is possible. Any situation calling for lots of data from each respondent usually means that fewer people can be surveyed. The other case would be where the researchers want only a little bit of information from each respondent, but need lots of respondents (Holbert and Speech, 1993).

With a small population of organizations with QMS certificates (about 400) and the situation calling for lots of data from each respondent, the sample size of this survey is determined by the rule of thumb. The sampling ratio is about 20% of the population, so the sample size is about 80.

With the "*comparative group*", the sample size is also based on the rule of thumb, so about 40 organizations were surveyed to obtain moderately reliable statistics.

Unit of analysis

While some researchers agree that the use of a single respondent in an organization may be unreliable (Bowman and Ambrosini, 1997), other authors suggest that this issue may not be a problem in certain contexts. However, it should be noted that their potential is a negative effect of multiple respondents on usable response rates (Malhotra, 1993), the difficulties of survey administration, and that there may be problems arising from poor inter-rater reliability. Consequently, it has been decided to adopt a single-respondent approach in this study. In order to limit potential measurement errors, responses are required from key informants knowledgeable in a variety of activities about quality and IT management in organizations. Each respondent is described as a sampling unit.

3.2.2 Data collection method

Clearly, a crucial aspect of the survey methodology was the development of a questionnaire shown in the Appendix 3. The perceptual questions were measured on a five-point Likert scale. Respondents are asked to evaluate the practice their firms usually adopted and tick one appropriate rating scale. Respondents give a number from 1 (very weak/ very little) to 5 (very good/ very much). The higher the rating scales the higher the result of the statement, and vice versa. Besides, other closed and open questions were designed to describe in detail the organizations surveyed.

The questionnaire was developed with the advice from several experts (e.g. senior academic persons in quality and IT management fields, and quality and computer managers in companies) to ensure that the questions were appropriate.

The final version of the questionnaire was then pilot-tested with three organizations: two with and one without QMS certification. The questionnaire was completed at the end of July 2003 and implemented to the major data collection phase from August to November 2003.

The author paid great attention to the contact approach in order to improve the response rate and accuracy. Target respondents were quality managers or senior quality staff from QMS implementing organizations. The senior staff of management information systems (MIS) was also asked to support quality managers or senior quality staff to complete the questionnaire. Moreover, an open letter attached in the questionnaire was aimed to make respondents understand the purpose of this study as well as how to complete the questionnaire.

Based on a list of organizations with QMS certification on the Internet (Vietnam Productive Center, 2003), about 400 questionnaires were sent to these organizations by four approaches: (1) face-to-face interviewing, (2) mailed surveys, (3) e-mail survey, and (4) direct contact with students, friends, and relatives who are working for these organizations and asking them to send to target respondents in their organizations. As a result, 91 usable responses were obtained - an effective response rate of 22.75%. The author recognized that the fourth approach (i.e. convenient sampling approach) had the highest response rate, about 70 questionnaires were collected from this approach.

For the *comparative group* (organizations without QMS certification), the convenient sampling approach (through connected persons) was used and 120 questionnaires were sent to these organizations. A total of 57 questionnaires were received, of which 55 usable responses were obtained.

3.2.3 Data analysis techniques

SPSS software 10.5 was used for data analysis in this study by using statistical techniques such as t-test for the difference between population means based on independent samples, factor analysis, and multiple regression analysis. The following will introduce the main concepts and the parameters of those techniques.

T-test for the difference between population means based on independent samples

When t-test is statistical significant, it is concluded that the data contain evidence for the difference between population means. This test is applied in chapter 5 and 7 of this study to compare the difference between the organizations with and without QMS certification about the practices of QMS, the organizational performance, and the support of IT application to QMS

Factor analysis

Factor analysis is a generic name given to a class of multivariate statistical methods whose primary purpose is to define the underlying structure in a data matrix. Broadly speaking, it addresses the problem of analyzing the structure of the inter-relationships (correlations) among a large number of variables by defining a set of common underlying dimensions, known as *factors*. With factor analysis, the analyst can first identify the separate dimensions of the structure and then determine the extent to which each variable is explained by each dimension. Once these dimensions and the explanation of each variable are determined, the two primary uses for factor analysis – summarization and data reduction – can be achieved. In summarizing the data, factor analysis derives underlying dimensions that, when interpreted and understood, describe the data in a much smaller number of items than the original individual variables. Data reduction can be achieved by calculating scores for each underlying dimension and substituting them for the original variables (Hair *et al.*, 1995).

Some key terms in factor analysis (Hair *et al.*, 1995) are as follows.

- *Bartlett test of sphericity:* A statistical test for the presence of correlations among the variables. It provides the statistical probability that the correlation matrix has significant correlations among at least some of the variables.
- *Common factor analysis*: Factor model in which the factors are based on a reduced correlation matrix. That is, communalities are inserted in the diagonal of the correlation matrix, and the extracted factors are based only on the common variance, with specific and error variance excluded.
- *Community:* Amount of variance an original variable shares with all other variables included in the analysis.

- *Component analysis*: Factor model in which the factors are based on the total variance. With component analysis, unities (1s) are used in the diagonal of the correlation matrix; this procedure computationally implies that all the variance is common or shared.
- *Correlation matrix:* Table showing the intercorrelations amongst all the variables.
- *Eigenvalue:* Column sum of squared loadings for a factor; also referred to as the latent root. It presents the amount of variance accounted for by a factor.
- *Factor:* Linear combination (variate) of the original variables. Factors also represent the underlying dimensions (constructs) that summarize or account for the original set of observed variables.
- *Factor loadings:* Correlation between the original variable and the factors, and the key to understanding the nature of a particular factor. Squared factor loadings indicate what percentage of the variance in an original variable in explained by a factor.
- *Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy:* A measure to quantify the degree of intercorrelations among the variables and the appropriateness of factor analysis. The index ranges from zero to one, reaching one when each variable is perfectly predicted without error by the other variables. The measure can be interpreted with the following guidelines: .90 or above, marvelous; .80 or above, meritorious; .70 or above, middling; .60 or above, mediocre; .50 or above, miserable; and below .50, unacceptable. The KMO value increases as (1) the sample size increases, (2) the average correlations increase, (3) the number of variables increase, or (4) the number of factors decrease. The KMO and the same guidelines can be extended to individual variables as well. The factor analyst should first examine the KMO values for each variable and exclude those falling in the unacceptable range. Once the individual variables achieve an acceptable level, then the overall KMO can be evaluated and a decision made on the continuance of the factor analysis.
- *Percentage of variance criterion:* The percentage of variance criterion is an approach in which the cumulative percentages of the variance extracted by successive factors are the criterion. The purpose is to ensure practical significance for the derived factors. In the social sciences, where information is often less precise, it is not uncommon for the analyst to consider a solution that accounts for

60 percent of the total variance (and in some instances even less) as a satisfactory solution.

- *Varimax rotation:* An important tool in interpreting factors is the rotation of factor. Specifically, the reference axes of the factors are turned about the origin until some other position has been reach. The simplest case of rotation is an orthogonal rotation in which the axes are maintained at 90 degrees. Varimax is one of the most popular orthogonal factor rotation methods. With the Varimax rotational approach, the maximum possible simplification is reached if there are only 1s and 0s in a single column. That is, the Varimax method maximizes the sum of variances of required loadings of the factor matrix. There tend to be some high loadings (i.e., close to –1 or +1) and some loadings near 0 in each column of the matrix. The logic is that interpretation is easiest when the variable-factor correlations are close to either (a) +1 or –1, thus indicating a clear positive or negative association between the variable and the factor, or (b) close to 0, indicating a clear lack of association.

Multiple regression analysis

Multiple regression analysis is a statistical technique that can be used to analyze the relationship between a single dependent (criterion) variable and several independent (predictor) variables. The objective of a multiple regression analysis is to use the independent variables whose values are known to predict the single dependent value selected by the researcher. Each predatory variable is weighted, the weights denote their relative contribution to the overall prediction. In calculating the weights, the regression analysis procedure ensures maximal prediction from the set of independent variables in the variate. These weights also facilitate interpretation as to the influence of each variable in making the prediction, although correlation among the independent variables complicates the interpretative process. The set of weighted independent variables is also known as the regression variate, a linear combination of the independent variables that best predicts the dependent variable. The regression equation, also referred to as the regression variate, is the most widely known example of a variate among all the multivariate techniques (Hair *et al.*, 1995).

Some key terms in multiple regression analysis (Hair *et al.*, 1995) are as follows.

- *Beta coefficient (B_n):* Standardized regression coefficient that allows for a direct comparison between coefficients as to their relative explanatory power of the dependent variable. While regression coefficients are expressed in term of the units of the associated variable, thereby making comparison inappropriate, beta coefficient use standardized data and can be directly compared.
- *Coefficient of determination (R^2):* Measure of the proportion of the variance of the dependent variable about its mean that is explained by the independent, or predictor, variables. The coefficient can vary between 0 and 1. If the regression model is properly applied and estimated, the analyst can assume that the higher the value of R^2, the greater the explanatory power of the regression equation, and therefore the better the prediction of the criterion variables.
- *Collinearity:* Expression of the relationship between two (collinearity) or more independent variables (multicollinearity). Two predictor variables are said to exhibit complete collinearity if their correlation coefficient is 1 and a complete lack of collinearity if their correlation coefficient is 0. Multicollinearity occurs when any single predictor variable is highly correlated with a set of other predictor variables.
- *Correlation coefficient (r):* Indicates the strength of the association between the dependent and the independent variables. The sign (+ or -) indicates the direction of the relationship. The value can range from –1 to +1, with +1 indicating a perfect positive relationship, 0 indicating no relationship, and –1 indicating a perfect negative or reverse relationship (as one grows larger, the other grows smaller).
- *Dependent variable (Y):* Variable being predicted or explained by the set of independent variables.
- *Independent variable:* Variable(s) selected as predictors and potential explanatory variables of the dependent variable.
- *Intercept (b_0):* Value on the Y axis (criterion variable axis) where the line defined by the regression equation $Y = b_0 + b_1X_1$ crosses the axis. It is described by the constant term b_0 in the regression equation. In addition to its role in prediction, the intercept may or may not have a managerial interpretation. If the complete absence of the predictor variable has meaning, then the intercept represents that amount.
- *Regression coefficient (b_n):* Numerical value of any parameter estimate directly associated with the independent variables. In the multiple predictor model (e.g., $Y = b_0 + b_1X_1 + b_2X_2$), the regression coefficients are partial because each takes into

account not only the relationships between Y and X_1 and between Y and X_2, but also between X_1 and X_2.

- *Stepwise estimation:* Method of selecting variables for inclusion in the regression model that starts with selecting the best predictor of the dependent variable. Additional independent variables are selected in terms of the incremental explanatory power they can add to the regression model. Independent variables are added as long as their partial correlation coefficients are statistically significant. Independent variables may also be dropped if their predictive power drops to a non-significant level.
- *Tolerance:* Commonly used measure of collinearity and multicollinearity, the tolerance of variable *i* (TOL_i) is $1-R^{2*}_i$, where R^{2*}_i is the coefficient of determination for the prediction of variable *i* by the other predictor variables. As the tolerance value grows smaller, the variable is more highly predicted (collinear) with the other predictor variables.

Factor analysis and multiple regression analysis techniques are used in chapter 6 and 8 of this study, for the purposes of data reduction and testing the relationship between the organizational performance and QMS, and between the organizational performance and the support of IT application to QMS.

CHAPTER 4

OVERVIEW OF SURVEYED VIETNAMESE ORGANIZATIONS

4.1 INTRODUCTION

During the past years, the Vietnamese economy has progressed dramatically. Several products of Vietnamese organizations have conquered the domestic markets and expanded to foreign markets. However, the competitiveness of Vietnamese goods is still weak in general because of poor quality, unstable quality, and high prices. On the other hand, the trend to globalization of the world economy is happening swiftly and tariff barriers and engineering barriers reduce and repeal. In the face of such a situation, what will Vietnamese organizations do to compete and be integrated into domestic and foreign markets?

Currently, many Vietnamese organizations are recognizing opportunities and threats of globalization and developing strategies to create their competitiveness through improving the quality of products and services and reducing costs. There are several ways to achieve this, such as the investment in new technologies, the improvement of technology, the recruitment of qualified personnel, the training of professional skills, the implementation of advanced management systems, or the applications of advanced standards. In fact, the organizations need to assess the implementation issues they face to select the most appropriate methods. As a starting point, Vietnamese organizations have applied the standards related quality management systems with certification, such as ISO 9000, HACCP, GMP and so on.

In this study, a total of 146 properly filled questionnaires (with a response rate of 28%) were received, in which 91 organizations with QMS certification (62% of the total sample) and 55 organizations without QMS certification (38% of the total sample). The list of the surveyed organizations is shown in Appendix 4.

The next part shows an overview of the surveyed Vietnamese organizations concerning several aspects such as industry type, enterprise ownership, number of employees, revenue, quality management system, and the strengths of the organization.

4.2 GENERAL INFORMATION OF THE ORGANIZATIONS SURVEYED

4.2.1 Industry Type

The industries in Vietnam can be classified into three different types: (1) manufacturing, (2) service, and (3) trading. Figure 4.1 provides the industry types of the surveyed organizations. *Manufacturing industry* has the largest portion, occupying 47% of the total sample. In which, 62% of the organizations with QMS certifications were of this industry type while there were about 22% of organizations without QMS certification. The organizations in this industry consist of different fields such as steel, plastic, shoes, textile, mechanical, packing, beverage, food, washing-powder, paper, construction materials, chemicals, and pharmaceuticals.

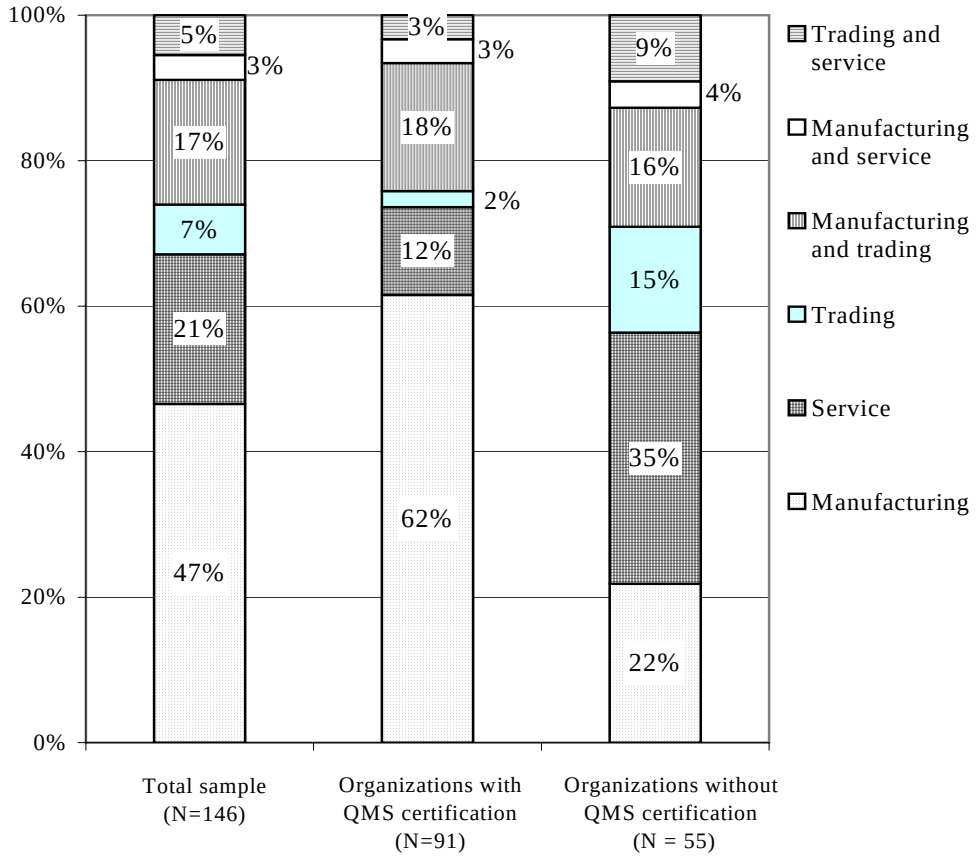


Figure 4.1 Industry types of the surveyed organizations

The organizations carrying out only *service* activities like insurance, transportation, bank, and IT service occupied about 21% of the total sample. In which, the rate of the organizations without QMS certification (35%) in the service industry was higher than ones with QMS certification (12%). The organizations carrying out only *trading* activities like wholesale and retail occupied a rather low rate (7% of total sample). In this trading industry, the rate of the organizations without QMS certification (15%) was much higher than ones with QMS certification (2%).

Moreover, today many organizations are carrying out their activities in various industries, for instance both *manufacturing and trading* (17% of the total sample), or *manufacturing and service* (3% of the total sample), and *trading and service* (5% of the total sample).

Compared to manufacturing organizations, trading/ service organizations have less QMS certification in Vietnam. In practice, trading/ service organizations, which have obtained QMS certification, accounted for only 24% of the total QMS certified Vietnamese organizations (Doan, 2003). Hence, only 28% pure trading/ service organizations were approached in this study, while manufacturing organizations were 62%. The reason that explains why service organizations are using less QMS certificates compared with manufacturing is due to the historical characteristics of the Vietnamese economy. Before the year 1986 the Vietnamese economy focused on the development of heavy and agricultural industries, therefore the number of organizations in manufacturing is higher. When the 'Innovation Policy' of the Vietnamese government was published in 1986 and began to apply in the beginning of the 1990s, all economic elements have been encouraged to develop. At that time, the service sector of Vietnam began to develop. Due to the late beginning, less service organizations have concerned themselves in getting QMS certifications. In fact, in the first four years fourteen of the fifteen ISO 9000 certified organizations were in the manufacturing sector, only one organization was in the service/ trading sector.

4.2.2 Enterprise Ownership

In terms of ownership, about 42% of respondents were private organizations (Figure 4.2), followed by state-owned organizations (32%) and foreign capital organizations (26%). During the period 1996 – 1998, most QMS certified organizations were represented

foreign capital organizations, but then domestic capital organizations (including state-owned and private ones) increased rapidly. 37% of state-owned and 31% of private organizations were surveyed to reflect the fast expansion of domestic capital organizations getting QMS certification. For the organizations without QMS certification, 62% of respondents were private organizations, followed by state-owned (22%) and foreign capital organizations (16%).

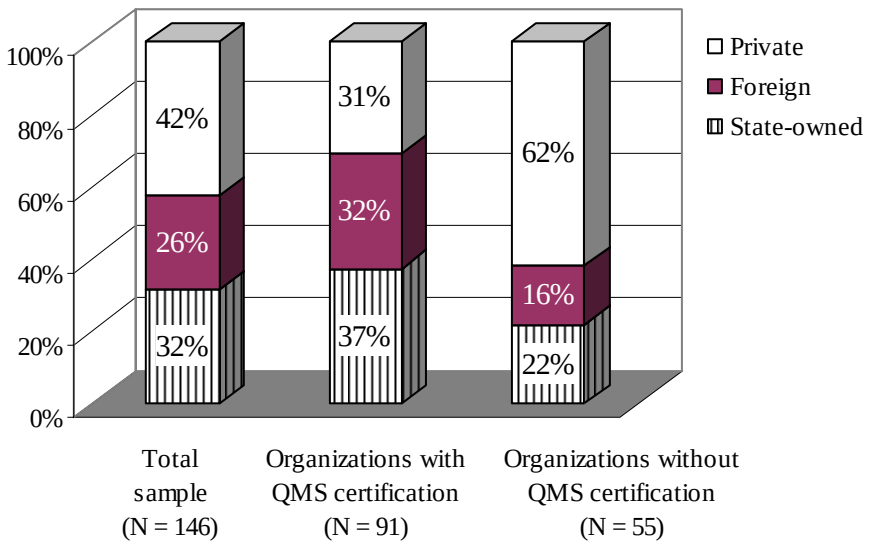


Figure 4.2 Enterprise ownership of the surveyed organizations

4.2.3 Number of Employees

Figure 4.3 shows the number of employees in the total organizations surveyed. A large proportion of the organizations (36%) were categorized as medium sized, which is employing between 101 – 500 employees. 27% of the organizations were small companies with less than 101 employees, while the large organizations (between 501 - 5000 employees) represent 30% and very large organizations are only 7% of total respondents. In general, the average number of employees in an organization is about 1273 persons, with the smallest one having only 14 employees and the largest one having more than 30,000 employees.

There was no considerable difference of the percentage between the medium sized organizations with and without QMS certification. However, the percentage of the large sized organizations with QMS certification was higher than of the ones without QMS

certifications, and the percentage of the small sized organizations without QMS certification was higher than the ones with QMS certifications in this survey.

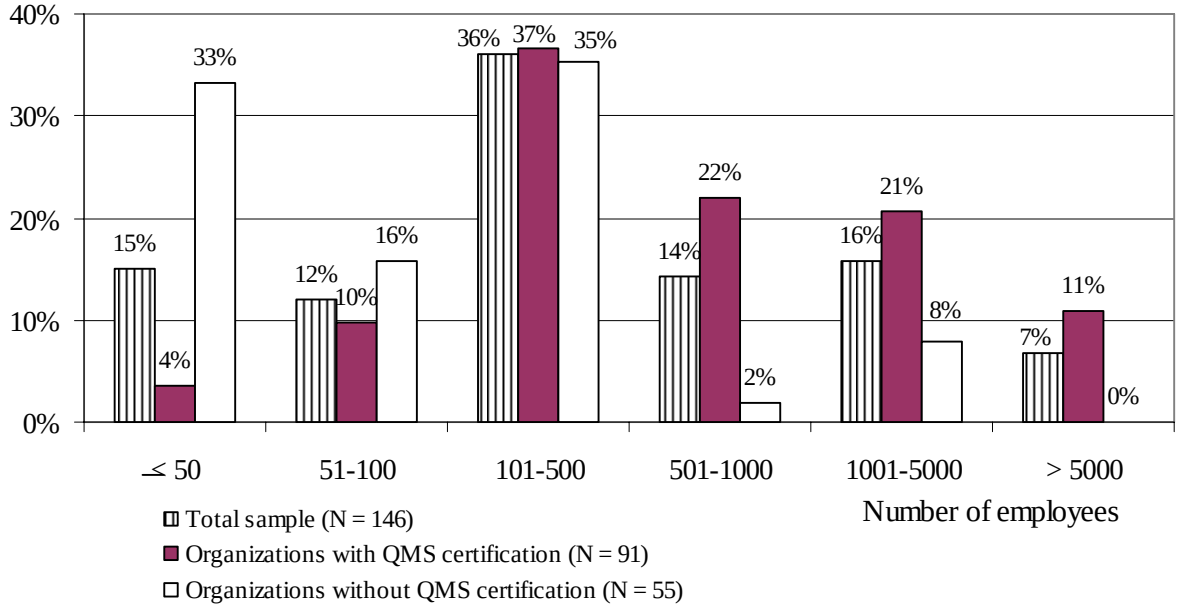


Figure 4.3 Number of employees in the organizations surveyed

4.2.4 Revenue

In Figure 4.4, it is recognized that the revenue of the surveyed organizations was reasonably stable from the year 2000 to 2002. In the total sample (Figure 4.4a), about 37% of organizations had VND 11-100 billion in revenue, nearly 30% had VND 101-500 billion, about 17% had less than VND 10 billion, and remaining organizations had more than VND 500 billion.

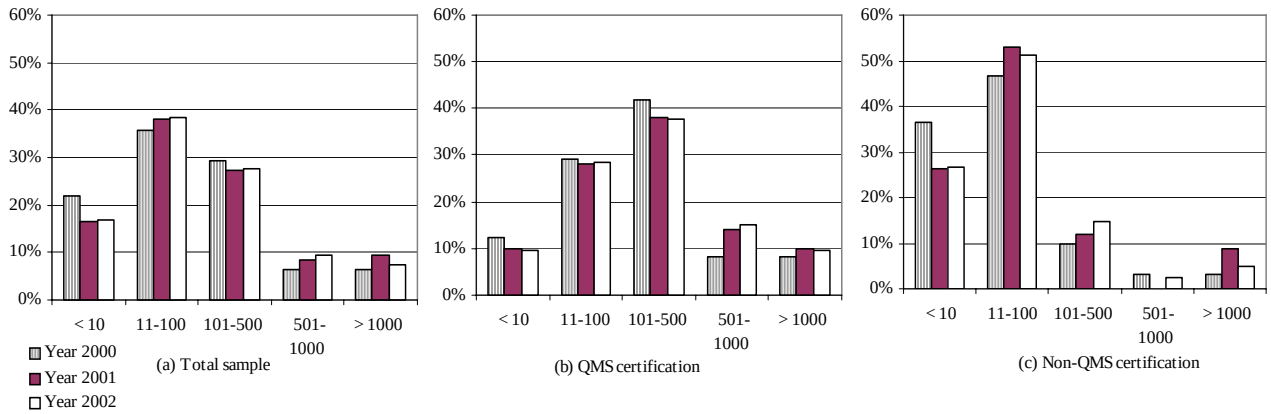


Figure 4.4 Revenue of the surveyed organizations

It is shown that the organizations with QMS certification (Figure 4.4b) had revenue of VND 101-500 billion (about 38%) and VND 11-100 billion (about 29%), while the ones without QMS certification (Figure 4.4c) had revenue of VND 11-100 billion (about 51%) and less than VND 10 billion (about 26%).

4.2.5 Quality management systems (QMS)

To receive QMS approval it is a general requirement to run a good business. ISO 9000 is the most popular type of QMS certifications. The revision of the best-known standards in quality management, the ISO 9000 family, was completed in December 2000. The ISO 9000:2000 versions adopt the TQM philosophy with a stronger emphasis on customer satisfaction and the effective connection of quality management system to organizational processes. The aim is to bring forth a natural move towards improved organizational performance in all aspects (Chan, *et al*. 2002). Adopting the ISO 9000:2000 version led to ISO 9000:1994 version which was out of date, as from the end of year 2003. That means ISO 9000:1994 certifications had no validity from 1st January 2004. Thus, from year 2004 no certification body certified ISO 9000:1994 for organizations, and organizations already having ISO 9000:1994 had to change from version 1994 to version 2000 if they would like to maintain ISO 9000 certification.

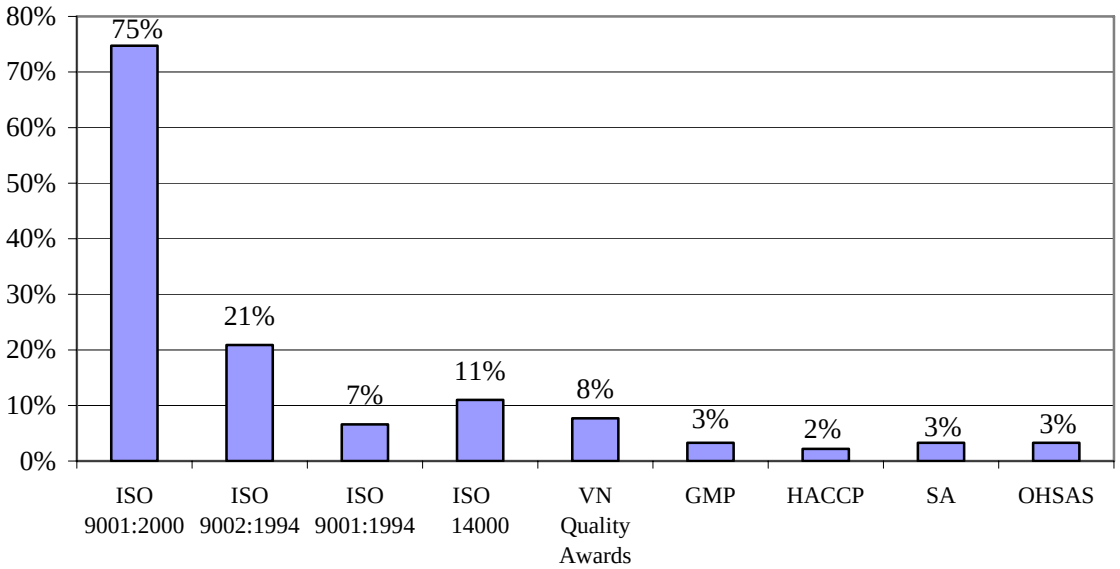


Figure 4.5 Types of QMS certifications

Of the 91 organizations with QMS certification surveyed, 75% had ISO 9000:2000 (Figure 4.5). About 28% of organizations had ISO 9000:1994 certificates, but 56% of these organizations have already changed to ISO 9000:2000. ISO 9000 certification accounts for a large proportion in various QMS certifications because of the following reason: ISO 9000 can be applied in all industries, while other QMS certifications can just apply in specific business fields, such as GMP in the pharmaceutical and chemical industries, or HACCP in the food processing industry. Moreover, many organizations simultaneously obtained different types of QMS certifications, for instance, besides ISO 9000 they had obtained ISO 14000, SA 8000, OHSAS…

4.2.6 Strengths of the organization

Most respondents said that the factors such as '*high product/ service quality*' and '*the ability to meet customer's orders quickly*' are their organizations' strengths (Table 4.1), because they were able to give a quality assurance and reliability to their customers. It is recognized that mean values of these two factors of the organizations with QMS certification (mean = 4.12 and 4.05 respectively) were higher than of the organizations without QMS certification (mean = 3.96 and 3.87 respectively). It is easily understood that these strengths relate to the requirements of the certified QMS, so organizations have to follow them when aiming to meet customer satisfaction. According to the quality managers' opinions, the price of product/ service is not as a competitive factor as before. Quality is the most important determinant of the competitive advantage. In practice, many customers are willing to pay a higher price to get a high quality product. The low mean values of factor '*low price/ low unit cost*' in this survey (mean = 3.26 and 3.28) were clear evidence for the above opinion.

Moreover, the '*terms of payment*' factor was also concerned by many organizations to attract customers (mean = 3.82 and 3.91 for the organizations with and without QMS certification respectively). They have various terms of payment such as deferred payment, receiving a discount for immediate payment and so on. They also combine a variety of promotions for customers, especially for buyers rather than ended-users. Besides the above, the '*different categories of product/ service*' factor was evaluated when considering the strong points of the organization (mean = 3.82 and 3.68 for the organizations with and without QMS certification respectively).

Table 4.1 Strengths of the surveyed organizations

Strengths of the organization	QMS certification	N	Mean	Std. Deviation	Sig. 2-Tailed
High product/ service quality	Yes	89	4.12	.67	.168
	No	54	3.96	.67	.168
Ability to meet customer's orders quickly	Yes	88	4.05	.73	.226
	No	53	3.87	.90	.201
Terms of payment	Yes	85	3.82	.77	.538
	No	54	3.91	.78	.537
Different categories of product/service	Yes	88	3.82	.90	.389
	No	53	3.68	.94	.385
Spread channels	Yes	86	3.59	1.02	.230
	No	51	3.37	1.04	.227
Low unit cost/ Low price	Yes	82	3.26	.66	.847
	No	54	3.28	.63	.849

Note: 5-point Likert scale was used to identify the strengths of the organizations, with 5 – Very Strong, 4 – Strong, 3 – Average, 2 – Weak, and 1 – Very weak.

In general, it is shown that the mean values of factors considering organization's strengths evaluated by the organizations with QMS certifications are higher than by the ones without QMS certification. However, there was not enough statistical evidence (significance or p-value > 0.10) for this difference. On the other word, there was no difference of opinion when identifying strengths or competitive advantages between the organizations with and without QMS certifications. Thus, it can be said that the strengths of both organizations with and without QMS certification are '*high product/ service quality*', '*the ability to meet customer's orders quickly*', '*terms of payment*', and '*different categories of product/ service*'.

CHAPTER 5

THE QMS PRACTICES OF VIETNAMESE ORGANIZATIONS

5.1 THE QMS PRACTICES OF ORGANIZATIONS WITH CERTIFICATION

This chapter presents the QMS practices of Vietnamese organizations with certification based on the seven dimensions developed in the conceptual framework in Chapter 3. They are *leadership, customer focus, employee involvement, information management, process management, continuous improvement, and supplier relationships*. This chapter also makes a comparison between Vietnamese organizations with and without QMS certification to determine which activities of quality management implemented in organizations with certification were better than those without certification.

A five – point Likert scale was used in this study to show the results of quality management activities, from "*1*" indicating *very weak*, to "*5*" indicating *very good*.

5.1.1 Leadership

Leaders are persons who establish the visions and goals of the organization. Their commitment is one of the critical determinants of successfully implementing TQM. Leadership practices promote quality and high performance by creating and maintaining the involvement of both internal (staff) and external (customers and suppliers) people to achieve the organization's goals.

Figure 5.1 shows an evaluation of the organizations with QMS certification concerning their leadership activities. It was recognized that these organizations were rather good at '*considering customer's needs'* (mean = 4.37), and '*creating clear vision and quality valu*e' (mean = 4.08). These two items are mandatory requirements for international standard QMS certification. This rating of leadership in the organizations with QMS certification was expected.

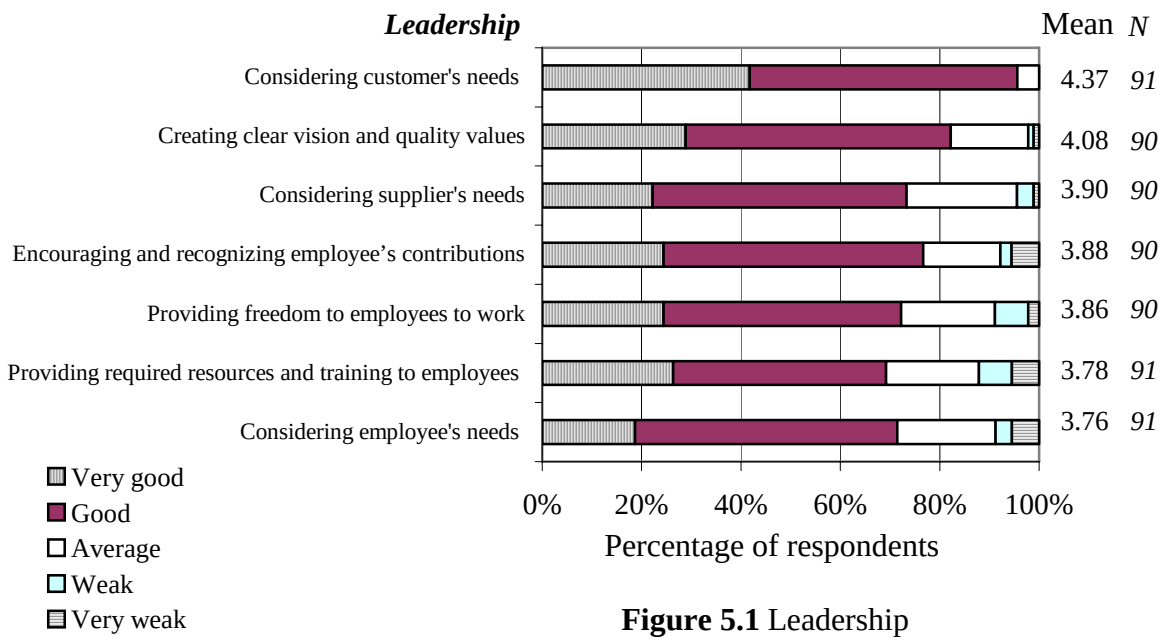


Figure 5.1 Leadership

In leadership, employee consideration is one important factor for the organization to achieve long-term benefits and development. In fact, the managers of some organizations emphasized training to provide knowledge and skills to their employees encouraging employees and promoting employee involvement. However, many organizations said that they had too many employees to consider. Training was costly and adversely affected production plans. Training was given low priority and support. Thus, many organizations supported activities relating to their employees at somewhat above average (mean = 3.76 – 3.88). In which, the item '*considering employee's needs*' was considered the lowest emphasis of leadership. It is additionally explained that many Vietnamese organizations emphasize a task-oriented leadership style rather than a people-oriented leadership style. These organizations emphasize tasks that have to be done. The achievement of goals is rewarded and it is the glue that holds the company together. The organizations with production oriented often define success by the efficiency of operations and the low-costs. Thus, the managers of these organizations have not really yet concerned themselves with the needs of employees.

5.1.2 Customer Focus

Organizations are driven by customer's needs. It is necessary to identify these needs and their level of satisfaction. The establishment and maintenance of customer relationships is a very important mission for organizations today.

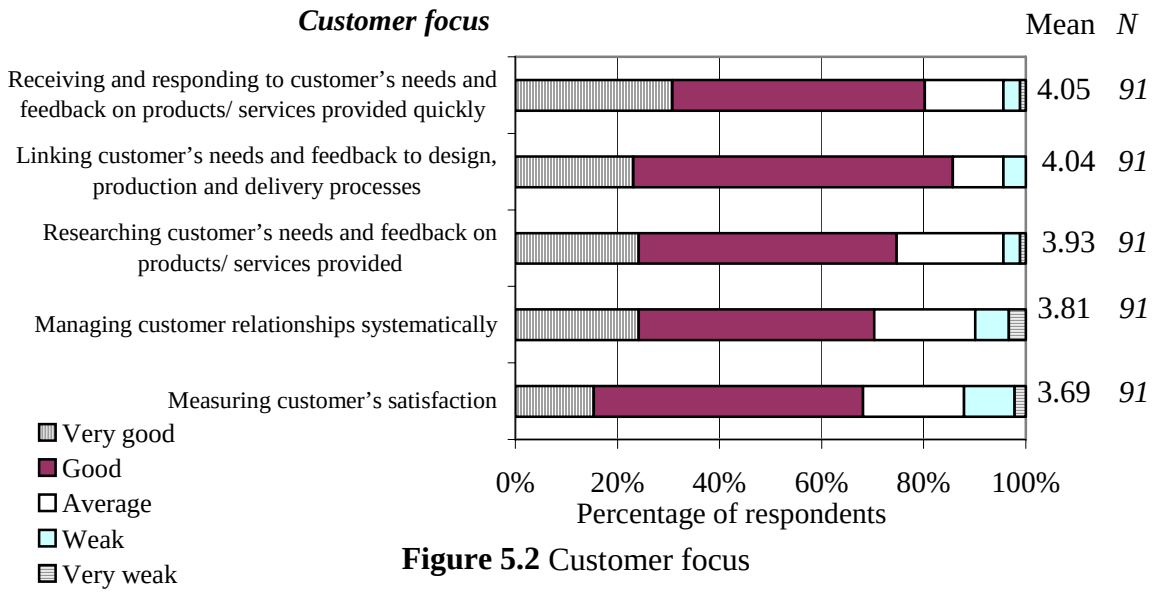


Figure 5.2 Customer focus

Figure 5.2 shows that some activities of customer focus are quite good, such as items *'receiving and responding customer's needs and feedback on product/ service provided quickly'* (mean = 4.05), *'linking customer's needs and feedback to design, production and delivery processes'* (4.04), and *'researching customer's needs and feedback on products/ services provided'* (3.93). In practice, the managers of many organizations have recognized the importance of understanding the needs of the customers. They said that reaching customer satisfaction was an important objective for their organizations. Many organizations have arranged customer meetings to collect customer feedback, and then to correct their weak points and promoting customer's needs. Some organizations have solved customer complaints quickly. Employees were categorized into different groups to service each kind of customer to reduce the overlap of procedures in customer service. With this they could manage their customers better.

According to many managers, the items '*managing customer relationships systematically*' and *'measuring customer's satisfaction'* have focused more on large and frequent buyers rather than small and infrequent ones. Information on customers has not been frequently updated to manage customers. The organizations have evaluated relationships and satisfaction measurement somewhat lower than.

5.1.3 Employee Involvement

Employee involvement is of crucial importance to TQM as it is a vital means to achieve customer satisfaction and commitment through continuous quality improvement. Employee involvement indicates the participation and contribution of all people in the organization, from the top to the bottom of the company.

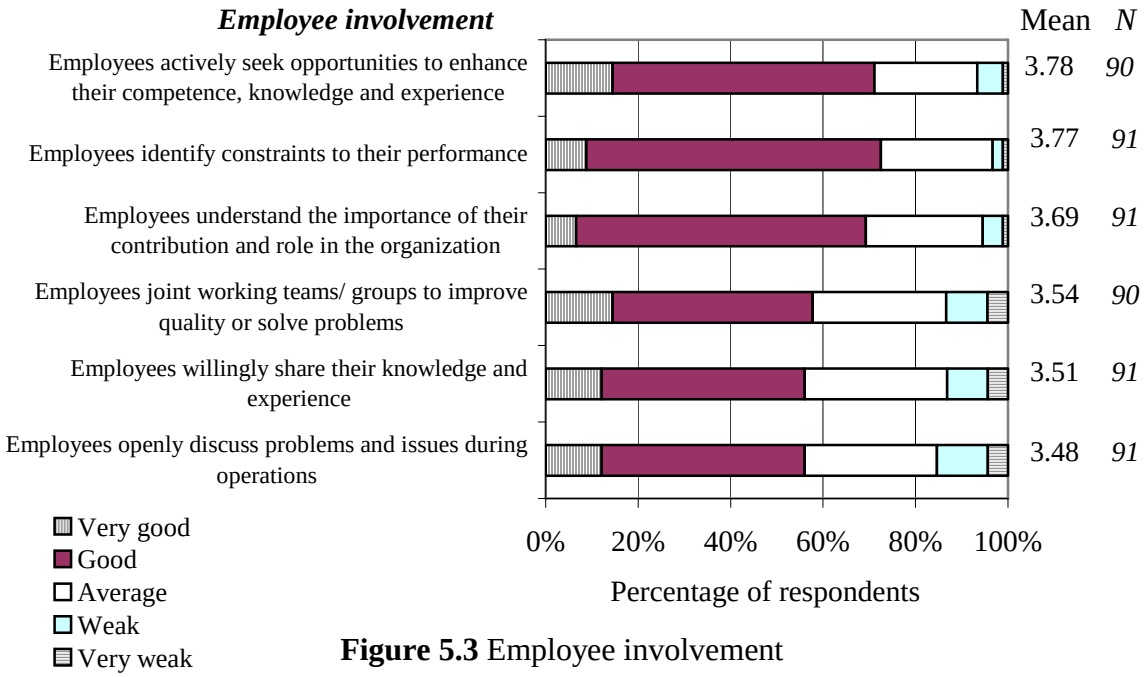


Figure 5.3 Employee involvement

Most respondents have evaluated their employee involvement at only an average level (Figure 5.3). This is the consequence of less top management attention to their employees. For instance, the items which were assessed as rather low in the employee involvement dimension were '*employees willingly share their knowledge and experience*', '*employees openly discuss problems and issues during operations*', and '*employees joint working teams/ groups to improve quality or solve problems*' (mean = 3.48-3.54). Most managers said that employees work alone. They were not used to teamwork. They do not like to share information. Thus, they have not established working teams. The effectiveness and efficiency of their work was low.

Some managers and employees also realize that each person has strong and weak points. They can complement each other by working in teams. Their exchanges of experiences will improve the effectiveness and efficiency of their organizations. However, they do not

know how to work in teams and to exchange information effectively because many organizations have not considered training their employees in these aspects. In fact, the organizations have focused only on training courses to improve professional knowledge and skills rather than teamwork. This is a common weakness of Vietnamese organizations.

5.1.4 Information Management

Reliable and appropriate information drives quality excellence and improves operational and competitive performance.

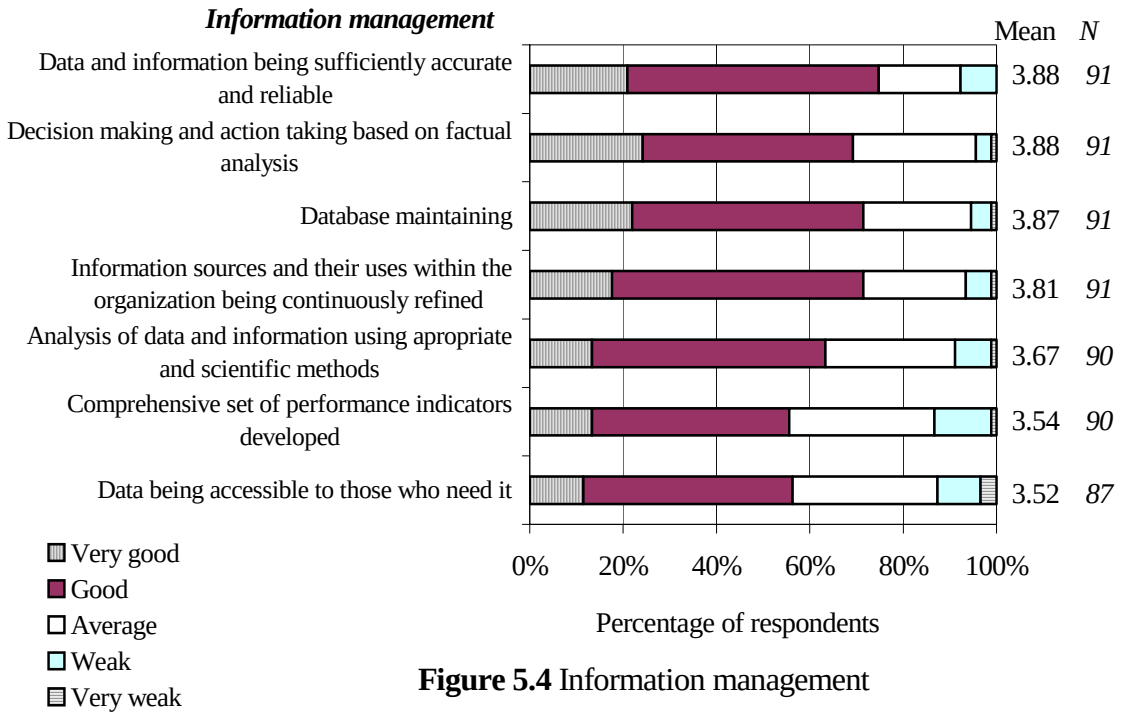


Figure 5.4 Information management

The organizations have recognized the importance of accurate and timely information and how it can improve processes and product/ service quality. As a result, some items of information management were evaluated high (Figure 5.4), such as *'data and information being sufficiently accurate and reliable'*, *'decision making and action taking based on factual analysis'*, *'database maintenance'*, and *'information sources and their uses within the organization continuously refined'* (mean = 3.81-3.88).

However, other items were evaluated much lower such as *'analysis of data and information using appropriate and scientific methods'* and *'data being accessible to those who need it'*. When interviewing managers, they said that these items were related to the

application of information technology. They needed the support of information technology systems to improve them. Some IT applications that need to develop were LAN, intranet, and decision support systems. The investment of these systems requires the investment in infrastructure, employee capability, and so on. In practice, few Vietnamese organizations have the ability to invest and use such systems effectively.

5.1.5 Process Management

Quality results are achieved better when activities and related resources are managed as a process.

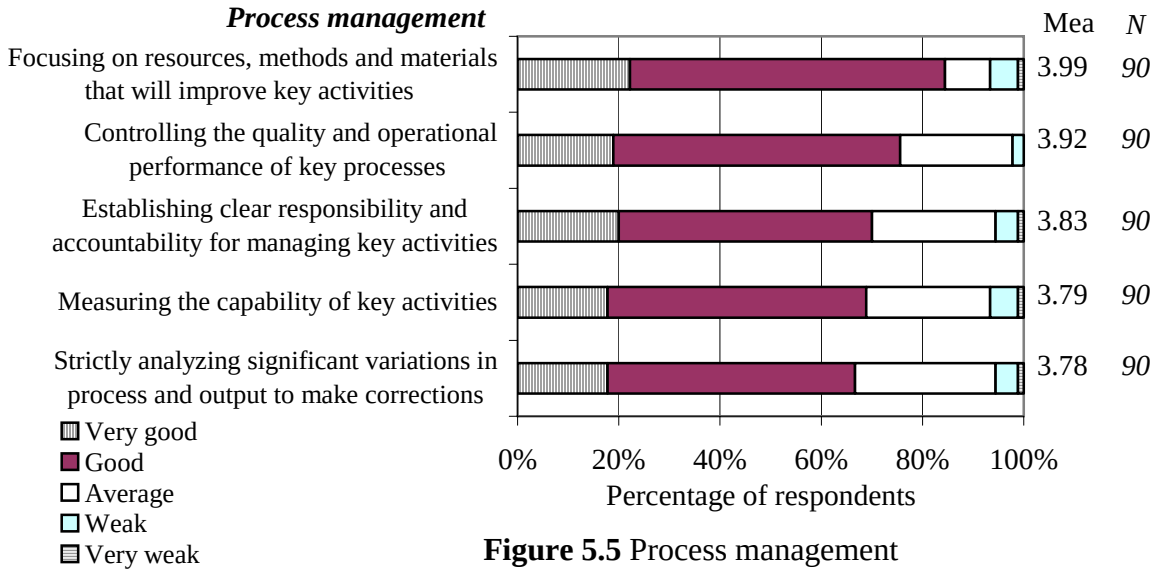


Figure 5.5 Process management

In this study, the respondents have evaluated the activities of process management well (Figure 5.5). For operations, they have much emphasized '*focusing on resources, methods and materials that will improve key activities*' (mean = 3.99). This relates to '*controlling the quality and operational performance of key processes'* (mean = 3.99). They have also *'established clear responsibility and accountability for managing key activities'* (mean = 3.99). To be able to manage the key processes easily and effectively includes establishing specific objectives for each individual, describing clear job titles, planning and reporting the quality results of each process producing product/ service. In fact, these are also the requirements of QMS certification.

However, the two remaining items '*measuring the capability of key activities*' and '*strictly analyzing significant variations in process and output to make corrections*' were assessed as much lower. Some organizations have done rather good at measuring the capability of key activities, but other organizations said that they have met with difficulties in measuring key activities because the methods used in their organizations have not yet reflected the true performance of the processes. They expect that training and consultant centers will help them to select appropriate methods of measurement for their specific processes. To analyze significant variations in process or output for corrections requires the application of statistical methods. This application has been limited in many organizations. Some do not know or consider these methods. They have not promoted the inherent productivity of these methods in managing processes. Previous research about improving quality through IT (Nguyen, 2004) found that Excel was the most used software tool for processing and analyzing statistical data on quality. The usage of specialized tools such as SPC and Minitab was still limited. Moreover, such applications included only used simple tools such as Histograms and Pareto Charts.

5.1.6 Continuous Improvement

Satisfying customer requirements involves the continuous improvement of products and processes. Continuous improvement is a permanent objective of organizations.

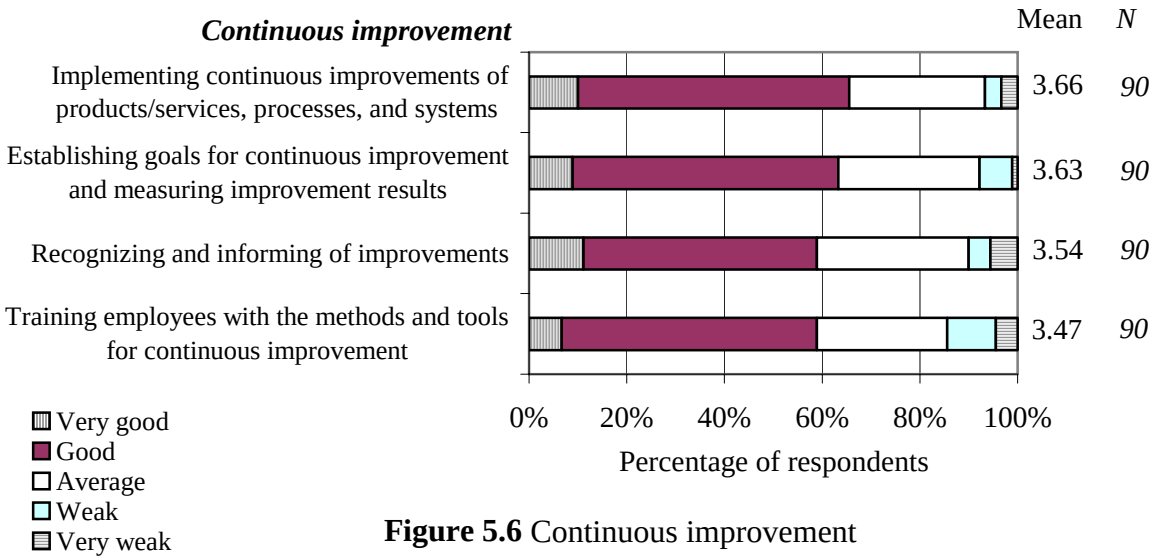


Figure 5.6 Continuous improvement

Continuous improvement is the foundation for increasing the added-value of a product or service. Most organizations realized the importance of this activity, but they said that their continuous improvement capability was still limited. The evaluation of continuous improvement activities was lower than the other activities of quality management (Figure 5.6). Continuous improvement activities are somewhat above average from 3.47 to 3.66. These include: *'implementing continuous improvements of products/services, processes, and systems'*, *'establishing goals for continuous improvement and measuring the improvement results'*, *'recognizing and informing of improvements'*, and *'training employees with the methods and tools for continuous improvement'*.

In practice, all organizations said that they made corrections for their problems, but these actions had to deal in the short term rather than to prevent problems in long term. If a problem happened, they immediately found a solution to overcome it, but the problem still continued. This way of solving problems was based on the operator's experience. Some organizations have set targets for each department annually. If they achieved the target, they would be recognized and rewarded. If they did not, they would not get any criticism or blame. Training employees with the methods of continuous improvement have been minimal in the organizations. Organizations have not emphasized continuous improvement for each employee. Moreover, the organizations do not yet motivate employees for such activities.

5.1.7 Supplier Relationships

Quality is a more important factor than price in selecting suppliers. Long-term relationships with suppliers have to be established and the company has to collaborate with suppliers to help improve the quality of products/ services

With the development of supplier relationships (Figure 5.7), the good points were *'clearly and openly communicating with suppliers'*, *'establishing supplier relationships with long-term considerations'*, and *'emphasizing on identifying and selecting key suppliers'* (mean = 3.92 - 3.97). Most organizations would like to select prestigious and trustworthy suppliers to ensure quality inputs. Through long-term relationships with suppliers, the organizations recognize that they can reduce expenses and costs. Moreover, the organizations can obtain special orders if they are loyal customers for such suppliers. On the contrary, when the

organizations often change their suppliers, they can reduce some costs of materials but lose more. The suppliers rarely support such organizations. Thus, the development of long-term relationships with suppliers is emphasized because of its benefits.

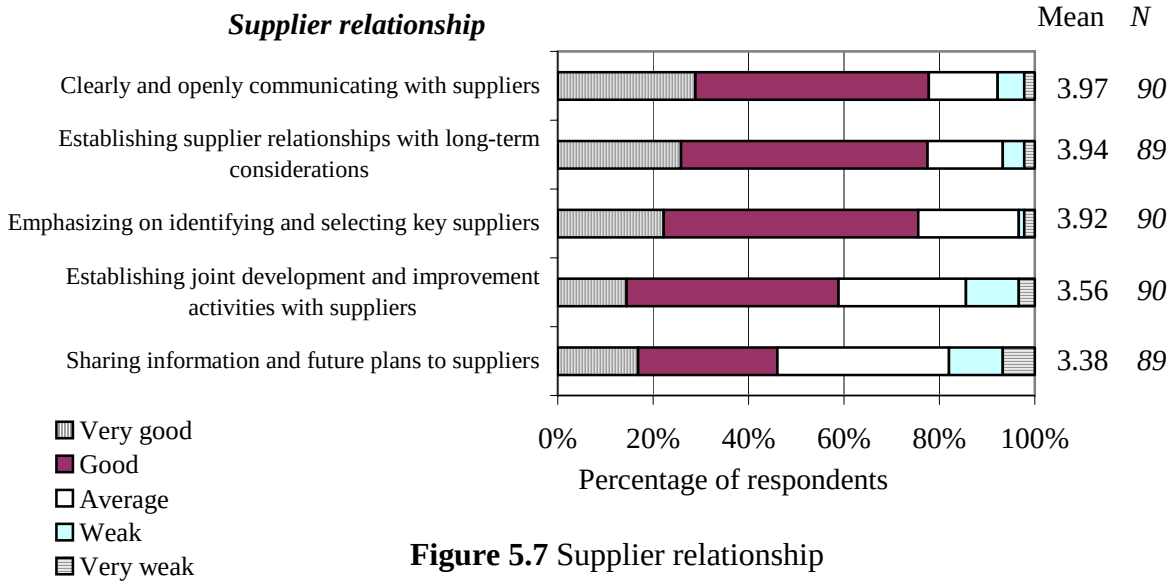


Figure 5.7 Supplier relationship

However, the development of more intense relationships with suppliers such as *'establishing joint development and improvement activities with suppliers'* and *'sharing information and future plans with suppliers'* were not rated highly. According to respondents, sharing information and future plans to suppliers can lead to revealing the organization's important information or special strategies, and creates more competitors. They are careful in establishing joint development activities or sharing strategic information with their suppliers. In practice, most organizations just maintain normal relations with suppliers, and have no specific plans to develop more collaborative relationships in the long term.

Based on the seven major activities of quality management, this study shows a general picture about the practices of Vietnamese organizations with QMS certification in Ho Chi Minh City and the surrounding provinces like Dong Nai and Binh Duong. Activities, such as leadership and customer focus, were evaluated well, while the remaining activities were only average, especially employee involvement, information management, and continuous improvement.

5.2 A COMPARISON OF THE QMS PRACTICES BETWEEN THE ORGANIZATIONS WITH AND WITHOUT CERTIFICATION

This section will compare the results of the QMS practices between the organizations with and without certifications based on the seven dimensions mentioned above. It is expected that this comparison reflect the salient activities of QMS in organizations with certification.

The t-test is used to assess the statistical significance of the differences between the certified and non-certified organizations in the practices of the seven QMS dimensions.

5.2.1 A Comparison of Leadership

Table 5.1 Ratings of leadership

Leadership	QMS certification	N	Mean	Std. Deviation	p-value
Leaders consider customer's needs	Yes	91	4.37	.57	.002***
	No	55	4.04	.72	
Leaders create clear vision and quality values	Yes	90	4.08	.77	.000***
	No	54	3.50	.95	
Leaders consider supplier's needs	Yes	90	3.90	.82	.071*
	No	52	3.63	.86	
Leaders encourage and recognize employee’s contributions	Yes	90	3.88	.99	.054*
	No	55	3.56	.86	
Leaders provide freedom to employees to work	Yes	90	3.86	.94	.885
	No	54	3.83	.80	
Leaders provide required resources and training to employees	Yes	91	3.78	1.08	.116
	No	55	3.51	.86	
Leaders consider employee's needs	Yes	91	3.76	.98	.097*
	No	55	3.49	.86	

** Significant difference at the .10 level (2-tailed)*
*** Significant difference at the .05 level (2-tailed)*
**** Significant difference at the .01 level (2-tailed)*

Leadership is an important factor of quality management. Therefore, the results of leadership activities in the organizations with QMS certification were expected to be

higher. Table 5.1 presents the significant differences in scores between the two groups. These results show that most items are significantly different between the two groups.

Organizations with QMS certification have significantly higher consideration of customer needs, vision and quality value. For the QMS certified, there are also significant differences for the encouragement and recognition of employees, supplier needs and employees' needs.

However, there are not statistically significant differences for items such as '*leaders provide freedom to employees to work'* and '*leaders provide required resources and training to employees'*. These finding suggests that there is no evidence to confirm which of these two leadership activities in the organizations with QMS certification is better than those without QMS certification.

5.2.2 A Comparison of Customer Focus

Table 5.2 Ratings of customer focus

Customer focus	QMS certification	N	Mean	Std. Deviation	p-value
Receiving and responding to customer's needs and feedback on product/ service provided quickly	Yes	91	4.05	.83	.087*
	No	55	3.82	.75	
Linking customer's needs and feedback to design, production and delivery processes	Yes	91	4.04	.71	.005***
	No	54	3.69	.77	
Researching customer's needs and feedback on products/ services provided	Yes	91	3.93	.83	.091*
	No	54	3.70	.72	
Managing customer relationships systematically	Yes	91	3.81	.99	.067*
	No	55	3.51	.92	
Measuring customer's satisfaction	Yes	91	3.69	.93	.022**
	No	53	3.32	.94	

** Significant difference at the .10 level (2-tailed)*
*** Significant difference at the .05 level (2-tailed)*
**** Significant difference at the .01 level (2-tailed)*

Customer focus is an often-heard benefit of QMS in general and ISO certification in particular. The t-test indicates significant differences between the two groups about the activities of customer focus (Table 5.2). For QMS certification, there are statistically significant higher ratings for '*linking customer's needs and feedback to design, production and delivery processes'* and '*measuring customer's satisfactions'*. The remaining items are also significantly different between the two groups.

5.2.3 A Comparison of Employee Involvement

Table 5.3 Ratings of employee involvement

Employee involvement	QMS certification	N	Mean	Std. Deviation	p-value
Employees actively seek opportunities to enhance their competence, knowledge and experience	Yes	90	3.78	.80	.764
	No	55	3.82	.75	
Employees identify constraints to their performance	Yes	91	3.77	.68	.044**
	No	54	3.52	.77	
Employees understand the importance of their contribution and role in the organization	Yes	91	3.69	.71	.216
	No	55	3.53	.88	
Employees joint working teams/ groups to improve quality or solve problems	Yes	90	3.54	1.00	.230
	No	55	3.35	.91	
Employees willingly share their knowledge and experience	Yes	91	3.51	.97	.926
	No	55	3.49	.81	
Employees openly discuss problems and issues during operations	Yes	91	3.48	.99	.342
	No	55	3.33	.90	

*** Significant difference at the .05 level (2-tailed)*

Employee involvement is one of the key approaches to improve organizational performance. Total participation recognizes that the person closest to the task is most qualified to suggest better ways of doing the job. So, part of a worker's responsibility is to suggest ways to make improvements therefore enhancing productivity and value to the customer.

In this study generally, the score of employee involvement of activities in the organizations with QMS were higher. However, there is no significant difference of most items in employee involvement between two groups (Table 5.3). Only the item '*employees identify constraints to their performance'* shows a significant difference of means between the two groups at the .05 level. The implication is that employees of the organizations with QMS certification know the constraints of their performance better. The clear procedures or records in the certified QMS help employees get better results of this item. The remaining items are not clearly shown in the requirements of the certified QMS, so the results of these activities are equal in both groups.

5.2.4 A Comparison of Information Management

Table 5.4 Ratings of information management

Information management	QMS certification	N	Mean	Std. Deviation	p-value
Data and information being sufficiently accurate and reliable	Yes	91	3.88	.83	.050**
	No	53	3.60	.77	
Decision making and action taking based on factual analysis	Yes	91	3.88	.85	.002***
	No	55	3.38	1.05	
Database maintenance	Yes	91	3.87	.85	.014**
	No	53	3.47	1.03	
Information sources and their uses within the organization continuously refined	Yes	91	3.81	.83	.005***
	No	54	3.39	.94	
Analysis of data and information using appropriate and scientific methods	Yes	90	3.67	.85	.073*
	No	53	3.38	1.04	
Comprehensive set of performance indicators developed	Yes	90	3.54	.91	.002***
	No	54	3.00	1.08	
Data being accessible to those who need it	Yes	87	3.52	.94	.216
	No	52	3.31	1.00	

** Significant difference at the .10 level (2-tailed)*
*** Significant difference at the .05 level (2-tailed)*
**** Significant difference at the .01 level (2-tailed)*

Information management much affects the provision of necessary information for making decisions in all organizations. Based on the finding of QMS practices above, information management of the organizations with certification was not really good comparing to other

activities as leadership and customer focus. However, all mean values of items in information management of the organizations with certification are higher scores than the organizations with it (Table 5.4). *Most items had statistically significant differences.* We can infer that the organizations without certification limited in recognizing the role of information management in their business, so the results of these activities only were average.

Only the item '*data being accessible to those who need it*' showed no significant difference between the two groups. Perhaps, both groups have not yet fully computerized their businesses, so this activity is still limited.

5.2.5 A Comparison of Process Management

Table 5.5 Ratings of process management

Process management	QMS certification	N	Mean	Std. Deviation	2-Tail Sig.
Focusing on resources, methods and materials that will improve key activities	Yes	90	3.99	.80	.004***
	No	52	3.56	.94	
Controlling the quality and operational performance of key processes	Yes	90	3.92	.71	.000***
	No	53	3.40	.84	
Establishing clear responsibility and accountability for managing key activities	Yes	90	3.83	.84	.001***
	No	53	3.34	.94	
Measuring the capability of key activities	Yes	90	3.79	.84	.004***
	No	53	3.34	.94	
Strictly analyzing significant variations in process and output to make corrections	Yes	90	3.78	.83	.005***
	No	53	3.36	.90	

**** Significant difference at the .01 level (2-tailed)*

Process management is considered one of the benefits of QMS certification. In this study, the statistically significant differences between the two groups of all items in process management have clearly reflected this aspect (Table 5.5). The requirements of QMS certification have much affected the activities of process management, such as '*focusing on resources, methods and materials that will improve key activities*', '*controlling the quality*

and operational performance of key processes', 'establishing clear responsibility and accountability for managing key activities', 'measuring the capability of key activities', and *'strictly analyzing significant variations in process and output to make corrections'*. Thus, the organizations with QMS certification have gotten better results of process management.

5.2.6 A Comparison of Continuous Improvement

Table 5.6 Ratings of continuous improvement

Continuous improvement	QMS certification	N	Mean	Std. Deviation	p-value
Implementing continuous improvements of products/services, processes, and systems	Yes	90	3.66	.84	.013**
	No	55	3.25	1.08	
Establishing goals for the continuous improvement and measuring the improvement results	Yes	90	3.63	.79	.001***
	No	55	3.13	1.09	
Recognizing and informing of improvements	Yes	90	3.54	.95	.009**
	No	55	3.07	1.18	
Training employees with the methods and tools for continuous improvement	Yes	90	3.47	.93	.001***
	No	55	2.85	1.24	

*** Significant difference at the .05 level (2-tailed)*

**** Significant difference at the .01 level (2-tailed)*

Continuous improvement is an important factor to enhance better quality of products/ services. In section 5.1.6, the activities of continuous improvement of the organizations with certification were evaluated only at average. However, all items of continuous improvement activities of these organizations still had higher scores than the organizations without certification. *All items had significant differences*. This finding implies that the organizations without certification have not yet considered continuous improvement activities, so their results are still limited.

5.2.7 A Comparison of Supplier Relationship

Supplier relationship is also one of the important factors affecting output quality of the organization. Developing good supplier relationship is the foundation for doing the right things at first time. This leads to an increase in the quality of products/ services and reduce wastes, defects/defectives, and production time.

Table 5.7 Ratings of supplier relationship

Supplier relationship	QMS certification	N	Mean	Std. Deviation	p-value
Clearly and openly communicating with suppliers	Yes	90	3.97	.93	.981
	No	54	3.96	.89	
Establishing supplier relationships with long-term considerations	Yes	89	3.94	.90	.624
	No	54	4.02	.86	
Much emphasizing on identifying and selecting key suppliers	Yes	90	3.92	.82	.267
	No	54	3.76	.89	
Establishing joint development and improvement activities with suppliers	Yes	90	3.56	.98	.516
	No	54	3.44	1.00	
Sharing information and future plans with suppliers	Yes	89	3.38	1.10	.981
	No	53	3.38	1.10	

Table 5.7 presents that both the organizations with and without certification are interested in developing supplier relationships, especially ‘clearly and openly communicating with suppliers’, ‘establishing supplier relationships with long-term considerations’ and ‘emphasizing on identifying and selecting key suppliers’. The two remaining items as ‘establishing joint development and improvement activities with suppliers’ and ‘sharing information and future plans with suppliers’ were considered less important.

There are no significant differences between the two groups about the activities of supplier relationships. This implies that the requirements of QMS certifications have not clearly affected the development of supplier relationships when compared to organization without QMS certifications. On the other word, the organizations with and without QMS certifications have the same opinions and evaluation results about supplier relationship development in their businesses.

In short, the comparison in this section shows some significant differences in the results of quality management activities between the organizations with and without QMS certifications. The most highlighted difference is the '*process management*' factor. This was expected, since the organizations with QMS certification generally spend a substantial amount of resources to document processes as part of the certification. It is followed by factors such as '*continuous improvement*', '*information management*', '*customer focus*', *and* '*leadership*'. In general, the evaluations of these items in the organizations with QMS certifications are better than in ones without QMS certifications. Thus, we can infer that QMS certification has affected these five quality management factors. However, we found that there was no significant difference between the two groups concerning factors such as '*employee involvement*' and '*supplier relationship*'. There are no salient results concerning the activities of employee involvement and supplier relationship between the organizations with and without QMS certifications. Both groups have not really considered to activities of employee involvement and just only considered activities of supplier relationship at normal relation levels. The results demonstrate that the use of the certified QMS, particularly ISO, do not necessarily mean that the organizations which possess an ISO certificate are in fact 'better' supplier relationships and employee involvement than the organizations without ISO certificate.

5.3 ORGANIZATIONAL PERFORMANCE

Twenty-one performance measures were investigated to represent the organizational performance in three recent years, from the year 2000 to 2002. The results are shown in Table 5.8 with the descending order of mean scores of the organizational performance based on the positive impacts. The respondents indicated the extent to which each of these had been achieved on the five-point scale, from '1 = Much decrease' to '5 = Much increase'. Table 5.9 represents the results of the organizational performance based on reduced impacts. Five- Likert scale indicates '1 = Much increase' to '5 = Much decrease'.

Thus, the items with the highest scores (over point three) indicate higher organizational performance. On the contrary, the items with the low scores (below point three) indicate worse organizational performance. The organizational performance has no change, if mean scores of the items are equal to three.

The mean scores calculated from the responses suggest that the two groups were achieving higher performance from the year 2000 to 2002, in which the highest improvements of performance were *product/ service quality and sales*. The next items of performance were evaluated well. They are *customer satisfactions, revenue and profits, productivity, competitive advantages, long-term relationship with customers, new market/ new customers, capacity, market share* (Table 5.8), *defectives/ defects, waste, and customer complaints* (Table 5.9). The remaining items were somewhat above average. In general, the mean scores of the organizations with certification were performed higher.

Table 5.8 The comparison of the organizational performance based on the positive impacts between the organizations with and without QMS certification

Items of organizational performance	QMS certification	N	Mean	Std. Deviation	Sig. (2-tailed)
Product/service quality	Yes	89	4.34	.77	.183
	No	50	4.16	.71	
Sales	Yes	87	4.31	.62	.136
	No	49	4.12	.83	
Customer satisfaction	Yes	89	4.28	.71	.460
	No	50	4.18	.87	
Revenue and profits	Yes	88	4.22	.65	.146
	No	49	4.02	.90	
Productivity	Yes	89	4.22	.67	.040**
	No	50	3.94	.93	
Competitive advantages	Yes	89	4.20	.73	.039**
	No	49	3.92	.84	
Long-term relationship with customers	Yes	88	4.19	.77	.206
	No	50	4.02	.77	
New market/ new customers	Yes	88	4.19	.68	.783
	No	50	4.16	.68	
Capacity	Yes	87	4.17	.72	.051*
	No	47	3.89	.89	
Market share	Yes	87	4.14	.70	.187
	No	49	3.96	.84	
Involvement of employees in organization	Yes	87	3.99	.80	.226
	No	49	3.82	.78	
Employee's job satisfactions	Yes	89	3.81	.84	.942
	No	50	3.82	.87	
Employee's income	Yes	89	3.76	.77	.467
	No	50	3.86	.70	

** Significant difference at the .10 level (2-tailed)*
*** Significant difference at the .05 level (2-tailed)*

In Table 5.8, the organizations with QMS certification scored significantly higher performance in *productivity, competitive advantage,* and *capacity*. In the other items, there are no significant differences with the non-certified QMS organizations.

In Table 5.9, there are no significant differences with the non-certified organizations, except that the organizations with certification have significantly lower *defectives/ defects and waste*.

Table 5.9 The comparison of the organizational performance based on the reduced impacts between the organizations with and without QMS certification

Items of organizational performance	QMS certification	N	Mean	Std. Deviation	Sig. (2-tailed)
Defectives/ defects	Yes	88	4.28	.80	.006***
	No	49	3.86	.96	
Waste	Yes	87	4.10	.84	.044**
	No	50	3.78	1.00	
Customer complaints	Yes	88	4.06	1.03	.519
	No	49	3.94	1.01	
Operating costs per units	Yes	85	3.71	.99	.509
	No	49	3.59	.91	
Order time of customers	Yes	84	3.44	1.15	.391
	No	47	3.62	1.07	
Complexity	Yes	88	3.22	1.25	.204
	No	50	3.48	.99	
Order time to suppliers	Yes	85	3.19	1.13	.448
	No	49	3.35	1.22	
Inventory control	Yes	85	2.92	1.13	.702
	No	47	3.28	1.02	

*** Significant difference at the .05 level (2-tailed)*
**** Significant difference at the .01 level (2-tailed)*

Pursuing QMS certificates helps the organizations get better organizational performance, such as reducing defectives/ defects and waste, and increasing productivity, competitive advantages, and capacity. This evidence explains why organizations often like to achieve QMS certification which improves their organizational performance.

In conclusion, getting QMS certifications has changed the activities of quality management in Vietnamese organizations. According to the evaluation of the organizations based on the seven dimensions of QMS, the most considerable changes are the activities of leadership and customer focus. However, other activities have not considerably changed, namely, process management, supplier relationship, employee involvement, information management, and continuous improvement, which were just evaluated at average. It implies that getting QMS certifications does not mean that all activities of QMS become higher in effectiveness. The managers therefore need to have the investment and concern to improve these five dimensions. During the maintenance period of the certifications in the

long term, the organizations have to continue to improvement the five remaining dimensions of QMS.

The organizations with QMS certifications have had higher evaluations concerning the activities of quality management, namely, process management, continuous improvement, information management, customer focus, and leadership. This reflects the positive impacts of QMS certification on the activities of quality management. However, the two activities of employee involvement and supplier relationship do not show statistically significant differences between organizations with and without QMS certifications.

Both organizations with and without QMS certifications have good organizational performance in the year 2000 to 2002. The organizations with QMS certifications have better organizational performance than the organizations without QMS in some aspects such as defectives/ defects, waste, productivity, competitive advantage, and capacity. To evaluate the impacts of QMS on performance objectively, we will test the relationship between the dimensions of QMS and organizational performance. This is presented in detail in chapter 6.

CHAPTER 6

THE RELATIONSHIP BETWEEN QMS DIMENSIONS AND ORGANIZATIONAL PERFORMANCE

6.1 RELIABILITY AND VALIDITY OF THE SURVEY INSTRUMENT

6.1.1 Independent variables – QMS model

A QMS model with 39 items (independent variables) was developed based on the seven dimensions (shown in chapter 3): leadership (L1 – L7), customer focus (CF1 – CF5), employee involvement (E1 – E6), information management (I1 – I7), process management (P1 – P5), continuous improvement (CI1 – CI4), and supplier relationship (S1 – S5). In order to ensure the credibility of findings by empirical research, the survey instrument should have reliability and validity. *Reliability* refers to consistency. It suggests that the same thing is repeated or recurs under identical or very similar conditions. The opposite of reliability is a measurement that yields erratic, unstable, or inconsistent results (Newman, 2000). *Validity* is the match between a construct, a conceptual definition, and a measure. It refers to actually measuring what you define (Newman, 2000). Three types of validity tests were considered in this study: content validity, construct validity, and criterion validity (Hair *et al*., 1998).

A phase of data reduction through factor analysis was necessary before the examination of the relationship between QMS and organizational performance. Factor analysis techniques identify representative variables from a much larger set of variable for use in the subsequent multivariate analysis (Hair *et al*., 1998). In interpreting factors, it had to be decided whether the factor loadings were worth considering. A factor loading represents the correlation between an original variable and its factors. In determining a significance level for the interpretation of loadings, an approach similar to determining the statistical significance of correlation coefficients was used. The correlation matrices of items and their significant level in seven criteria are shown in Appendix 5.1. Factor loadings of the data set of 39 items developed based on the seven dimensions of QMS model was analyzed by principal component analysis and Varimax rotation. As a result, seven factors were

extracted (table 6.1). As mentioned in chapter 3, in order to provide empirical evidence supporting the appropriateness of the data for unidimensionably, the Kaiser-Mayer-Olkin (KMO) measure of sampling adequacy was used. As a guideline, KMO values in the .50s or above were relevant, and below .50s were unacceptable (Hair *et al*., 1998).

6.1.1.1 Reliability

Cronbach's alpha is a commonly used measure of reliability of a set of two or more construct indicators. Reliability is a measure of internal consistency of the construct indicators. Alpha values range between 0 and 1.0 with higher values indicating higher reliability among the indicators (Hair *et al*., 1998). Nunnally (1978) suggested that in exploratory research, alpha value of .60 is sufficient.

An internal consistency analysis was performed separately for the items under each of the criteria. The reliability coefficient (Cronbach's alpha) was calculated for each construct and ranged between .816 (customer focus - CF) and .905 (continuous improvement - CI) (Table 6.1, column "Cronbach's alpha"). The alpha values found for each construct indicated that each construct was a strongly reliable measure.

6.1.1.2 Validity

Content validity. A measure has content validity if there was general agreement from the literature that the TQM model had measurement items that cover all aspects of the variable being measured. Since selection of the initial measurement items was based on the extensive review of international literature and several frameworks of quality management system, e.g. quality management principles of ISO 9000, and the Malcolm Baldrige Quality Award, the measures were generally considered to have content validity. Therefore, they generally do measure the key dimensions of the QMS models.

Table 6.1 Results of reliability and validity of quality management factors (independent variables)

Criteria	*Constructs*	*Items*	*Factor loading*	*Commu -nity*	*Eigen-values*	*% Variance explained*	*KMO*	*Cronbach's alpha*
Leadership	Leadership (L)	L1 - Leaders create clear vision and quality values	.707	.500	3.963	56.61	.850	.871
		L2 - Leaders consider employee's needs	.625	.390				
		L3 - Leaders consider supplier's needs	.637	.405				
		L4 - Leaders consider customer's needs	.849	.721				
		L5 - Leaders provide freedom to employees to work	.750	.562				
		L6 - Leaders provide required resources and training to employees	.821	.673				
		L7 - Leaders encourage and recognize employee's contributions	.843	.710				
Customer focus	Customer focus (CF)	CF1 - Researching customer's needs and feedback on products/ services provided	.778	.605	2.902	58.03	.791	.816
		CF2 - Linking customer's needs and feedback to design, production and delivery processes	.738	.545				
		CF3 - Receiving and responding to customer's needs and feedback on products/ services provided quickly	.751	.564				
		CF4 - Managing customer relationships systematically	.737	.543				
		CF5 - Measuring customer's satisfaction	.803	.644				
Employee involvement	Employee involvement (E)	E1 - Employees understand the importance of their contribution and role in the organization	.677	.458	3.526	58.77	.798	.859
		E2 - Employees identify constraints to their performance	.707	.500				
		E3 - Employees joint working teams/ groups to improve quality or solve problems	.803	.645				
		E4 - Employees openly discuss problems and issues during operations	.861	.741				
		E5 - Employees willingly share their knowledge and experience	.814	.662				
		E6 - Employees actively seek opportunities to enhance their competence, knowledge and experience	.721	.520				

Table 6.1 Results of reliability and validity of quality management factors (independent variables) (cont.)

Criteria	*Constructs*	*Items*	*Factor loading*	*Commu -nity*	*Eigen-values*	*% Variance explained*	*KMO*	*Cronbach's alpha*
Information management	Information management (I)	I1 - Comprehensive set of performance indicators developed	.779	.606	4.375	62.51	.918	.896
		I2 - Data and information being sufficiently accurate and reliable	.731	.534				
		I3 - Data being accessible to those who need it	.646	.417				
		I4 - Analysis of data and information using appropriate and scientific methods	.862	.743				
		I5 - Decision making and action taking based on factual analysis	.823	.677				
		I6 - Database maintenance	.790	.624				
		I7 - Information sources and their uses within the organization continuously refined	.880	.774				
Process management	Process management (P)	P1 - Establishing clear responsibility and accountability for managing key activities	.805	.648	3.314	66.29	.828	.872
		P2 - Controlling the quality and operational performance of key processes	.842	.708				
		P3 - Strictly analyzing significant variations in process and output to make corrections	.800	.641				
		P4 - Measuring the capability of key activities	.846	.715				
		P5 - Focusing on resources, methods and materials that will improve key activities	.776	.602				
Continuous improvement	Continuous improvement (CI)	CI1 - Establishing goals for continuous improvement and measuring the improvement results	.875	.765	3.124	78.10	.843	.905
		CI2 - Training employees with the methods and tools for continuous improvement	.893	.797				
		CI3 - Implementing continuous improvements of products/services, processes, and systems	.889	.790				
		CI4 - Recognizing and informing of improvements	.878	.772				
Supplier relationship	Supplier relationship (S)	S1 - Emphasizing on identifying and selecting key suppliers	.777	.604	3.432	68.64	.819	.882
		S2 - Establishing supplier relationships with long-term considerations	.866	.749				
		S3 - Clearly and openly communicating with suppliers	.862	.743				
		S4 - Sharing information and future plans with suppliers	.790	.625				
		S5 - Establishing joint development and improvement activities with suppliers	.843	.710				

Table 6.2 Results of reliability and validity of organizational performance factors (dependent variables)

Constructs	***Items***	***Factor loading***	***Commu-nity***	***Eigen-values***	***% Variance explained***	***KMO***	***Cronbach's alpha***
Market and profitability (OP1)	P11 - Revenue and profits	.794	.630	3.236	64.73	.832	.863
	P12 - Sales	.820	.673				
	P13 - Market share	.835	.698				
	P14 - New market/ new customers	.768	.589				
	P15 - Competitive advantages	.804	.646				
Customer satisfactions (OP2)	P16 - Long-term relationship with customers	.839	.704	1.949	64.96	.631	.704
	P17 - Customer satisfaction	.868	.753				
	P18 - Customer compliance	.701	.491				
Order time (OP3)	P7 - Order time of customers	.955	.911	1.823	91.13	.510	.903
	P8 - Order time to suppliers	.955	.911				
Employee satisfactions (OP4)	P19 - Employee's income	.823	.678	2.262	75.39	.705	.837
	P20 - Employee's job satisfaction	.894	.799				
	P21 - Involvement of employees in organization	.886	.785				
Process efficiency (OP5)	P2 - Complexity and wordiness of internal process	.585	.342	2.427	60.67	.707	.758
	P3 - Defectives/ defects	.806	.650				
	P4 - Waste	.903	.815				
	P5 - Operating costs per unit	.787	.620				
Process effectiveness (OP6)	P1 - Product/service quality	.758	.574	2.194	73.12	.631	.814
	P9 - Productivity	.877	.769				
	P10 - Capacity	.923	.851				

Construct validity. A measure has construct validity if it measures the theoretical construct that it was designed to measure. The construct validity of each construct was evaluated by using Principal Components Factor Analysis. In this QMS model, the items assigned to each of the seven quality management criteria were submitted to principal components factor analysis to determine the number of factors and factor loadings extracted by Kaiser Criterion (with eigenvalue greater than one). Table 6.1 shows that each of the constructs has high unifactorial loadings. In the case of sample size about 150 needed for significance, the items that had a factor loading more than .45 were accepted (Hair *et al.*, 1998). All items here had factor loadings ranging between .625 (L2) and .889 (CI3), so they were acceptable. The eigenvalue generated by within-scale factor analysis were also examined. All constructs have an eigenvalue greater than one.

KMO is one of measures to quantify the degree of intercorrelation among the variables and the appropriateness of factor analysis. The KMO measure was used to assess the suitability of the sample for each unifactorial. A small value of KMO means each variable cannot be predicted/ explained by the other variables without significant error; hence factor analysis may not be appropriate. KMO values (Table 6.1) ranged between .791 (CF) and .918 (I) were considered acceptable. All constructs in each unifactorial test accounted for more than 56 percent of variance of the respective variable sets. This suggests that only a small amount of the total variance for each group of variables is associated with causes other than the construct itself.

Criterion validity. This is also known as predictive validity or external validity. It is concerned with the extent to which the model is related to dependent measures of organizational performance. The criterion related validity of the model was determined by examining the Multiple R coefficient computed for the seven measures of QMS and the five measures of organizational performance. The Multiple R coefficients ranged from .409 (model 3) to .609 (model 4). These are presented in Table 6.5. This indicates that the seven measures of QMS have a reasonably high degree of criterion validity when taken together.

6.1.2 Dependent variables – Organizational performance

Organizational performance is characterized by twenty-one dependent variables that were identified in researches conducted by Prabhu, *et al.* (2000), Terziovski and Samson (2000). These dependent variables are the basis to demonstrate the impact of QMS practices on organizational performance.

Similar to the independent variables, a phase of data reduction through factor analysis was necessary. The correlations between dependent variables are shown in Appendix 5.2. By principal component analysis, the organizational performance variables were reduced in six measures (factors). Only one item (P6 – inventory control) was eliminated in the factor analysis to improve the reliability of the instrument. Out of twenty items, six factors were extracted:

- *Market and profitability (OP1):* This factor covers revenue and profits (P11), sales (P12), market share (P13), new market/ new customers (P14), and competitive advantage (P15).
- *Customer satisfaction (OP2):* This factor covers long-term relationship with customers (P16), customer satisfaction (P17), and customer complaints (P18).
- *Order time (OP3):* This factor covers the order time of customers (P7) and the order time to suppliers (P8).
- *Employee satisfaction (OP4):* This factor covers employee's income (P19), employee's job satisfaction (P20), and involvement of employees in the organization (P21).
- *Process efficiency (OP5):* This factor covers the complexity of the internal process and procedures (P2), defectives/defects (P3), waste (P4) and operating costs per unit (P5).
- *Process effectiveness (OP6):* This factor covers products/ services quality (P1), productivity (P9), and capacity (P10).

Six organizational performance factors were thus identified. The reliability and validity of these factors were acceptable as shown in Table 6.2. The Cronbach's alpha coefficients of these factors ranged between .704 (QP2) and .903 (QP3). All factor loadings were greater than .58, so they confirm that each of the performance factors consist of a meaningful set of items. All eigenvalues of the factors were greater than one, and KMO values are greater than .50.Thus, six factors will be referred to as the factors in subsequent analysis.

6.2 THE RELATIONSHIP BETWEEN QMS DIMENSIONS AND ORGANIZATIONAL PERFORMANCE

Studying the relationships between the quality management activities and organizational performance will help the managers understand QMS development better. Managers can build appropriate solutions for QMS to improve their organizational performance. Multiple regression provides a means of objectively assessing the degree and character of the relationship between the dependent and independent variables (Hair *et al.,* 1995). Based on multiple regression models, the impact of QMS on organizational performance will be identified.

Before building multiple regression models, the study provides the correlation matrices among the seven criteria of QMS (independent variables), and between the factors of organizational performance (dependent variables) and the seven criteria of QMS (independent variables). The bivariate correlation of the seven independent variables is shown in Table 6.3. All the correlations between the seven independent variables and the six dependent variables are displayed in Table 6.4. Examination of the correlation matrix indicates that all the seven criteria of QMS are closely correlated with the five factors of organizational performance. Only one factor of organizational performance (QP3 – Order time) does not correlate with the seven criteria of QMS. Thus, the five multiple regression models are built (Appendix 5.3) and their synthetic results are shown in table 6.5.

In chapter 3, proposition 1 stated that there was a correlation between the seven criteria of QMS and the organizational performance. If proposition 1 is true, each of the measures of the organizational performance should be correlated to the seven criteria of QMS. The five measures of the organizational performance are each used as dependent variables in the regression model and the seven criteria of QMS are used as the independent variables. Proposition 1 has continued to develop into the five following sub-propositions.

- *Proposition 1-1*: There was correlation between the seven criteria of QMS and market and profitability.
- *Proposition 1-2*: There was correlation between the seven criteria of QMS and customer satisfaction.
- *Proposition 1-3*: There was correlation between the seven criteria of QMS and employee satisfaction.

- *Proposition 1-4*: There was correlation between the seven criteria of QMS and process efficiency.
- *Proposition 1-5*: There was correlation between the seven criteria of QMS and process effectiveness.

The five models (QP1, QP2, QP4, QP5 and QP6) to test the five sub-propositions above are statistically significant at less than 1 percent, and the regression coefficients (beta coefficients) of the significant factors are positive (Table 6.5). Since five measures of the organizational performance are found to have significant correlation with the criteria of QMS, proposition 1 is supported.

In model QP1 with *'market and profitability'* as the dependent variable, process management (P) is significant at $p < .05$; employee involvement (E) and leadership (L) are significant at $p < .10$. Three out of seven QMS criteria have regression correlations with market and profitability. This partially supported proposition 1-1. This implies that the improvement in *process management, leadership, and employee involvement* will result in better market and profitability of the organizations. The largest impact on market and profitability is process management (beta coefficient = .219), the next is leadership (.192) and the last is employee involvement (.185).

In model QP2 with *'customer satisfaction'* as the dependent variable, process management (P) is significant at $p < .01$, and supplier relationship (S) is significant at $p < .05$. Two out of the seven QMS criteria have regression correlations with customer satisfaction. This partially supported proposition 1-2. Hence, effective process management and supplier relationship will result in increased customer satisfaction. Process management made the highest influence on customer satisfaction (beta coefficient = .382), followed by supplier relationships (.230).

In model QP4 with *'employee satisfaction'* as the dependent variable, two factors are statistically significant at $p < .01$, namely, leadership (L) and process management (P). Proposition 1-3 was partially supported. When the activities of leadership and process management are emphasized, employee satisfaction increases. Leadership (beta coefficient = .432) has a higher impact on employee involvement than process management (.305).

In model QP5 with '*process efficiency*' as the dependent variable, three factors are significant at $p < .05$. These are leadership (L), process management (P) and information management. Proposition 1-4 was partially supported. This suggests that if organizations want to improve their process efficiency, they need to focus on leadership, improving process management, as well as information management. Process management had the highest influence on process efficiency (beta coefficient = .319), followed by leadership (.273) and information management (.264).

In model QP6 with '*process effectiveness*' as the dependent variable, leadership (L) is significant at $p < .01$; continuous improvement (CI) is significant at $p < .05$; and information management (I) is significant at $p < .10$. Proposition 1-5 was also supported partially. This implies that as leadership, information management, and continuous improvement are emphasized, process effectiveness improves. Leadership impacting on process effectiveness (beta coefficient = .286) is higher than continuous improvement (.235) and process management (.234).

Table 6.3 Correlation matrix of independent variable constructs

	L	CF	E	I	P	CI	S
Leadership (L)	1.000						
Customer focus (CF)	.580**	1.000					
Employee involvement (E)	.543**	.505**	1.000				
Information management (I)	.498**	.492**	.565**	1.000			
Process management (P)	.635**	.632**	.553**	.714**	1.000		
Continuous improvement (CI)	.518**	.458**	.521**	.630**	.679**	1.000	
Supplier relationship (S)	.523**	.529**	.502**	.462**	.546**	.435**	1.000

***: Pearson Correlation is significant at the .01 level (2-tailed)*

Table 6.4 Correlation matrix of independent and dependent variable constructs

	Market and profitability (QP1)	Customer satisfaction (QP2)	Order time (QP3)	Employee satisfaction (QP4)	Process efficiency (QP5)	Process effectiveness (QP6)
Leadership (L)	.468**	.432**	-.064	.648**	.407**	.593**
Customer focus (CF)	.373**	.395**	.012	.486**	.269**	.492**
Employee involvement (E)	.373**	.396**	.048	.419**	.276**	.435**
Information management (I)	.416**	.424**	-.004	.483**	.222**	.507**
Process management (P)	.426**	.513**	-.056	.571**	.384**	.569**
Continuous improvement (CI)	.332**	.298**	-.092	.493**	.319**	.547**
Supplier relationship (S)	.341**	.427**	.083	.376**	.304**	.467**

***: Pearson Correlation is significant at the .01 level (2-tailed)*

Table 6.5 Multiple regression analysis of QMS on organizational performance factors

QMS factors (Independent variables)	Organizational performance factors (dependent variables)									
	Market and profitability (Model QP1)		Customer satisfaction (Model QP2)		Employee satisfaction (Model QP4)		Process efficiency (Model QP5)		Process effectiveness (Model QP6)	
	Beta	*p-value*	*Beta*	*p-value*	*Beta*	*p-value*	*Beta*	*p-value*	*Beta*	*p-value*
Leadership (L)	***.192***	***.090***	.092	.379	***.432***	***.000***	***.273***	***.012***	***.286***	***.003***
Customer focus (CF)	.017	.878	-.013	.899	.043	.643	.011	.925	.114	.235
Employee involvement (E)	***.185***	***.073***	.141	.154	.074	.397	-.115	.353	.094	.317
Information management (I)	.124	.313	.071	.528	.106	.288	***.264***	***.028***	.102	.354
Process management (P)	***.219***	***.049***	***.382***	***.000***	***.305***	***.001***	***.319***	***.011***	***.234***	***.029***
Continuous improvement (CI)	-.076	.502	-.151	.145	.094	.315	.167	.263	***.235***	***.016***
Supplier relationship (S)	.002	.982	***.230***	***.015***	-.052	.557	.126	.259	.122	.178
Multiple R	.503		.540		.669		.409		.640	
R square	.253		.292		.448		.167		.410	
F ratio	12.406		23.487		45.814		6.291		25.714	
p-value of F ratio	***.000***		***.000***		***.000***		***.001***		***.000***	

Note: *p-value in the table is the significant levels of the t-tests for the independent variables. Beta coefficient shows the relative importance of individual independent variables. All independent variables that are significant at the .10 level appear in bold and italics.*

6.3 DISCUSSION AND IMPLICATION

The results of the five regression models show that there is enough statistical evidence to demonstrate important relationships between QMS and organizational performance. Organizations who implement the activities of QMS will positively increase their performance.

From interviews with the managers of some organizations, the relationships can be understood better.

In model QP1, there are three regression relationships with *market and profitability*, namely, leadership, employee involvement, and process management. The relationship between market and profitability with *leadership* is explained that when top management builds clear visions and quality strategies, they gain opportunities in occupying and expanding market. The profitability of the organization then increases. Market and profitability from *employee involvement* indicate that the employee is a core factor to create added value for customers. Moreover, when the employees have motivation and satisfaction, they become active in performance and improve operational processes. This matches customer expectations. Market and profitability also positively correlates with *process management*. When organizations have good logistics, appropriate operations, and control the quality in process and output, the cost from waste and defects/defective items are considerably reduced. In other words, the organization can increase profit by focusing on process management.

In model QP2, there are two regression relationships with *customer satisfaction*, namely, process management and supplier relationship. Customer satisfaction relating to *process management* is said that when customer complaints are sent to related processes, the employees of these processes strictly identify and analyze the problems making those complaints, and they then correct and verify the results. Customers then believe their complaints are of concerned to the organization, and the products/ services of the organizations are improved to satisfy customers. The relationship between customer satisfaction and *supplier relationship* is more difficult to interpret. Some managers were asked about this matter. One possible explanation may be that the customer of the organization is also the supplier of this organization, that is, the customer supplies

materials to the organization for producing products based on the requirements of that customer. This situation often applies in the garment industry. This establishes the close relationship between the company, customer and supplier.

There are two regression relationships with *employee involvement* in model QP4. These are leadership and process management. In fact, *leadership* of the managers impact on the effort of the employees. When the management emphasizes positive leadership, the employees feel secure about their jobs, and they trust their leaders. They become actively involved in working and contributing their efforts for the organization. *Process management* can improve employee involvement. When the employees have a thorough understanding of the processes, they quickly find out the main causes, and provide effective solutions to solve problems better. From the initiative in solving problems, the employees become more interested and satisfied with their work. A process with high quality brings not only customer satisfactions, but also employee satisfaction.

Three relationships with *process efficiency* are shown in model QP5, including leadership, information management, and process management. The explanation for the relationship between process efficiency and *leadership* may be that leaders are concerned with the reduction of waste, and defects/defective items in operation, so they provide direction to prevent such problems. They can also support a variety of training to improve the employees' capability to produce higher quality products/ services. Process efficiency also relates to *information management*. This can be explained by the fact that the activities of information management, such as data maintenance system, accurate and reliability information, and the use of data analysis methods, are necessary activities to provide timely information for operational processes. This increases the efficiency of processes and achieving objectives. When a process becomes efficient, its cost is reduced. This can create more competitiveness for the organization. The relationship of *process management* to efficiency can be easily interpreted because the objective of process management is to improve efficiency and effectiveness.

In model QP6, the three significant relationships with *process effectiveness* are leadership, process management, and continuous improvement. The relationships of *leadership* and *process management* with process effectiveness can be explained similarly to the relationship with the process efficiency in model QP5. One possible explanation for the

relationship between process effectiveness and *continuous improvement* is that the results such as the reduction of the waste, and defects/defective items and the increase in capacity are based on continuous improvement. Moreover, training employees about improvement tools motivates the employees to be more effective.

From the five models, it is clear that the *process management* factor of QMS impacts on all five indicators of organizational performance. The next factor, *leadership*, relates to four factors of performance. The remaining factors of QMS, except the *customer focus*, only affect one specific factor of organizational performance. This implies that when the activities of process management and leadership are implemented well, the organization can improve most indicators of organizational performance. If the organizations want to focus on market and profitability, they need to increase the activities of employee involvement. If the organizations want to improve customer satisfaction, they need concentrate on supplier relationships. If the organizations want to improve process efficiency, they need to implement information management, leadership and process management. If the organizations want to increase process effectiveness, they need to emphasize continuous improvement.

It is surprising that the *customer focus* factor is not in a statistically significant relationship with all five indicators of organizational performance, it is an unexpected result of this study. Thus, it can be said that organizations with good customer focus aiming at reaching better customer satisfaction are not necessary excellent. However, I am inclined towards a proposition that the *customer focus* factor is not a direct variable which impacts on organizational performance, that means, it exists as an intermediate variable between the *customer focus* factor and organizational performance. The identification of the intermediate variable and test of this proposition suggest further research beyond the scope and objective of this study.

Although correlated, none of these QMS criteria are strongly correlated with the indicators of organizational performances. According to Miller (1991), a strong correlation should be more than .60. In Table 6.4, the correlation coefficients range from .222 to .648. Such correlation coefficients can only be interpreted as a moderate correlation, except for the one correlation above .60. In this finding, each of the criteria of QMS can only explain moderate increases in performance.

However, the multi-regression analysis in Table 6.5 reveals that two models (model QP4 and QP6) show strong correlations between the performance indicators and the criteria of QMS (R = .669 and .640 respectively; R^2 = .448 and .410 respectively). In particular, in model QP4 the independent variables 'leadership' and 'process management' can explain 44.8% of the variances of the dependent variable 'employee satisfaction'. In model QP6 the independent variables 'leadership', 'process management' and 'continuous improvement' can explain 41.0% of the variances of the dependent variable 'process effectiveness'. On the other hand, the criteria of QMS contribute to the organizational performances collectively, instead of individually. This finding supports the argument that a QMS must include all QMS criteria and perhaps also company-wide.

Three remaining models (model QP1, QP2, and QP5) show moderate correlations between the performance indicators and the criteria of QMS. Although the independent variables only explaining from 16.7% to 29.2% of the variances of dependent variables (Table 6.5). The previous variables also contribute to the later variables collectively better than individually.

In short, the five sub-propositions of proposition 1 are supported based on statistical tests. The six criteria of QMS have significant relationships with organizational performance. In other words, if the quality management activities are done well, it positively relates to both internal (such as employee satisfaction, process efficiency, and process effectiveness) and external performance (such as market and profitability, and customer satisfaction). Moreover, leadership and process management are the most important factors influencing organizational performance.

The managerial implications for both organizations with and without QMS certification are that good organizational performance can be gained by the improvement of the QMS criteria. Better performance requires implementing all QMS criteria simultaneously. In which, leadership and process management are the most important factors that need to be emphasized in the process of implementation of QMS.

CHAPTER 7

IT APPLICATION AND THEIR IMPACTS ON QMS DIMENSIONS

7.1 IT APPLICATION IN VIETNAMESE ORGANIZATIONS

In the survey, all organizations use computers in their activities. However, there is difference level of usage of IT in the organizations, such as the level of computerization, management information system (MIS) staff, and IT application in business activities.

7.1.1 Level of Computerization

For levels, this study includes PC (personal computer in desktop type), notebook, server, and mainframe. Table 7.1 illustrates the amount of PCs and notebooks used in the organizations surveyed.

There are no organizations without PCs. In the total sample, 41% of the organizations used PCs ranging from 1 to 20 units, 30% have from 21 to 50 units, and 17% have from 51 to 100 units. Only 11% of the organizations had more than 100 units. Comparing the usage of PCs between the organizations with and without QMS certification, 60% of the organizations without QMS certification have from 1 to 20 units of PCs. Only 29% of organizations with QMS certification are at this level. 30% of both organizations use from 21 to 50 units. Only a few organizations without QMS certification have from 51 to 100 (6%) and from 101 to 500 (0%). The organizations with QMS certification have 24% (51-100 units) and 15% (101-500 units).

In the total sample, 36% of the organizations have not used notebooks (Table 7.1). A large proportion of the organizations (58%) use 1 – 20 notebooks. Comparing the usage of notebooks between the organizations, QMS certified organizations use more notebooks. There is no organization without QMS certification using more than 20 notebooks, while 10% of the organizations with QMS certification have more than 20 notebooks.

QMS certification relates to greater PC and notebook use. This can be explained by the fact that the size of the QMS organizations is larger than those without QMS certification. QMS companies have invested more in the application of information technology to support their activities.

Table 7.1 Organizations using PCs and Notebooks (%)

	PCs			Notebooks		
Number of computers	With QMS certification	Without QMS certification	Total sample	With QMS certification	Without QMS certification	Total sample
0	0%	0%	0%	30%	44%	36%
1-20	29%	60%	41%	60%	56%	58%
21-50	30%	30%	30%	8%	0%	5%
51-100	24%	6%	17%	1%	0%	1%
101-500	15%	0%	9%	0%	0%	0%
> 500	2%	4%	3%	1%	0%	1%
Total	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
N (Samples)	*87*	*53*	*140*	*87*	*59*	*146*

Many organizations have servers to link computers. In general, the number of servers is rather small, mostly from 1 to 20 units (Table 7.2). There is no difference between the two kinds of organizations about the level of servers. Few organizations use mainframe. In fact, only three organizations have mainframes.

Table 7.2 Organizations using server (%)

Number of servers	With QMS certification	Without QMS certification	Total sample
0	20%	18%	19%
1-20	78%	82%	79%
21-50	1%	0%	1%
51-100	0%	0%	0%
101-500	1%	0%	1%
> 500	0%	0%	0%
Total	*100%*	*100%*	*100%*
N (Samples)	*87*	*49*	*136*

This study shows that the average number of computers per organization is 54. Four organizations have more than 500 computers. The average ratio of computers per employee in the total sample is .10. The average ratio of computers per employee in the organizations with QMS certification (.12) is double than non-QMS certification organizations (Table 7.3). QMS organizations used more computers in their business.

Table 7.3 The average ratio of computers per employee

	With QMS certification	Without QMS certification	Total sample
Average ratio (computers/employee)	.12	.06	.10

When comparing the average ratio of computers per employee in Vietnamese organizations (Table 7.3) with the average ratio of computers per person of other countries (Appendix 1.4), it is recognized that the ratio of computer usage of Vietnam is still much lower than countries in Europe and Canada &US in 2001 by about 2 – 6 times. When comparing with some countries in Asia, the rate of computer usage of Vietnam is higher. However, the survey in Vietnam was conducted in year 2004, while surveys in other countries were conducted in 2001. Therefore, the accuracy of the comparison remains open to conjecture. Moreover, the survey in Vietnam focused on computer usage of employees in business organizations, while other countries were surveyed based on computer usage of population in the whole country. Thus, it may be said that the rate of computer usage of Vietnamese employees is lower than of several other Asian countries.

7.1.2 MIS Staff

The operation of computer system in the organizations requires staff specializing in management information system. In general, the organizations employ few MIS staff (Table 7.4), about 1-5 persons (56% of total sample). Approximately 10% of the total organizations have 6-10 MIS staff, and only 5% have over 10 MIS employees. The average MIS staff per organization is 4.55. However, 28% of the organizations don’t have any MIS staff. Instead of employing MIS staff for the whole organization, they assign the responsibilities of computer management to departments or individuals using computers. Table 7.4 also shows some differences concerning the number of MIS staff between the organizations with and without QMS certification. 48% of non-QMS organizations don’t

employ any MIS staff compared to 16% of the QMS organizations. The average MIS staff per organization of the certified organizations (5.74 persons/organization) is twice as much as the non-certified organizations (2.56 persons/organization). The number of MIS staff related to QMS certification is higher because of the higher number of computers used in these organizations.

Table 7.4 MIS staff employed in the organizations (%)

Number of employees	With QMS certification	Without QMS certification	Total sample
0	16%	48%	28%
1-5	64%	42%	56%
6-10	11%	8%	10%
11-25	7%	0%	4%
>25	1%	2%	1%
N (Samples)	*87*	*52*	*139*
Average (Persons/organization)	*5.74*	*2.56*	*4.55*

7.1.3 Computer Applications in Business Activities

In this study, computer applications in business activities include office automation, manufacturing, and communication activities. All organizations use computers for word processing and spreadsheet (Table 7.5). Many organizations (86% of the sample) also use computers for data management. The other computer application in office activities is graphics. There is a statistically significant difference in the graphics usage between the two kinds of organizations. The graphics usage related to QMS certified organizations is more significant.

In an empirical study of Sohal *et al.* (2001) about IT success in Australia's top 500 businesses, IT application in office automations were popular, especially in accounting/finance and human resources (100% of organizations). Vietnamese organizations also used a lot of IT application in office automation but they focused on daily activities like document compiling rather than management of accounting/finance and human resources as Australian organizations did. When referring to software tools used by America's information system practitioners, Lee *et al.* (2002) have ranged office

automation activities in descending order as (1) word processing, (2) graphics, (3) spreadsheet, and (4) data management. While Vietnamese organizations emphasized on word processing and spreadsheets rather than graphics like the American organizations.

Table 7.5 Computer applications in office automation activities (%)

Type	With QMS certification	Without QMS certification	Total sample
Word processing	100%	100%	100%
Spreadsheet	100%	100%	100%
Data management	89%	82%	86%
Graphics*	62%	41%	54%

** Significant difference between 2 groups at .05 level (2-tailed)*

Compared to computer applications in office automation activities, fewer organizations applied computers in manufacturing activities (Table 7.6). A large proportion of the organizations (37% in total sample) use Program Logic Control (PLC) in their manufacturing activities, the next applications are computer aided design (CAD), occupying 25% of the sample. The Chi-square test shows significant differences between QMS certification and non-QMS certification about computer applications in manufacturing. The organizations with QMS certification have significantly applied more PLC, CAD, and CAM in manufacturing (Table 7.6).

Table 7.6 Computer applications in manufacturing activities (%)

Type	QMS certification	Non-QMS certification	Total sample
PLC**	46%	24%	37%
CAD**	33%	13%	25%
CNC	21%	13%	18%
CAM*	19%	6%	14%
FMS	9%	4%	7%
CIM	7%	6%	7%
AIS	7%	9%	8%

** Significant difference between 2 groups at .05 level (2-tailed)*

*** Significant difference between 2 groups at .01 level (2-tailed)*

The percentage of Vietnamese organizations using IT application in manufacturing activities is much lower than in developed countries. Only about 39% of Vietnamese organizations applied CAD/CAM (Table 7.6), while 84% of Australian companies used CAD/CAM/CAE in manufacturing activities (Sohal *et al.*, 2001).

Most organizations have applied computers in communication activities. Three types of computer applications such as email (92%), Internet access (91%), and LAN (75%) are often used in organizations (Table 7.7). Other applications were also used such as intranet, website, stock control, invoicing, purchasing online, decision support, selling online, and extranet. The Chi-square test indicates that the rate of the organizations with QMS certification using computers for some applications such as intranet, website, stock control and decision support is greater than those without QMS certification. This is additional evidence of more computer applications in organizations with certification.

Table 7.7 Computer applications in communication activities (%)

Type	With QMS certification	Without QMS certification	Total sample
Email	93%	91%	92%
Internet access	91%	91%	91%
LAN	78%	69%	75%
Intranet*	67%	46%	59%
Website**	63%	33%	51%
Stock control **	48%	19%	37%
Invoicing	37%	25%	32%
Purchasing online	23%	19%	20%
Decision support **	20%	4%	14%
Selling online	18%	15%	17%
Extranet	12%	4%	9%

** Significant difference of frequency between 2 groups at .05 level (2-tailed)*
*** Significant difference of frequency between 2 groups at .01 level (2-tailed)*

The usage of Email and accessing the Internet were popular in Vietnamese organizations, but computer applications in other communication activities, for example, LAN (75%), intranet (59%), stock control (37%), and selling online (17%), are much lower than in the

developed countries, like Australia. In the survey of Sohal *et al.* (2001) in Australian organizations, 97% of organizations used IT in inventory logistics, 88% used LAN/intranet/Internet, and 86% applied IT in distribution /wholesaling.

For future plans in the next three years, Vietnamese organizations are concerned with various aspects of information technology (IT) applications. They will invest in both software and hardware for computer applications in office automation, manufacturing, and especially communication. Many organizations refer to the establishment of intranet and LAN for better performance. They are also considering training employees in using computers and the training of MIS staff to maintain the computer systems of the organizations.

However, there are some problems with IT application. Firstly, some managers are still vague about the effect of IT application because most computers are now used for word processing and spreadsheets. Several employees have used PCs for playing games rather than for working. Thus, they wonder whether IT investment will be a cost or a benefit. Secondly, some managers have no real awareness of IT application. In fact, they are only concerned with investing in the most expensive and powerful computers rather than how to use them more effectively. Thirdly, the management system of Vietnamese organizations is often limited and lacks overall perspective, so it is difficult to apply IT. Finally, the investment capital for IT is limited for the small- and medium- sized organizations. Some managers said that they could invest only by USD 12,000 in the IT application for the whole organization. However, a complete IT system can cost up to 50,000 USD. This investment is too high for most Vietnamese small- and medium- sized organizations.

In short, the Vietnamese organizations have applied IT in their business activities for the benefits that IT offers. In general, the organizations with QMS certification have invested more in MIS staff and IT application such as in office automation, manufacturing, and communication than the organizations without QMS certification. However, IT application in Vietnamese organizations still is far behind developed countries.

7.2 BENEFITS OF COMPUTER APPLICATIONS FOR EMPLOYEES

In Figure 7.1, 80% of the organizations said that the usage of computers helps employees increase their work efficiency and effectiveness (mean = 4.01). The next benefits are also evaluated highly such as easier and simpler jobs (3.98), increasing the work control of employees (mean =3.87), reducing complex and hard manpower (3.84). The remaining benefits such as increasing enjoyment in work and increasing morale are somewhat above an average level. Therefore, it can be said that most organizations recognize that computer applications support employees at work and create job satisfaction. There is no significant difference of the benefits of IT application for employees between the organizations with and without QMS certification (Appendix 6).

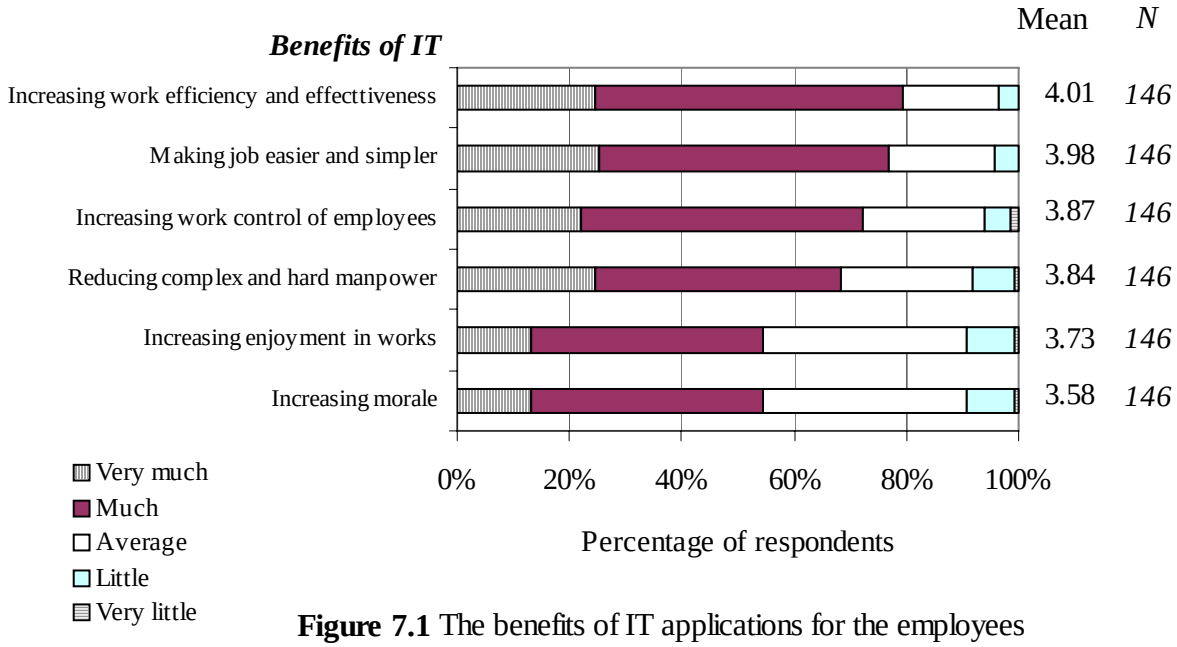


Figure 7.1 The benefits of IT applications for the employees

7.3 SUPPORT OF IT APPLICATION TO QMS DIMENSIONS IN THE ORGANIZATIONS WITH CERTIFICATION

The power of IT has been strongly emphasized in the literature, so whether IT impacts or not on QMS dimensions. It is warranted further analysis. This section demonstrates the evaluation of the organizations with certification on the impact of IT application to the seven criteria of QMS.

The five – point Likert scale was used in this study to show the evaluation of support levels of IT application to quality management activities. In which, "*1*" means *very little*, and point "*5*" indicates *very much* support.

7.3.1 Support of IT Application to Leadership

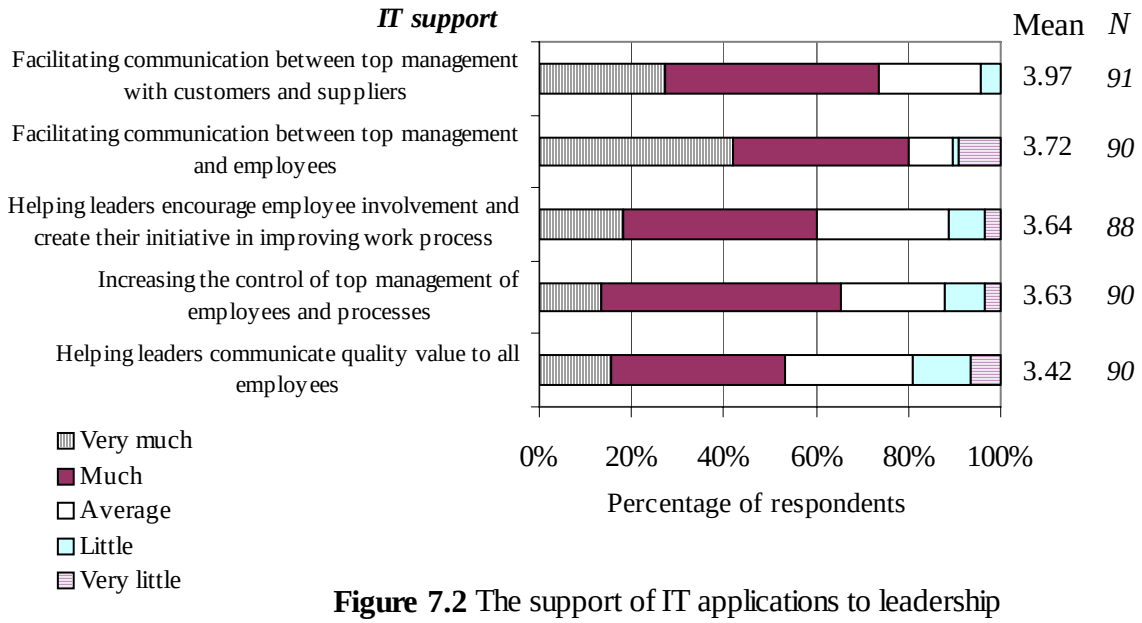


Figure 7.2 The support of IT applications to leadership

Figure 7.2 shows an evaluation of QMS organizations concerning the support of IT application to their leadership activities. It was recognized that these organizations have highly evaluated as '*facilitating communication between top management with customers and suppliers*' (mean = 3.97) and '*facilitating communication between top management and employees* (3.72). With a network system, management can quickly exchange information with customers and suppliers by email. Internet facilitates management of market information quickly and precisely, hence they can develop appropriate and timely strategies. They can save a lot of time in communicating with customers and suppliers, and increase the level of communication with a variety of customers and suppliers. However, the managers also said that face-to-face discussions with customers and suppliers are frequently used because it helps clearly understand the point of view of these partners, especially in negotiations. Through the intranet and LAN, information exchange between top management and employees has also become easier. The managers can inform employees by email rather than meetings, so they save considerable time. Moreover, they can clearly identify the information of employees based on management software. With top management often on business trips, the Internet is useful for remotely managing and controlling employees. For the organizations which have many agencies in different areas, intranet helps top management to control work effectively and solving problems quickly.

The next issues are '*helping leaders encourage employee involvement and create their initiative in improving work processes* and '*increasing the control of top management to employees and processes'*. These items are assessed lower than the two items above (mean = 3.64 and 3.63). The benefits of IT application for employees, and the investment of top management in IT really encourage the involvement of the employees in their work. The control of employees and processes require employees reporting their work weekly or monthly. However, several organizations have emphasized the control of output rather than processes, so they evaluate the process controls by network systems lower.

The last concern is '*helping leaders communicate quality value to all employees'*. This is evaluated at an above average level (mean = 3.42). Some managers said that their quality system has been communicated by documents. They often disseminate quality values in meetings and information by newsletters or bulletin boards. In their opinion, the quality values communicated by these forms were better than by intranet or LAN. The lowest level of the support of IT application is related to leadership communicating quality values.

7.3.2 Support of IT Application to Customer focus

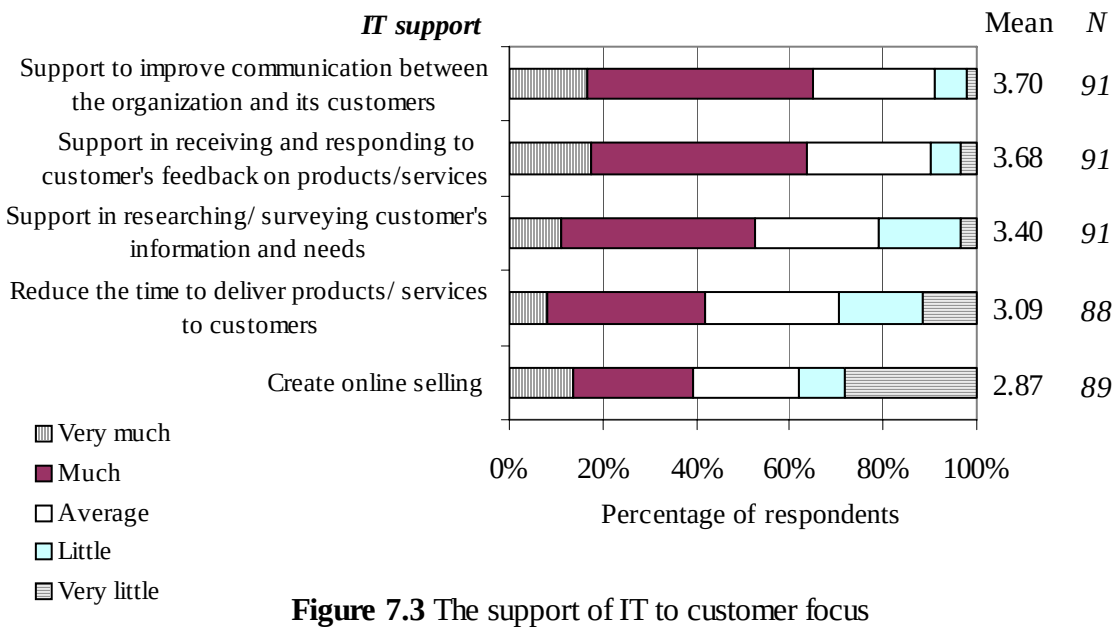


Figure 7.3 The support of IT to customer focus

Figure 7.3 shows the support of IT application to customer focus with the results in descending order. The highest evaluation of support is '*to improve communication between*

the organization and its customers' (mean = 3.70). In fact, many organizations established a website to introduce the company and advertise their products or services. This form of advertising provides more savings compared to other media such as television, newspapers, and sales force. For organizations which have overseas customers, the Internet becomes an important means for transactions. The next support is *'to receive and respond to customer's feedback on products/ services'* (mean = 3.68). According to some managers' statements, email helps them to receive and respond to customer's requirements and complaints quickly. However, other managers said that they prefer to use fax, telephone and face-to-face contact rather than email for receiving and meeting customer's requirements and complaints.

The support for researching/ surveying customer's information and needs is evaluated at mean = 3.40. Some organizations have used email for customer surveys, but many managers said that the response rate of customer survey by email is often lower than by mail, telephone, or face-to-face interview. The next support is *'reducing the time to deliver product/ service to customers'* which is average (3.09). *'Creating online selling'* is the last support. It is evaluated below average (2.87), because there is only a few organizations that implement selling online now. Thus, the organizations without online sales have assessed this support at a rather low rate.

7.3.3 Support of IT Application to Employee Involvement

The support of IT application to employee involvement is shown in Figure 7.4. Two IT application which evaluated highly were *'enabling employees to share task-related information'* (mean = 3.77) and *'making information available to employees for carrying out their responsibilities'* (mean = 3.60). In fact, data management is convenient for sharing information, hence it creates favorable conditions for employees to work.

The organizations have assessed the remaining supports lower, but still above average (3.52 – 3.34). These include *'facilitating to provide feedback to employees on quality performance', 'helping to recognize employee's contributions to quality improvement', facilitating to get suggestions from employees for quality improvement', 'facilitating teamwork to solve problems', and 'facilitating to form working teams or groups for quality*

improvement'. As mentioned in chapter 5, many employees did not emphasize team-work, so these two items were evaluated at the lowest rate.

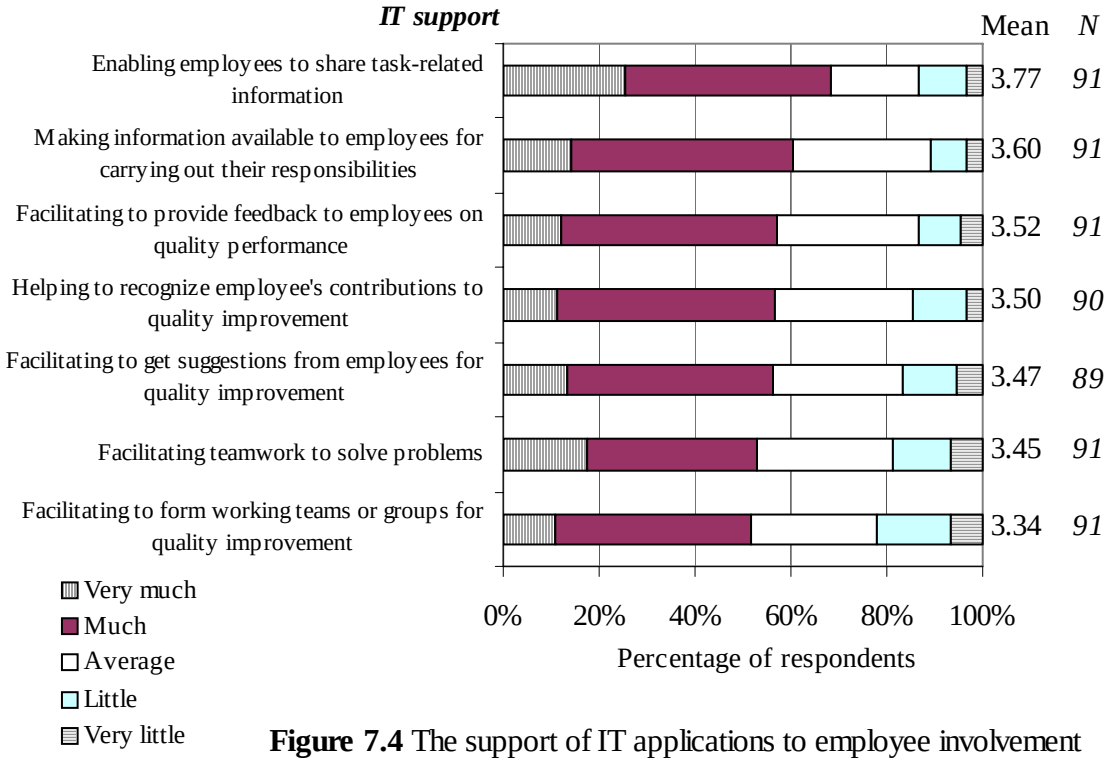


Figure 7.4 The support of IT applications to employee involvement

7.3.4 Support of IT Application to Information Management

The support of IT application to information management is shown in Figure 7.5. The first item assessed at the highest level is '*collecting data about work/ production processes*' (mean = 3.88). The following example can illustrate the reason for such evaluations. Some organizations had machines equipped with PLC (Program Logic Control) and were automatically linked to computers. The data collection of production processes became very easy and convenient. Thus, the operators could exactly know the parameters such as current capacity, number of finished products, defect rates, and which steps in the manufacturing process often stop. Such information was very important for overcoming problems in operation as well as improvement processes.

Other supports were evaluated at an above average level. These were '*providing information accuracy*', '*collecting data about employees, suppliers, and customers*', '*providing relevant information to meet employee's requirements*', and '*analyzing data*

and producing comprehensive information for the different levels of need' (mean = 3.55 – 3.25). The last support was rated lowest because many companies did not know the software or have a budget to purchase specialized software for analyzing data.

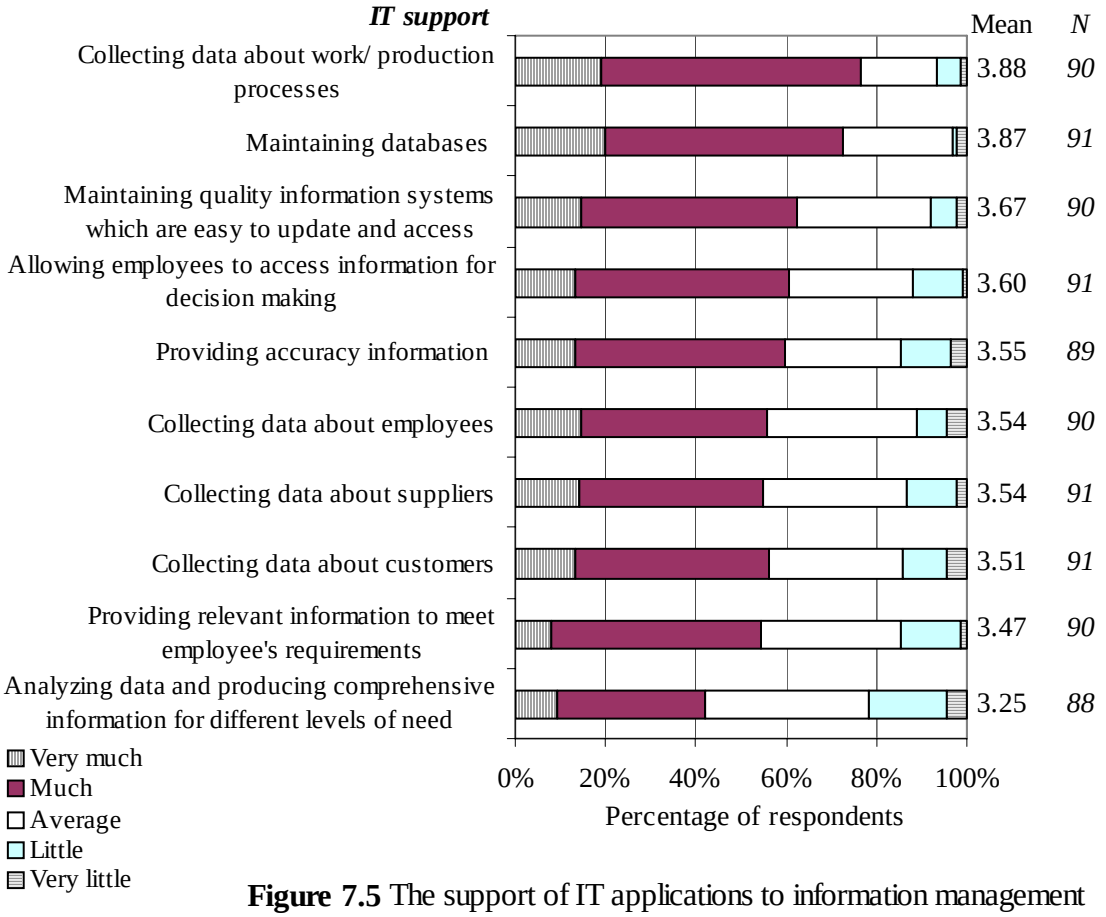


Figure 7.5 The support of IT applications to information management

7.3.5 Support of IT Application to Process Management

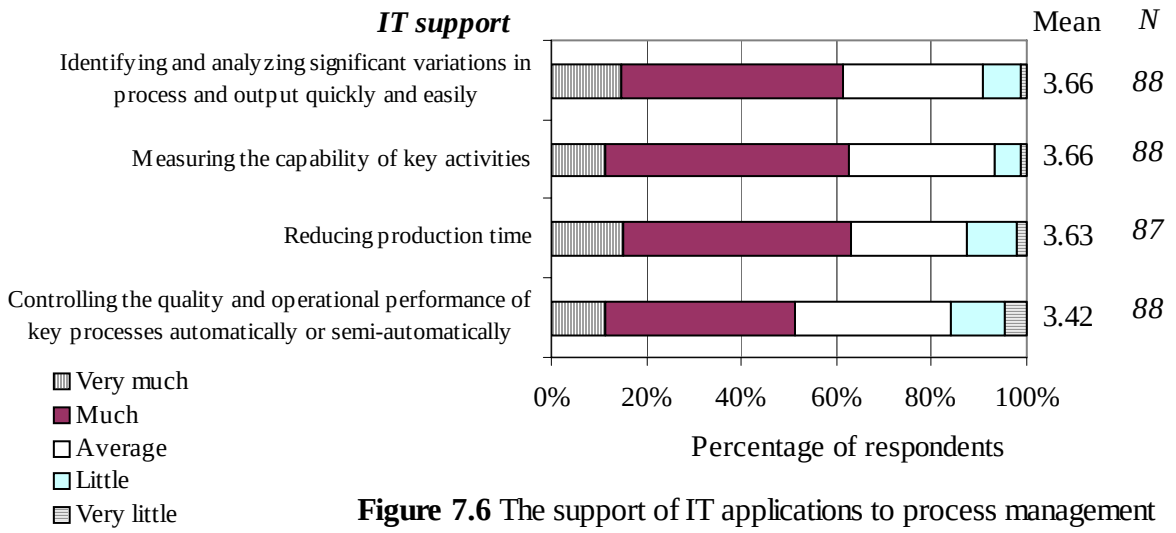


Figure 7.6 The support of IT applications to process management

Figure 7.6 shows the support of IT application to process management. Three items were evaluated highly. They were *'identifying and analyzing significant variations in process and output quickly and easily'*, *'measuring the capability of key activities'*, and *'reducing production time'* (mean = 3.66 – 3.63).

Due to the limitation of the budget to invest in specialized software and hardware, or/and software exploration, the support for '*automatic or semi-automatic control of the quality and operational performance of key processes*' was not evaluated highly.

7.3.6 Support of IT Application to Continuous Improvement

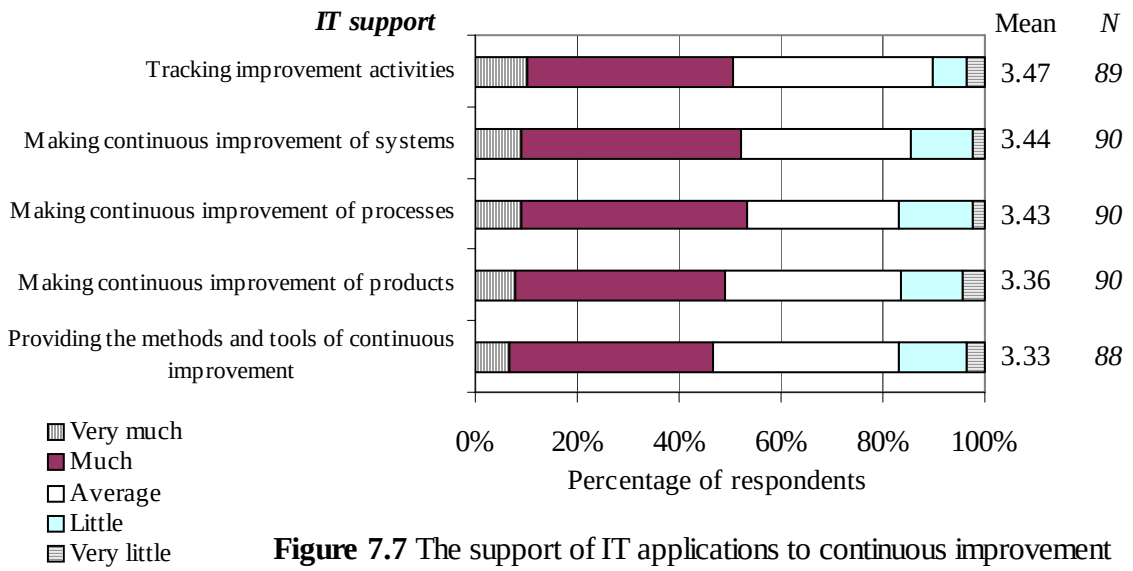


Figure 7.7 The support of IT applications to continuous improvement

Figure 7.7 indicates the support of IT application to continuous improvement. As mentioned in Chapter 5, the organizations said that they have not implemented the activities of continuous improvement well. Thus, the support of IT application to continuous improvement was evaluated lower than other supports. The highest mean value of 3.47 was for '*tracking improvement activities*'. The remaining supports ranged from 3.44 to 3.33. These were '*making continuous improvement of system, processes, and products*' and '*providing the methods and tools of continuous improvement*'.

7.3.7 Support of IT Application to Supplier Relationship

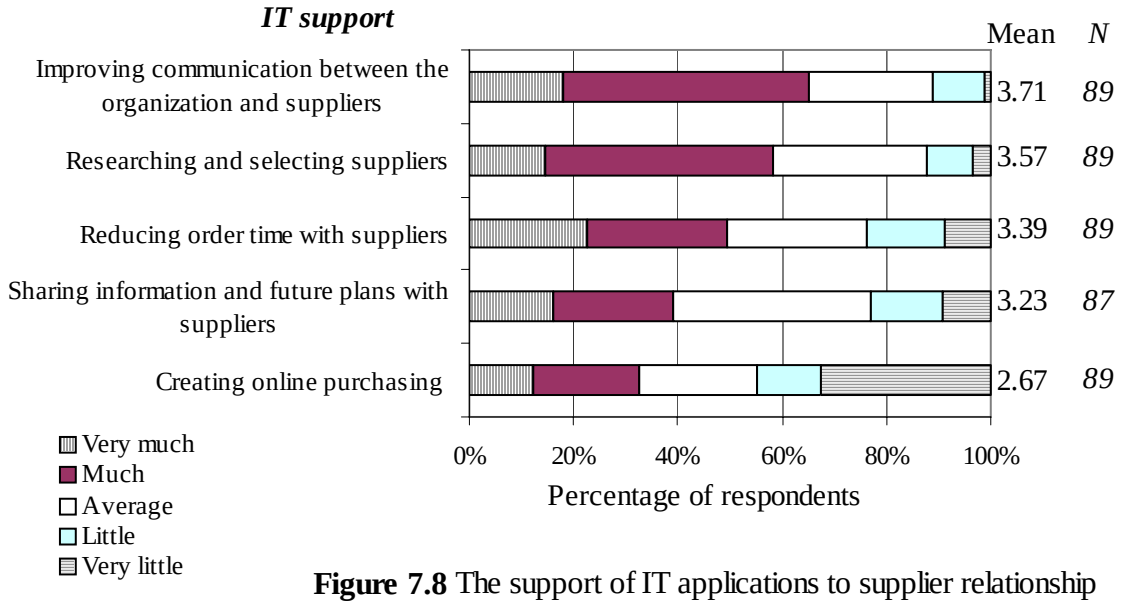


Figure 7.8 The support of IT applications to supplier relationship

The support of IT application to supplier relationship is described in Figure 7.8. Similar to the support of IT application in improving communication between the organization and the customers, '*improving communication between the organization and suppliers*' was assessed very high. Email helps the organization in communicating with the suppliers quickly and easily, especially overseas. Besides, IT application have also supported '*researching and selecting suppliers*', '*reducing order time with suppliers*', and '*sharing information and future plans with suppliers*' (mean = 3.57 – 3.23).

The support for *creating online purchasing* was evaluated very low similar to the support for *creating online selling* as related to customer focus (below average). In fact, many suppliers have not yet implemented online selling, so the organization could not indicate much support.

In short, the organizations with QMS certification have realized the impacts of IT application on the seven dimensions of QMS. These include support of IT application on leadership, customer focus, employee involvement, information management, process management, continuous improvement, and supplier relationship. Overall the support for leadership was evaluated the highest and the supports for continuous improvement were evaluated the lowest. The particular IT supports with high evaluations were:

- Facilitating communication between top management with customers and suppliers
- Facilitating communication between top management and employees
- Support to improve communication between the organization and customers
- Support to receive and respond customer's feedback on product/ service
- Enabling employees to share task-related information
- Collecting data about work/ production processes
- Maintaining database
- Improving communication between the organization and suppliers

The organizations with QMS certification have effectively explored IT application in some dimensions of QMS. As mentioned in chapter 6, the criteria of QMS contribute to the organizational performances collectively rather than individually. Thus, this finding comments that the organizations with QMS certification have to continue the exploration of IT application in the dimensions of QMS as well as company-wide.

7.4 A COMPARISON OF THE SUPPORT OF IT APPLICATION TO QMS DIMENSIONS BETWEEN THE ORGANIZATIONS WITH AND WITHOUT CERTIFICATION

As mentioned in chapter 4, revenues of the organizations with certification (group 1) are better than the organizations without it (group 2). Thus, it can be said that group 1 is better than group 2. Why is group 1 better than group 2? There are many reasons to answer this question. This study proposes QMS and IT application being the two main reasons to influence better performance. In chapter 5, the study already analyzed the critical dimensions of QMS that can positively impact on performance. In this section, the study continues to analyze IT application in both groups to explain why group 1 is better than group 2.

In particular, this section conducts a comparison of the impacts of IT application on seven QMS dimensions between the organizations with and without certification. It is expected that the results reflect the salient support of IT to QMS activities in the organizations with certification.

The t-test was used to assess the statistical significance of the difference between the certified and non-certified organizations concerning the evaluation of the support of IT application to the QMS dimensions.

7.4.1 A Comparison of the Support of IT Application to Leadership

Table 7.8 represents the significant difference in scores between two groups. Organizations with QMS certification have significantly higher IT impacts on facilitating communication with employees and encouraging employee involvement.

Table 7.8 Ratings of the support of IT application to leadership

Supports of IT application to leadership	QMS certification	N	Mean	Std. Deviation	p-value
Facilitating communication between top management with customers and suppliers	Yes	91	3.97	.82	.256
	No	55	3.78	1.13	
Facilitating communication between top management and employees	Yes	90	3.72	.95	.021**
	No	55	3.33	1.06	
Helping leaders encourage employee involvement and create their initiative in improving work process	Yes	88	3.64	.98	.029**
	No	54	3.26	.99	
Increasing the control of top management of employees and processes	Yes	90	3.63	.94	.240
	No	54	3.43	1.14	
Helping leaders communicate quality value to all employees	Yes	90	3.43	1.10	.150
	No	55	3.16	1.07	

*** Significant difference at .05 level (2-tailed)*

There are not statistically significant differences in other leadership related support. These are the impacts of IT on communication with customers and suppliers, communication of quality value to employees, and control of employees and processes. This finding suggests that there is no evidence to confirm which results of these three leadership activities in the organizations with QMS certification are supported by IT better.

7.4.2 A Comparison of the Support of IT Application to Customer Focus

Table 7.9 Ratings of the support of IT application to customer focus

Supports of IT application to customer focus	QMS certification	N	Mean	Std. Deviation	p-value
Support to improve communication between the organization and customers	Yes	91	3.70	.90	.080*
	No	55	3.40	1.16	
Support to receive and respond to customer's feedback on product/ service provided quickly	Yes	91	3.68	.95	.021**
	No	55	3.25	1.25	
Support to research/ survey customer's information and needs	Yes	91	3.40	1.01	.124
	No	55	3.11	1.20	
Reduce the time to deliver product/ service to customers	Yes	88	3.09	1.14	.105
	No	53	2.75	1.25	
Create online selling	Yes	89	2.87	1.42	.509
	No	53	2.70	1.50	

** Significant difference at .10 level (2-tailed)*
*** Significant difference at .05 level (2-tailed)*

The t-test indicates significant differences between the two groups about the support of IT application to customer focus (Table 7.9). For QMS certification, there are statistically significant higher ratings for support to receive and respond to customer's feedback on product/ service provided quickly. The support of communication between the organization and customers' is also significantly different between the two groups.

However, there are no statistically significant differences in other customer focus related support. This implies that the impacts of IT on the survey of customer's needs, products/services delivery, and online selling are similar between the two groups.

7.4.3 A Comparison of the Support of IT Application to Employee Involvement

Most support of IT application to employee involvement has significant differences between the two groups (Table 7.10). For QMS certification, there are significantly higher

impacts of IT application to share task-related information, provide feedback to employees, recognize employee's contributions, get suggestions from employees, and solve problems by teamwork.

Table 7.10 Ratings of the support of IT application to employee involvement

Support of IT application to employee involvement	QMS certification	N	Mean	Std. Deviation	p-value
Enabling employees to share task-related information	Yes	91	3.77	1.04	.010**
	No	54	3.30	1.08	
Making information available to employees for carrying out their responsibility	Yes	91	3.60	.94	.279
	No	55	3.42	1.10	
Facilitating to provide feedback to employees on quality performance	Yes	91	3.52	.97	.022**
	No	54	3.11	1.09	
Helping to recognize employee's contributions to quality improvement	Yes	90	3.50	.95	.029**
	No	54	3.11	1.14	
Facilitating to get suggestions from employees for quality improvement	Yes	89	3.47	1.05	.083*
	No	54	3.15	1.12	
Facilitating teamwork to solve problems	Yes	91	3.45	1.12	.042**
	No	54	3.06	1.12	
Facilitating to form working teams or groups for quality improvement	Yes	91	3.34	1.08	.036**
	No	55	2.95	1.11	

** Significant difference at .10 level (2-tailed)*
*** Significant difference at .05 level (2-tailed)*

7.4.4 A Comparison of the Support of IT Application to Information Management

As mentioned in chapter 5, the comparison of the practices of information management of the organizations with certification is better than the organizations without. Table 7.11 shows the higher scores of the support of IT application to information management in the organizations with certification. For QMS certification, however, only three out of ten items are significantly higher. These are IT impact to collect data about processes and

employees, and provide relevant information. Moreover, the data collection of customers and data analysis are also significantly different.

Table 7.11 Ratings of the support of IT application to information management

Support of IT application to information management	QMS certification	N	Mean	Std. Deviation	p-value
Collecting data about work/ production processes	Yes	90	3.88	.82	.000***
	No	52	3.12	1.25	
Maintaining databases (customer, supplier, employees, process...)	Yes	91	3.87	.82	.113
	No	53	3.62	1.00	
Maintaining quality information systems which are easy to update and access	Yes	90	3.67	.87	.199
	No	55	3.45	1.09	
Allowing employees to access information for decision making	Yes	91	3.60	.89	.441
	No	55	3.47	1.15	
Providing accuracy information	Yes	89	3.55	.98	.167
	No	55	3.31	1.07	
Collecting data about employees	Yes	90	3.54	.97	.000***
	No	54	2.93	1.06	
Collecting data about suppliers	Yes	91	3.54	.95	.127
	No	54	3.28	1.05	
Collecting data about customers	Yes	91	3.51	.99	.093*
	No	55	3.20	1.16	
Providing relevant information to meet employee's requirements	Yes	90	3.47	.86	.025**
	No	55	3.09	1.13	
Analyzing data and producing comprehensive information for the different levels of need	Yes	88	3.25	1.00	.089*
	No	55	2.95	1.10	

** Significant difference at .10 level (2-tailed)*
*** Significant difference at .05 level (2-tailed)*
**** Significant difference at .01 level (2-tailed)*

There are no significant differences in the five remaining IT supports. It can be said that these supports of IT application are similar between the two groups.

7.4.5 A Comparison of the Support of IT Application to Process Management

The t-test indicates significant differences between the two groups concerning the support of IT application to process management (Table 7.12). Organizations with QMS certification have significantly a higher IT impact on all activities of process management. This implies that the certified organizations are better than the non-certified organizations in utilizing computers to analyze variations in process, measure the capability, reduce production time, and control quality and performance. This explained why the practices of process management (mentioned in chapter 5) in the organizations with QMS certification are better than the organizations without.

Table 7.12 Ratings of the support of IT application to process management

Support of IT application to process management	QMS certification	N	Mean	Std. Deviation	p-value
Identifying and analyzing significant variations in process and output are quicker and easier	Yes	88	3.66	.87	.000***
	No	54	2.83	1.18	
Measuring the capability of key activities	Yes	88	3.66	.80	.000***
	No	53	2.77	1.09	
Reducing production time	Yes	87	3.63	.94	.004***
	No	52	3.10	1.22	
Controlling the quality and operational performance of key processes becomes automatic or semi-automatic	Yes	88	3.42	.99	.002***
	No	52	2.81	1.28	

**** Significant difference at .01 level (2-tailed)*

7.4.6 A Comparison of the Support of IT Application to Continuous Improvement

All items of the support of IT application to continuous improvement of QMS organizations have higher scores than non-QMS organizations (Table 7.13). For QMS certified organizations, all items have significantly higher scores. This finding implies that the organizations without certification have been limited in using computers to track their improvement activities, make improvements of systems, processes, and products, and provide the methods and tools of continuous improvement.

Table 7.13 Ratings of the support of IT application to continuous improvement

Support of IT application to continuous improvement	QMS certification	N	Mean	Std. Deviation	p-value
Tracking improvement activities	Yes	89	3.47	.89	.003***
	No	53	2.96	1.13	
Making continuous improvement of systems	Yes	90	3.44	.90	.004***
	No	53	2.91	1.30	
Making continuous improvement of processes	Yes	90	3.43	.92	.047**
	No	53	2.75	1.33	
Making continuous improvement of products	Yes	90	3.36	.95	.037**
	No	54	2.96	1.27	
Providing the methods and tools of continuous improvement	Yes	88	3.33	.92	.010***
	No	52	2.87	1.17	

*** Significant difference at .05 level (2-tailed)*
**** Significant difference at .01 level (2-tailed)*

7.4.7 A Comparison of the Support of IT Application to Supplier Relationship

Unlike the results of the six supports above, there are no significant differences of the support of IT application to supplier relationship between the two groups (Table 7.14). Most means are over an average level except the item ‘creating online purchasing’ is below average. The implication is that both organizations with and without QMS certification are alike in applying IT to improve communications between the organization and suppliers, research and select suppliers, reduce order time with suppliers, and share information and

future plans with suppliers. Moreover, both organizations have not been concerned to create online purchasing.

Table 7.14 Ratings of the support of IT application to supplier relationship

Support of IT application to supplier relationship	QMS certification	N	Mean	Std. Deviation	p-value
Improving communications between your organization and suppliers	Yes	89	3.71	.92	.722
	No	54	3.65	1.05	
Researching and selecting suppliers	Yes	89	3.57	.96	.473
	No	54	3.44	1.14	
Reducing order time with suppliers	Yes	89	3.39	1.24	.983
	No	54	3.39	1.19	
Sharing information and future plans with suppliers	Yes	87	3.23	1.16	.337
	No	54	3.04	1.15	
Creating online purchasing	Yes	89	2.67	1.43	.664
	No	54	2.78	1.30	

In short, there are remarkable differences between the two groups concerning the support of IT application in some QMS dimensions such as process management, continuous improvement, and employee involvement. Besides, some items such as leadership, customer focus, and information management have significant differences between the two groups. The particular supports of IT application consist of:

- Facilitating communication between top management and employees
- Helping leaders encourage employee involvement and create their initiative in improving work processes
- Support to receive and respond to customer's feedback on products/ services provided quickly
- Support to improve communication between the organization and customers
- Collecting data about work/ production processes
- Collecting data about employees
- Collecting data about customers

- Providing relevant information to meet employees' requirements
- Analyzing data and producing comprehensive information for the different levels of need

Thus, it is concluded that there are many differences concerning the evaluation of the support of IT application to the seven QMS dimensions between the organizations with and without QMS certification. In other words, the organizations with QMS certification utilizing IT in QMS dimensions are better than the organizations without. It is explained that the certified organizations have invested IT in their business much more than the non-certified organizations. Thus, the certified organizations have recognized that the support of IT to their businesses is crucial. Another explanation is that for the organizations having a quality management system following international or national standards, all procedures and processes become clear and logic. The computerization in such organizations also becomes easier and quicker. Thanks to IT application, the organizations meet the criteria of QMS more favorably and effectively. Thus, this finding recommends that Vietnamese organizations should link IT and TQM in business strategies. This will be presented in chapter 9.

CHAPTER 8

THE RELATIONSHIP BETWEEN THE SUPPORT OF IT APPLICATION ON QMS AND ORGANIZATIONAL PERFORMANCE

8.1 RELIABILITY AND VALIDITY OF THE SURVEY INSTRUMENT

This chapter examines the relationships between the support of IT application on QMS and organizational performance and then it presents discussions and implementations of the relationships discovered. Before the test of the relationships, this chapter analyzes the reliability and validity of the survey instrument.

A thorough reliability and validity on survey instruments in empirical research is essential for several reasons. First, it provides confidence that the empirical findings accurately reflect the proposed constructs. Second, empirically-validated scales can be used directly in other studies in the field for different populations and for longitudinal studies (Flynn *et al*., 1994). This study tests reliability and validity for both independent and dependent variables.

8.1.1 Independent variables – ITQMS model

The support of IT application to the seven QMS dimension is described as an ITQMS model. The survey instrument with 41 items was developed based on the seven criteria of ITQMS: support of IT to leadership (IL1 – IL5), support of IT to customer focus (ICF1 – ICF5), support of IT to employee involvement (IE1 – IE7), support of IT to information management (II1 – II10), support of IT to process management (IP1 – IP4), support of IT to continuous improvement (ICI1 – ICI5), and support of IT to supplier relationship (IS1 – IS5). The data set of such 41 items was factor analyzed by principal component analysis. As a result, seven constructs (or factors) were extracted (Table 8.1). None of the items were removed.

Reliability

An internal consistency analysis was performed to assess the reliability aspect of the survey instrument. Coefficient alpha (Cronbach's alpha) is the basic measure for reliability. The reliability coefficient (Cronbach's alpha) of the constructs ranged between .7337 (ICI – support of IT application to continuous improvement) and .9434 (IE - support of IT application to employee involvement) (Table 8.1). The analysis indicates the sufficient reliability of each construct as a scale.

Validity

Content validity. Content validity represents the adequacy of the operational definitions (Nunnally, 1978). The instrument has measurement items that cover all aspects of the variables being measured. The instrument developed in this study demonstrates the content validity of the use of IT to support QMS since the selection of measurement items was based on both a comprehensive review of the literature and detailed evaluations by experts and practicing managers during the pre-test interviews.

Construct validity. Construct validity refers to the degree to which a measure assesses the construct it is supposed to assess. Prior to performing factor analysis, the data matrices of items and their significant levels in the seven supports of IT application to the criteria of QMS were examined to ensure that they had sufficient correlations to justify the application of a factor analysis (Appendix 7.1).

One of the measures to quantify the degree of intercorrelation among the variables and the appropriateness of factor analysis is KMO values. The KMO values for the seven measures of ITQMS are above .70 (Table 8.1). The smallest value (KMO = .710) is for the construct 'support of IT application to customer focus' and the highest value (KMO = .917) is for 'support of IT application to employee involvement'. Overall the measures of ITQMS indicate that principle component factor analysis is appropriate.

Table 8.1 Results of reliability and validity of the support of IT application to QMS (independent variables)

Criteria	*Constructs*	*Items*	*Factor loading*	*Commu-nity*	*Eigen-values*	*% Variance explained*	*KMO*	*Cronbach's alpha*
Support of IT application to Leadership	*Support of IT application to Leadership (IL)*	IL1 - It helps leaders communicate quality value to all employees	.879	.773	3.659	73.189	.870	.9077
		IL2 - It facilitates communication between top management and employees	.885	.783				
		IL3 - It increase the control of top management to employees and process	.901	.811				
		IL4 - It helps leaders encourage employee involvement and create their activeness in improving work processes	.864	.746				
		IL5 - It facilitates communication between top management with customers and suppliers	.739	.547				
Support of IT application to Customer Focus	*Support of IT application to Customer Focus (ICF)*	ICF1 - It supports in researching/ surveying customer's information and needs	.820	.745	3.659	80.155	.710	.8215
		ICF2 - It supports in receiving and responding to customer's feedback on products/services provided quickly	.843	.877				
		ICF3 - It supports in improving communications between the organization and customers	.784	.718				
		ICF4 - It creates selling online	.721	.822				
		ICF5 - It reduces the time to deliver products/ services to customers	.684	.846				
Support of IT application to Employee Involvement	*Support of IT application to Employee Involvement (IE)*	IE1 - It makes information available to employees for carrying out their responsibility	.780	.609	5.231	74.728	.917	.9434
		IE2 - It facilitates to form working teams or group for quality improvement	.885	.783				
		IE3 - It facilitates teamwork to solve problems	.883	.779				
		IE4 - It facilitates to get suggestions from employees for quality improvement	.889	.790				
		IE5 - It facilitates to provide feedback to employees on quality performance	.867	.752				
		IE6 - It enables employees to share task-related information	.847	.717				
		IE7- It helps to recognize employee's contributions to quality improvement	.895	.801				

Table 8.1 Results of reliability and validity of the support of IT application to QMS (independent variables) (cont.)

Criteria	***Constructs***	***Items***	***Factor loading***	***Commu-nity***	***Eigen-values***	***% Variance explained***	***KMO***	***Cronbach's alpha***
Support of IT application to Information Management	*Support of IT application to Information Management (II)*	II1 - Collecting data about customers	.754	.569	6.039	60.392	.862	.9263
		II2 - Collecting data about suppliers	.720	.518				
		II3 - Collecting data about employees	.800	.641				
		II4 - Collecting data about work/ production processes	.749	.562				
		II5 - Maintaining quality information systems which are easy to update and access	.752	.565				
		II6 - Providing relevant information to meet employee's requirements	.835	.697				
		II7 - Information sources and their uses within the organization refined continuously	.773	.598				
		II8 - Analyzing data and producing comprehensive information for different levels of need	.818	.669				
		II9 - Improving accuracy information	.809	.654				
		II10 - Allowing employees to access information for decision making	.753	.567				
Support of IT application to Process Management	*Support of IT application to Process Management (IP)*	IP1 - Controlling the quality and operational performance of key processes used to produce and deliver products and services automatically or semi-automatically	.873	.763	3.141	78.531	.836	.9072
		IP2 - Identifying and analyzing significant variations in process and output, determining root causes, making corrections and verifying result are quicker and easier	.894	.800				
		IP3 - Measuring the capability of key activities	.923	.851				
		IP4 - Reducing production time	.852	.727				
Support of IT application to Continuous Improvement	*Support of IT application to Continuous Improvement (ICI)*	ICI1 - Support to make continuous improvement of products	.880	.774	3.415	68.304	.871	.7337
		ICI2 - Support to make continuous improvement of processes	.438	.192				
		ICI3 - Support to make continuous improvement of systems	.915	.837				
		ICI4 - Support to track improvement activities	.894	.800				
		ICI5 - Providing the methods and tools of continuous improvement	.901	.812				

Table 8.1 Results of reliability and validity of the support of IT application to QMS (independent variables) (cont.)

Criteria	***Constructs***	***Items***	***Factor loading***	***Commu-nity***	***Eigen-values***	***% Variance explained***	***KMO***	***Cronbach's alpha***
Support of IT application to Supplier Relationship	*Support of IT application to Supplier Relationship (IS)*	IS1 - Support to research and select suppliers	.851	.725	3.353	67.055	.786	.8700
		IS2 - Improving communications between your organization and suppliers	.794	.631				
		IS3 - Creating online purchasing	.752	.566				
		IS4 - Reducing order time with suppliers	.822	.676				
		IS5 - Supporting to share information and future plans with suppliers	.869	.755				

Table 8.1 also shows that each of the constructs has high unifactorial loadings. All items here had factor loadings ranging between .684 (ICF5) and .923 (IP3), so they were acceptable. The eigenvalue generated by the within-scale factor analysis was also examined. All constructs have eigenvalue greater than one, ranging from 3.11 (IP) to 6.039 (II). In addition, all constructs in each unifactorial test accounted for more than 60 percent of the total variance and were regarded as a satisfactory solution. As a result, the findings indicate that the measures of ITQMS model contained in the instrument have sufficient construct validity.

Criterion validity. A criterion-related validity analysis was performed utilizing the seven factors as independent variables and the five factors of the organizational performance as the dependent variables. The criterion related validity of the model was determined by examining the Multiple R coefficient computed for the seven measures of ITQMS model and the measures of organizational performance. The Multiple R coefficients of the five models ranged from .297 (model 4) to .559 (model 5) (Table 8.4). This indicates that the seven measures of ITQMS model have an acceptable degree of criterion validity when taken together.

8.1.2 Dependent variables – Organizational performance

This chapter still continues to use the same six factors of the organizational performance extracted from twenty items by the factor analysis in chapter 6 (Table 6.2), namely, *market and profitability (OP1), customer satisfaction (OP2), order time (OP3), employee satisfaction (OP4), process efficiency (OP5), and process effectiveness (OP6).*

8.2 THE RELATIONSHIP BETWEEN THE SUPPORT OF IT APPLICATION TO QMS AND THE ORGANIZATIONAL PERFORMANCE

Even though the relationship between IT and organizational performance was widely studied, the result is not consistent. Some researchers found positive relationship between IT and performance; others found a negative relationship. Thus, we empirically tested that it is the supports of IT application on QMS rather than to consider IT positively related to organizational performance in this study. The link of IT and TQM to improve organizational performance can be considered.

The proposition 2 was stated in chapter 3 that there was correlation between the seven dimensions of ITQMS and the organizational performance. If the proposition 2 is true, each of the measures of the organizational performance should be correlated to the seven dimensions of ITQMS. The five measures of the organizational performance are each used as the dependent variables in a regression model and the seven dimensions of ITQMS are used as the independent variables. Thus, proposition 2 continued to develop into the five following sub-propositions.

- *Proposition 2-1*: There was correlation between the seven dimensions of ITQMS and market and profitability.
- *Proposition 2-2*: There was correlation between the seven dimensions of ITQMS and customer satisfaction.
- *Proposition 2-3*: There was correlation between the seven dimensions of ITQMS and employee satisfaction.
- *Proposition 2-4*: There was correlation between the seven dimensions of ITQMS and process efficiency.
- *Proposition 2-5*: There was correlation between the seven dimensions of ITQMS and process effectiveness.

Before building multiple regression models, the study develops the correlation matrices among the seven dimensions of ITQMS (independent variables), and between the factors of organizational performance (dependent variables) and the seven dimensions of ITQMS (independent variables). Table 8.2 shows the bivariate correlation of the seven independent variables. Table 8.3 displays all the correlations between the seven independent variables and the six dependent variables. Examination of the correlation matrix indicates that all the seven dimensions of ITQMS are closely correlated with most factors of organizational performance, excepting one factor ‘order time’ (OP3). Thus, the five multiple regression models are built (Appendix 7.2) and their results are shown in Table 8.4

The five measures of the organizational performance are each used as the dependent variables in a regression model and the seven dimensions of ITQMS are each used as the independent variables. In Table 8.4, this finding shows that the five models (ITQP1, ITQP2, ITQP4, ITQP5 and ITQP6) are statistically significant at less than 1 percent level, and the regression coefficients (beta coefficients) of the significant factors are positive.

Since five measures of the organizational performance are found to have a significant correlation with the dimensions of ITQMS, proposition 2 can be supported.

In the ITQP1 model with *'market and profitability'* as the dependent variable, the support of IT application to process management (IP) is significant at $p < .01$ and the support of IT application to leadership (IL) is significant at $p < .10$. Two out of seven ITQMS dimensions have regression correlations with market and profitability. This partially supported proposition 2-1. This implied that the support of IT application to process management and leadership resulted in better market and profitability of the organizations. The largest impact on market and profitability is process management (beta coefficient = .309) and the next is leadership (.174).

In the ITQP2 model with *'customer satisfaction'* as the dependent variable, the support of IT application to customer focus (ICF) is significant at $p < .01$, the support of IT application to leadership (IL) is significant at $p < .05$, and the support of IT application to process management (IP) is significant at $p < .10$. Three out of seven ITQMS dimensions have regression correlations with customer satisfaction. This partially supported proposition 2-2. Hence, the effective IT application in customer focus, leadership and process management result in increased customer satisfaction. The support of IT application to customer focus had the highest influence on customer satisfaction (beta coefficient = .279), followed by the support to leadership (.218) and process management (.172).

In the ITQP4 model with '*employee satisfaction'* as the dependent variable, two factors have statistically significant regression correlations. These are the support to information management and leadership. Proposition 2-3 was also supported partially. When IT application in information management and leadership are emphasized, employee satisfaction increases. The support of IT to information management (beta coefficient = .324) has a higher impact on employee satisfaction than the support to leadership (.221).

In the ITQP5 model with *'process efficiency'* as the dependent variable, only the support of IT application to process management is significant at $p < .01$. Its impact on process efficiency is .297 (beta coefficient). Proposition 2-4 was supported partially. This suggests that if the organizations want to improve their process efficiency, they need to increase the IT application in the activities of process management.

In the ITQP6 model with '*process effectiveness'* as the dependent variable, two factors are significant at $p < .01$, namely, the support of IT application to continuous improvement and supplier relationship. Proposition 2-5 was also supported partially. This implies that when IT is applied in the activities of continuous improvement and supplier relationship, process effectiveness improves. The support of IT to continuous improvement (beta coefficient = .350) has a higher impact on process effectiveness than the support to supplier relationship (.271).

The empirical test for the five models indicates that the factors of organizational performance are associated with the dimensions of ITQMS. The five sub-propositions of proposition 2 are supported. Thus, it can be said that proposition 2 is true. The discussions and managerial implications for such results will be presented in the next section.

8.3 DISCUSSION AND IMPLICATION

The results show that IT application support to QMS can improve organizational performance. In the ITQP1 model, there are two regression relationships with *market and profitability*, namely, the support of IT application to process management and to leadership. Market and profitability are also positively correlated with *the support of IT application to process management*. Process parameters such as capacity, dimension, color, and time controlled by computers would facilitate operations, because workers can easily adjust such parameters based on the customer's particular orders. Moreover, stored process data that can be easily accessed, helps employees get the necessary information quickly for solving problems or meeting customer's requirements. This can lead to increased productivity and reduce the amount of defects/ defective items. Thus, the support of IT application to process management can improve the organization's profitability. The relationship between market and profitability with *the support of IT application to leadership* is related to top management understanding computer applications. They could use it as an effective management means in communicating to customers about important aspects such as negotiation, contracts, and appointments. They can also control the processes and employees from a distance to ensure stable sales and profits. IT can support leaders in various activities that positively impact on market and profitability. In other words, one of the effective ways of getting better market and profitability is the ability of the leaders to use computers in their management activities.

Table 8.2 Correlation matrix of independent variable constructs

	IL	ICF	IE	II	IP	ICI	IS
Support of IT application to Leadership (IL)	1.000						
Support of IT application to Customer Focus (ICF)	.482**	1.000					
Support of IT application to Employee Involvement (IE)	.661**	.499**	1.000				
Support of IT application to Information Management (II)	.514**	.517**	.666**	1.000			
Support of IT application to Process Management (IP)	.504**	.423**	.653**	.751**	1.000		
Support of IT application to Continuous Improvement (ICI)	.408**	.356**	.696**	.724**	.732**	1.000	
Support of IT application to Supplier Relationship (IS)	.382**	.329**	.632**	.631**	.483**	.566**	1.000

*** Pearson Correlation is significant at the .01 level (2-tailed)*

Table 8.3 Correlation matrix of independent and dependent variable constructs

	Market and profitability (OP1)	Customer satisfaction (OP2)	Order time (OP3)	Employee satisfactions (OP4)	Process efficiency (OP5)	Process effectiveness (OP6)
Support of IT application to Leadership (IL)	.341**	.492**	.067	.372**	.154	.383**
Support of IT application to Customer Focus (ICF)	.256**	.378**	.119	.327**	.178*	.349**
Support of IT application to Employee Involvement (IE)	.340**	.381**	.109	.384**	.175*	.407**
Support of IT application to Information Management (II)	.337**	.360**	.028	.465**	.221*	.522**
Support of IT application to Process Management (IP)	.407**	.419**	-.047	.439**	.357**	.497**
Support of IT application to Continuous Improvement (ICI)	.348**	.344**	.005	.408**	.268**	.520**
Support of IT application to Supplier Relationship (IS)	.333**	.443**	.007	.389**	.195*	.473**

** Pearson Correlation is significant at the .05 level (2-tailed)*
*** Pearson Correlation is significant at the .01 level (2-tailed)*

Table 8.4 Multiple regression analysis of the support of IT application to QMS factors on organizational performance factors

Supports of IT application to QMS factors (Independent variables)	Organizational performance factors (dependent variables)									
	Market and profitability (ITQP1)		Customer satisfaction (ITQP2)		Employee satisfactions (ITQP4)		Process efficiency (ITQP5)		Process effectiveness (ITQP6)	
	Beta	*p-value*	*Beta*	*p-value*	*Beta*	*p-value*	*Beta*	*p-value*	*Beta*	*p-value*
Support of IT application to Leadership (IL)	***.174***	***.086***	***.218***	***.025***	***.221***	***.027***	-.071	.509	.130	.162
Support of IT application to Customer Focus (ICF)	.029	.781	***.279***	***.005***	.085	.416	-.030	.776	.126	.154
Support of IT application to Employee Involvement (IE)	.099	.484	-.233	.108	-.048	.718	-.162	.205	-.094	.455
Support of IT application to Information Management (II)	.018	.897	-.139	.301	***.324***	***.001***	-.188	.178	.170	.170
Support of IT application to Process Management (IP)	***.309***	***.003***	***.172***	***.090***	.196	.128	***.297***	***.002***	.187	.114
Support of IT application to Continuous Improvement (ICI)	.021	.874	-.183	.150	.137	.107	.030	.827	***.350***	***.001***
Support of IT application to Supplier Relationship (IS)	.134	.214	.088	.367	.177	.152	.003	.980	***.273***	***.008***
Multiple R	.422		.542		.477		.297		.559	
R square	.178		.294		.288		.089		.313	
F ratio	11.599		14.980		15.939		10.195		24.593	
p-value of F ratio	***.000***		***.000***		***.000***		***.002***		***.000***	

Note: *p-value in the table is the significant levels of the t-tests for the independent variables. Beta coefficient shows the relative importance of individual independent variables. All independent variables that are significant at the .10 level appear in bold and italics.*

In the ITQP2 model, there are three relationships with *customer satisfaction*, namely, the support of IT application to customer focus, leadership, and process management. The positive relationship between the *support of IT application to customer focus* and customer satisfaction is easily explained. Vietnamese organizations have begun to use the Internet as a new tool for researching/ surveying the needs of customers as well as responding to the complaints or questions of customers quickly. Customers recognize that the organizations value them. This makes the customers more satisfied with the organization's products and services. Customer satisfaction is also positively correlated to *the support of IT application to leadership*. In many cases, business transactions with customers require top management to make decisions quickly and timely, so the Internet really helps them in giving important information, negotiating, and making contracts. With IT application, the leaders can contact many customers at the same time. This communication leads to more customer satisfaction. The relationship between the *support of IT application to process management* and customer satisfaction is rather difficult to interpret because many organizations said that the customers are not yet involved in their process management. However, IT application such as CAD, CAM or FMS in manufacturing help the organizations to change product designs based on customer's requirements. This responsiveness increases the satisfaction of customers. Therefore, customer satisfaction increases when the organizations apply IT to support quality management, such as customer focus, leadership and process management.

There are two relationships with *employee involvement* in the ITQP4 model, namely, the support of IT application to information management and leadership. Employee involvement is correlated with *the support of IT application to information management*. IT makes information more available and accessible. This provides useful information to employees. This encourages the involvement of employees in the work. *The support of IT application to leadership* also positively relates to employee involvement. In fact, the managers can exchange any information with employee by intranet or Internet. This exchange allows managers and employees to have better understanding each other. It also increases the involvement of employees in their works.

In the ITQP5 model, only one factor '*support of IT application to process management*' has a regression relationship with *process efficiency*. An interesting observation was that

IT application reduced the need of inspectors and increased the number of automated inspection points, reducing the inspection cost per unit. This may have an implication for the use of sample inspection and statistical process control (SPC). The support of IT application to process management can lead to better process efficiency.

In the ITQP6 model, two significant relationships with *process effectiveness* are the support of IT application to continuous improvement and supplier relationship. These relationships are more difficult to explain and require further investigation.

From the five models (Table 8.4), the support of IT application to leadership and process management are two factors of ITQMS impacting on three indicators of the organizational performance. The other factors such as the support of IT application to customer focus, information management, continuous improvement and supplier relationship only affect one factor of the organizational performance. Only one factor the support of IT application to employee involvement has no impact on performance indicators. The implication is that when IT is well implemented in the activities of leadership and process management, most indicators of the organizational performance can be improved. When IT is applied in the activities of customer focus, information management, continuous improvement, and supplier relationship, only a particular indicator of the organizational performance can become better. In other words, the support of IT application to leadership and process management are two important factors for better performance.

In the multi-regression analysis, five models show slight and moderate correlations between the performance indicators and the criteria of ITQMS (with R ranging from .297 to .559; R^2 ranging from .089 to .313, see Table 8.4). The independent variables explain from 8.9% to 31.3%, of variances of the dependent variables. The criteria of ITQMS contribute to the organizational performances collectively, instead of individually. This finding supports the argument that a TQM programme should be completed in terms of all ITQMS criteria and perhaps also company-wide.

Proposition 2 is supported based on this analysis. The six dimensions of ITQMS have a relationship with the organizational performance. In other words, the quality management activities applying IT will positively impact both internal (such as employee satisfaction, process efficiency, and process effectiveness) and external performance (such as market

and profitability, and customer satisfaction). Moreover, IT application in the activities of leadership and process management are successful factors to improve organizational performance.

As mentioned in previous chapters, the overall items of the organizational performance of the organizations with QMS certification are better than of the organizations without. The better implementation of QMS with certification is one of the main reasons for better organizational performance. The result of this chapter also shows that applying IT effectively in the activities of QMS is another reason to obtain better organizational performance. For managerial implications, the link of TQM and IT is one of the effective ways to improve the organizational performance. This link will be discussed in the next chapter in detail.

CHAPTER 9

CONCLUSIONS

9.1 SUMMARY OF MAIN FINDINGS

The performance improvement of Vietnamese organizations by getting QMS certifications came later than other countries in the world. In fact, not until 1996, did only two Vietnamese organizations achieve ISO 9000 certification. Furthermore, chapter 1 shows the number of ISO 9000 certifications in Vietnam much lower than those of other countries. However, the number of Vietnamese organizations getting ISO 9000 certification or other certifications such as ISO 14000, GMP, HACCP, and so on has considerably increased in recent years.

Concerning performance improvement of Vietnamese organizations, a conceptual framework was developed in this study. This framework was used not only to evaluate the practices of QMS and the support of IT application to it, but also to examine the relationship between QMS and organizational performance together with the relationship between ITQMS and that performance.

The empirical support for this framework was undertaken using four approaches: (1) face-to-face interviewing, (2) mailed surveys, (3) e-mail survey, and (4) direct contact. The sample of the study includes Vietnamese organizations in Ho Chi Minh City and the surrounding provinces such as Dong Nai, Binh Duong. The total sample size was 146, in which 91 organizations (62% of the total sample) already had QMS certification and 55 organizations (38% of the total sample) did not have.

A set of seven dimensions of QMS model was considered from various academic and practitioner perspectives. They included leadership, customer focus, employee involvement, information management, process management, continuous improvement, and supplier relationship. The seven dimensions of ITQMS model were formed based on the QMS model combining with several previous researches, namely, supports of IT application to the seven QMS dimensions.

The measures of both QMS and ITQMS models were empirically tested to be reliable and valid. The reliability coefficients (Cronbach's alpha) of all measures were well above 0.70. Furthermore, detailed item analysis confirmed that all the items were appropriately assigned to their respective measures. In addition, the extensive literature review and qualitative pre-testing helped to insure that the measures have content validity.

The evaluation of quality practices of Vietnamese organizations is based on the QMS model. Most dimensions of the quality management in the organizations with QMS certification were evaluated at a *'good'* level (point four). Leadership and customer focus were evaluated at the highest level, and process management and supplier relationship were moderately evaluated. The remaining dimensions such as employee involvement, information management, and continuous improvement were only somewhat above average. As part of QMS certification, the practices of process management, continuous improvement, information management, customer focus, and leadership of the organizations with QMS certification were much better than the organizations without it. The organizational performance of the organizations with QMS certification is better than the "without", specifically in defectives/ defects, wastes, productivity, competitive advantage, and capacity.

Based on the ITQMS model, most support of IT application to QMS in the organizations with QMS certification was also evaluated only at somewhat above *'average'* (point three). In overall, the support for leadership was the highest while the support for continuous improvement was the lowest. Organizations with QMS certification have applied IT much more than the non-certified organizations. The impact of the support of IT application in the organizations with QMS certification is much better than the organizations without it.

For organizational performance, six factors were extracted from twenty items and used for correlation analysis. They were market and profitability, customer satisfaction, order time, employee satisfaction, process efficiency, and process effectiveness. This study evaluated the impact of QMS dimensions on performance as well as the support of IT application in QMS again on performance by testing two propositions:

- Organizational performance is correlated to the dimensions of QMS *(P1)*
- Organizational performance is correlated to the support of IT application to QMS *(P2)*

Through the multiple regression analysis, the two propositions were well supported by statistical significances of five performance factors, except 'order time' factor. This implies that obtaining QMS certification is really a good way to improve organizational performance. Furthermore, IT application in QMS is another valuable mean to improve performance.

9.2 CONTRIBUTIONS OF THE STUDY

The contributions of this study are indicated in the following theoretical and practical aspects.

Theoretical contributions

At first, a QMS model was developed by adapting the quality management principles of ISO 9000:2000 (ISO, 2000). It included seven dimensions with 39 items, which generally indicate the major activities of a quality management system towards TQM. This model can be used to evaluate the QMS practices towards TQM of the organizations effectively.

Secondly, an ITQMS model was developed based on seven dimensions of the QMS model combining the adaptation of the study of Ang *et al.* (2000). It consists of the seven dimensions with 41 items, which represent the support of IT application to QMS. This model can be used to not only assess the practices of the support of IT application to QMS in the organizations but to motivate it as well.

These two models were empirically tested to be reliable and valid. The benefits derived from the adoption of these models are:

- Assisting management to identify the strengths and weaknesses in the current QMS and the support of IT application to QMS.
- Providing means for the management committee and/or the TQM committee to assess the results and progress of QMS in their organizations.
- Last but not least, providing means for management to benchmark their QMS and IT application in QMS with other organizations.

The study built twenty-one items of organizational performance, which were then extracted into six factors. A framework of the relationships was developed based on these six factors of performance and the two models above. They are (1) the relationship between the seven QMS dimensions and organizational performance, and (2) the relationship between the support of IT application to QMS and organizational performance.

Practical contributions

This study describes a general picture of the practices of Vietnamese organizations on QMS, the support of IT application to QMS and their organizational performance. In particular, the organizations with certifications had 'QMS', 'the support of IT application', and 'organizational performance' better than those without certifications. For the certified QMS organizations, leadership and customer focus were considered the strongest points. However, employee involvement, information management and continuous improvement were the dimensions which needed to improve.

The support of IT application to QMS is still limited in the organizations with QMS certification. However, the support of IT application to leadership was the strongest point, while the support of IT application to continuous improvement was the weakest one.

In general, organizational performance of Vietnamese organizations with QMS certifications has a positive trend in the recent years from 2000 to 2002. The remarkable improvements were quality of products/ services, sales, customer satisfaction, profits, productivity, competitive advantage, and defects/ defectiveness items.

Besides the description of the practices of Vietnamese organizations, this study also statistically tested two propositions. They were (1) the relationships between the seven QMS dimensions and organizational performance, and (2) the relationships between the support of IT application to QMS and organizational performance. Based on the multiple regression analysis, these two propositions were statistically supported. Therefore, there is strong evidence enough to confirm that both QMS and IT application in QMS have positive impacts on organizational performance. As a result of the study, this suggests that organizational performance could be improved by improving QMS and IT application in QMS.

The study provided recommendations for managers to develop appropriate strategies concerning the integration of IT and QMS.

9.3 MANAGERIAL RECOMMENDATIONS FOR LINKING IT APPLICATION WITH QMS IN BUSINESS STRATEGY

Many important insights can be gained from a practical and managerial viewpoint. With the well demonstration of how IT application support to QMS, the study tells managers that information technology can be one of the effective approaches to improve QMS for better performance. Buying the latest model and state-of-the-art computers does not mean that the organizations can do business successfully. Managers need to develop an IT capability. This means that they need to know how to mobilize and deploy IT in combination with other activities in the organizations to improve QMS. However, to develop such a capability is not easy at all. The organizations also need to invest in learning how to do this the best and effective way. Thus, the study presents some managerial recommendations for linking IT application with QMS in business strategies.

According to the results in Chapter 6 and 8, *'leadership'* and *'the support of IT application to leadership'* are the two most important factors relating to organizational performance. The managerial implication here is that top management must recognize their role in QMS implementation and in exploring IT application. In the other words, top management need to have a high commitment to the use of IT as a strategic tool for improving QMS.

Top management can demonstrate a commitment to the use of IT in QMS in several ways. First, top management needs to be knowledgeable about IT. Since the resources in any organization are usually limited and investment in IT is often costly, it is important for top management to recognize the value of IT in order to objectively evaluate proposals to purchase or upgrade hardware and software. Top management will be better able to evaluate benefits and problems from IT investment and have more realistic expectations of what investment in IT can or cannot achieve. IT should be viewed as a valuable resource to support or influence business strategies in term of streamlining operations, reengineering business processes, and developing electronic links with suppliers and customers. However, top management must realize that IT is not a panacea for all organizational problems.

Second, top management has to evaluate their QMS status to identify processes that can be computerized. Third, top management needs to allocate appropriate and adequate resources (e.g. funds, MIS staff), and initiate the setting up of an information system (IS) steering committee for the development of strategic IT application, in which top management is obviously one of member of this IS steering committee in the organization.

Similar to 'leadership', 'the support of IT application to leadership', *'process management'* and *'the support of IT application to process management'* are also two important factors that influence organizational performance. Therefore, managers of organizations should identify and computerize key processes, for examples, the usage of CAD, CAM, MRPII, ERP, PLC, AIS, intranet and specialized software.

Many organizations understand customer needs by surveys, but they still fail to perform these in all design and production processes. Failure may happen if a design does not match customer needs, or if the production is not capable to meet design specifications. QMS practices require cooperation across all functions. Sharing information, data management and analysis throughout the organization are absolutely critical for an organization to survive in today's competitive world. A supply of consistent, accurate, valuable and timely information across all functional areas facilitates a better organizational response to increasing customer needs. With a comprehensive information strategy, organizations can work with customers and suppliers to reduce cost, improve both products and processes quality, and shorten cycle times to finally increase productivity. Thus, organizations have to plan the development of LAN, intranet, Internet and specialized software to get comprehensive information for achieving the full QMS status.

In conclusion, organizations should implement the computerization of QMS as the next step after certification and toward full TQM. For organizations with sufficient financial resources, they can integrate the implementation of QMS with certification and IT application at the same time.

From the macro management point of view, the Vietnamese government needs to have the policies of IT development to support the organizations in exploring IT application in their

business. The study suggests to training workforces so that they have knowledge and skills in applying IT in business by:

- Enlarging more centers or universities that train engineers or bachelor of IT
- Supporting finance for schools or universities in network connection and computer investment.
- Share best practices to other organizations as benchmarking

9.4 CONCLUSIONS

Some main conclusions of this study can be shown as follows:

- Pursuing QMS certification is a good way to improve organizational performance.
- IT application is an appropriate approach to improve QMS which is aiming to achieve better organizational performance.
- Top management commitment is a must to the integration of IT and QMS.

9.5 LIMITATIONS OF THE STUDY AND RECOMMENDATIONS FOR FURTHER STUDY

This study investigated Vietnamese organizations in a variety of industries and enterprise ownership. The findings are generalizable in this setting. However, this study has certain limitations.

Firstly, although getting a generalization in the context of Vietnam, a further study should be expanded to other countries to achieve a higher generalization.

Secondly, for the organizations which recently acquired QMS certification during the data collection (July to November 2003), it was difficult to exactly measure the impact of QMS on performance. There is also a necessity to identify the organizations that are moving beyond QMS certification, particularly ISO 9000 certification, to achieve full TQM status. A longitudinal study will be required to draw a more substantive conclusion. For example, a further study can call for a longitudinal comparison of organizational performance before and after the implementation of ISO 9000, or a longitudinal study to measure TQM practices and their impact on performance across a three to five year period examining the relationships and their development through time.

Lastly, this study was conducted during the second half of 2003. The sample data used in the study is therefore a snapshot at one specific point in time. It does not account for changes over. All studies of such nature suffer from this limitation. Thus, in addition to cross-sectional surveys, in-depth case studies could be considered.

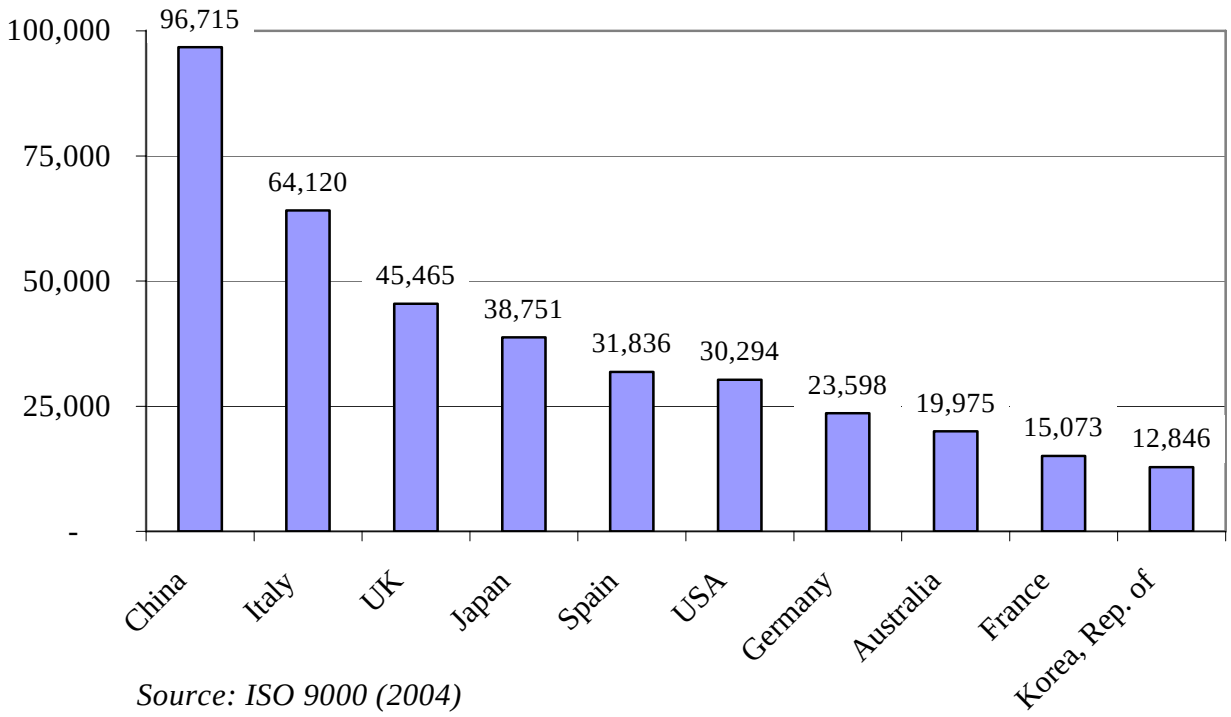
Moreover, other ideas for further researches relating to TQM and IT should be considered: (1) the success factors of linking IT application plans to TQM, (2) the major problems in implementing IT application to TQM, (3) the integration of IT and TQM in business.

In spite of the limitations, the results of the research are the valuable proof to the Vietnamese organizations their organizational performance can be improved by QMS and IT application in QMS significantly.

APPENDICES

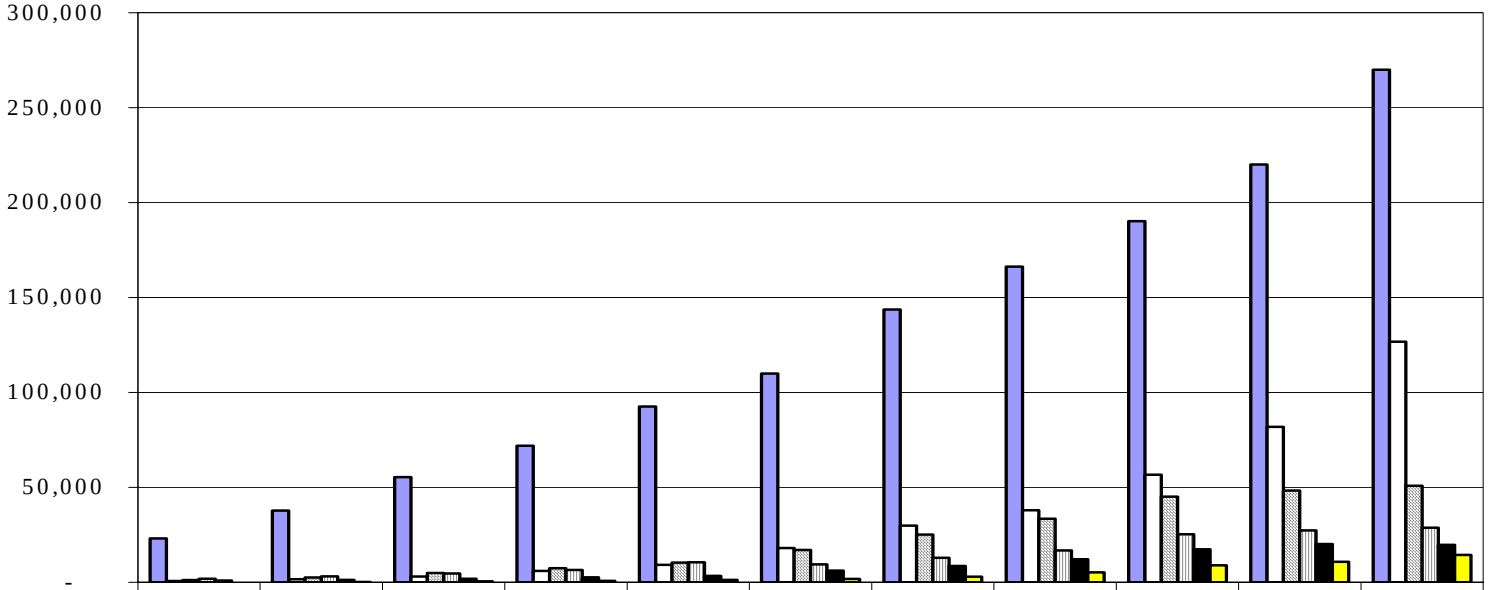
APPENDIX 1
(Used in Chapter 1)

Appendix 1.1: Top Ten Countries for ISO 9000:2000 Certificates



Source: ISO 9000 (2004)

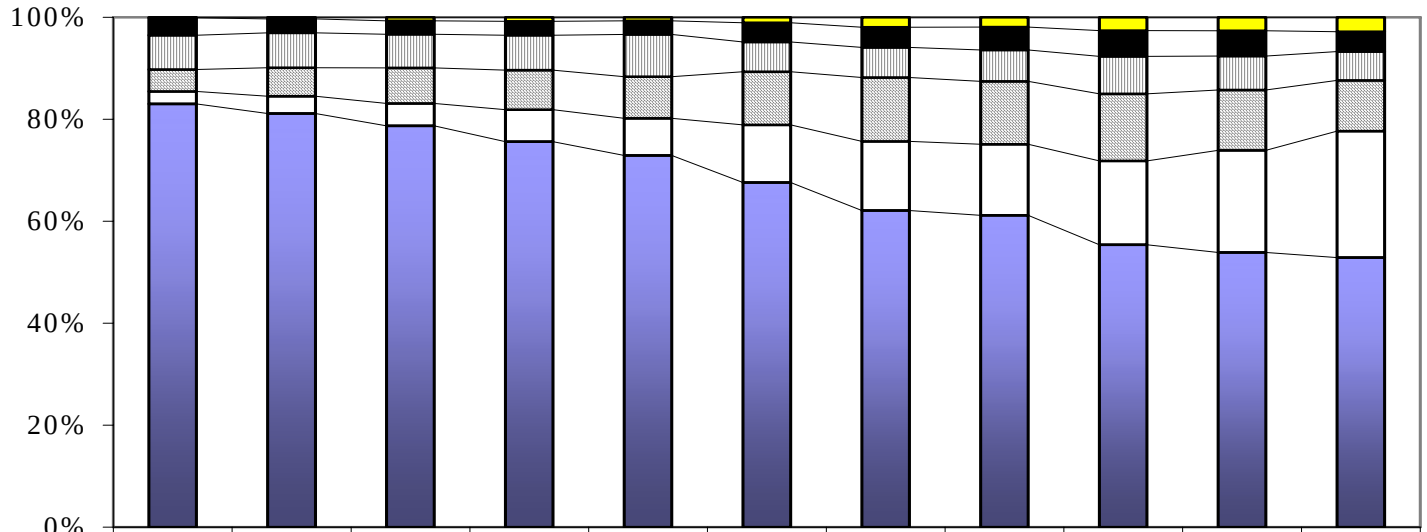
Appendix 1.2: Growth of ISO 9000 Certificates Worldwide



	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11
Europe	23,092	37,779	55,400	71,918	92,611	109,961	143,674	166,255	190,248	220,127	269,950
Far East countries	683	1,583	3,091	5,979	9,240	18,047	29,878	37,920	56,648	81,919	126,779
North America	1,201	2,613	4,915	7,389	10,374	16,980	25,144	33,550	45,166	48,296	50,894
Australia/New Zealand	1,862	3,184	4,628	6,479	10,526	9,478	12,946	16,751	25,302	27,299	28,819
Africa/West Asia	951	1,272	1,855	2,619	3,378	6,162	8,668	12,150	17,307	20,185	19,751
Central & South Americas	27	140	475	733	1,220	1,713	2,989	5,221	8,972	10,805	14,423

Figure 1.1 Growth of ISO 9000 certificates worldwide
(Source: ISO, 2002,"The ISO Survey of ISO 9000 and ISO 14000 Cerificates")

Appendix 1.3: Regional Share in Percent of ISO 9000 Certificates Worldwide



	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11
Central & South Americas	0.10	0.30	0.68	0.77	0.69	1.05	1.92	1.92	2.61	2.64	2.83
Africa/West Asia	3.42	2.73	2.64	2.75	2.65	3.79	3.88	4.47	5.04	4.94	3.87
Australia/NewZealand	6.69	6.84	6.58	6.81	8.27	5.80	5.80	6.16	7.36	6.68	5.65
North America	4.32	5.61	6.99	7.77	8.15	10.44	12.34	12.34	13.14	11.82	9.97
Far East countries	2.46	3.40	4.39	6.29	7.26	11.31	13.38	13.95	16.48	20.05	24.83
Europe	83.02	81.12	78.73	75.61	72.72	67.58	61.16	61.16	55.36	53.87	52.87

Figure 1.2 Regional share in percent of ISO 9000 certificates worldwide
(Source: ISO, 2002,"The ISO Survey of ISO 9000 and ISO 14000 Cerificates")

Appendix 1.4: Number of Internet Host Computers, Internet Users and PCs by Country (1999, 2001)

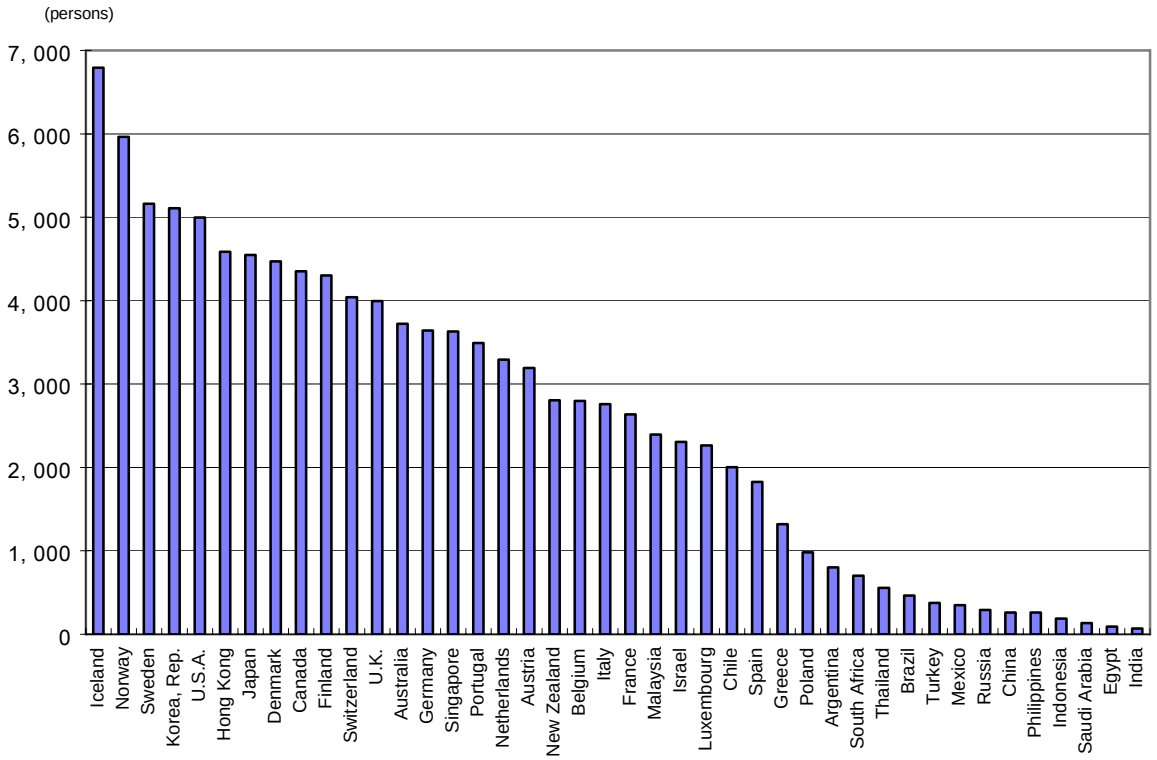
Country (region)	Internet host computers (1)			Internet users (2)			PCs (3)		
	(1,000 units)	Per 10,000 persons		(1,000 persons)	Per 10,000 persons		(1,000 units)	Per 100 persons	
	2001	1999	2001	2001	1999	2001	2001	1999	2001
Argentina	465	39.0	124.1	3,000	136.7	800.3	2,000	4.7	5.3
Australia	2,289	575.8	1,183.4	7,200	3,168.4	3,723.1	10,000	41.7	51.7
Austria	326	321.2	400.5	2,600	1,528.7	3,194.1	2,270	25.7	28.0
Belgium	352	334.3	342.0	2,881	1,182.0	2,799.3	3,500	31.5	34.5
Brazil	1,645	26.6	95.3	8,000	208.4	463.6	10,800	3.6	6.3
Canada	2,890	547.6	931.9	13,500	3,607.3	4,352.7	12,000	36.1	39.0
Chile	123	26.8	79.2	3,102	416.2	2,002.0	1,300	6.7	8.4
China (4)	89	0.6	0.7	33,700	70.3	260.0	25,000	1.2	1.9
Denmark	561	636.6	1,045.4	2,400	2,823.0	4,471.8	2,300	41.4	43.2
Egypt	2	0.4	0.3	600	32.0	93.0	1,000	1.2	1.6
Finland	887	894.0	1,707.3	2,235	3,227.4	4,302.8	2,200	36.0	42.4
France	789	210.4	132.9	15,653	916.1	2,637.7	20,000	26.8	33.7
Germany	2,426	199.0	294.6	30,000	1,752.6	3,642.5	27,640	29.7	33.6
Greece	143	70.7	135.2	1,400	705.8	1,321.3	860	6.0	8.1
Hong Kong SAR	388	170.9	573.5	3,100	2,580.1	4,586.1	2,600	29.8	38.5
Iceland	55	1,071.8	1,904.8	195	5,381.8	6,794.4	120	35.9	41.8
India	83	0.2	0.8	7,000	28.1	68.2	6,000	0.3	0.6
Indonesia	46	1.0	2.1	4,000	43.0	186.2	2,300	0.9	1.1
Israel	144	244.9	220.8	1,500	1,310.6	2,304.9	1,600	22.3	24.6
Italy	680	52.6	117.3	16,000	872.0	2,757.8	11,300	19.2	19.5
Japan	7,118	208.4	559.0	57,900	2,139.0	4,547.1	44,400	28.7	34.9
Korea, Rep. of	461	98.4	92.1	24,380	2,317.6	5,106.8	12,000	18.2	25.1
Luxembourg	14	...	312.4	100	...	2,266.0	230	...	51.5
Malaysia	74	27.0	31.1	5,700	1,145.2	2,395.0	3,000	6.9	12.6
Mexico	918	41.6	91.5	3,500	187.1	348.7	6,900	4.4	6.9
Netherlands	2,632	605.5	1,634.8	5,300	1,894.1	3,291.7	6,900	36.0	42.9
New Zealand	408	711.2	1,049.6	1,092	1,836.9	2,807.0	1,500	32.8	38.6
Norway	305	980.2	673.8	2,700	4,465.8	5,962.9	2,300	44.7	50.8
Philippines	31	1.7	4.0	2,000	67.2	259.3	1,700	1.7	2.2
Poland	490	44.2	126.8	3,800	542.1	983.7	3,300	6.2	8.5

Country (region)	Internet host computers (1)			Internet users (2)			PCs (3)		
	(1,000 units)	Per 10,000 persons		(1,000 persons)	Per 10,000 persons		(1,000 units)	Per 100 persons	
	2001	1999	2001	2001	1999	2001	2001	1999	2001
Portugal	247	77.8	239.3	3,600	700.2	3,494.1	1,210	9.3	11.7
Russia	354	6.2	24.1	4,300	101.9	293.0	7,300	3.7	5.0
Singapore	198	380.8	479.2	1,500	2,439.9	3,630.9	2,100	43.7	50.8
South Africa	238	38.2	54.5	3,068	415.0	700.6	3,000	5.5	6.9
Spain	539	116.8	133.2	7,388	704.0	1,827.5	6,800	11.9	16.8
Saudi Arabia	11	1.4	5.1	300	143.6	134.4	1,400	5.7	6.3
Sweden	735	590.1	825.1	4,600	4,137.0	5,162.7	5,000	45.1	56.1
Switzerland	528	377.6	730.7	2,917	1,997.3	4,040.2	3,600	46.2	50.0
Thailand	72	6.6	11.3	3,536	131.5	556.1	1,700	2.3	2.7
Turkey	107	12.2	16.1	2,500	231.3	377.2	2,700	3.4	4.1
U.K.	2,231	292.3	371.4	24,000	2,100.8	3,995.0	22,000	30.3	36.6
U.S.A.	106,193	1,950.0	3,714.0	142,823	2,717.4	4,995.1	178,000	51.7	62.3

Notes:
(1) Internet host computers refer to the number of computers in the country (region) that are directly linked to the worldwide Internet network. They are identified by a two digit country code or a three digit code generally reflecting the nature of the organization. The numbers of the computers are assigned to countries based on the country code although this does not necessarily indicate that the computer is actually physically in the country.
(2) The numbers of Internet users are based on reported estimates, derivations based on reported Internet Access Provider subscriber counts, or calculated by multiplying the number of hosts by an estimated multiplier.
(3) The numbers of PCs are estimated from the annual questionnaire supplemented by other sources.
(4) China excludes Hong Kong SAR, Macao SAR and Taiwan.

Source: International Telecommunication Union, *World Telecommunication Indicators, 2000/2001*
International Telecommunication Union, *World Telecommunication Development Report, 2002*
(Statistics Bureau, MPHPT, *SEKAI NO TOKEI*)

Appendix 1.5: Number of Internet Users per 10,000 Persons (2001)



APPENDIX 2
(Used in Chapter 2)

Appendix 2.1: The Eight Principles of ISO 9000 Standards (ISO, 2000)

Principle 1: Customer focus

Organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectations. Applying the principle of customer focus typically leads to:

- Researching and understanding customer needs and expectations.
- Ensuring that the objectives of the organization are linked to customer needs and expectations.
- Communicating customer needs and expectations throughout the organization.
- Measuring customer satisfaction and acting on the results.
- Systematically managing customer relationships.
- Ensuring a balanced approach between satisfying customers and other interested parties (such as owners, employees, suppliers, financiers, local communities and society as a whole).

Principle 2: Leadership

Leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives. Applying the principle of leadership typically leads to:

- Considering the needs of all interested parties including customers, owners, employees, suppliers, financiers, local communities and society as a whole.
- Establishing a clear vision of the organization's future.
- Setting challenging goals and targets.
- Creating and sustaining shared values, fairness and ethical role models at all levels of the organization.
- Establishing trust and eliminating fear.
- Providing people with the required resources, training and freedom to act with responsibility and accountability.
- Inspiring, encouraging and recognizing people's contributions.

Principle 3: Involvement of people

People at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit. Applying the principle of involvement of people typically leads to:

- People understanding the importance of their contribution and role in the organization.
- People identifying constraints to their performance.
- People accepting ownership of problems and their responsibility for solving them.
- People evaluating their performance against their personal goals and objectives.
- People actively seeking opportunities to enhance their competence, knowledge and experience.
- People freely sharing knowledge and experience.
- People openly discussing problems and issues.

Principle 4: Process approach

A desired result is achieved more efficiently when activities and related resources are managed as a process. Applying the principle of process approach typically leads to:

- Systematically defining the activities necessary to obtain a desired result.
- Establishing clear responsibility and accountability for managing key activities.
- Analyzing and measuring of the capability of key activities.
- Identifying the interfaces of key activities within and between the functions of the organization.
- Focusing on the factors such as resources, methods, and materials that will improve key activities of the organization.
- Evaluating risks, consequences and impacts of activities on customers, suppliers and other interested parties.

Principle 5: System approach to management

Identifying, understanding and managing interrelated processes as a system contribute to the organization's effectiveness and efficiency in achieving its objectives. Applying the principle of system approach to management typically leads to:

- Structuring a system to achieve the organization's objectives in the most effective and efficient way.
- Understanding the interdependencies between the processes of the system.

- Structured approaches that harmonize and integrate processes.
- Providing a better understanding of the roles and responsibilities necessary for achieving common objectives and thereby reducing cross-functional barriers.
- Understanding organizational capabilities and establishing resource constraints prior to action.
- Targeting and defining how specific activities within a system should operate.
- Continually improving the system through measurement and evaluation.

Principle 6: Continual improvement

Continual improvement of the organization's overall performance should be a permanent objective of the organization. Applying the principle of continual improvement typically leads to:

- Employing a consistent organization-wide approach to continual improvement of the organization's performance.
- Providing people with training in the methods and tools of continual improvement.
- Making continual improvement of products, processes and systems an objective for every individual in the organization.
- Establishing goals to guide, and measures to track, continual improvement.
- Recognizing and acknowledging improvements.

Principle 7: Factual approach to decision making

Effective decisions are based on the analysis of data and information. Applying the principle of factual approach to decision making typically leads to:

- Ensuring that data and information are sufficiently accurate and reliable.
- Making data accessible to those who need it.
- Analyzing data and information using valid methods.
- Making decisions and taking action based on factual analysis, balanced with experience and intuition.

Principle 8: Mutually beneficial supplier relationships

An organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value. Applying the principles of mutually beneficial supplier relationships typically leads to:

- Establishing relationships that balance short-term gains with long-term considerations.
- Pooling of expertise and resources with partners.
- Identifying and selecting key suppliers.
- Clear and open communication.
- Sharing information and future plans.
- Establishing joint development and improvement activities.
- Inspiring, encouraging and recognizing improvements and achievements by suppliers.

Appendix 2.2: A 22-Step Implementation Guideline of TQM Adoption (Chin and Pun, 2002)

Step 1. Increase organization's awareness of TQM

Before considering the adoption of TQM, management should determine the strategic quality needs of the organization. Senior management needs to evaluate the current operation practices, assess the strengths and weaknesses, determine the opportunities for improvements, and explore the threats being faced by the organization.

Step 2. Review organization's status of TQM adoption

A review should be conducted of the current status of the beliefs, concepts, and system of quality management practices in the company. Senior management needs to investigate the success elements and critical processes of TQM adoption that cover the design, planning, operations, delivery, maintenance, control and monitoring functions, as well as the performance audits of the processes, products and services currently provided by the organization.

Step 3. Confirm management commitment to TQM

Senior management needs to commit time and organizational resources for adopting TQM. They should take the initiative to identify areas for improvement throughout the organization, obtain agreements from all parties involved regarding the scope and objectives of improvement efforts, and develop an employee-led process for improvement.

Step 4. Create corporate TQM vision

Senior management needs to set forth a clear TQM vision and mission statement(s) that indicates company objectives for performance improvement. The vision should be translated into quality goals and strategies, and communicated to employees, customers, suppliers and other stakeholders by the use of company newsletters, periodicals, and other media. This would allow them to visualize the mission, culture and commitments of the company.

Step 5. Form TQM steering committee

A management committee, panel or steering committee needs to be established to design, plan, and manage the introduction and development of TQM. The committee should

comprise top management, operations executives and front-line representatives. The main role is to assess and monitor the entire process of TQM adoption. For example, the committee should establish a set of priorities for project selection, provide guidance to project teams, set up examples of personal commitment, and identify any blockages.

Step 6. Formulate TQM objectives and strategies

The steering committee would help senior management establish the corporate TQM vision and translate it into a set of TQM objectives, operating principles and action plans. It would activate a company-wide strategic quality planning, formulate strategies and prepare quality plans with the divisions and appropriate personnel, and provide new motivation to make the improvements.

Step 7. Communicate TQM campaign

It is necessary for senior management to communicate with employees their roles and needs in the TQM campaign. The steering committee should publicize the TQM vision, guiding principles and objectives in an open and effective way. It also needs to make the performance criteria more specific to fit the company's situation and give them meaning within the context of the business operations. Typical communication channels include monthly/annual business meetings, informal gatherings, departmental meetings, and company newsletters.

Step 8. Promote TQM education and training

It is important for both management and staff to know which constituent parts require development of documentation and conformity to quality, environmental, and occupational health and safety management standards. The design and provision of a company-wide education and training programme need to promote awareness and introduction of TQM practices. The programme should convey the quality management concepts and team practices (e.g. bottom-up quality culture, leadership, team building, and quality control circles).

Step 9. Identify advocates and resistors

In order to promote TQM practices and minimize or avoid unnecessary resistance from employees, it is beneficial to investigate the attitude of employees using employee satisfaction surveys and performance appraisals. This would help identify and distinguish

the advocates and resistors of TQM adoption, and seek possible means to establish a favorable and harmonious organizational working environment. Decisions need to be made about the resistors.

Step 10. Plan for implementation

An implementation plan for continuous improvement activities needs to be developed in line with the four sections of TQM framework, namely organizing, systems and techniques, measurement and feedback, and changing the culture. Typically, the process would go through a series of stages encompassing awareness, education and training, consolidation, problem identification, improvement planning, implementation of quality plans, and assessment. It is necessary to identify the milestones and have ongoing monitoring of the plan. Co-ordination and co-operation among various functional areas (e.g. design, operations, marketing, and maintenance) should be encouraged. An agreed pay/rewards and recognition scheme for promoting TQM adoption should be established.

Step 11. Determine improvement projects

This is to ensure that the quality improvement projects are supportive of the TQM vision and objectives. Improvement and problematic areas are segregated to determine whether "Kaizen-type'' improvements or breakthrough actions and or both are required. It is advisable to assign initial projects that have a high probability of success. Detailed action plans should be developed with consensus and support from all functional areas concerned. Appropriate operation procedures should be prepared and work instructions revised in line with users' and customers' feedback and requirements.

Step 12. Compose project teams

For facilitating the project work, it is necessary to establish a strong team infrastructure (e.g. departmental improvement teams, process improvement teams, cross-functional teams, as well as ad hoc task forces), appoint team leaders and select members who are committed to teamwork and develop clear operating guidelines for the teams. These teams and task forces are formed according to their skills and different operational requirements. They need to be action-centered, establish ground rules, share information, and cultivate team unity.

Step 13. Provide team training

Adopting TQM should include training in applying practical skills, methods, tools and techniques (e.g. problem solving techniques, quality control tools, and 5S concepts) in job-related areas. The quality policies and the conformity requirements of quality management and related standards (e.g. ISO 9000 series, SA 8000, QS 9000, ISO 14000 and OHSAS 18001, etc.) would be included in the training programmes. Common approaches to training include cascaded training, training by designated in-house trainers, and training by external consultants and/or quality professionals.

Step 14. Activate team efforts

Teams and task forces should be activated with formal team meetings. They should be encouraged to initiate projects and plans regarding the improvements of processes, operations and procedures in their work places. Senior management needs to delegate suitable authority and deploy resources to teams and task forces, in conjunction with the execution of improvement tasks and activities. The steering committee should provide a clear project scope and objectives, review the progress of individual teams, and advise as appropriate, management for improved deployment of resources. In addition, trained facilitators should be assigned to help direct the administration and improvement efforts of individual teams and task forces. Motivation and morale support should be initiated from the top, and then deployed to the different departments and/or divisions of the organization.

Step 15. Obtain teams' feedback

The steering committee should acquire the teams' feedback of project progress and final outcomes through standard feedback channels (e.g. regular progress reports, performance assessment and audit sheets). The progress of improvement plans and the corrective actions undertaken should be reviewed. Activities that address team effectiveness would stimulate team efforts and encourage feedback in performance improvement. The efforts of teams should be explicitly rewarded, and management should show appreciation of team efforts in achieving predetermined targets of improvement performance. This would stimulate teams and individuals to perform even better, and also encourage others to participate actively in continuous improvement activities.

Step 16. Obtain users'/customers' feedback

This is to collect users' and customers' (internal and external) feedback through customer-satisfaction surveys, customer visits, customer complaints, marketing research, user groups or customer panels, and customer-supplier meetings. The feedback and requirements acquired from users/customers would help prioritize the identified areas of continuous improvement, along with the time and resource constraints, as well as other organizational concerns (e.g. environmental, safety and social responsibilities).

Step 17. Obtain employees' feedback

Employees' views should be sought on their attitude and comments towards TQM implementation by all possible means, including employee satisfaction surveys, employee performance appraisal and departmental meetings. Positive recognition and feedback of quality efforts are both important for organizational learning and as a stimulus to create structured, planned and continual improvement activities in the organization.

Step 18. Assess internal business performance

Internal business assessment is an effective means to audit the performance of internal operations by comparison with internal standards and organizational goals. The core requirements of design quality, prevention, conformance and documentation should be stressed. All positive changes and improvements should be evaluated in line with the corporate mission and operational objectives. Deviations from the predetermined objectives should be explained. In addition, useful data and information should be processed and shared to promote company-wide organizational learning.

Step 19. Conduct competitive benchmarking

Competitive benchmarking of operations and processes with the "best-in-class" performers and competitors in industry should be performed. In order to diagnose the improvement opportunities and analyze problematic areas, performance information of organization operation/process should be acquired, and relevant standards, specifications and methods employed. The findings can contribute to refinement of the quality goals, safeguard the performance improvement, and enhance customer values.

Step 20. Benchmark world-class performance

Once some of the basic steps in the continuous improvement process have been put into place, the proven means of assessing the progress of business towards world-class performance should be used. This includes performance benchmarking against other competitors of world-class performance, and performing self-assessment of progress against the excellence model criteria of the Malcolm Baldrige National Quality Award, the European Quality Award, or other national and regional quality awards (e.g. the HKMA Quality Award).

Step 21. Modify organizational infrastructure

The adaptation of TQM practices requires comprehensive organizational changes and human integration into every aspect of the business. To support TQM adoption, policy deployment and continual improvement, it is usually necessary to modify the existing organizational infrastructure and change the procedures and process, organizational structure, rewards and recognition systems. Any implementation roadblocks, obstacles and barriers should be identified and eliminated.

Step 22. Refine project scope, objectives and methodologies

Several variables and factors affect the progress of quality projects and programmes, including organizational resources, management commitment, state of operations, equipment condition, impact of changes, communication between departments, time spent on training, employee resistance, conflicting interpretations of policies and other decisions, customer satisfaction, safety, operational and financial performance. It is necessary to perform periodical reviews on the scope, objectives and methodologies of these projects/programmes, and refine them accordingly to take account of the changing organizational needs and requirements. In addition, the creation and transfer of good practices should be facilitated, and continuous improvement procedures properly established, documented and monitored according to the quality manual.

APPENDIX 3
(Used in Chapter 3)

Appendix 3.1: Questionnaire

We are studying on quality management systems (QMS) and IT application in the Vietnamese firms. Your supports through answering questions in this questionnaire help us to complete the study. Thus, we greatly appreciate your time and effort in responding to this questionnaire. Thank you very much!

A. GENERAL INFORMATION OF THE ORGANIZATION

a. Name of organization: .....
b. Address: .....
c. Telephone: ..... Fax:.....
d. Email:..... Web site:.....

Q1. Please indicate the industry of your organization:

❑ Manufacturing ❑ Insurance ❑ Bank
❑ Wholesale ❑ Retail ❑ Public service
❑ Consulting ❑ Transportation ❑ Others (please specify): ……

Q2. Please indicate the enterprise ownership of your organization:

❑ State-owned ❑ Foreign capital ❑ Private

Q3. How many of employees are there in your organization at this address? ……

Q4. What are the main kinds of products and services of your organization?
.....

Q5. How much revenues are there in your organization in three recent years?

2000: …….. 2001: …….. 2002: …….

Q6. Which quality management systems have your organization gotten?

❑ Have *not yet* gotten quality management systems with certificates
❑ Have gotten quality management systems with certificates. Specify the year of certification.

	Year of certification		*Year of certification*
❑ ISO 9002: 1994	…….	❑ HACCP	…….
❑ ISO 9001: 1994	…….	❑ GMP	…….
❑ ISO 9001: 2000	…….	❑ SA 8000	…….
❑ ISO 14000	…….	❑ OHSAS	…….

Others (please specify): …… …….

Q7. Please indicate your organization's strength and weakness:

	Very weak	*Weak*	*Average*	*Strong*	*Very strong*
1. Low unit costs/ Low prices	1	2	3	4	5
2. High product/ service quality	1	2	3	4	5
3. Spread channels	1	2	3	4	5
4. Ability to meet customer's orders quickly	1	2	3	4	5
5. Different categories of products/ services	1	2	3	4	5
6. Term of payment	1	2	3	4	5
7. Others (please specify): ……	1	2	3	4	5

B. IT APPLICATION

Q8. Please indicate the categories and amount of computers in your organization.

	Amount		Amount
❑ PC (desktop)	……	❑ Notebook (laptop)	……
❑ Server	……	❑ Mainframe	……

Others (please specify): ……..

Q9. Does your organization have staff of MIS?

❑ No ❑ Yes (please specify number of staff of MIS in your organization: ……..)

Q10. The computer applications in ***office automation activities*** of your organization are as follows.

Please specify software used

❑ Word processing: .....
❑ Spreadsheets: .....
❑ Data management: .....
❑ Graphics: .....
Others (please specify): .....

Q11. The computer applications in ***manufacturing activities*** of your organization are as follows.

❑ CNC (Computer Numerical Control) ❑ CAD (Computer Aided Design)
❑ CAM (Computer Aided Manufacturing) ❑ CIM (Computer Integrated Manufacturing)
❑ FMS (Flexible Manufacturing System) ❑ AIS (Automatic Identification System)
❑ PLC (Program Logic Control) Others (please specify): …….

.....

Please specify these applications in your organization's current activities/ operations: ……..
.....
.....
.....

Q12. The computer applications in ***communication*** of your organization are as follows.

❑ LAN ❑ Intranet ❑ Extranet
❑ Accessing Internet ❑ Email ❑ Website
❑ Online purchasing ❑ Online selling ❑ Invoicing system
❑ Stock control system ❑ Decision support system Others (please specify): ……

.....

Q13. What do IT application in your organization help staff or workers in their works?

	Very little	*Little*	*Average*	*Much*	*Very much*
1. Increasing work efficiency and effectiveness	1	2	3	4	5
2. Making job easier and more simple	1	2	3	4	5
3. Reducing complex and hard manpower	1	2	3	4	5
4. Increasing morale	1	2	3	4	5
5. Increasing enjoyment in work	1	2	3	4	5
6. Increasing work control of employees	1	2	3	4	5

Q14. Please comment on future plans for IT application in your organization in the next three years:
.....
.....
.....
.....

C. QMS PRACTICES AND IMPACT OF IT APPLICATION ON QMS

Q15. For *Leadership* activity, please indicate the results of this activity in your organization:

		Very weak	*Weak*	*Average*	*Good*	*Very good*
1.	Leaders create clear vision and quality values	1	2	3	4	5
2.	Leaders consider the needs of customers	1	2	3	4	5
3.	Leaders consider the needs of suppliers	1	2	3	4	5
4.	Leaders consider the needs of employees	1	2	3	4	5
5.	Leaders provide freedom to employees to work	1	2	3	4	5
6.	Leaders provide required resources and training to employees to act with responsibility and accountability	1	2	3	4	5
7.	Leaders encourage and recognize employee's contributions	1	2	3	4	5

Please give comments for your evaluations: ……..
.....
.....

Q16. Please indicate the *support of IT application to Leadership* activity in your organization

		Very little	*Little*	*Average*	*Much*	*Very much*
1.	It helps leaders communicate quality value to all employees	1	2	3	4	5
2.	It facilitates communication between top management and employees	1	2	3	4	5
3.	It increase the control of top management to employees and processes	1	2	3	4	5
4.	It helps leaders encourage employee involvement and create their initiative in improving work process	1	2	3	4	5
5.	It facilitates communication of top management, customers and suppliers	1	2	3	4	5

Please give comments for your evaluations: ……..
.....
.....

Q17. For *Customer Focus* activity, please indicate the results of this activity in your organization:

		Very weak	*Weak*	*Average*	*Good*	*Very good*
1.	Your organization frequently researches/ surveys customer's needs and feedback on product/ service provided	1	2	3	4	5
2.	Your organization links customer's needs and feedback on products/ services provided to design, production and delivery processes	1	2	3	4	5
3.	Your organization receive and respond to customer's their needs and feedback on products/ services provided quickly	1	2	3	4	5
4.	Your organization manages customer relationships systematically	1	2	3	4	5
5.	Your organization measures customer's satisfaction	1	2	3	4	5

Please give comments for your evaluations: ……..
.....
.....

Q18. Please indicate the *support of IT application to Customer Focus* activity in your organization:

	Very little	*Little*	*Average*	*Much*	*Very much*
1. It supports in researching/ surveying customer's information and needs	1	2	3	4	5
2. It supports in receiving and responding to customer's feedback on products/services provided quickly	1	2	3	4	5
3. It supports in improving communications between the organization and customers	1	2	3	4	5
4. It creates online selling	1	2	3	4	5
5. It reduces the time to deliver products/ services to customers	1	2	3	4	5

Please give comments for your evaluations: ……..
.....
.....

Q19. For *Employee Involvement* activity, please indicate the results of this activity in your organization:

	Very weak	*Weak*	*Average*	*Good*	*Very good*
1. Employees understand the importance of their contribution and role in the organization	1	2	3	4	5
2. Employees identify constraints to their performance	1	2	3	4	5
3. Employees joint working teams/ groups to improve quality or solve problems	1	2	3	4	5
4. Employees openly discuss problems and issues during operations	1	2	3	4	5
5. Employees willingly share their knowledge and experience	1	2	3	4	5
6. Employees actively seek opportunities to enhance their competence, knowledge and experience	1	2	3	4	5

Please give comments for your evaluations: ……..
.....
.....

Q20. Please indicate the *support of IT application to Employee Involvement* activity in your organization:

	Very little	*Little*	*Average*	*Much*	*Very much*
1. It makes information available to employees for carrying out their responsibilities	1	2	3	4	5
2. It facilitates to form work teams or groups for quality improvement	1	2	3	4	5
3. It facilitates teamwork to solve problems	1	2	3	4	5
4. It facilitates to get suggestions from employees for quality improvement	1	2	3	4	5
5. It facilitates to provide feedback to employees on quality performance	1	2	3	4	5
6. It enables employees to share task-related information	1	2	3	4	5
7. It helps to recognize employee's contributions to quality improvement	1	2	3	4	5

Please give comments for your evaluations: ……..
.....
.....

Q21. For *Information Management* activity, please indicate the results of this activity in your organization:

	Very weak	*Weak*	*Average*	*Good*	*Very good*
1. Your organization develop a comprehensive set of performance indicators which reflect internal and external customer requirements and the key factors that drive the business	1	2	3	4	5
2. Your organization's data and information are sufficiently accurate and reliable	1	2	3	4	5
3. Your organization's data are accessible to those who need it	1	2	3	4	5
4. Your organization analyzes data and information using appropriate and scientific methods	1	2	3	4	5
5. Employees make decisions and take actions based on factual analysis	1	2	3	4	5
6. Your organization maintains databases	1	2	3	4	5
7. Your organization continuously refine information sources and their uses within the organization	1	2	3	4	5

Please give comments for your evaluations: ……..
.....

Q22. Please indicate the *support of IT application to Information Management* activity in your organization:

	Very little	*Little*	*Average*	*Much*	*Very much*
1. Collecting data about customers	1	2	3	4	5
2. Collecting data about suppliers	1	2	3	4	5
3. Collecting data about employees	1	2	3	4	5
4. Collecting data about work/ production processes	1	2	3	4	5
5. Maintaining database (customer, supplier, employees, process,..)	1	2	3	4	5
6. Maintaining quality information systems which are easy to update and access	1	2	3	4	5
7. Providing relevant information to meet employee's requirements	1	2	3	4	5
8. Analyzing data and producing comprehensive information for different levels of need	1	2	3	4	5
9. Improving accuracy information	1	2	3	4	5
10. Allowing employees to access information for decision making	1	2	3	4	5

Please give comments for your evaluations: ……..
.....

Q23. For *Process Management* activity, please indicate the results of this activity in your organization:

	Very weak	*Weak*	*Average*	*Good*	*Very good*
1. Your organization establishes clear responsibility and accountability for managing key activities	1	2	3	4	5
2. Your organization controls the quality and operational performance of key processes used to produce and delivery product and service	1	2	3	4	5
3. Your organization strictly identifies and analyzes significant variations in process and output, determines root causes, makes corrections and verifies result	1	2	3	4	5
4. Your organization measures the capability of key activities	1	2	3	4	5
5. Your organization focuses on the factors such as resources, methods and materials that will improve key activities of the organizations.	1	2	3	4	5

Please give comments for your evaluations: ……..
.....

Q24. Please indicate the *support of IT application to Process Management* activity in your organization:

	Very little	*Little*	*Average*	*Much*	*Very much*
1. Controlling the quality and operational performance of key processes used to produce and delivery products and services automatically or semi-automatically	1	2	3	4	5
2. Identifying and analyzing significant variations in process and output, determining root causes, making corrections and verifying result quickly and easily	1	2	3	4	5
3. Measuring the capability of key activities	1	2	3	4	5
4. Reducing production time	1	2	3	4	5

Please give comments for your evaluations: ……
……..

Q25. For *Continuous Improvement* activity, please indicate the results of this activity in your organization:

	Very weak	*Weak*	*Average*	*Good*	*Very good*
1. Your organization establishes goals to guide continuous improvement and measures the results of improvement	1	2	3	4	5
2. Your organization trains employees with the methods and tools for continuous improvement	1	2	3	4	5
3. Your organization makes continuous improvement of products/services, processes, and systems in the organization	1	2	3	4	5
4. Your organization recognizes and informs of improvements	1	2	3	4	5

Please give comments for your evaluations: ……..
.....

Q26. Please indicate the *support of IT application to Continuous Improvement* activity in your organization:

	Very little	*Little*	*Average*	*Much*	*Very much*
1. It supports to make continuous improvement of products	1	2	3	4	5
2. It supports to make continuous improvement of processes	1	2	3	4	5
3. It supports to make continuous improvement of systems	1	2	3	4	5
4. It supports to track improvement activities	1	2	3	4	5
5. It provides the methods and tools of continuous improvement	1	2	3	4	5

Please give comments for your evaluations: ……..
.....

Q27. For *Supplier Relationship* activity, please indicate the results of this activity in your organization:

	Very weak	*Weak*	*Average*	*Good*	*Very good*
1. Your organization emphasizes on identifying and selecting key suppliers	1	2	3	4	5
2. Your organization establishes supplier relationships with long-term considerations	1	2	3	4	5
3. Your organization clearly and openly communicates with suppliers	1	2	3	4	5
4. Your organization share information and future plans to suppliers	1	2	3	4	5
5. Your organization establishes joint development and improvement activities with suppliers	1	2	3	4	5

Please give comments for your evaluations: ……..
.....

Q28. Please indicate the *support of IT application to Supplier Relationship* activity in your organization:

	Very little	*Little*	*Average*	*Much*	*Very much*
1. It supports to research and select suppliers	1	2	3	4	5
2. It improves communications between the organization and suppliers	1	2	3	4	5
3. It creates online purchasing	1	2	3	4	5
4. It reduces order time with suppliers	1	2	3	4	5
5. It supports to share information and future plans with suppliers	1	2	3	4	5

Please give comments for your evaluations: ……..
.....

D. PERFORMANCE OF THE ORGANIZATION

Q29. Please indicate your organization performance after getting QMS certificates (if your organization have not yet gotten QMS certificate, please indicate your organization performance in the recent years):

	Much decrease	*Little decrease*	*No change*	*Little increase*	*Much increase*
1. Product/service quality	1	2	3	4	5
2. Complexity and wordiness of internal process and procedures	1	2	3	4	5
3. Defectives/ defects	1	2	3	4	5
4. Wastes	1	2	3	4	5
5. Operating costs per units	1	2	3	4	5
6. Inventory control	1	2	3	4	5
7. Order time of customers	1	2	3	4	5
8. Order time to suppliers	1	2	3	4	5
9. Productivity	1	2	3	4	5
10. Capacity	1	2	3	4	5
11. Revenue and profits	1	2	3	4	5
12. Sales	1	2	3	4	5
13. Market share	1	2	3	4	5
14. New market/ new customers	1	2	3	4	5
15. Competitive advantages	1	2	3	4	5
16. Long-term relationship with customers	1	2	3	4	5
17. Customer satisfactions	1	2	3	4	5
18. Customer complaints	1	2	3	4	5
19. Employee’s income	1	2	3	4	5
20. Employee's job satisfactions	1	2	3	4	5
21. Involvement of employees in organization	1	2	3	4	5

Please give other comments of TQM and IT application:……
.....
.....

Q30. Please give other comments on quality management systems and IT application:
.....
.....
.....
.....

E. INFORMATION OF RESPONDENTS

Please give information yourselves (optional):

Name	*Department*	*Position*
1.		
2.		
3.		
4.		

Thank you again for your highly valuable supports!

Appendix 3.2 Questionnaire (By Vietnamese Language)

BẢNG CÂU HỎI

Kính chào Anh/ Chị!
Chúng tôi, là nhóm nghiên cứu của Khoa Quản lý Công nghiệp trường Đại học Báck Khoa Tp. HCM, hiện đang thực hiện đề tài nghiên cứu thực tiễn về việc hệ thống quản lý chất lượng (HT QLCL) và ứng dụng công nghệ thông tin (CNTT) của các doanh nghiệp Việt nam. Sự hỗ trợ của Anh/ Chị thông qua việc trả lời bảng câu hỏi này sẽ giúp chúng tôi hoàn thành được nghiên cứu. Các kết quả trả lời trong bảng câu hỏi này sẽ được xử lý thống kê nên những thông tin chi tiết mà Anh/ Chị đưa ra sẽ không được công bố với bất kỳ tổ chức nào. Chúng tôi rất biết ơn và đánh giá cao những nỗ lực và thời gian của Anh/ Chị cho việc trả lời bảng câu hỏi này. Xin chân thành cám ơn!

A. NHỮNG THÔNG TIN CHUNG VỀ CÔNG TY

a. Tên công ty: .....

b. Địa chỉ: .....

c. Điện thoại: ..... Fax: .....

d. Email: ..... Trang Web: .....

Q1. Xin Anh/ Chị vui lòng cho biết ngành công nghiệp của công ty:

❑ Sản xuất ❑ Bảo hiểm ❑ Ngân hàng
❑ Bán buôn ❑ Bán lẻ ❑ Dịch vụ công
❑ Tư vấn ❑ Giao thông vận tải ❑ Khác (xin nói rõ): . . . . . .

Q2. Hình thức sở hữu của công ty:

❑ Nhà nước ❑ Nước ngoài ❑ Tư nhân, Cổ phần, TNHH

Q3. Công ty của Anh/ Chị có bao nhiêu nhân viên? . . . . . .

Q4. Các sản phẩm/ dịch vụ chính của công ty: . . . . . .
. . . . . .

Q5. Tình hình doanh thu của công ty trong 3 năm gần đây?

2000: . . . . . 2001: . . . . . 2002: . . . . . .

Q6. Công ty của Anh/ Chị đang áp dụng HT QLCL nào sau đây? Nếu HT QLCL có giấy chứng nhận xin vui lòng cho biết thời gian được cấp giấy chứng nhận này.

❑ Chưa áp dụng HT QLCL có giấy chứng nhận
❑ Đã áp dụng HT QLCL có giấy chứng nhận, đó là:

	Năm cấp giấy chứng nhận		*Năm cấp giấy chứng nhận*
❑ ISO 9002: 1994	. . . . .	❑ HACCP	. . . . .
❑ ISO 9001: 1994	. . . . .	❑ GMP	. . . . .
❑ ISO 9001: 2000	. . . . .	❑ SA 8000	. . . . .
❑ ISO 14000	. . . . .	❑ OHSAS	. . . . .
❑ Giải thưởng CLVN	. . . . .		

Khác (xin nói rõ): . . . . . .

Q7. Thế mạnh và điểm yếu hiện nay của công ty là:

		Rất yếu	*Yếu*	*Trung bình*	*Mạnh*	*Rất mạnh*
1.	Chi phí đơn vị thấp / giá thấp	1	2	3	4	5
2.	Chất lượng sản phẩm/ dịch vụ cao	1	2	3	4	5
3.	Kênh phân phối rộng khắp	1	2	3	4	5
4.	Khả năng đáp ứng đơn hàng nhanh chóng	1	2	3	4	5
5.	Có nhiều chủng loại sản phẩm/ dịch vụ	1	2	3	4	5
6.	Phương thức thanh toán	1	2	3	4	5
7.	Khác (xin nói rõ) ……	1	2	3	4	5

B. CÁC ỨNG DỤNG CÔNG NGHỆ THÔNG TIN TRONG CÔNG TY

Q8. Xin vui lòng cho biết chủng loại và số lượng máy tính được sử dụng trong công ty của Anh/ Chị.

	Số lượng		Số lượng
❑ PC	……	❑ Notebook	……
❑ Server	……	❑ Mainframe	……

Khác (xin nói rõ): ……

Q9. Công ty của Anh/Chị có nhân viên chuyên phụ trách hệ thống máy tính trong công ty hay trong mỗi phòng ban không?

❑ Không ❑ Có (cụ thể là bao nhiêu nhân viên? ……)

Q10. Các ứng dụng CNTT trong ***hoạt động văn phòng*** của công ty là:

Liệt kê các phần mềm ứng dụng

❑ Gõ văn bản: .....
❑ Tính toán số liệu: .....
❑ Quản lý dữ liệu: .....
❑ Đồ họa: .....
Khác (xin nói rõ): .....

Q11. Các ứng dụng CNTT trong ***hoạt động sản xuất*** của công ty là:

❑ CNC (Computer Numerical Control) ❑ CAD (Computer Aided Design)
❑ CAM (Computer Aided Manufacturing) ❑ CIM (Computer Integrated Manufacturing)
❑ FMS (Flexible Manufacturing System) ❑ AIS (Automatic Identification System)
❑ PLC (Program Logic Control) Khác: . . . . . .

Xin vui lòng mô tả cụ thể các ứng dụng máy tính hóa này trong các hoạt động hiện tại của công ty:

.....
.....
.....

Q12. Các ứng dụng CNTT trong ***truyền đạt thông tin (giao tiếp)*** của công ty là:

❑ Mạng cục bộ (LAN) ❑ Mạng nội bộ (Intranet) ❑ Extranet
❑ Truy cập Internet ❑ Email ❑ Website
❑ Mua hàng trên mạng ❑ Bán hàng trên mạng ❑ Hệ thống hóa đơn
❑ Hệ thống kiểm soát tồn kho ❑ Hệ thống hỗ trợ ra quyết định ❑ Điện thoại
❑ Fax Khác: . . . . . .

Q13. Các ứng dụng CNTT hiện tại của công ty có giúp ích gì cho nhân viên trong quá trình vận hành/ thực hiện công việc của họ?

		Rất ít	*Ít*	*Trung bình*	*Nhiều*	*Rất nhiều*
1.	Làm tăng hiệu quả và hiệu năng của công việc	1	2	3	4	5
2.	Làm cho công việc trở lên đơn giản, dễ thực hiện hơn	1	2	3	4	5
3.	Giảm bớt lao động thủ công phức tạp và nặng nhọc	1	2	3	4	5
4.	Làm tăng ý thức của nhân viên với công việc	1	2	3	4	5
5.	Gia tăng sự thích thú cho nhân viên trong công việc	1	2	3	4	5
6.	Nhân viên có thể kiểm soát được công việc của họ	1	2	3	4	5

Q14. Anh/ Chị hãy cho biết các kế hoạch (dự kiến) tương lai về việc ứng dụng CNTT của công ty trong vòng 3 năm tới:

.....
.....
.....

C. NHỮNG THỰC TIỄN VỀ HT QLCL VÀ ẢNH HƯỞNG CỦA CNTT VÀO HT QLCL NÀY

Q15. Khi xem xét công tác ***Lãnh Đạo*** trong công ty, Anh/ Chị có cho rằng kết quả thực hiện của công tác này hiện nay là:

	Rất yếu	*Yếu*	*Trung bình*	*Tốt*	*Rất tốt*
1. Người lãnh đạo đã xây dựng một viễn ảnh và giá trị chất lượng rõ ràng cho công ty	1	2	3	4	5
2. Người lãnh đạo quan tâm đến các nhu cầu của khách hàng	1	2	3	4	5
3. Người lãnh đạo quan tâm đến các nhu cầu của nhà cung cấp	1	2	3	4	5
4. Người lãnh đạo quan tâm đến các nhu cầu của nhân viên	1	2	3	4	5
5. Người lãnh đạo cho phép nhân viên chủ động trong công việc	1	2	3	4	5
6. Người lãnh đạo cung cấp những nguồn lực được yêu cầu và đào tạo nhân viên để họ làm việc với tinh thần trách nhiệm và chịu trách nhiệm	1	2	3	4	5
7. Người lãnh đạo luôn khuyến khích nhân viên và công nhận những đóng góp của họ	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

.....

Q16. Anh/ Chị có cho rằng việc ứng dụng CNTT hiện tại trong công ty đã *hỗ trợ* cho công tác ***Lãnh Đạo*** là:

	Rất ít (Chưa có)	*Ít*	*Trung bình*	*Nhiều*	*Rất nhiều*
1. Nó hỗ trợ người lãnh đạo truyền đạt viễn ảnh và giá trị tới tất cả nhân viên	1	2	3	4	5
2. Nó hỗ trợ điều kiện thuận lợi cho việc giao tiếp nhà quản lý cấp cao và nhân viên	1	2	3	4	5
3. Nó hỗ trợ người lãnh đạo cấp cao kiểm soát nhân viên và quá trình	1	2	3	4	5
4. Nó hỗ trợ người lãnh đạo cấp cao khuyến khích và tạo sự chủ động cho nhân viên trong công việc	1	2	3	4	5
5. Nó hỗ trợ điều kiện thuận lợi cho việc giao tiếp giữa nhà quản lý cấp cao với khách hàng và nhà cung cấp	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

.....

Q17. Khi xem xét công tác ***Hướng Đến Khách Hàng*** trong công ty, Anh/ Chị có cho rằng kết quả thực hiện của công tác này hiện nay là:

	Rất yếu	*Yếu*	*Trung bình*	*Tốt*	*Rất tốt*
1. Công ty thường xuyên tìm hiểu/ điều tra nhu cầu của khách hàng và những phản hồi của họ về những sản phẩm/ dịch vụ mà công ty cung cấp	1	2	3	4	5
2. Công ty đã kết hợp các nhu cầu và phản hồi của khách hàng về sản phẩm/ dịch vụ với các quá trình thiết kế, sản xuất và phân phối	1	2	3	4	5
3. Công ty đã tiếp nhận và phản hồi nhanh chóng các nhu cầu và than phiền của khách hàng về sản phẩm/ dịch vụ	1	2	3	4	5
4. Công ty quản lý khách hàng một cách hệ thống	1	2	3	4	5
5. Công ty đo lường sự hài lòng của khách hàng	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

.....

.....

Q18. Anh/ Chị có cho rằng việc ứng dụng CNTT hiện tại trong công ty đã hỗ trợ cho công tác ***Hướng Đến Khách Hàng*** là:

	Rất ít (Chưa có)	*Ít*	*Trung bình*	*Nhiều*	*Rất nhiều*
1. Nó hỗ trợ trong việc tìm hiểu/ điều tra thông tin về khách hàng và nhu cầu của họ	1	2	3	4	5
2. Nó hỗ trợ trong việc tiếp nhận và phản hồi nhanh chóng các nhu cầu và than phiền của khách hàng về sản phẩm/ dịch vụ	1	2	3	4	5
3. Nó hỗ trợ trong việc cải thiện giao tiếp giữa công ty và khách hàng	1	2	3	4	5
4. Nó tạo việc kinh doanh bán hàng trên mạng	1	2	3	4	5
5. Nó giảm thời gian phân phối sản phẩm/ dịch vụ đến khách hàng	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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Q19. Khi xem xét công tác ***Tham Gia Của Nhân Viên*** trong công ty, Anh/ Chị có cho rằng kết quả thực hiện của công tác này hiện nay là:

	Rất yếu	*Yếu*	*Trung bình*	*Tốt*	*Rất tốt*
1. Các nhân viên hiểu rõ tầm quan trọng về vai trò và những đóng góp của họ trong tổ chức	1	2	3	4	5
2. Các nhân viên xác định được những ảnh hưởng hay khó khăn đến khả năng thực hiện công việc của mình	1	2	3	4	5
3. Các nhân viên tham gia làm việc theo nhóm để cải thiện chất lượng hoặc giải quyết vấn đề	1	2	3	4	5
4. Các nhân viên thảo luận một cách cởi mở các sự kiện và vấn đề xảy ra trong lúc vận hành	1	2	3	4	5
5. Các nhân viên luôn sẵn lòng chia sẻ những kiến thức và kinh nghiệm của mình	1	2	3	4	5
6. Nhân viên luôn chủ động tìm kiếm các cơ hội để nâng cao năng lực, kiến thức và kinh nghiệm của họ	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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Q20. Anh/ Chị có cho rằng việc ứng dụng CNTT hiện tại trong công ty đã hỗ trợ cho công tác ***Tham Gia Của Nhân Viên*** là:

	Rất ít (Chưa có)	*Ít*	*Trung bình*	*Nhiều*	*Rất nhiều*
1. Nó làm cho thông tin trở nên sẵn có để nhân viên có thể thực hiện trách nhiệm của họ	1	2	3	4	5
2. Nó hỗ trợ điều kiện thuận lợi để hình thành các nhóm làm việc để cải thiện chất lượng	1	2	3	4	5
3. Nó hỗ trợ điều kiện thuận lợi cho các nhóm dễ dàng cải thiện vấn đề	1	2	3	4	5

4. Nó hỗ trợ điều kiện thuận lợi cho nhân viên đưa ra các đề xuất cải thiện chất lượng	1	2	3	4	5
5. Nó hỗ trợ điều kiện thuận lợi cung cấp những phản hồi cho nhân viên về kết quả chất lượng	1	2	3	4	5
6. Nó hỗ trợ cho nhân viên chia sẻ những thông tin liên quan đến công việc	1	2	3	4	5
7. Nó hỗ trợ cho việc nhận biết những đóng góp của nhân viên cho cải thiện chất lượng	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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Q21. Khi xem xét công tác ***Quản Lý Thông Tin*** trong công ty, Anh/ Chị có cho rằng kết quả thực hiện của công tác này hiện nay là:

	Rất yếu	*Yếu*	*Trung bình*	*Tốt*	*Rất tốt*
1. Công ty đã xây dựng một bộ các tiêu chí kết quả để phản ánh những yêu cầu của khách hàng bên trong và bên ngoài cũng như các yếu tố quan trọng để thúc đẩy kinh doanh	1	2	3	4	5
2. Dữ liệu và thông tin của công ty luôn chính xác và tin cậy	1	2	3	4	5
3. Dữ liệu của công ty có thể truy cập dễ dàng cho những ai cần đến nó	1	2	3	4	5
4. Công ty luôn sử dụng những phương pháp hợp lý, khoa học khi phân tích dữ liệu và thông tin	1	2	3	4	5
5. Các nhân viên và lãnh đạo thường ra quyết định và hàng động dựa trên phân tích sự kiện (dựa vào kết quả thống kê) kết hợp với kinh nghiệm	1	2	3	4	5
6. Công ty duy trì cơ sở dữ liệu (KH, nhà cung cấp, nhân viên, quá trình,…)	1	2	3	4	5
7. Công ty liên tục cập nhật và hiệu chỉnh các nguồn thông tin cho phù hợp việc sử dụng chúng	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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Q22. Anh/ Chị có cho rằng việc ứng dụng CNTT hiện tại trong công ty đã hỗ trợ cho công tác ***Quản Lý Thông Tin*** là:

	Rất ít (Chưa có)	*Ít*	*Trung bình*	*Nhiều*	*Rất nhiều*
1. Thu thập dữ liệu về khách hàng	1	2	3	4	5
2. Thu thập dữ liệu về nhà cung cấp	1	2	3	4	5
3. Thu thập dữ liệu về nhân viên	1	2	3	4	5
4. Thu thập dữ liệu về các quá trình sản xuất/ vận hành	1	2	3	4	5
5. Duy trì/ lưu trữ cơ sở dữ liệu (KH, nhà cung cấp, nhân viên, quá trình,…)	1	2	3	4	5
6. Duy trì hệ thống thông tin dễ cập nhật và truy xuất	1	2	3	4	5
7. Cung cấp thông tin thích hợp theo các yêu cầu của nhân viên	1	2	3	4	5
8. Phân tích dữ liệu và tạo ra những thông tin toàn diện cho các cấp độ khác nhau của nhu cầu	1	2	3	4	5
9. Cải thiện độ chính xác của thông tin	1	2	3	4	5
10. Nhân viên có thể truy cập thông tin dễ dàng	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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Q23. Khi xem xét công tác ***Quản Lý Theo Quá Trình*** trong công ty, Anh/ Chị có cho rằng kết quả thực hiện của công tác này hiện nay là:

	Rất yếu	*Yếu*	*Trung bình*	*Tốt*	*Rất tốt*
1. Công ty đã thiết lập trách nhiệm rõ ràng cho việc quản lý các hoạt động chính trong công ty	1	2	3	4	5
2. Công ty kiểm soát được chất lượng và kết quả vận hành của các quá trình chính để tạo ra và phân phối các sản phẩm/ dịch vụ	1	2	3	4	5
3. Công ty đã xác định và phân tích kỹ càng những biến đổi lớn trong quá trình và đầu ra, xác định các nguyên nhân gốc rễ, đưa ra những hành động hiệu chỉnh và xác minh kết quả	1	2	3	4	5
4. Công ty đo lường được năng lực (năng suất) của các quá trình chính	1	2	3	4	5
5. Công ty rất quan tâm đến các yếu tố như là nguồn lực, phương pháp và nguyên vật liệu mà nó giúp cải thiện các hoạt động chính	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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Q24. Anh/ Chị có cho rằng việc ứng dụng CNTT hiện tại trong công ty đã hỗ trợ cho công tác ***Quản Lý Theo Quá Trình*** là:

	Rất ít (Chưa có)	*Ít*	*Trung bình*	*Nhiều*	*Rất nhiều*
1. Việc kiểm soát được chất lượng và kết quả vận hành của các hoạt động chính để tạo ra và phân phối các sản phẩm/ dịch vụ trở nên tự động hoặc bán tự động	1	2	3	4	5
2. Việc xác định và phân tích những biến đổi lớn trong quá trình và đầu ra, xác định các nguyên nhân gốc rễ, đưa ra những hành động hiệu chỉnh và xác minh kết quả trở nên nhanh chóng và dễ dàng hơn	1	2	3	4	5
3. Nó hỗ trợ đo lường được năng lực (năng suất) của các quá trình chính	1	2	3	4	5
4. Nó hỗ trợ giảm thời gian tạo ra sản phẩm/ dịch vụ	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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Q25. Khi xem xét công tác ***Cải Tiến Liên Tục*** trong công ty, Anh/ Chị có cho rằng kết quả thực hiện của công tác này hiện nay là:

	Rất yếu	*Yếu*	*Trung bình*	*Tốt*	*Rất tốt*
1. Công ty đã thiết lập các mục tiêu về hướng dẫn cải tiến liên tục và đo lường kết quả cải tiến	1	2	3	4	5
2. Công ty đào tạo cho nhân viên phương pháp, công cụ cải tiến liên tục	1	2	3	4	5
3. Công ty đã thực hiện cải tiến liên tục các sản phẩm/ dịch vụ, các quá trình, và hệ thống trong tổ chức	1	2	3	4	5
4. Công ty công bố những cải tiến đạt được	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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Q26. Anh/ Chị có cho rằng việc ứng dụng CNTT hiện tại trong công ty đã hỗ trợ cho công tác ***Cải Tiến Liên Tục*** là:

	Rất ít (Chưa có)	*Ít*	*Trung bình*	*Nhiều*	*Rất nhiều*
1. Nó hỗ trợ thực hiện việc cải tiến liên tục sản phẩm/ dịch vụ	1	2	3	4	5
2. Nó hỗ trợ thực hiện việc cải tiến liên tục các quá trình	1	2	3	4	5
3. Nó hỗ trợ thực hiện việc cải tiến liên tục các hệ thống	1	2	3	4	5
4. Nó hỗ trợ việc theo dõi các hoạt động cải tiến	1	2	3	4	5
5. Nó cung cấp các công cụ cải tiến chất lượng liên tục	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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Q27. Khi xem xét công tác ***Quan Hệ Với Nhà Cung Cấp*** trong công ty, Anh/ Chị có cho rằng kết quả thực hiện của công tác này hiện nay là:

	Rất yếu	*Yếu*	*Trung bình*	*Tốt*	*Rất tốt*
1. Công ty rất quan tâm đến việc xác định và lựa chọn nhà cung cấp	1	2	3	4	5
2. Công ty thiết lập mối quan hệ với nhà cung cấp dựa trên cơ sở lâu dài	1	2	3	4	5
3. Công ty giao tiếp rất cởi mở và rõ ràng với các nhà cung cấp của mình	1	2	3	4	5
4. Công ty chia sẻ thông tin và kế hoạch tương lai cho các nhà cung cấp của mình	1	2	3	4	5
5. Công ty đã thiết lập các hoạt động cải tiến và phát triển với các nhà cung cấp của mình	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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Q28. Anh/ Chị có cho rằng việc ứng dụng CNTT hiện tại trong công ty đã hỗ trợ cho công tác ***Quan Hệ Với Nhà Cung Cấp*** là:

	Rất ít (Chưa có)	*Ít*	*Trung bình*	*Nhiều*	*Rất nhiều*
1. Nó hỗ trợ cho việc tìm kiếm và lựa chọn nhà cung cấp	1	2	3	4	5
2. Nó cải thiện việc giao tiếp giữa công ty và nhà cung cấp	1	2	3	4	5
3. Nó tạo ra hình thức mua hàng qua mạng	1	2	3	4	5
4. Nó giúp giảm thời gian đặt hàng	1	2	3	4	5
5. Nó hỗ trợ việc chia sẻ thông tin và kế hoạch tương lai với nhà cung cấp	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....

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D. KẾT QUẢ THỰC HIỆN CỦA CÔNG TY

Q29. Xin Anh/ Chị cho biết kết quả thực hiện của công ty sau khi có giấy chứng nhận ISO 9000 (đối với công ty chưa có giấy chứng nhận xin cho biết kết quả thực hiện trong vài năm gần đây):

	Giảm nhiều	*Giảm ít*	*Không thay đổi*	*Tăng ít*	*Tăng nhiều*
1. Chất lượng sản phẩm/ dịch vụ	1	2	3	4	5
2. Sự phức tạp, rườm rà của các quá trình và thủ tục nội bộ	1	2	3	4	5
3. Sai hỏng/ khuyết tật	1	2	3	4	5
4. Lãng phí	1	2	3	4	5
5. Chi phí vận hành trên một đơn vị sản phẩm	1	2	3	4	5
6. Kiểm soát tồn kho	1	2	3	4	5
7. Thời gian đặt hàng của khách hàng	1	2	3	4	5
8. Thời gian đặt hàng với nhà cung cấp	1	2	3	4	5
9. Năng suất	1	2	3	4	5
10. Công suất hoạt động	1	2	3	4	5
11. Doanh thu và lợi nhuận	1	2	3	4	5
12. Doanh số bán	1	2	3	4	5
13. Thị phần	1	2	3	4	5
14. Thị trường mới/ khách hàng mới	1	2	3	4	5
15. Lợi thế cạnh tranh	1	2	3	4	5
16. Sự hợp tác lâu dài với khách hàng	1	2	3	4	5
17. Sự hài lòng của khách hàng	1	2	3	4	5
18. Các than phiền của khách hàng	1	2	3	4	5
19. Thu nhập cho nhân viên	1	2	3	4	5
20. Sự hài lòng trong công việc của nhân viên	1	2	3	4	5
21. Sự tham gia của nhân viên trong công ty	1	2	3	4	5

Anh/ Chị vui lòng nêu một vài minh chứng cho kết quả đánh giá này: .....
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Q30. Anh/ Chị có nhận xét khác gì về HT QLCL và các ứng dụng của CNTT? .....
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E. THÔNG TIN VỀ NGƯỜI TRẢ LỜI

Xin Anh/ Chị vui lòng cho biết các thông tin sau (tùy chọn):

Họ và tên	*Thuộc bộ phận/ phòng ban*	*Chức vụ*
1.		
2.		
3.		
4.		
5.		

APPENDIX 4
(Used in Chapter 4)

List of Surveyed Organizations

No.	*Name of Firm*	*Address*	*Tel*	*Fax*	*Email*	*Website*	*Type of Business*
1	Nha Be Steel	25 Nguyen Van Quy St., Dist. 7, HCM City	8733825	8730264			Manufacturing (Steel)
2	Ngoc Nghia Ltd.	IV-22 Tay Thanh St., Tan Binh Industrial Zone, W.15, Tan Binh Dist., HCMC	8151778	8151756	nnc@hcm.fpt.vn		Manufacturing (Plastic)
3	VinaSun Travel	30 Thu Khoa Huan St., Dist. 1, HCMC	8272727	8225766	vinasuntravel@hcm.vnn.vn	www.vinasuntravel.com	Services (Tourist)
4	Hoc Mon Casumina	Tan Thoi Hiep W., Dist. 12, HCMC	7171452	8822208			Manufacturing (Tyre and Inner Tube of Motorbike and Bike)
5	My Chau Printing and Packing	18 Luy Ban Bich St., W. 20, Tan Binh Dist., HCMC	9612728	9612737	mychau@hcm.vnn.vn		Manufacturing (Packing)
6	Tribeco	12 Ky Dong St., W. 9, Dist. 3, HCMC					Manufacturing (Beverage)
7	Tan Thien Nien Ky	72/4 Phan Dang Luu St., Phu Nhuan Dist., HCMC	8442810		contacts@ttnkvn.com	www.ttnkvn.com	Manufacturing (Software)
8	Biti's	1/11 Tam Hiep W., Bien Hoa City, Dong Nai Province					Manufacturing (Shoes)
9	Financial and Auditing Consultant Services	29 Vo Thi Sau St., W. 6, Dist. 3, HCMC	8205944	8205942			Services (Finance and Accounting)
10	Phu Nhuan Jewelry (P&J)	170E Phan Dang Luu St., Phu Nhuan Dist., HCMC	8421087	8440065	pnj@hcm.vnn.vn	www.pnj.com.vn	Manufacturing (Jewelry)
11	Nha be Garment	Ben Nghe St., Tan Thuan W., Dist. 7, HCMC	8720077	8725107	nhabeco@hcm.fpt.vn	www.nhabe.com.vn	Manufacturing (Garment)
12	Long An Manufacturing and Trading Ltd.	53 Pham Van Lai St., W. 6, Tan An Town, Long An Province	07289576	072826327	ladfeco@hcm.vnn.vn		Manufacturing (Garment, Feather,..)
13	Bien Hoa Packing	No. 7 St., Bien Hoa 1 Industrial Zone, Dong Nai Province	061836642	061836030	baobibienhoa@hcm.vnn.vn		Manufacturing (Packing)
14	Petrosin Corporation Vietnam	17 Vo Van Tan St., Dist. 3, HCMC	9301848	9301851	mail@petrosin.com	www.petrosin.com	Manufacturing (Software)

No.	*Name of Firm*	*Address*	*Tel*	*Fax*	*Email*	*Website*	*Type of Business*
15	Sam Sung Vina	938 Highway 1A Linh Trung, Dist. Thu Duc, HCMC	8965500	8965566			Manufacturing (Audio/Video, Air Conditioner,..)
16	Samco	262 Tran Hung Dao St., Dist. 1, HCMC	9200919	9201876	samco@hcm.vnn.vn	www.samco.com.vn	Manufacturing (Bus)
17	Dien Quang Light Buld	125 Ham Nghi St., Dist. 1, HCMC	8290135	8251518			Manufacturing (Lighting Bulb)
18	Lac Long Quan Manufacturing	168/11 Lac Long Quan St., W. 3, Dist. 11, HCMC	8587991	9606291	Cashewnuts@hcm.com.vnn.vn		Manufacturing (Bean)
19	Thanh Cong Garment - Thread Factory 2	8 Truong Chinh St., W. 15, Tan Binh Dist., HCMC	8154010	8154010	soi2@thanhcong.net	www.thanhcong.com	Manufacturing (Thread)
20	Tuyet Ltd.	110 Nguyen Trung Truc St., W. 2, Tan An Town, Long An Province	072825414	072821154			Manufacturing (Aluminum door, electrical equipment)
21	Printing Industrial Mechanical	102A Hai Thuong Lan Ong St., W. 10, Dist. 5, HCMC	8552402	8559042			Manufacturing (Printing equipment)
22	Tico	121 Huong lo 14, W. 20, Tan Binh Dist., HCMC	9612405	9612538		www.ticovietnam.com.vn	Manufacturing (Washing-powder)
23	Seafood	213 Hoa Binh St., W. 19, Tan Binh Dist., HCMC	8606085	8653143	Seaspimex@hcm.vnn.vn		Manufacturing (Shrimp and fishes)
24	CISCOM	33 Ngo Thoi Nhiem St., Dist. 3, HCMC	9330009			www.siscomvn.com.vn	Manufacturing and Services (Hardware and Software)
25	Hong Co Trading and Computers Ltd.	4 Nam Quoc Cang St., Dist. 1, HCMC	9252932	9252934	hongco@hcm.vnn.vn	www.hongco.com.vn	Services and Trading (Computer)
26	Vietnam Seaprodex	245/60 Hoa Binh St., W. 20, Tan Binh Dist., HCMC	8650520				Manufacturing and Services (Packing and Transportation)
27	NetSoft	142 Nguyen Dinh Chieu St., W. 6, Dist. 3, HCMC	8237770	8237773	netsoft@netsoft.com.vn	www.netcenter.vn.net	Services (Computer)
28	Tam Thanh Trading	11 Ho Bien Chanh St., HCMC					Trading (products of labor safety)
29	Ben Thanh Beverage	151 No Trang Long St., Binh Thanh St., HCMC					Manufacturing (Beverage & Beer)
30	Vietnam Le Long	An Thanh Commune, Ben Luc Dist., Long An Province	072872213				Manufacturing (Battery)
31	Vinh Khang Tranding and Services	310 Tran Phu St., Dist. 5, HCMC	9230361	9233356	vinhkhang@hcm.vnn.vn		Services (Advertising)
32	Anh Hong Food	61 Nguyen Cu Trinh St., Dist. 1, HCMC	8848509	8377665	ah@hcm.vnn.vn		Manufacturing (Gracilaria, Flan, Jelly,..)

No.	*Name of Firm*	*Address*	*Tel*	*Fax*	*Email*	*Website*	*Type of Business*
33	AGTEX 28	3 Nguyen Oanh St., W. 10, Go Vap Dist., HCMC	8942238	8943053	agtexntm@hcm.vnn.vn		Manufacturing and Trading (Garment, Real state,..)
34	Viet Nam Air Caterers	Tan Son Nhat Airport, HCMC	8448367	8446719		www.vnaircaterers.com	Manufacturing (Airplane Ration)
35	Ha Tien 1 Cement	Km 8, Hanoi Highway, Thu Duc Province, HCMC	8966608	8967635			Manufacturing (Cement)
36	Mobile Phone Center II	750 Dien Bien Phu St., Dist. 10, HCMC	8303123				Trading (Mobile phone)
37	Tan Phu Cuong Industrial Trading	15/2 Phan Van Hon St., Dist. 12, HCMC	7190098				Manufacturing (Garment)
38	Lam Giang Computer Ltd.	15/2 Binh Trieu St., Thu Duc Dist., HCMC	7269659		thlamgiang@hcm.vnn.vn		Services (Computer)
39	Freetrend Ltd.	Plots of Land 22, 24, 26, 28, and 30, Export Processing Zone, Thu Duc Dist., HCMC	8975028	8975024			Manufacturing (Sport Shoes)
40	Vietnam NISSEI ELECTRIC	Export Processing Zone, Thu Duc Dist., HCMC	8960239	8974754			Manufacturing (Electric Wire)
41	LaTek Leather Manufactuirng Ltd.	Plots of Land 36-40, Export Processing Zone, Thu Duc Dist., HCMC	8969408	8966853	latekvn@hcm.vnn.vn		Manufacturing (Leather Shoes)
42	Saigontourist Cable Television	31-33 Dinh Cong Trang St., Tan Dinh W., Dist. 1, HCMC	8205605		SCTV@fmail.vnn.vn	http://SCTV.vnn.vn	Services (Cable Television)
43	VDC		045372755	045372753		http://home.vnn.vn	Services (Data Transmission)
44	Eat City Phone	125 Hai Ba Trung St., Dist. 1, HCMC	8254444	8220402			Services (Telephone)
45	Water Supply	194 Pasteur St., Dist. 3, HCMC	8297147				Services (Water)
46	I.P. Telecommunication	202A Hoang Van Thu St., W. 9, Phu Nhuan Dist., HCMC	8459094				Trading (Computer Spare Parts)
47	Phu Dong Joinventer	29 Le Duan St., Dist. 1, HCMC	8236318	8236323	sfr@hcm.vnn.vn		Manufacturing (Wood)
48	Hoanh Co Trading and Services Ltd.	49B Tran Hung Dao St., W. 9, Dist. 5, HCMC	9235146	9230192	hoanhcoco@hcm.vnn.vn		Trading and Services (Sanitary Napkin)
49	HCM City Metal	8 Le Duan St., Dist. 3, HCMC	8754887				Trading (Steel)
50	Tan Mai Paper	Quarter , Thong Nhat W., Bien Hoa City, Dong Nai Province	06182257	061821915	tanmai@hcm.vnn.vn	www.tanmai.com.vn	Manufacturing (Paper)
51	Tan Vinh Tien Manufacturing and Trading Ltd.	Soc Trang Town, Soc Trang Province					Manufacturing (Notebook)
52	KPMG Limited	Floor 10th, 115 Nguyen Hue St., HCMC	8219266	8219267			Services (Finance and Auditing)

No.	*Name of Firm*	*Address*	*Tel*	*Fax*	*Email*	*Website*	*Type of Business*
53	Hoang Hung Manufacturing and Trading Ltd.	56/6 Highway 1A, Tan The Hiep W., Dist. 12, HCMC	7161957				Manufacturing and Trading (Industrial Electricity Equipment,..)
54	Binh Chanh Construction	93/8 Hung Vuong St., Binh Chanh Dist., HCMC	88753021	88753522			Manufacturing and Services (Constructions, Real State)
55	Thanh Le Industrial Zone Development	G3 Yersin Avenue, Thu Dau Mot, Binh Duong Province	650829605	(84-650) 821734	hdgroup@,vnn.vn		Trading (Infrastructure Investment of Industrial Zone, Inhabitant Areas)
56	Nestle Vietnam Ltd.	17 Bien Hoa II Intrustrial Zone, Dong Nai Province	061836601	061836602			Manufacturing (Formula and Beverage)
57	Thuan Loi Trading Ltd.	1131 Tran Hung Dao B St.,W. 5, Dist. 5, HCMC	9241139				Trading (Cosmetic)
58	TRV	235 Dong Khoi St., Dist. 1, HCMC	8236900	8236899	sales@trginternational.com.vn	www.trginternational.com.vn	Manufacturing (Software)
59	KURABE Inustrial VN	26 Tu Do Avenue, VSIP				www.kurabe.com	Manufacturing (Electric Equipment)
60	Nguyen Anh	816-818 Thich Minh Nguyet St., Tan Binh Dist., HCMC	9970547	8462390	nguyen-anh-tssc@hcm.fpt.vn		Trading (Medical Equipment)
61	VN Interflour Ltd.	Phuoc Hoa Town, Tan Thanh, Ba Ria Vung Tau Province	064936936	064936946			Manufacturing (Wheat Flour)
62	Sony Vietnam	248 A No Trang Long St., Binh Thanh Dist., HCMC	8414488	8414465		sonyvietnam@sony.com.vn	Manufacturing (Electronic Products)
63	Saigon Toyota Tshusho Motor Coporation	570 Hung Vuong St., Dist. 6, HCMC	8763881	8763880			Services (Motor Repairing)
64	DOMEX (VN) Co. Ltd	Linh Trung Import and Export Processing, Thu Duc Dist., HCMC	8975203	7240373			Manufacturing (Garment)
65	SHIHFA RUBBER INDUSTRIAL COMPANY	539-540 Au Co St., W. 10, Tan Binh Dist., HCMC	8640825	8640826			Manufacturing (Tyre and Inner Tube of Motorbike)
66	Cai Lan Vegetable Oil	2 Ngo Duc Ke St., Dist. 1, HCMC	8237846	8241265		caloficjobs.com	Manufacturing (Cooking Oil)
67	Viet Duc Pharmaceutical	138B8 To Hien Thanh St., W. 15, Dist. 10, HCMC	8632234		vdxal@hcm.vnn.vn		Trading (Drug)
68	Dai Viet Electronic Manufacturing and Trading Ltd.	125/20 Au Duong Lan St., W. 2, Dist. 8, HCMC	8511068	8511201	davicoelectric@hcm.vnn.vn		Manufacturing and Trading (Household Electrical Appliance)
69	EXXONMOBIL UNIQUE VN Ltd.	34 Le Duan St., Dist. 1, HCMC	8233250	8233252			Trading (Lubricant)

No.	*Name of Firm*	*Address*	*Tel*	*Fax*	*Email*	*Website*	*Type of Business*
70	Viet PC	66B Dong Du St., Ben Nghe W., Dist. 1, HCMC					Trading (Biological products)
71	Saigon Wool	255 Hoang Van Thu, W. 2, Tan Binh Dist., HCMC	9970882	8443228	sawotraco@hcm.vnn.vn		Manufacturing (Wool)
72	Hoa Binh Real Estate Trading and Construction	235 Vo Thi Sau St., Dist. 3, HCMC	9325030	9325221	hoabinh@hcm.vnn.vn	www.hoabinhcorporation.com	Manufacturing and Trading (Construction and Real State)
73	Khanh Hoa Transportation Services	58 Evenue 23/10, Nha Trang City	058822136	058814301			Services (Transportation)
74	TA2	Thuan An, Binh Duong Province	0650740770	0650740770		www.theodorealexander.com	Manufacturing (Arts and Crafts)
75	FENIX Knitting (VN)	53 Linh Trung Import and Export Processing, Thu Duc Dist., HCMC	8960984	8964564	fenixfac@hcm.fpt.vn		Manufacturing (Knitting)
76	KH VINA .LTD	Phuoc Long B W., Dist. 9, HCMC					Manufacturing (Cloth)
77	ASTRO SAIGON .LTD	70-72 Linh Trung Import and Export Processing, Thu Duc Dist., HCMC	8964774	8964773	tung-trading@hcm.vnn.vn	www.Astropia.com	Manufacturing (Handbag and Suitcase)
78	Paramount Enterprise	Linh Trung Import and Export Processing, Thu Duc Dist., HCMC					Manufacturing (Jumper)
79	UPGAIN(VIETNAM) MANUFACTURING CO.LTD	64-66-68 Linh Trung Import and Export Processing, Thu Duc Dist., HCMC	8967155	8967154			Manufacturing (Garments)
80	Saigon Industrial and Commercial Bank – Thai Binh Branch	333 Pham Ngu Lao St., Dist. 1, HCMC	8368188				Services (Banking)
81	Saigon Hotel	41-47 Dong Du St., Dist. 1, HCMC	8299734	8291466			Services (Hotel)
82	Tien Dung Trading and Services	56C Thong Nhat St., Go Vap Dist., HCMC	8947071	8947071			Trading (Dealum Products)
83	BST GROUP	33 Cuu Long St., Tan Binh Dist., HCMC	8488432	8441451			Manufacturing (Software)
84	Phamedic	367 Nguyen Trai St., Dist. 1, HCMC	9200300				Manufacturing (Drug)
85	A Chau Commercial Stock Bank	141-143 Hung Vuong St., Dist. 6, HCMC	9606980				Services (Banking)
86	VIMEDIMEX II	246 Cong Quynh St., Dist. 1, HCMC	8398441	8325953		www.netpharm.com.vn	Manufacturing and Trading (Medicated Oil, Warehouse)
87	VN Register	1 Hanoi Highway, Dist. 9, HCMC					Services (Vehicle Testing)

No.	*Name of Firm*	*Address*	*Tel*	*Fax*	*Email*	*Website*	*Type of Business*
88	Verification Management Board of Mechanical Vehicle of Southern Provinces	160 Nam Ky Khoi Nghia St., Dist. 3, HCMC	9330845	9330844	varphianam@hcm.vnn.vn		Services (Vehicle Testing)
89	Bien Hoa Cafe	Bien Hoa Industrial Zone, Dong Nai Province	061836554	061836108			Manufacturing (Coffee)
90	KAO Vietnam	A12 Amata Industrial Zone, Bien Hoa, Dong Nai Province	061891190	061891189			Manufacturing (Shampoo)
91	HAPROSIMEX	Km 11 Highway 1A, Van Dien, Thanh Tri	048615334	048615390	hapro@fpt.vn	www.hapro.com	Manufacturing (Garment)
92	Thai Tuan Garmex	1/148 Nguyen Van Qua St., Dong Hung Thuan W., Dist. 12 HCMC					Manufacturing (Textile)
93	An Tam Ltd.	50/6 Nguyen Dinh Chieu St., W. 3, Phu Nhuan Dist., HCMC	8447647				Manufacturing (Construction)
94	De Vuong Ltd.	58 A Highway I, My Yen, Ben Luc, Long An Province	072890422	072890420			Manufacturing (Garment & Shoes)
95	Bao Minh CMG	96A3-96A4 Dien Bien Phu St., W. 15, Binh Thanh Dist., HCMC	8408020	8408021		www.baominhcmg.com.vn	Services (Insurance)
96	Chau Son Ltd.	207 To Hien Thanh St., W. 13, Dist. 10, HCMC	8656052		chauson@hcm.fpt.vn	www.chausonfurniture.com	Manufacturing (Wood)
97	ATLAS	6th Floor, E.Town, 364 Cong Hoa St., Tan Binh Dist., HCMC	8101000	8102000	infor@atlasindustries.com	www.altasinustries.com	Services (Documents)
98	Vietnam Airline (Southern Areas)	49 Truong Son St., Tan Binh Dist., HCMC	8446667			www.vietnamairline.com	Services (Air tickets)
99	Nguyen Lam Trading and Services	113/842/2 Nguyen Kiem St., W. 3, Go Vap Dist., HCMC	9858622	9858622			Trading and Services (Medical Equipments)
100	IKEA	5B Ton Duc Thang St., Dist. 1, HCMC					Manufacturing and Trading (Home Decoration)
101	M&N Mauri - Langa	106 Dinh Bo Linh St., W. 26, Binh Thanh Dist., HCMC	5112580	5112582			Manufacturing and Trading (Food)
102	99 VINA	23B Street B, Linh Trung II Import and Export Processing Zone	7291999	7291856			Manufacturing (Embroidering)
103	Samhung Vina	Song Than 1 Industrial Zone, Binh Duong Province	065732833	065732835			Manufacturing (Silk-screen Printing)
104	ALCAMAX Packing	7 Street 26, VSIP	0650743031				Manufacturing (Carton Packing)
105	DANU VINA	56-58 Linh Trung Import and Export Processing Zone, Thu Duc Dist., HCMC	8975066	8975069			Manufacturing (Cotton Animals)

No.	*Name of Firm*	*Address*	*Tel*	*Fax*	*Email*	*Website*	*Type of Business*
106	MEBIPHAR	31 Ngo Thoi Nhiem St., Dist. 3, HCMC	9301871				Manufacturing (Pharmacy)
107	Fujitsu Computer Products of Vietnam, Inc	31A, Street No.3, Bien Hoa II Industrial Zone	061836565	061836561		www.fcvfujitsu.com	Manufacturing (Electronic Circuit)
108	Saigon engine bikes	252 Lac Long Quan St., Dist. 11, HCMC	9633602	9633629			Manufacturing (Bike Spare Parts)
109	Tan Dong Ltd.	1B1 Street 1, W. 20, Tan Binh Dist., HCMC	9730731	9730655	Shintung@hcm.fpt.vn		Manufacturing (Switch)
110	Dong Hung Services	25 Highway 1A, Tan Chanh Hiep W., Dist. 12, HCMC					Services (Tourist, Hotel)
111	SAMCO ANLAC	36 Kinh Duong Vuong St., An Lac, Binh Chanh Dist., HCMC	7522157	7520681	Anlacsamco@hcm.vnn.vn		Manufacturing (Bus)
112	Tan Tien Platics Packing	117/2 Luy Ban Bich St., W. 20, Tan Binh Dist., HCMC	9612279	9612641	tantien@hcm.fpt.vn	Tapack.com	Manufacturing (Packing)
113	Bien Xanh Import and Export Ltd.	50 Pasteur St., Ben Nghe W., Dist. 1, HCMC	8217102	8217067	bienxanh@hcm.vnn.vn		Trading (Oil)
114	Nam Viet Import and Export Ltd.	99 Tan Thanh St., W. 17, Tan Binh Dist., HCMC	8104074	8429323			Manufacturing (Garment & Shoes)
115	Saigon Technology	95 Dien Bien Phu St., Dist. 1, HCMC	9103163	9103162	techgel@hcm.vnn.vn		Manufacturing (Industrial Electricity)
116	Esquel Garment Manufacturing Viet Nam Ltd.	5 Street 9, VSIP					Manufacturing (Garment)
117	Cotec	9-19 Ho Tung Mau St., Dist. 1, HCMC	8211965	8210293	cotectcompany@hcm.vnn.vn	www.cotec.com	Manufacturing (Construction Materials)
118	Rong Viet Trading	18 B2 Street 3/2, Dist. 10, HCMC	8627499				Trading (Gas Oven)
119	LYNTEX (VN) CO. LTD	Linh Trung Import and Export Processing Zone, Thu Duc Dist., HCMC	8975203	7240373			Manufacturing (Garment)
120	Saigon Precision Co. Ltd	Street D, Linh Trung Import and Export Processing Zone, Thu Duc Dist., HCMC	8174388				Manufacturing (Mould)
121	Thuong Hao Ltd.	H2 Street 43, Song Than II Import and Export Processing Zone, Di An, Binh Duong Province	0650790215	0650790218			Manufacturing (Mould)
122	Tien Dat Electronic	354 Dien Bien Phu St., Dist. 1, HCMC	8398757				Manufacturing (Electronic Equipment)

No.	*Name of Firm*	*Address*	*Tel*	*Fax*	*Email*	*Website*	*Type of Business*
123	Binh Chanh Investment and Construction	260/4 Kinh Duong Vuong, An Lac, Binh Chanh Dist., HCMC	8753021				Trading and Services (Real Estate, Construction)
124	TPC Vina Plastic & Chemical Corp. Ltd	Go Dau Industrial Zone, Phuoc Thai, Long Thanh, Dong Nai Province	061841461	061841460			Manufacturing (PVC Plastic)
125	Binh Thanh Garment	24C Phan Dang Luu st., W. 6, Binh Thanh Dist., HCMC	8060971	8411598		www.gilimex.com	Manufacturing (Garment)
126	Ha Yen Manufacturing and Trading	81 D2 Van Thanh Bac St., W. 25, Binh Thanh St., HCMC	5120538	5120460	hayensg@hcm.vnn.vn	www.hayenind.com	Manufacturing and Trading (Industrial Oven, Water Filter Equipment)
127	ITACO	Street 4, Tan Tao Industrial Zone, Binh Chanh Dist., HCMC	8764467		tantao@hcm.vnn.vn		Trading (Real Estate)
128	Packing Printing and Tobacco Materials	Cat Lai Industrial Zone, Thanh My Loi W., Dist. 2, HCMC					Manufacturing (Tobacco)
129	Binh Minh Plastic	240 Hau Giang St., W. 9, Dist. 6, HCMC	9690973	9606814	binhminhplas@hcm.fpt.vn	binhminhplastic.com	Manufacturing (Plastic)
130	Liksin	701 Duong Vuong St., W. 12, Dist. 6, HCMC	7512562	7512561	liksin@hcm.vnn.vn	www.liksin.com	Manufacturing (Packing)
131	Mobile Information		8649533	8649534	mail.VMS.com.vn	www.mobilefone.com	Services (Information)
132	Kinh Do	6/134 Highway 13, Hiep Binh Phuoc W., Thu Duc Dist., HCMC	7269497	7269472	kido.co@kinhdifood.com	www.kinhdofood.com	Manufacturing (Food)
133	Aquatic Product Processing						Manufacturing (Food)
134	Ben Thanh Rubber	B1-3 Tay Bac Industrial Zone, Cu Chi Dist., HCMC	7907619				Manufacturing (Conveyor Belt)
135	Phu Rieng Rubber	Phu Rieng Commune, Phuoc Long Dist., Binh Phuoc Province	651.77776	651.777761	phurieng.ruber@vnn.vn	phuriengrubercompany.com	Manufacturing and Trading (Rubber)
136	TW2 Pharmaceutical	136 To Hien Thanh St., Dist. 10, HCMC	8650834	8650750			Trading (Drug)
137	Phu Nhuan Services	78A Nguyen Van Troi St., W. 8, Phu Nhuan Dist., HCMC	8444861	8443264	maseco@hcm.fpt.vn		Service (Real Estate, Hotel)
138	SVC Co. Ltd.	95 Nguyen Trai St., Dist.1, HCMC	8325353	8331947	svcsales@hcm.vnn.vn	www.svc.com.vn	Service and Trading (Software, Hardware)
139	Sai gon Industrial Commercial Stock Bank	2C Pho Duc Chinh St., Dist., Ben Nghe W., Dist. 1, HCMC	92143183	9143193			Service (Banking)
140	Construction Consultant No.7	296 Nguyen Van Dau St., W. 11, Binh Thanh Dist., HCMC	5150187				Service (Document, Design)

No.	*Name of Firm*	*Address*	*Tel*	*Fax*	*Email*	*Website*	*Type of Business*
141	Binh Long Rubber	An Loc Commune, Binh Long Dist., Binh Phuoc Province	651.666324	651.666222			Manufacturing (Rubber)
142	Karos Ltd.	628C Hanoi Highway , An Phu W., Dist. 2, HCMC	8980275	8966658	karosun@hcm.vnn.vn		Manufacturing (Garment)
143	Construction Consultant No.23	439A Phan Van Tri St., W. 5, Go Vap Dist., HCMC	9854311	8942024	tecco@hcm.vnnn.vn		Service (Document, Design)
144	Binh Tay Steel Net	117 Au Co St., W. 19, Tan Binh Dist., HCMC	9743946	8656862			Manufacturing and Trading (Steel)
145	Hiep Hung Shoes	161 Da Nam St., W. 3, Dist. 8, HCMC					Manufacturing (Shoes)
146	Nha Y Ceramics	74/13 Su Van Hanh St., W. 12, Dist. 10, HCMC	8636802	8620695			Manufacturing (Ceramics)

APPENDIX 5
(Used in Chapter 6)

Appendix 5.1: Correlation Matrix of Items in Seven Criteria of QMS

A. Correlation matrix of items of leadership

		Create clear vision and quality values	Consider the needs of customers	consider the needs of suppliers	consider the needs of employees	provide freedom to employees to work	provide required resources and training to employees to act with responsibility and accountability	encourage and recognize employee's contributions
Create clear vision and quality values	Pearson Correlation	1.000	.425**	.393**	.479**	.428**	.554**	.486**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000
	N	144	144	140	144	142	144	143
Consider the needs of customers	Pearson Correlation	.425**	1.000	.500**	.466**	.222**	.406**	.377**
	Sig. (2-tailed)	.000	.	.000	.000	.007	.000	.000
	N	144	146	142	146	144	146	145
consider the needs of suppliers	Pearson Correlation	.393**	.500**	1.000	.428**	.344**	.353**	.444**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000
	N	140	142	142	142	140	142	141
consider the needs of employees	Pearson Correlation	.479**	.466**	.428**	1.000	.587**	.608**	.758**
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000
	N	144	146	142	146	144	146	145
provide freedom to employees to work	Pearson Correlation	.428**	.222**	.344**	.587**	1.000	.650**	.620**
	Sig. (2-tailed)	.000	.007	.000	.000	.	.000	.000
	N	142	144	140	144	144	144	143
provide required resources and training to employees to act with responsibility and accountability	Pearson Correlation	.554**	.406**	.353**	.608**	.650**	1.000	.626**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000
	N	144	146	142	146	144	146	145
encourage and recognize employee's contributions	Pearson Correlation	.486**	.377**	.444**	.758**	.620**	.626**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.
	N	143	145	141	145	143	145	145

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

B. Correlation matrix of items of customer focus

		frequently researches/ surveys customer's needs and feedback on product/ service provided	links customer's needs and feedback on product/ service provided to design, production and delivery processes	receive and respond customer's their needs and feedback on product/ service provided quickly	manages customer relationships systematically	measures customer's satisfactions
frequently researches/ surveys customer's needs and feedback on product/ service provided	Pearson Correlation	1.000	.558**	.520**	.418**	.464**
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	145	145	145	145	144
links customer's needs and feedback on product/ service provided to design, production and delivery processes	Pearson Correlation	.558**	1.000	.460**	.342**	.469**
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	145	145	145	145	144
receive and respond customer's their needs and feedback on product/ service provided quickly	Pearson Correlation	.520**	.460**	1.000	.417**	.462**
	Sig. (2-tailed)	.000	.000	.	.000	.000
	N	145	145	146	146	144
manages customer relationships systematically	Pearson Correlation	.418**	.342**	.417**	1.000	.641**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	145	145	146	146	144
measures customer's satisfactions	Pearson Correlation	.464**	.469**	.462**	.641**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	N	144	144	144	144	144

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

C. Correlation matrix of items of employee involvement

		understand the importance of their contribution and role in the organization	identify constraints to their performance	joint working teams/ group to improve quality or solve problems	openly discuss problems and issues during operations	willingly share their knowledge and experience	actively seek opportunities to enhance their competence, knowledge and experience
understand the importance of their contribution and role in the organization	Pearson Correlation	1.000	.661**	.395**	.423**	.388**	.285**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.001
	N	146	145	145	146	146	145
identify constraints to their performance	Pearson Correlation	.661**	1.000	.479**	.445**	.380**	.358**
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000
	N	145	145	144	145	145	144
joint working teams/ group to improve quality or solve problems	Pearson Correlation	.395**	.479**	1.000	.708**	.554**	.497**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000
	N	145	144	145	145	145	144
openly discuss problems and issues during operations	Pearson Correlation	.423**	.445**	.708**	1.000	.741**	.551**
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000
	N	146	145	145	146	146	145
willingly share their knowledge and experience	Pearson Correlation	.388**	.380**	.554**	.741**	1.000	.604**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000
	N	146	145	145	146	146	145
actively seek opportunities to enhance their competence, knowledge and experience	Pearson Correlation	.285**	.358**	.497**	.551**	.604**	1.000
	Sig. (2-tailed)	.001	.000	.000	.000	.000	.
	N	145	144	144	145	145	145

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

D. Correlation matrix of items of information management

		develop a comprehensive set of performance indicators	data and information are sufficiently accurate and reliable	data are accessible to those who need it	analyzes data and information using valid methods	make decisions and take actions based on factual analysis, balanced with experience and intuition	maintains database	continuously refine information sources and their uses within the organization
develop a comprehensive set of performance indicators	Pearson Correlation	1.000	.490**	.402**	.626**	.590**	.547**	.621**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000
	N	144	142	138	141	144	142	143
data and information are sufficiently accurate and reliable	Pearson Correlation	.490**	1.000	.365**	.578**	.493**	.473**	.528**
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000
	N	142	144	138	142	144	143	144
data are accessible to those who need it	Pearson Correlation	.402**	.365**	1.000	.520**	.450**	.414**	.472**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000
	N	138	138	139	138	139	138	139
analyzes data and information using valid methods	Pearson Correlation	.626**	.578**	.520**	1.000	.661**	.587**	.705**
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000
	N	141	142	138	143	143	142	143
make decisions and take actions based on factual analysis, balanced with experience and intuition	Pearson Correlation	.590**	.493**	.450**	.661**	1.000	.608**	.671**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000
	N	144	144	139	143	146	144	145
maintains database	Pearson Correlation	.547**	.473**	.414**	.587**	.608**	1.000	.689**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000
	N	142	143	138	142	144	144	144
continuously refine information sources and their uses within the organization	Pearson Correlation	.621**	.528**	.472**	.705**	.671**	.689**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.
	N	143	144	139	143	145	144	145

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

E. Correlation matrix of items of process management

		establishes clear responsibility and accountability for managing key activities	controls the quality and operational performance of key processes	strictly identifies and analyzes significant variations in process	measures the capability of key activities	focuses on the factors such as resources, methods and materials that will improve key activities
establishes clear responsibility and accountability for managing key activities	Pearson Correlation	1.000	.666**	.514**	.613**	.478**
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	143	143	143	143	142
controls the quality and operational performance of key processes	Pearson Correlation	.666**	1.000	.575**	.570**	.602**
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	143	143	143	143	142
strictly identifies and analyzes significant variations in process	Pearson Correlation	.514**	.575**	1.000	.654**	.514**
	Sig. (2-tailed)	.000	.000	.	.000	.000
	N	143	143	143	143	142
measures the capability of key activities	Pearson Correlation	.613**	.570**	.654**	1.000	.583**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	143	143	143	143	142
focuses on the factors such as resources, methods and materials that will improve key activities	Pearson Correlation	.478**	.602**	.514**	.583**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	N	142	142	142	142	142

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

F. Correlation matrix of items of continuous improvement

		establishing goals to guide continuous improvement and measures the results of improvement	trainning employees with the methods and tools for continuous improvement	making continuous improvement of product/service, process, and system in the organization	recognizing and informing improvements
establishing goals to guide continuous improvement and measures the results of improvement	Pearson Correlation	1.000	.715**	.719**	.661**
	Sig. (2-tailed)	.	.000	.000	.000
	N	145	145	145	145
trainning employees with the methods and tools for continuous improvement	Pearson Correlation	.715**	1.000	.707**	.731**
	Sig. (2-tailed)	.000	.	.000	.000
	N	145	145	145	145
making continuous improvement of product/service, process, and system in the organization	Pearson Correlation	.719**	.707**	1.000	.715**
	Sig. (2-tailed)	.000	.000	.	.000
	N	145	145	145	145
recognizing and informing improvements	Pearson Correlation	.661**	.731**	.715**	1.000
	Sig. (2-tailed)	.000	.000	.000	.
	N	145	145	145	145

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

G. Correlation matrix of items of supplier relationship

		much emphasizing on identifying and selecting key suppliers	establishing supplier relationships with long-term considerations	clearly and openly communicating with suppliers	sharing information and future plans to suppliers	establishing joint development and improvement activities with suppliers
much emphasizing on identifying and selecting key suppliers	Pearson Correlation	1.000	.718**	.572**	.434**	.510**
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	144	143	144	142	144
establishing supplier relationships with long-term considerations	Pearson Correlation	.718**	1.000	.729**	.522**	.606**
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	143	143	143	141	143
clearly and openly communicating with suppliers	Pearson Correlation	.572**	.729**	1.000	.597**	.625**
	Sig. (2-tailed)	.000	.000	.	.000	.000
	N	144	143	144	142	144
sharing information and future plans to suppliers	Pearson Correlation	.434**	.522**	.597**	1.000	.726**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	142	141	142	142	142
establishing joint development and improvement activities with suppliers	Pearson Correlation	.510**	.606**	.625**	.726**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	N	144	143	144	142	144

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

Appendix 5.2: Correlation Matrix of Items of the Organizational Performance

	Product/ service quality	Complexity and wordiness of internal process and procedures	Defectives / defects	Wastes	Operating costs per units	Inventory control	Order time of customers	Order time to suppliers	Productivity	Capacity	Revenue and profits	Sales
Product/service quality	1.000	-.101	-.456**	-.416**	-.327**	.016	-.062	-.031	.448**	.561**	.394**	.409**
Complexity and	-.101	1.000	.317**	.385**	.309**	.020	.224*	.170	-.243**	-.259**	-.175*	-.172*
Defectives/	-.456**	.317**	1.000	.687**	.467**	.021	.108	.071	-.381**	-.388**	-.298**	-.263**
Wastes	-.416**	.385**	.687**	1.000	.642**	.067	.225*	.111	-.385**	-.445**	-.340**	-.283**
Operating costs	-.327**	.309**	.467**	.642**	1.000	.225*	.261**	.153	-.236**	-.267**	-.264**	-.180*
Inventory	.016	.020	.021	.067	.225*	1.000	.255**	.171	-.015	.028	-.077	.021
Order time of	-.062	.224*	.108	.225*	.261**	.255**	1.000	.823**	.009	-.102	-.131	.025
Order time to	-.031	.170	.071	.111	.153	.171	.823**	1.000	.026	-.064	-.139	-.076
Productivity	.448**	-.243**	-.381**	-.385**	-.236**	-.015	.009	.026	1.000	.772**	.331**	.468**
Capacity	.561**	-.259**	-.388**	-.445**	-.267**	.028	-.102	-.064	.772**	1.000	.410**	.514**
Revenue and	.394**	-.175*	-.298**	-.340**	-.264**	-.077	-.131	-.139	.331**	.410**	1.000	.690**
Sales	.409**	-.172*	-.263**	-.283**	-.180*	.021	.025	-.076	.468**	.514**	.690**	1.000
Market share	.447**	-.199*	-.356**	-.350**	-.174*	-.034	-.073	-.061	.373**	.487**	.538**	.585**
New market/	.404**	-.207*	-.221**	-.173*	-.090	-.105	-.171	-.240**	.397**	.538**	.442**	.444**
Competitive	.479**	-.190*	-.261**	-.317**	-.222*	.054	-.186*	-.164	.376**	.475**	.509**	.542**
Long-term	.582**	-.228**	-.335**	-.318**	-.166	.081	-.088	-.081	.445**	.573**	.352**	.428**
Customer	.574**	-.176*	-.342**	-.289**	-.174*	.093	-.083	-.049	.406**	.425**	.319**	.425**
Customer	-.379**	.279**	.493**	.400**	.341**	.067	.197*	.177*	-.283**	-.390**	-.192*	-.287**
Employee's	.411**	-.186*	-.223**	-.170*	-.063	-.006	-.220*	-.165	.452**	.499**	.379**	.385**
Employee's job	.526**	-.191*	-.242**	-.208*	-.246**	-.053	-.229**	-.158	.427**	.439**	.340**	.417**
Involvement of	.553**	-.232**	-.324**	-.279**	-.198*	.029	-.062	-.063	.571**	.583**	.427**	.510**

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

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

Appendix 5.2: Correlation Matrix of Items of the Organizational Performance (cont.)

	Market share	New market/ new customers	Competitive advantages	Long-term relationship with customers	Customer satisfactions	Customer compliances	Employee's income	Employee's job satisfactions	Involvement of employees in organization
Product/service quality	.447**	.404**	.479**	.582**	.574**	-.379**	.411**	.526**	.553**
Complexity and	-.199*	-.207*	-.190*	-.228**	-.176*	.279**	-.186*	-.191*	-.232**
Defectives/	-.356**	-.221**	-.261**	-.335**	-.342**	.493**	-.223**	-.242**	-.324**
Wastes	-.350**	-.173*	-.317**	-.318**	-.289**	.400**	-.170*	-.208*	-.279**
Operating costs	-.174*	-.090	-.222*	-.166	-.174*	.341**	-.063	-.246**	-.198*
Inventory	-.034	-.105	.054	.081	.093	.067	-.006	-.053	.029
Order time of	-.073	-.171	-.186*	-.088	-.083	.197*	-.220*	-.229**	-.062
Order time to	-.061	-.240**	-.164	-.081	-.049	.177*	-.165	-.158	-.063
Productivity	.373**	.397**	.376**	.445**	.406**	-.283**	.452**	.427**	.571**
Capacity	.487**	.538**	.475**	.573**	.425**	-.390**	.499**	.439**	.583**
Revenue and	.538**	.442**	.509**	.352**	.319**	-.192*	.379**	.340**	.427**
Sales	.585**	.444**	.542**	.428**	.425**	-.287**	.385**	.417**	.510**
Market share	1.000	.630**	.583**	.420**	.439**	-.360**	.370**	.273**	.391**
New market/	.630**	1.000	.577**	.495**	.352**	-.338**	.435**	.347**	.369**
Competitive	.583**	.577**	1.000	.546**	.472**	-.295**	.393**	.420**	.500**
Long-term	.420**	.495**	.546**	1.000	.635**	-.356**	.426**	.431**	.566**
Customer	.439**	.352**	.472**	.635**	1.000	-.426**	.340**	.337**	.487**
Customer	-.360**	-.338**	-.295**	-.356**	-.426**	1.000	-.210*	-.243**	-.288**
Employee's	.370**	.435**	.393**	.426**	.340**	-.210*	1.000	.595**	.575**
Employee's job	.273**	.347**	.420**	.431**	.337**	-.243**	.595**	1.000	.722**
Involvement of	.391**	.369**	.500**	.566**	.487**	-.288**	.575**	.722**	1.000

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

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

Appendix 5.3: Multiple Regression Models between Five Organizational Performance Indicators and Seven Criteria of QMS

Model QP1: Regression model with market and profitability as dependent variable

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Process management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
2	Employee involvement	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
3	Leadership	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).

a. Dependent Variable: Market and profitability

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.435[a]	.189	.182	.8860339
2	.483[b]	.233	.219	.8657597
3	.503[c]	.253	.232	.8583731

a. Predictors: (Constant), Process management

b. Predictors: (Constant), Process management, Employee involvement

c. Predictors: (Constant), Process management, Employee involvement, Leadership

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20.544	1	20.544	26.169	.000[a]
	Residual	87.926	112	.785		
	Total	108.470	113			
2	Regression	25.271	2	12.636	16.858	.000[b]
	Residual	83.199	111	.750		
	Total	108.470	113			
3	Regression	27.422	3	9.141	12.406	.000[c]
	Residual	81.048	110	.737		
	Total	108.470	113			

a. Predictors: (Constant), Process management

b. Predictors: (Constant), Process management, Employee involvement

c. Predictors: (Constant), Process management, Employee involvement, Leadership

d. Dependent Variable: Market and profitability

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.927E-02	.083		.473	.637		
	Process management	.433	.085	.435	5.116	.000	1.000	1.000
2	(Constant)	4.920E-02	.081		.606	.546		
	Process management	.308	.097	.309	3.187	.002	.733	1.364
	Employee involvement	.229	.091	.244	2.511	.013	.733	1.364
3	(Constant)	3.952E-02	.081		.490	.625		
	Process management	.217	.109	.219	1.988	.049	.562	1.779
	Employee involvement	.174	.096	.185	1.811	.073	.650	1.538
	Leadership	.199	.117	.192	1.708	.090	.535	1.867

a. Dependent Variable: Market and profitability

Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Leadership	.261[a]	2.436	.016	.225	.604	1.656	.604
	Customer focus	.124[a]	1.149	.253	.108	.620	1.612	.620
	Employee involvement	.244[a]	2.511	.013	.232	.733	1.364	.733
	Information management	.194[a]	1.618	.108	.152	.497	2.013	.497
	Continuous improvement	.021[a]	.191	.849	.018	.595	1.679	.595
	Supplier relationship	.114[a]	1.140	.257	.108	.723	1.383	.723
2	Leadership	.192[b]	1.708	.090	.161	.535	1.867	.535
	Customer focus	.059[b]	.540	.591	.051	.579	1.728	.561
	Information management	.116[b]	.939	.350	.089	.453	2.209	.453
	Continuous improvement	-.065[b]	-.571	.569	-.054	.543	1.841	.543
	Supplier relationship	.038[b]	.368	.713	.035	.647	1.546	.640
3	Customer focus	.017[c]	.154	.878	.015	.548	1.826	.490
	Information management	.124[c]	1.013	.313	.097	.452	2.212	.388
	Continuous improvement	-.076[c]	-.674	.502	-.064	.542	1.847	.457
	Supplier relationship	.002[c]	.022	.982	.002	.620	1.614	.513

a. Predictors in the Model: (Constant), Process management

b. Predictors in the Model: (Constant), Process management, Employee involvement

c. Predictors in the Model: (Constant), Process management, Employee involvement, Leadership

d. Dependent Variable: Market and profitability

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Process management	Employee involvement	Leadership
1	1	1.027	1.000	.49	.49		
	2	.973	1.027	.51	.51		
2	1	1.515	1.000	.00	.24	.24	
	2	1.003	1.229	.99	.00	.00	
	3	.482	1.773	.01	.76	.76	
3	1	2.130	1.000	.00	.09	.09	.09
	2	1.006	1.455	.97	.00	.01	.00
	3	.498	2.068	.02	.28	.87	.08
	4	.366	2.411	.01	.63	.03	.83

a. Dependent Variable: Market and profitability

Model QP2: Regression model with customer focus as dependent variable

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Process management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
2	Supplier relationship	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).

a. Dependent Variable: Customer satisfaction

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.504[a]	.254	.247	.8422300
2	.540[b]	.292	.279	.8239523

a. Predictors: (Constant), Process management

b. Predictors: (Constant), Process management, Supplier relationship

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.709	1	27.709	39.063	.000[a]
	Residual	81.575	115	.709		
	Total	109.285	116			
2	Regression	31.890	2	15.945	23.487	.000[b]
	Residual	77.394	114	.679		
	Total	109.285	116			

a. Predictors: (Constant), Process management

b. Predictors: (Constant), Process management, Supplier relationship

c. Dependent Variable: Customer satisfaction

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	5.881E-02	.078		.755	.452		
	Process management	.502	.080	.504	6.250	.000	1.000	1.000
2	(Constant)	5.907E-02	.076		.775	.440		
	Process management	.380	.092	.382	4.114	.000	.721	1.387
	Supplier relationship	.218	.088	.230	2.482	.015	.721	1.387

a. Dependent Variable: Customer satisfaction

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Leadership	.154[a]	1.522	.131	.141	.623	1.605	.623
	Customer focus	.066[a]	.648	.518	.061	.633	1.580	.633
	Employee involvement	.201[a]	2.154	.033	.198	.720	1.389	.720
	Information management	.111[a]	.989	.325	.092	.513	1.951	.513
	Continuous improvement	-.116[a]	-1.106	.271	-.103	.590	1.695	.590
	Supplier relationship	.230[a]	2.482	.015	.226	.721	1.387	.721
2	Leadership	.092[b]	.883	.379	.083	.574	1.743	.561
	Customer focus	-.013[b]	-.128	.899	-.012	.570	1.755	.570
	Employee involvement	.141[b]	1.436	.154	.134	.641	1.559	.631
	Information management	.071[b]	.634	.528	.059	.500	1.999	.459
	Continuous improvement	-.151[b]	-1.466	.145	-.137	.580	1.723	.509

a. Predictors in the Model: (Constant), Process management

b. Predictors in the Model: (Constant), Process management, Supplier relationship

c. Dependent Variable: Customer satisfaction

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Process management	Supplier relationship
1	1	1.032	1.000	.48	.48	
	2	.968	1.033	.52	.52	
2	1	1.531	1.000	.00	.23	.23
	2	.998	1.238	1.00	.00	.00
	3	.471	1.802	.00	.76	.76

a. Dependent Variable: Customer satisfaction

Model QP4: Regression model with employee satisfaction as dependent variable

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Leadership	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
2	Process management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).

a. Dependent Variable: Employee satisfaction

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.626[a]	.392	.387	.7650591
2	.669[b]	.448	.438	.7324155

a. Predictors: (Constant), Leadership

b. Predictors: (Constant), Leadership, Process management

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	43.043	1	43.043	73.538	.000[a]
	Residual	66.726	114	.585		
	Total	109.769	115			
2	Regression	49.152	2	24.576	45.814	.000[b]
	Residual	60.617	113	.536		
	Total	109.769	115			

a. Predictors: (Constant), Leadership

b. Predictors: (Constant), Leadership, Process management

c. Dependent Variable: Employee satisfaction

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1.11E-02	.071		-.156	.877		
	Leadership	.641	.075	.626	8.575	.000	1.000	1.000
2	(Constant)	-1.01E-02	.068		-.148	.883		
	Leadership	.443	.093	.432	4.781	.000	.597	1.674
	Process management	.301	.089	.305	3.375	.001	.597	1.674

a. Dependent Variable: Employee satisfaction

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Customer focus	.152[a]	1.716	.089	.159	.670	1.492	.670
	Employee involvement	.147[a]	1.695	.093	.157	.694	1.442	.694
	Information management	.229[a]	2.818	.006	.256	.762	1.313	.762
	Process management	.305[a]	3.375	.001	.303	.597	1.674	.597
	Continuous improvement	.205[a]	2.486	.014	.228	.750	1.333	.750
	Supplier relationship	.038[a]	.437	.663	.041	.707	1.415	.707
2	Customer focus	.043[b]	.465	.643	.044	.563	1.776	.502
	Employee involvement	.074[b]	.851	.397	.080	.640	1.562	.532
	Information management	.106[b]	1.067	.288	.100	.494	2.023	.388
	Continuous improvement	.094[b]	1.008	.315	.095	.568	1.760	.452
	Supplier relationship	-.052[b]	-.589	.557	-.056	.642	1.557	.542

a. Predictors in the Model: (Constant), Leadership

b. Predictors in the Model: (Constant), Leadership, Process management

c. Dependent Variable: Employee satisfaction

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Leadership	Process management
1	1	1.078	1.000	.46	.46	
	2	.922	1.081	.54	.54	
2	1	1.647	1.000	.01	.18	.18
	2	.989	1.291	.99	.00	.01
	3	.364	2.129	.00	.82	.81

a. Dependent Variable: Employee satisfaction

Model QP5: Regression model with process efficiency as dependent variable

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Leadership	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
2	Process management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
3	Information management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).

a. Dependent Variable: Process efficiency

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.313[a]	.098	.088	.9281136
2	.351[b]	.123	.105	.9196248
3	.409[c]	.167	.141	.9010775

a. Predictors: (Constant), Leadership

b. Predictors: (Constant), Leadership, Process management

c. Predictors: (Constant), Leadership, Process management, Information management

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.952	1	8.952	10.393	.002[a]
	Residual	105.694	111	.861		
	Total	114.646	112			
2	Regression	11.304	2	5.652	6.683	.002[b]
	Residual	103.342	110	.846		
	Total	114.696	112			
3	Regression	15.324	3	5.108	6.291	.001[c]
	Residual	109.322	109	.812		
	Total	91.646	112			

a. Predictors: (Constant), Leadership

b. Predictors: (Constant), Leadership, Process management

c. Predictors: (Constant), Leadership, Process management, Information management

d. Dependent Variable: Process efficiency

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.302E-02	.094		.459	.648		
	Leadership	.346	.107	.313	3.224	.002	1.000	1.000
2	(Constant)	3.968E-02	.093		.427	.670		
	Leadership	.259	.118	.234	2.192	.031	.808	1.238
	Process management	.172	.103	.178	1.667	.099	.808	1.238
3	(Constant)	2.779E-02	.091		.305	.761		
	Leadership	.302	.117	.273	2.572	.012	.786	1.273
	Process management	.307	.118	.319	2.606	.011	.593	1.687
	Information management	.256	.115	.264	2.225	.028	.628	1.592

a. Dependent Variable: Process efficiency

Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Customer focus	.020[a]	.177	.860	.018	.748	1.336	.748
	Employee involvement	-.073[a]	-.645	.520	-.066	.743	1.345	.743
	Information management	-.105[a]	-.999	.320	-.102	.856	1.169	.856
	Continuous improvement	.092[a]	.784	.435	.080	.686	1.457	.686
	Process management	.178[a]	1.667	.099	.169	.808	1.238	.808
	Supplier relationship	.108[a]	.985	.327	.101	.789	1.268	.789
2	Customer focus	-.021[b]	-.181	.857	-.019	.714	1.401	.678
	Employee involvement	-.176[b]	-1.455	.149	-.148	.623	1.606	.623
	Information management	-.264[b]	-2.225	.028	-.224	.628	1.592	.593
	Continuous improvement	-.007[b]	-.050	.960	-.005	.513	1.948	.513
	Supplier relationship	.071[b]	.636	.526	.065	.749	1.334	.707
3	Customer focus	.011[c]	.094	.925	.010	.703	1.423	.584
	Employee involvement	-.115[c]	-.934	.353	-.096	.581	1.720	.557
	Continuous improvement	.167[c]	1.126	.263	.116	.400	2.498	.400
	Supplier relationship	.126[c]	1.137	.259	.117	.717	1.394	.588

a. Predictors in the Model: (Constant), Leadership

b. Predictors in the Model: (Constant), Leadership, Process management

c. Predictors in the Model: (Constant), Leadership, Process management, Information management

d. Dependent Variable: Process efficiency

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Leadership	Process management	Information management
1	1	1.030	1.000	.49	.49		
	2	.970	1.030	.51	.51		
2	1	1.439	1.000	.00	.28	.28	
	2	1.001	1.199	.99	.00	.00	
	3	.560	1.603	.01	.72	.72	
3	1	1.950	1.000	.00	.11	.11	.11
	2	1.001	1.396	.99	.00	.00	.00
	3	.651	1.730	.00	.86	.06	.21
	4	.398	2.214	.01	.03	.82	.68

a. Dependent Variable: Process efficiency

Model QP6: Regression model with process effectiveness as dependent variable

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Process management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
2	Leadership	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
3	Continuous improvement	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).

a. Dependent Variable: Process effectiveness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.558[a]	.312	.306	.8091204
2	.615[b]	.378	.367	.7727305
3	.640[c]	.410	.394	.7559445

a. Predictors: (Constant), Process management

b. Predictors: (Constant), Process management, Leadership

c. Predictors: (Constant), Process management, Leadership, Continuous improvement

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	33.536	1	33.536	51.225	.000[a]
	Residual	73.978	113	.655		
	Total	107.514	114			
2	Regression	40.638	2	20.319	34.029	.000[b]
	Residual	66.877	112	.597		
	Total	107.514	114			
3	Regression	44.083	3	14.694	25.714	.000[c]
	Residual	63.431	111	.571		
	Total	107.514	114			

a. Predictors: (Constant), Process management

b. Predictors: (Constant), Process management, Leadership

c. Predictors: (Constant), Process management, Leadership, Continuous improvement

d. Dependent Variable: Process effectiveness

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	9.876E-03	.076		.131	.896		
	Process management	.554	.077	.558	7.157	.000	1.000	1.000
2	(Constant)	2.016E-03	.072		.028	.978		
	Process management	.358	.093	.361	3.838	.000	.628	1.592
	Leadership	.330	.096	.324	3.449	.001	.628	1.592
3	(Constant)	-4.74E-03	.071		-.067	.947		
	Process management	.232	.105	.234	2.219	.029	.478	2.093
	Leadership	.291	.095	.286	3.070	.003	.611	1.636
	Continuous improvement	.226	.092	.235	2.455	.016	.578	1.729

a. Dependent Variable: Process effectiveness

Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Leadership	.324[a]	3.449	.001	.310	.628	1.592	.628
	Customer focus	.191[a]	1.966	.052	.183	.627	1.595	.627
	Employee involvement	.227[a]	2.541	.012	.233	.731	1.369	.731
	Information management	.206[a]	1.876	.063	.175	.494	2.023	.494
	Continuous improvement	.284[a]	2.898	.005	.264	.595	1.682	.595
	Supplier relationship	.218[a]	2.405	.018	.222	.712	1.405	.712
2	Customer focus	.111[b]	1.132	.260	.107	.580	1.725	.518
	Employee involvement	.145[b]	1.590	.115	.149	.656	1.524	.564
	Information management	.167[b]	1.574	.118	.148	.488	2.049	.407
	Continuous improvement	.235[b]	2.455	.016	.227	.578	1.729	.478
	Supplier relationship	.141[b]	1.538	.127	.144	.651	1.535	.563
3	Customer focus	.114[c]	1.195	.235	.113	.580	1.725	.409
	Employee involvement	.094[c]	1.006	.317	.095	.611	1.637	.469
	Information management	.102[c]	.931	.354	.088	.448	2.234	.375
	Supplier relationship	.122[c]	1.354	.178	.128	.646	1.547	.448

a. Predictors in the Model: (Constant), Process management

b. Predictors in the Model: (Constant), Process management, Leadership

c. Predictors in the Model: (Constant), Process management, Leadership, Continuous improvement

d. Dependent Variable: Process effectiveness

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Process management	Leadership	Continuous improvement
1	1	1.043	1.000	.48	.48		
	2	.957	1.044	.52	.52		
2	1	1.618	1.000	.01	.19	.19	
	2	.993	1.276	.99	.00	.00	
	3	.389	2.038	.00	.80	.81	
3	1	2.168	1.000	.00	.08	.09	.09
	2	.994	1.477	1.00	.00	.00	.00
	3	.510	2.062	.00	.00	.66	.50
	4	.328	2.572	.00	.91	.25	.42

a. Dependent Variable: Process effectiveness

APPENDIX 6
(Used in Chapter 7)

Comparing Point of View between the Organizations with and without QMS Certifications about the Benefits of IT application for Employees

	QMS certification	N	Mean	Std. Deviation	Sig. (2-tailed)
Increasing work efficiency and effecttiveness	Yes	91	4.01	.77	.932
	No	55	4.00	.72	
Making job easier and more simple	Yes	91	4.04	.84	.202
	No	55	3.87	.67	
Reducing complex and hard manpower	Yes	91	3.92	.92	.168
	No	55	3.71	.88	
Increasing morale	Yes	89	3.70	.83	.136
	No	54	3.39	.86	
Increasing enjoyment in works	Yes	91	3.78	.87	.363
	No	53	3.64	.90	
Increasing work control of employees	Yes	91	3.91	.81	.435
	No	54	3.80	.94	

APPENDIX 7
(Used in Chapter 8)

Appendix 7.1: Correlation matrices of items in the seven supports of IT application to the criteria of QMS

A. Correlation matrix of items of the support of IT applications to leadership

		helps leaders communicate quality value to all employees	facilitates communication between top management and employees	increase the control of top management to employees and process	helps leaders encourage employee involvement and create their activeness in improving work process	facilitates communication between top management with customers and suppliers
helps leaders communicate quality value to all employees	Pearson Correlation	1.000	.743**	.748**	.664**	.523**
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	145	145	144	142	145
facilitates communication between top management and employees	Pearson Correlation	.743**	1.000	.773**	.696**	.517**
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	145	145	144	142	145
increase the control of top management to employees and process	Pearson Correlation	.748**	.773**	1.000	.717**	.565**
	Sig. (2-tailed)	.000	.000	.	.000	.000
	N	144	144	144	142	144
helps leaders encourage employee involvement and create their activeness in improving work process	Pearson Correlation	.664**	.696**	.717**	1.000	.611**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	142	142	142	142	142
facilitates communication between top management with customers and suppliers	Pearson Correlation	.523**	.517**	.565**	.611**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	N	145	145	144	142	146

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

B. Correlation matrix of items of the support of IT applications to customer focus

		support in researching/ surveying customer's information and needs	support in receiving and responding customer's feedback on product/service provided quickly	support in improving communications between your organization and customers	create selling online	reduce the time to deliver product/ service to customers
support in researching/ surveying customer's information and needs	Pearson Correlation	1.000	.750**	.551**	.405**	.405**
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	146	146	146	142	141
support in receiving and responding customer's feedback on product/service provided quickly	Pearson Correlation	.750**	1.000	.706**	.401**	.323**
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	146	146	146	142	141
support in improving communications between your organization and customers	Pearson Correlation	.551**	.706**	1.000	.371**	.362**
	Sig. (2-tailed)	.000	.000	.	.000	.000
	N	146	146	146	142	141
create selling online	Pearson Correlation	.405**	.401**	.371**	1.000	.667**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	142	142	142	142	139
reduce the time to deliver product/ service to customers	Pearson Correlation	.405**	.323**	.362**	.667**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	N	141	141	141	139	141

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

C. Correlation matrix of items of the support of IT applications to employee involvement

		makes information available to employees for carrying out their responsibility	facilitates to form work teams or groups for quality improvement	facilitates team-working to solve problems	facilities to get suggestions of employees for quality improvement	facilitates to provide feedback to employees on quality performance	enables employees to share task-related information	helps to recognize employee's contributions to quality improvement
makes information available to employees for carrying out their responsibility	Pearson Correlation	1.000	.641**	.655**	.626**	.620**	.597**	.604**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000
	N	146	146	145	143	145	145	144
facilitates to form work teams or group for quality improvement	Pearson Correlation	.641**	1.000	.850**	.742**	.679**	.672**	.744**
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000
	N	146	146	145	143	145	145	144
facilitates team-working to solve problems	Pearson Correlation	.655**	.850**	1.000	.759**	.653**	.632**	.771**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000
	N	145	145	145	143	145	145	144
facilities to get suggestions of employees for quality improvement	Pearson Correlation	.626**	.742**	.759**	1.000	.753**	.722**	.761**
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000
	N	143	143	143	143	143	143	143
facilitates to provide feedback to employees on quality performance	Pearson Correlation	.620**	.679**	.653**	.753**	1.000	.759**	.763**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000
	N	145	145	145	143	145	145	144
enables employees to share task-related information	Pearson Correlation	.597**	.672**	.632**	.722**	.759**	1.000	.738**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000
	N	145	145	145	143	145	145	144
helps to recognize employee's contributions to quality improvement	Pearson Correlation	.604**	.744**	.771**	.761**	.763**	.738**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.
	N	144	144	144	143	144	144	144

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

D. Correlation matrix of items of the support of IT applications to information management

		collecting data about customers	collecting data about suppliers	collecting data about employees	collecting data about work/ production processes	maintaining database (customer, supplier, employees, process,..)	maintaining quality information systems easier to update and access	providing relevant information to meet employee's requirements	analyzing data and producing comprehensive information for different levels of need	providing information accuracy	allowing employees to access information for decision making
collecting data about customers	Pearson Correlation	1.000	.775**	.624**	.472**	.536**	.468**	.441**	.551**	.558**	.489**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	146	145	144	142	144	145	145	143	144	146
collecting data about suppliers	Pearson Correlation	.775**	1.000	.592**	.477**	.488**	.542**	.474**	.508**	.483**	.383**
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000	.000	.000
	N	145	145	143	141	143	144	144	142	143	145
collecting data about employees	Pearson Correlation	.624**	.592**	1.000	.630**	.587**	.563**	.592**	.496**	.590**	.486**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000	.000	.000
	N	144	143	144	140	143	143	143	141	142	144
collecting data about work/ production processes	Pearson Correlation	.472**	.477**	.630**	1.000	.677**	.536**	.496**	.519**	.540**	.517**
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000	.000	.000	.000
	N	142	141	140	142	141	141	141	139	141	142
maintaining database (customer, supplier, employees, process,..)	Pearson Correlation	.536**	.488**	.587**	.677**	1.000	.661**	.530**	.526**	.495**	.450**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000	.000	.000	.000
	N	144	143	143	141	144	143	143	141	142	144
maintaining quality information systems easier to update and access	Pearson Correlation	.468**	.542**	.563**	.536**	.661**	1.000	.730**	.697**	.624**	.690**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000	.000	.000	.000
	N	145	144	143	141	143	145	144	143	144	145
providing relevant information to meet employee's requirements	Pearson Correlation	.441**	.474**	.592**	.496**	.530**	.730**	1.000	.623**	.644**	.563**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.	.000	.000	.000
	N	145	144	143	141	143	144	145	142	143	145
analyzing data and producing comprehensive information for different levels of need	Pearson Correlation	.551**	.508**	.496**	.519**	.526**	.697**	.623**	1.000	.686**	.615**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.	.000	.000
	N	143	142	141	139	141	143	142	143	142	143
providing information accuracy	Pearson Correlation	.558**	.483**	.590**	.540**	.495**	.624**	.644**	.686**	1.000	.645**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.	.000
	N	144	143	142	141	142	144	143	142	144	144
allowing employees to access information for decision making	Pearson Correlation	.489**	.383**	.486**	.517**	.450**	.690**	.563**	.615**	.645**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.
	N	146	145	144	142	144	145	145	143	144	146

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

E. Correlation matrix of items of the support of IT applications to process management

		controlling the quality and operational performance of key processes becomes automatic or semi-automatic	identifying and analyzing significant variations in process and output are quicker and easier	measuring the capability of key activities	reducing production time
controlling the quality and operational performance of key processes becomes automatic or semi-automatic	Pearson Correlation	1.000	.726**	.733**	.641**
	Sig. (2-tailed)	.	.000	.000	.000
	N	140	140	140	139
identifying and analyzing significant variations in process and output are quicker and easier	Pearson Correlation	.726**	1.000	.789**	.651**
	Sig. (2-tailed)	.000	.	.000	.000
	N	140	142	141	139
measuring the capability of key activities	Pearson Correlation	.733**	.789**	1.000	.741**
	Sig. (2-tailed)	.000	.000	.	.000
	N	140	141	141	139
reducing production time	Pearson Correlation	.641**	.651**	.741**	1.000
	Sig. (2-tailed)	.000	.000	.000	.
	N	139	139	139	139

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

F. Correlation matrix of items of the support of IT applications to continuous improvement

		make continuous improvement of products	make continuous improvement of processes	make continuous improvement of systems	track improvement activities	provides the methods and tools of continuous improvement
make continuous improvement of products	Pearson Correlation	1.000	.300**	.755**	.718**	.743**
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	144	143	143	142	140
make continuous improvement of processes	Pearson Correlation	.300**	1.000	.320**	.300**	.270**
	Sig. (2-tailed)	.000	.	.000	.000	.001
	N	143	143	143	142	140
make continuous improvement of systems	Pearson Correlation	.755**	.320**	1.000	.779**	.795**
	Sig. (2-tailed)	.000	.000	.	.000	.000
	N	143	143	143	142	140
track improvement activities	Pearson Correlation	.718**	.300**	.779**	1.000	.763**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	142	142	142	142	139
provides the methods and tools of continuous improvement	Pearson Correlation	.743**	.270**	.795**	.763**	1.000
	Sig. (2-tailed)	.000	.001	.000	.000	.
	N	140	140	140	139	140

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

G. Correlation matrix of items of the support of IT applications to supplier relationship

		researching and selecting suppliers	improving communications between your organization and suppliers	creating purchasing online	reducing order time with suppliers	sharing information and future plans
researching and selecting suppliers	Pearson Correlation	1.000	.758**	.507**	.547**	.659**
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	143	143	143	143	141
improving communications between your organization and suppliers	Pearson Correlation	.758**	1.000	.344**	.537**	.604**
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	143	143	143	143	141
creating purchasing online	Pearson Correlation	.507**	.344**	1.000	.635**	.625**
	Sig. (2-tailed)	.000	.000	.	.000	.000
	N	143	143	143	143	141
reducing order time with suppliers	Pearson Correlation	.547**	.537**	.635**	1.000	.650**
	Sig. (2-tailed)	.000	.000	.000	.	.000
	N	143	143	143	143	141
sharing information and future plans	Pearson Correlation	.659**	.604**	.625**	.650**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	N	141	141	141	141	141

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

Appendix 7.2: Multiple Regression Models between Five Organizational Performance Indicators and Seven Supports of IT application to Criteria of QMS

Model ITP1: Regression model with market and profitability as dependent variable

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Support of IT applications to Process Management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
2	Support of IT applications to Leadership	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).

a. Dependent Variable: Market and profitability

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.394[a]	.155	.147	.9323927
2	.422[b]	.178	.163	.9238677

a. Predictors: (Constant), Support of IT applications to Process Management

b. Predictors: (Constant), Support of IT applications to Process Management, Support of IT applications to Leadership

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.237	1	17.237	19.828	.000[a]
	Residual	93.890	108	.869		
	Total	111.128	109			
2	Regression	19.800	2	9.900	11.599	.000[b]
	Residual	91.328	107	.854		
	Total	111.128	109			

a. Predictors: (Constant), Support of IT applications to Process Management

b. Predictors: (Constant), Support of IT applications to Process Management, Support of IT applications to Leadership

c. Dependent Variable: Market and profitability

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.051	.089		-.571	.569		
	Support of IT applications to Process Management	.406	.091	.394	4.453	.000	1.000	1.000
2	(Constant)	-.053	.088		-.605	.546		
	Support of IT applications to Process Management	.318	.104	.309	3.069	.003	.760	1.316
	Support of IT applications to Leadership	.184	.106	.174	1.733	.086	.760	1.316

a. Dependent Variable: Market and profitability

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Support of IT applications to Leadership	.174[a]	1.733	.086	.165	.760	1.316	.760
	Support of IT applications to Customer Focus	.085[a]	.866	.388	.083	.810	1.234	.810
	Support of IT applications to Employee Involvement	.035[a]	.283	.778	.027	.530	1.887	.530
	Support of IT applications to Information Management	.042[a]	.313	.755	.030	.442	2.264	.442
	Support of IT applications to Continuous Improvement	.061[a]	.467	.642	.045	.457	2.187	.457
	Support of IT applications to Supplier Relationship	.171[a]	1.651	.102	.158	.714	1.400	.714
2	Support of IT applications to Customer Focus	.029[b]	.279	.781	.027	.709	1.411	.665
	Support of IT applications to Employee Involvement	-.099[b]	-.703	.484	-.068	.390	2.565	.390
	Support of IT applications to Information Management	-.018[b]	-.130	.897	-.013	.413	2.422	.413
	Support of IT applications to Continuous Improvement	.021[b]	.159	.874	.015	.442	2.262	.430
	Support of IT applications to Supplier Relationship	.134[b]	1.250	.214	.121	.666	1.500	.637

a. Predictors in the Model: (Constant), Support of IT applications to Process Management

b. Predictors in the Model: (Constant), Support of IT applications to Process Management, Support of IT applications to Leadership

c. Dependent Variable: Market and profitability

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Support of IT applications to Process Management	Support of IT applications to Leadership
1	1	1.034	1.000	.48	.48	
	2	.966	1.035	.52	.52	
2	1	1.491	1.000	.00	.25	.25
	2	1.000	1.221	.99	.00	.00
	3	.509	1.711	.00	.75	.74

a. Dependent Variable: Market and profitability

Model ITP2: Regression model with customer focus as dependent variable

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Support of IT applications to Customer Focus	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
2	Support of IT applications to Leadership	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
3	Support of IT applications to Process Management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).

a. Dependent Variable: Customer satisfaction

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.463[a]	.214	.207	.8712322
2	.524[b]	.275	.261	.8407038
3	.542[c]	.294	.274	.8333646

a. Predictors: (Constant), Support of IT applications to Customer Focus

b. Predictors: (Constant), Support of IT applications to Customer Focus, Support of IT applications to Leadership

c. Predictors: (Constant), Support of IT applications to Customer Focus, Support of IT applications to Leadership, Support of IT applications to Process Management

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.727	1	22.727	29.942	.000[a]
	Residual	83.495	110	.759		
	Total	106.222	111			
2	Regression	29.183	2	14.592	20.645	.000[b]
	Residual	77.039	109	.707		
	Total	106.222	111			
3	Regression	31.217	3	10.406	14.983	.000[c]
	Residual	75.006	108	.694		
	Total	106.222	111			

a. Predictors: (Constant), Support of IT applications to Customer Focus

b. Predictors: (Constant), Support of IT applications to Customer Focus, Support of IT applications to Leadership

c. Predictors: (Constant), Support of IT applications to Customer Focus, Support of IT applications to Leadership, Support of IT applications to Process Management

d. Dependent Variable: Customer satisfaction

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.024	.083		-.295	.769		
	Support of IT applications to Customer Focus	.438	.080	.463	5.472	.000	1.000	1.000
2	(Constant)	-.031	.080		-.395	.694		
	Support of IT applications to Customer Focus	.326	.086	.344	3.803	.000	.813	1.231
	Support of IT applications to Leadership	.282	.093	.273	3.022	.003	.813	1.231
3	(Constant)	-.032	.079		-.409	.684		
	Support of IT applications to Customer Focus	.264	.092	.279	2.858	.005	.688	1.455
	Support of IT applications to Leadership	.224	.098	.218	2.280	.025	.718	1.394
	Support of IT applications to Process Management	.173	.101	.172	1.711	.090	.644	1.552

a. Dependent Variable: Customer satisfaction

Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Support of IT applications to Leadership	.273[a]	3.022	.003	.278	.813	1.231	.813
	Support of IT applications to Supplier Relationship	.199[a]	2.196	.030	.206	.840	1.190	.840
	Support of IT applications to Employee Involvement	.115[a]	1.001	.319	.095	.544	1.837	.544
	Support of IT applications to Information Management	.115[a]	1.052	.295	.100	.602	1.661	.602
	Support of IT applications to Process Management	.251[a]	2.601	.011	.242	.730	1.371	.730
	Support of IT applications to Continuous Improvement	.059[a]	.557	.578	.053	.640	1.562	.640
2	Support of IT applications to Supplier Relationship	.114[b]	1.194	.235	.114	.722	1.384	.699
	Support of IT applications to Employee Involvement	-.094[b]	-.713	.477	-.068	.384	2.601	.384
	Support of IT applications to Information Management	.014[b]	.121	.904	.012	.539	1.854	.539
	Support of IT applications to Process Management	.172[b]	1.711	.090	.162	.644	1.552	.644
	Support of IT applications to Continuous Improvement	-.024[b]	-.228	.820	-.022	.595	1.680	.595
3	Support of IT applications to Supplier Relationship	.088[c]	.905	.367	.087	.698	1.432	.623
	Support of IT applications to Employee Involvement	-.233[c]	-1.623	.108	-.155	.314	3.188	.314
	Support of IT applications to Information Management	-.139[c]	-1.040	.301	-.100	.364	2.750	.364
	Support of IT applications to Continuous Improvement	-.183[c]	-1.448	.150	-.139	.407	2.454	.407

a. Predictors in the Model: (Constant), Support of IT applications to Customer Focus

b. Predictors in the Model: (Constant), Support of IT applications to Customer Focus, Support of IT applications to Leadership

c. Predictors in the Model: (Constant), Support of IT applications to Customer Focus, Support of IT applications to Leadership, Support of IT applications to Process Management

d. Dependent Variable: Customer satisfaction

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Support of IT applications to Customer Focus	Support of IT applications to Leadership	Support of IT applications to Process Management
1	1	1.075	1.000	.46	.46		
	2	.925	1.078	.54	.54		
2	1	1.440	1.000	.01	.28	.27	
	2	.998	1.201	.97	.00	.02	
	3	.562	1.600	.02	.72	.70	
3	1	1.965	1.000	.00	.12	.11	.12
	2	1.002	1.401	.98	.00	.01	.00
	3	.566	1.863	.02	.44	.76	.03
	4	.467	2.052	.00	.45	.12	.85

a. Dependent Variable: Customer satisfaction

Model ITP4: Regression model with employee satisfaction as dependent variable

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Support of IT applications to Information Management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
2	Support of IT applications to Leadership	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).

a. Dependent Variable: Employee satisfaction

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.438[a]	.192	.185	.9052052
2	.477[b]	.228	.214	.8889623

a. Predictors: (Constant), Support of IT applications to Information Management

b. Predictors: (Constant), Support of IT applications to Information Management, Support of IT applications to Leadership

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.226	1	21.226	25.904	.000[a]
	Residual	89.314	109	.819		
	Total	110.540	110			
2	Regression	25.192	2	12.596	15.939	.000[b]
	Residual	85.347	108	.790		
	Total	110.540	110			

a. Predictors: (Constant), Support of IT applications to Information Management

b. Predictors: (Constant), Support of IT applications to Information Management, Support of IT applications to Leadership

c. Dependent Variable: Employee satisfaction

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.090	.086		-1.044	.299		
	Support of IT applications to Information Managemen	.432	.085	.438	5.090	.000	1.000	1.000
2	(Constant)	-.094	.085		-1.118	.266		
	Support of IT applications to Information Managemen	.319	.097	.324	3.283	.001	.734	1.363
	Support of IT applications to Leadership	.232	.104	.221	2.240	.027	.734	1.363

a. Dependent Variable: Employee satisfaction

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Support of IT applications to Leadership	.221[a]	2.240	.027	.211	.734	1.363	.734
	Support of IT applications to Customer Focus	.144[a]	1.434	.155	.137	.727	1.375	.727
	Support of IT applications to Employee Involvement	.091[a]	.781	.437	.075	.547	1.827	.547
	Support of IT applications to Process Management	.242[a]	1.897	.061	.180	.446	2.240	.446
	Support of IT applications to Continuous Improvement	.178[a]	1.439	.153	.137	.479	2.087	.479
	Support of IT applications to Supplier Relationship	.216[a]	1.945	.054	.184	.589	1.698	.589
2	Support of IT applications to Customer Focus	.085[b]	.816	.416	.079	.662	1.511	.638
	Support of IT applications to Employee Involvement	-.048[b]	-.363	.718	-.035	.412	2.425	.412
	Support of IT applications to Process Management	.196[b]	1.533	.128	.147	.431	2.318	.416
	Support of IT applications to Continuous Improvement	.137[b]	1.110	.269	.107	.467	2.143	.439
	Support of IT applications to Supplier Relationship	.177[b]	1.590	.115	.152	.570	1.755	.524

a. Predictors in the Model: (Constant), Support of IT applications to Information Management

b. Predictors in the Model: (Constant), Support of IT applications to Information Management, Support of IT applications Leadership

c. Dependent Variable: Employee satisfaction

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Support of IT applications to Information Management	Support of IT applications to Leadership
1	1	1.052	1.000	.47	.47	
	2	.948	1.053	.53	.53	
2	1	1.519	1.000	.00	.24	.24
	2	.999	1.233	.99	.00	.01
	3	.482	1.775	.01	.76	.75

a. Dependent Variable: Employee satisfaction

Model ITP5: Regression model with process efficiency as dependent variable

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Support of IT applications to Process Management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).

a. Dependent Variable: Process efficiency

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.297[a]	.089	.080	.9322533

a. Predictors: (Constant), Support of IT applications to Process Management

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.860	1	8.860	10.195	.002[a]
	Residual	91.255	105	.869		
	Total	100.116	106			

a. Predictors: (Constant), Support of IT applications to Process Management

b. Dependent Variable: Process efficiency

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.072	.090		-.799	.426		
	Support of IT applications to Process Managemen	.291	.091	.297	3.193	.002	1.000	1.000

a. Dependent Variable: Process efficiency

Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Support of IT applicatio to Leadership	-.071[a]	-.663	.509	-.065	.761	1.314	.761
	Support of IT applicatio to Customer Focus	-.030[a]	-.286	.776	-.028	.806	1.240	.806
	Support of IT applicatio to Employee Involveme	-.162[a]	-1.274	.205	-.124	.532	1.879	.532
	Support of IT applicatio to Information Management	-.188[a]	-1.357	.178	-.132	.448	2.231	.448
	Support of IT applicatio to Continuous Improvement	.030[a]	.220	.827	.022	.479	2.086	.479
	Support of IT applicatio to Supplier Relationship	.003[a]	.025	.980	.002	.723	1.383	.723

a. Predictors in the Model: (Constant), Support of IT applications to Process Management

b. Dependent Variable: Process efficiency

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions	
				(Constant)	Support of IT applications to Process Management
1	1	1.039	1.000	.48	.48
	2	.961	1.040	.52	.52

a. Dependent Variable: Process efficiency

Model ITP6: Regression model with process effectiveness as dependent variable

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Support of IT applications to Continuous Improvement	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).
2	Support of IT applications to Supplier Relationship	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .150).

a. Dependent Variable: Process effectiveness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.516[a]	.266	.260	.8463215
2	.559[b]	.313	.300	.8227538

a. Predictors: (Constant), Support of IT applications to Continuous Improvement

b. Predictors: (Constant), Support of IT applications to Continuous Improvement, Support of IT applications to Supplier Relationship

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.330	1	28.330	39.553	.000[a]
	Residual	78.072	109	.716		
	Total	106.402	110			
2	Regression	33.295	2	16.647	24.593	.000[b]
	Residual	73.108	108	.677		
	Total	106.402	110			

a. Predictors: (Constant), Support of IT applications to Continuous Improvement

b. Predictors: (Constant), Support of IT applications to Continuous Improvement, Support of IT applications to Supplier Relationship

c. Dependent Variable: Process effectiveness

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.103	.080		-1.287	.201		
	Support of IT applications to Continuous Improvement	.501	.080	.516	6.289	.000	1.000	1.000
2	(Constant)	-.091	.078		-1.160	.249		
	Support of IT applications to Continuous Improvement	.340	.098	.350	3.476	.001	.628	1.592
	Support of IT applications to Supplier Relationship	.255	.094	.273	2.708	.008	.628	1.592

a. Dependent Variable: Process effectiveness

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Support of IT applications to Leadership	.184[a]	2.020	.046	.191	.792	1.263	.792
	Support of IT applications to Customer Focus	.180[a]	2.090	.039	.197	.879	1.137	.879
	Support of IT applications to Employee Involvement	.065[a]	.570	.570	.055	.516	1.937	.516
	Support of IT applications to Information Management	.263[a]	2.273	.025	.214	.483	2.072	.483
	Support of IT applications to Process Management	.234[a]	1.981	.050	.187	.469	2.134	.469
	Support of IT applications to Supplier Relationship	.273[a]	2.708	.008	.252	.628	1.592	.628
2	Support of IT applications to Leadership	.130[b]	1.409	.162	.135	.740	1.351	.587
	Support of IT applications to Customer Focus	.126[b]	1.437	.154	.138	.813	1.229	.581
	Support of IT applications to Employee Involvement	-.094[b]	-.750	.455	-.072	.405	2.467	.405
	Support of IT applications to Information Management	.170[b]	1.381	.170	.132	.414	2.415	.414
	Support of IT applications to Process Management	.187[b]	1.592	.114	.152	.456	2.195	.401

a. Predictors in the Model: (Constant), Support of IT applications to Continuous Improvement

b. Predictors in the Model: (Constant), Support of IT applications to Continuous Improvement, Support of IT applications to Supplier Relationship

c. Dependent Variable: Process effectiveness

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Support of IT applications to Continuous Improvement	Support of IT applications to Supplier Relationship
1	1	1.022	1.000	.49	.49	
	2	.978	1.022	.51	.51	
2	1	1.615	1.000	.01	.19	.19
	2	.996	1.274	.99	.01	.00
	3	.389	2.038	.01	.80	.81

a. Dependent Variable: Process effectiveness

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GLOSSARY

GLOSSARY OF TQM APPLICATIONS

ISO 14000 system is environmental management and auditing standards. The ISO 14000 family contains more than 20 standards, guides, and other publications, dealing with a variety of topics such as forest management and life-cycle assessment.

HACCP (Hazard Analysis and Critical Control Points) is the internationally recognized system for preventing microbiological, chemical and physical contamination from entering the food chain.

GMP (Good Manufacturing Practices) is a specific quality management system in pharmaceutical industry. The quality system regulation includes requirements related to the methods used in, and the facilities and controls used for, designing, manufacturing, packaging, labeling, storing, installing, and servicing of medical.

5S (Sort – Set in order – Shine – Standardize – Sustain) is translated from Japanese words such as Seiri – Seiton – Seiso – Seiketsu – Shitsuke. Based on Japanese words that begin with 'S', the 5S Philosophy focuses on effective work place organization and standardized work procedures. 5S simplifies your work environment, reduces waste and non-value activity while improving quality efficiency and safety.

OHSAS 18000 is an international occupational health and safety management system specification. The (OHSAS) specification gives requirements for an occupational health and safety (OH&S) management system, to enable an organization to control its OH&S risks and improve its performance. It does not state specific OH&S performance criteria, nor does it give detailed specifications for the design of a management system.

QS 9000 (Quality System Requirements) is based on the 1994 edition of ISO 9001, but it contains additional requirements that are particular to the automotive industry. These additions are considered automotive "interpretations" by the ISO community of accreditation bodies and registrars. QS-9000 applies to suppliers of production materials, production and service parts, heat-treating, painting and plating and other finishing services.

SA 8000 (Social Accountability) offers the routes for companies that want to demonstrate their commitment to social responsibility. The SA8000 code of practice is broken down into nine key areas: (1) child labor, (2) forced labor, (3) health and safety, (4) freedom of association and collective bargaining, (5) discrimination, (6) disciplinary practices, (7) working hours, (8) compensation, (9) management systems.

SQF 2000^{CM} (Safe Quality Food) is a HACCP quality code designed specifically for the Food/Agriculture industry.

GLOSSARY OF IT APPLICATION

AIS (Automatic Identification System) use bar codes, radio frequencies, magnetic stripes, optical character recognition, and machine vision to sense and input data into computers. Data are read from products, documents, parts, and containers without the need for workers to read or interpret the data. A good example of these systems is in checkout counters at grocery stores. The clerk passes the bar code on an item across the scanner. The system reads the identification number from the bar code on the item, accesses a computer data base and sends the price of the item to the cash register, describes the items to the customer through a speaker, and inputs the item identification number to the inventory system for the purpose of adjusting inventory counts.

CAD (Computer-Aided Design) software allows designers to design and “build” production prototypes in software, “test” them as a computer object under given parameters, compile parts and quantity lists, outline production and assembly procedures, and then transmit the final design directly to milling and rolling machine.

CAE (Computer-Aided Engineering) enables engineers to execute complex engineering analysis on a computer. Once CAD work has been completed, a designer can use CAE to analyze the design and determine whether it will work the way the designer thought it would. With any kind of CAE, detailed engineering analysis provides data that may be useful when actually manufacturing the product. Such data include not only product specifications but also information about the design of tools or molds and programs used for controlling the motions of numerical control machines or robots. Thus, a database created as a result of CAD/CAE may then be used to support CAM.

CAM (Computer-Aided Manufacturing) software uses a digital design such as that from a CAD system to directly control production machinery. CAM encompasses the computer-aided techniques that facilitate planning, operation, and control of a production facility. Such techniques include computer-aided process planning, numerical control part programming, robotics programming, computer-generated work standards, MRP II (Materials requirement planning II), capacity requirements planning, and shop-floor control. When CAD feeds information to CAM, the combined system is referred to as CAD/CAM.

CIM (Computer-Integrated Manufacturing) integrates several computerized systems, such as CAD, CAM, MRP, and JIT into a whole, in a factory.

CNC (Computer Numerical Control) transfers information storage from punched tape to the more capacious and flexible memory of a computer. This change not only makes editing and altering programs easier but also makes a computer available for a variety of other tasks, such as logging the time each tool is in use.

Data mining is the process of researching for unknown information or relationships in large databases using tools such as neural computing or case-based reasoning. Given databases of sufficient size and quality, data mining technology can generate new business opportunities by providing these capabilities: (1) automated prediction of trends and behaviors, and (2) automated discovery of previously unknown patterns.

Data warehouse is a repository of historical data, subject oriented and organized, integrated from various sources that can easily be accessed and manipulated for decision support. These warehouses are integrated with the Internet so they can be accessed from any location at any time.

Database is an organized logical grouping of related files. In a database, data are integrated and related so that one set of software programs provides access to all the data, alleviating many of the problems associated with data file environments. Therefore, data redundancy, data isolation, and data inconsistency are minimized, and data can be shared among all users of the data. In addition, security and data integrity are increased, and applications and data are independent of one another.

DBMSS (Database Management Systems) is simply the software that permits an organization to centralize data, manage them efficiently, and provide access to the stored data by application programs. On the other word, DBMSS is special software to create and maintain a database and enable individual business applications to extract the data they need without having to create separate files or data definitions in their computer programs. The DBMSS acts as interface between application programs and the physical data files. When the application program calls for a data item such as gross pay, the DBMSS finds this item in the database and presents it to the application program. Using traditional data files, the programmer would have to specify the size and format of each data element used in the program and then tell the computer where they were located

DSS (Decision Support System) is a computer-based information system that combines models and data in an attempt to solve semi-structured problems with extensive user involvement,

EDI (Electronic Data Interchange) is a direct computer-to-computer file exchange. Files such as purchase orders, bills of lading, shipping notices, and similar business documents can be transmitted electronically over EDI network. EDI allows sending and receiving of messages betweens connected by a communication link.

E-mail (Electronic mail) is computer-based messages that can be electronically manipulated, stored, combine with other information, and exchanged with other computers.

ERP (Enterprise Resource Planning) is software to provide transaction management for administrative purposes. ERP is concerned with making sure that a firm's manufacturing decision are not make without taking into account their impact on the supply chain, both upstream and downstream. Taken further, production decisions are effected by and affect all of the other major areas in the business, including engineering, accounting, marketing and human resources to make better decision. There is a need to take into account all of these important interactions within the business. ERP software is the medium for accomplishing this integration of decision-making processes. Sine nearly every department in a company could be computerized, the ERP software can link and coordinate all and of these computerized functions, to make them "talk" to each other.

Extranet is a secured network that allows business partners to access portions of each other's intranets. An extranet, like an intranet, is typically protected by a firewall and is

closed to the public. It is open to selected suppliers, customers, and other business partners, who access it on a private wide-area network over the Internet or on a virtual private network, which increases security and functionality.

FMS (Flexible Manufacturing System) are groups of production machines, arranged in a sequence, connected by automated materials handling and transferring machines, and integrated by a computer system. In these systems, which are also sometimes called flexible machining systems, kits of materials and parts for a product are loaded on the materials-handling system. A code is then entered into the computer system identifying the product to be produced and the location of the product in the sequence. As partially completed products finish at once production machine, they are automatically passed to the next production machine. Each production machine receives its settings and instructions from the computer, automatically loads and unloads as required, and completes its work without the need for workers to attend its operations.

Graphics software allows the user to create, store, and display or print charts, graphs, maps, and drawings. Graphics software enables users to absorb more information more quickly, to spot relationships and trends in data more easily, and to make points more emphatically.

Internet is a network that connects hundreds of thousands of internal organizational computer networks worldwide.

Intranet, or internal Web, is an internet-based network for use within an organization. It provides Internet capabilities, namely easy and inexpensive browsing, communication, and collaboration.

JIT (Just-In-Time) is a comprehensive production scheduling and inventory control system that attempts to reduce costs and improve workflow by scheduling materials and parts to arrive at a workstation exactly when they are needed. JIT minimizes in-process inventories and waste and saves space. While some just-in-time systems can be managed manually, IT makes it easier to implement large and complex JIT systems.

LAN (Local Area Network) connects two or more communicating devices within a short distance, so that every user device on the network has the potential to communicate with any other device.

MRP (Materials Requirement Planning) is software of a planning process that integrates production, purchasing, and inventory management of interrelated products.

PLC (Programmable Logic Controller) is a device used to automate monitoring and control of industrial plant. The input of PLC is often entered by PC.

Purchasing online is the buying of information, products and services via computer network.

Robot is an electromechanical device that can be programmed to automate manual tasks.

Selling online is the selling of information, products and services via computer network.

Spreadsheet software transforms a computer screen into a ledger sheet, or grid, of coded rows and columns. Users can enter numeric or textual data into each grid location, called *a cell*. Spreadsheet packages include a large number of already programmed statistical, financial, and other business formulas

Word Wide Web (WWW) is a vast collection of interconnected pages of information that are stored on computers around the world that are connected to the Internet. The Web allows quick access to information that is stored as text, pictures, video, and so on. The Web is based upon a set of standards for storing, retrieving, and manipulating information, using a special tool called a Web browser. Documents accessible on the Web contain links to other documents. Such links or hyperlinks are used to link documents, either internal or external. **Web site** is a computer network that has a connection to the Internet.

Word processing software allows the user to manipulate text rather than just numbers. Modern word processors contain many productive writing features. A typical word processing software package consist of an integrated set of programs including an editor program, a formatting program, a dictionary, a thesaurus, a grammar checker, a mailing list program, and integrated graphics, charting, and drawing program.