

IMPROVING PERFORMANCE THROUGH LINKING IT WITH TQM

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ABSTRACT: *Information technology (IT) and total quality management (TQM) have significantly impacted on most organizations and each has been widely researched. However, there is little empirical research on the relationship between the two, especially the impact of IT on TQM. Thus, this paper reviews the state – of – the – art literature on critical dimensions of TQM, IT applications, the links of IT applications with TQM, and summarizes the results of our recent research study. This is a foundation to propose a framework for improving performance through linking IT applications with TQM.*

Keywords: TQM dimensions, IT applications, performance.

1. INTRODUCTION

In today's competitive business environment, organizations are being challenged to improve performance by continuously improving processes, reducing costs, and increasing output. TQM has been described even as an appropriate method to achieve best performance and improve competitiveness of companies. TQM has become a global phenomenon, as it affects Japanese companies as much as US, European and Asia-Pacific ones (Corbett and Rastrick, 2000).

In reality, application of a quality management system to ISO 9000 by a certification body – third party – has become a requisite condition from customers and consumers as a proof of commitment and capability of an organization. The success of the ISO 9000 family is still growing, and the number of countries where ISO 9000 is being implemented has increased. Up to the end of December 2001 (ISO, 2002), at least 510,616 ISO 9000 certificates had been awarded in 161 countries and economies, an increase of 101,985 certificates (+24,96%) over the end of December 2000, when the total stood at 408,631 in 158 countries. Of the ISO 9000 total, 44,388 were certificates of conformity to ISO 9001:2000. In Vietnam, up to 2/2003 there were 979 ISO 9000 certificates, in which 501 certificates of ISO 9000:1994, 478 certificates of ISO 9000:2000. Besides, 43 certificates are of ISO 14000 and 33 certificates are of other quality systems such as GMP, HACCP, OHSAS, SA 8000, SQF, QS 9000 (Vietnam Productivity Center, 2003). These figures of Vietnamese certificates are much lower than ISO 9000 certified organizations in the world as well as Far East countries.

Besides TQM phenomenon, IT is also being considered in business by many organizations in the world. Over the past decade, the continuing global boom in IT has dramatically changed the world's social and economic life. Internet based information superhighways enables the instantaneous transfer of, and access to a huge amount of information from all spheres. In a survey conducted by Asean member countries (GIC, 2001), Vietnam's IT development was ranked at 7 from 10 Asean members, and is about 10 years

behind Thailand's. IT infrastructure of Vietnam still has a big gap in comparison with the world, especially in computer equipment and Internet usage. Up to December 2001, there were about 122,600 Internet subscribers countrywide, 0.15% of the country's population comparing with the world's average of 7.05% (Vietnam Internet Network Information Center). There was about 0.1% of the country's population using computer comparing with the world's average of 5.8% (Central Commission for Science and Education). Moreover, the computer usage in business mostly is document compiling and accounting.

In fact, Vietnamese companies are in the early stage of TQM and IT implementation. They have achieved certain benefits from the implementations of TQM as well as IT applications. The question is whether Vietnamese companies recognize the benefits in linking TQM and IT applications in their business activities?

It is suggested that the subject of the Internet with TQM is new ideas for further studies of TQM (Sila and Ebrahimpour, 2002). The use of the Internet is considered as a vehicle to conduct business and communicate with employees, customers and suppliers. Increasingly, the Internet is affecting not only the nature of business transactions, but the collection, sharing and communication of data and information as well. This implies that this technology impacts on the TQM system and activities of companies.

The consideration given to how IT influences TQM is the reference model developed by Forza (1995a) to link 'TQM practices, information systems and quality performance through empirical research. However, using his own model and associated measures did not succeed in empirically establishing a link between TQM practices and IT, and only the use of IT in the quality assurance aspect of TQM was explored (Forza, 1995b). Thus, Forza (1995b) proposed that the contribution of IT should be further investigated by developing adequate measures especially with reference to its use. Ang *et al.* (2000) have measured the impact of IT on quality management, with purpose to understand how IT supports quality management. However, these authors just focused on the quality process rather than the 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) had an initial assessment of the influence of IT on TQM. The results of this study showed that the effect of IT on TQM could appear by two ways: (1) the use of IT as an enabler mechanism with TQM, and (2) a negative impact of IT introduction on employees' motivation. However, the conclusions drawn from this study were limited by the relative small sample size.

Thus, this paper expands to study the impact of IT applications on TQM. Besides, the study also examine whether or not the conclusions of previous studies are appropriate in Vietnam context. Moreover, there is a scarcity of research on practices of TQM, IT applications, and the relationships between IT and TQM in Vietnamese organizations. This leads to the following research questions of this study:

- (1) What are the practices of TQM applications? How are they implemented in Vietnamese organizations?
- (2) What are IT applications? How are they implemented in Vietnamese organizations?
- (3) What are the impacts of IT applications on TQM dimensions? How do Vietnamese organizations evaluate them?
- (4) What are the effects of IT and TQM on business performance of Vietnamese organizations?

(5) What are the managerial implications for linking IT and TQM in business strategy of Vietnamese organizations?

An empirical research in Vietnam context is then expected to provide better understanding of these five issues that will provide valuable insights into management of quality, IT applications, organizational performance to Vietnamese organizations.

This paper begins the discussion by reviewing the literatures on critical dimensions of TQM, IT applications, the links of IT applications with TQM, and summarizing our recent research study. Next, it presents the proposed framework of the study. Finally, it is conclusions of the paper.

2. CRITICAL DIMENSIONS OF TQM

TQM provides a generic concept for continuous improvement in quality and performance. The definitions of TQM vary a lot. In general, TQM includes three major themes: customer focus, process improvement and total involvement (Tenner and DeToro, 1992).

Table 1: Critical dimensions of TQM

QM dimensions	Descriptions
<i>1. Leadership</i>	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.
<i>2. Customer focus</i>	The organization is driven by customer's needs. It is necessary to identify these needs and their level of satisfactions. The establishment and maintenancce of customer relationship is very important missions to organization today.
<i>3. Employee involvement</i>	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.
<i>4. Information management</i>	The reliable and appropriate data and information drive quality excellence and improve operational and competitive performance.
<i>5. Process management</i>	A desired result is achieved more efficiently when activities and related resources are managed as a process.
<i>6. Continuous improvement</i>	Continuous improvement is a permanent objective of the organization.
<i>7. Supplier relationship</i>	Quality is more important factor than price in selecting suppliers. Long-term relationship with suppliers has to be established and the company has to collaborate with supplier to help improve the quality of products/ services

As reflected by successful companies in the world, these major themes are further decomposed in several major dimensions in implementing TQM. They in general include seven critical dimensions (see table 1). These dimensions were derived through a process

involving identification and synthesis of the requirements for quality management that have been prescribed by quality practitioners and academics (Ahire *et al.*, 1996, US Department of Commerce, 1996, Ang *et al.*, 2000 and ISO, 2000).

3. IT APPLICATIONS

IT is often defined in term of a convergence of telecommunications and computer technologies (Brooke, 1994). 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 industry largely impact on other sectors which use information technologies to streamline operations, lower labor and inventory costs, accelerate product development cycle and to implement responsive marketing and pricing.

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

The types of IT applications in the organizations' business activities can be referred to as office activities, manufacturing and communication network.

- IT applications in *office automation* may be word processing, spreadsheets, data management, and graphics.
- IT is a key ingredient to get competitive advantage through manufacturing. The blend of computer and manufacturing are being explored. This connection can provide full strategic benefits only if there exists a broadened partnership of top management as well as engineering, marketing, manufacturing and IT executives. IT applications in *manufacturing* can be listed as computer numerical control (CNC), computer-aided design (CAD), computer-aided manufacturing (CAM), computer-integrated manufacturing (CIM), computer-aided engineering (CAE), computer-aided process planning (CAPP), flexible manufacturing system (FMS), materials requirement planning (MRP), enterprise resource planning (ERP), and so on.
- For communication, the development of electronic commerce provides unprecedented opportunities to integrate various types of *communication networks*, including the three primary types (Shaw, 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, and (3) the Internet for setting up electronic storefronts, providing customer service, and collecting market intelligence. These types of communication network 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.

4. THE LINK OF IT APPLICATIONS WITH TQM

Table 2: The links of IT applications with the critical dimensions of TQM

QM Dimensions	Impacts of IT applications on TQM
<i>1. Leadership</i>	<ul style="list-style-type: none"> - Communicating quality value to all employees - Facilitating communication between top management and employees - Increasing top management control - Encouraging employee involvement to improve work process - Empowering employee for continuous improvement
<i>2. Customer focus</i>	<ul style="list-style-type: none"> - Researching/ surveying customer's information and needs - Receiving and responding customer's feedback on product/service provided quickly - Improving communications between your organization and customers - Selling online - Reducing the time to deliver product/ service to customers
<i>3. Employee involvement</i>	<ul style="list-style-type: none"> - Making information available to employees for carrying out their responsibility - Forming work teams or group for quality improvement - Facilitating team-working to solve problems - Soliciting 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
<i>4. Information management</i>	<ul style="list-style-type: none"> - Collecting data about customers - Collecting data about suppliers - Collecting data about employees - Collecting data about work/ production processes - Maintaining database - Maintaining quality information systems - Providing relevant information for meeting employee's requirements - Analyzing data and producing comprehensive information for different levels of need - Improving information accuracy - Allowing employees to access information for decision making
<i>5. Process management</i>	<ul style="list-style-type: none"> - Controlling the quality and operational performance of key processes used to produce and delivery product and service - Identifying and analyzing significant variations in process and output, determining root causes, making corrections and verifying result

	- Measuring the capability of key activities
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6. <i>Continuous improvement</i>	- Making continuous improvement of products
	- Making continuous improvement of processes
	- Making continuous improvement of systems
	- Tracking improvement activities
	- Providing the methods and tools of continuous improvement
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7. <i>Supplier relationships</i>	- Researching and selecting suppliers
	- Improving communications between your organization and suppliers
	- Purchasing online
	- Reducing order time
	- Sharing information and future plans

Many firms have adopted quality management programs falling generally under TQM in their strategies, while others have emphasized the use of IT as a vehicle for attaining quality. Both programs offer potential for responding to customer needs, saving cost, and the like (Fok, *et al.*, 2000). There is little doubt that applications of IT affect all sections and functions of a company; therefore, it is argued that IT also must affect TQM. The links of IT applications with the critical dimensions of TQM can be synthesized in table 2 based on the previous researches (Dewhurst, 2003; For, *et al.*, 2001; Ang *et al.*, 1999; Forza, 1995b).

Results of our previous study

On the period of September 2002 – March 2003, we conducted a research on “Improving quality through IT: An empirical study of ISO 9000 certified Vietnamese firms” (Nguyen, 2003). This study just focused on *information management dimension of TQM, the supports of IT on quality information, and improvement of quality performance*. The results of this study can be summarized as follows.

- Vietnamese firms are convinced that quality information is necessary to improving quality performance
- Those firms who apply IT argued that IT has supported them in quality management.
- The IT applications are still limited in Vietnamese firms.
- Through statistical test on relationships, the result showed that there were closed relationships between quality information and improvements of quality performance, and between supports of IT and quality performance.

These results recommend that the Vietnamese managers should link IT applications with TQM for improving their organizational performance. However, this study has some limitations. The sample size was small, and the dimensions of TQM and IT applications were limited, so they could not fully explain the influence of IT applications on TQM.

5. THE PROPOSED FRAMEWORK OF THE STUDY

Based on the reviews of previous literatures on critical dimensions of TQM, IT applications, and links of IT applications and TQM, we propose a framework to reach the objectives of the study shown in figure 1, and this leads to recover the limitations of our previous study.

This framework defines five major themes: (1) company characteristics, (2) TQM practices, (3) IT applications, (4) Impact of IT applications on TQM, and (5) organizational

performance. The information on *organization characteristics*, consisting of industry, enterprise ownership, amount of employees, main kinds of products and services, revenues, quality management systems, and competitive advantage, are foundation to do descriptive statistical analysis of the study. Moreover, the factors are also used to compare TQM practices, IT applications and performances among organizations.

The seven dimensions of *TQM practices* we consider in the framework include leadership, customer focus, employee involvement, information management, process management, continuous improvement, and supplier relationship. They are foundation for examining the status of TQM implementation in the organizations surveyed and for measuring of the *impact of IT applications on TQM*. We categorize various kinds of *IT applications* in three types: office automation, manufacturing and communication network. Based on this classification, the study will evaluate the perception of IT usage of employees in the organizations. The *organizational performances* are defined into six indicators: operation, productivity, employee satisfaction, customer satisfaction, finance, and market. Based on these indicators, the relationships between TQM practices, IT applications, the impact of IT applications on TQM, and organizational performances are tested.

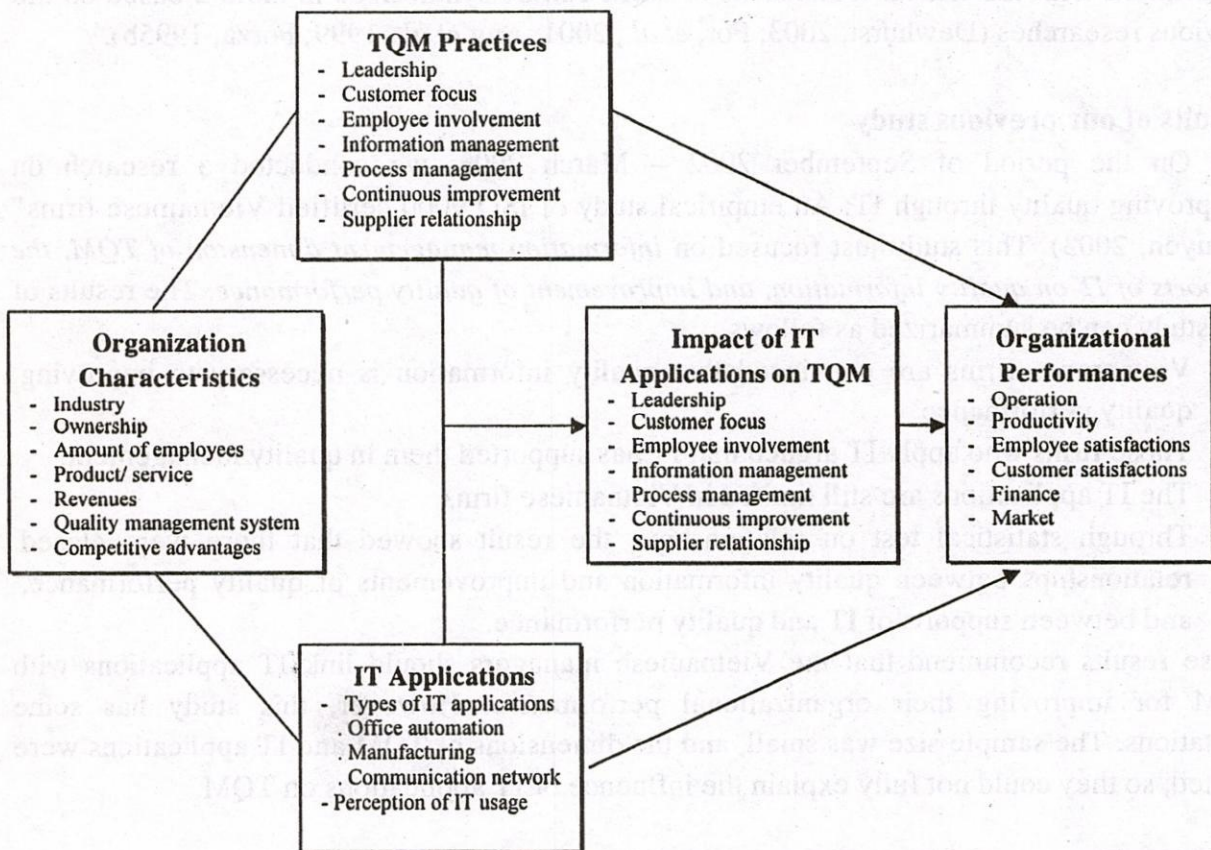


Figure 1: The proposed framework of the study

6. CONCLUSIONS

This paper reviews the literatures relating to TQM and IT applications. This review shows that IT applications have a key role to play in the process of applying TQM in organizations and can affect all the seven TQM dimensions in this paper. In other words, IT

can facilitate in implementing TQM practices. Many organizations are still at the early stage of IT implementation as well as TQM, especially Vietnamese organizations, therefore they need to carefully consider the impact of IT on TQM for improving organizational performances. It implies that the organizations should link IT applications with TQM in their business strategies.

The paper also proposes the framework for the study of the performance improvement through linking IT applications with TQM. This framework will be applied in Vietnam context. Both Vietnamese organizations who got ISO 9000 certificates and those who did not will be surveyed in the coming months. The results of this survey will be hoped to consistent with our priori expectations.

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CẢI THIỆN KẾT QUẢ THỰC HIỆN THÔNG QUA VIỆC LIÊN KẾT CÔNG NGHỆ THÔNG TIN VỚI TQM

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TÓM TẮT: Công nghệ thông tin (CNTT) và quản lý chất lượng toàn diện (TQM) có ảnh hưởng rất lớn đến nhiều tổ chức và đã có nhiều nghiên cứu về mỗi lĩnh vực này. Tuy nhiên, ít có những nghiên cứu thực tiễn về mối quan hệ giữa hai lĩnh vực này, đặc biệt là tác động của CNTT lên TQM. Do đó, bài báo này tổng kết các lý thuyết trước đây về các yếu tố chính của TQM, các ứng dụng CNTT, các liên kết giữa CNTT với TQM, và tóm tắt kết quả nghiên cứu gần đây của chúng tôi. Đây sẽ là cơ sở để chúng tôi đề xuất một khung nghiên cứu nhằm cải thiện kết quả thực hiện thông qua liên kết các ứng dụng CNTT với TQM.

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