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## TQM—A predecessor of ERP implementation

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## ABSTRACT

Is total quality management (TQM) a predecessor of enterprise resource planning systems (ERP) implementation? This question draws a lot of interest from business managers. Many firms intend to implement both TQM and ERP systems to match the market competition. The question is: Which system should be implemented first? Using US manufacturing companies that have a focus on TQM and have implemented ERP systems, this study examines the relationship among TQM, ERP implementation, operations performance, customer satisfaction, and a firm's performance and subsequently provides a better understanding about the synergistic relationship between TQM and ERP implementation. Structural equation modeling is applied to analyze the data from 154 manufacturing companies in the US. We argue that TQM is a philosophy that emphasizes process improvement, whereas an ERP system is an IT mechanism that implements enterprise-wide process management. Conceptual development and our findings suggest ERP implementation can be successful if it is preceded by a TQM focus.

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## 1. Introduction

Is total quality management (TQM) a predecessor of enterprise resource planning systems (ERP) implementation? This is a question that draws a lot of interest from business managers. Many firms intend to implement both TQM and ERP systems to match market competition (Laframboise and Reyes, 2005). The question is: Which system should be implemented first? So far there is no published research that answers this question. This study investigates this issue using data from 154 US manufacturing firms that have a focus on TQM and have implemented ERP systems. The purpose of the study is to provide a better understanding about the synergistic relationship between TQM and ERP implementation, and the focus is placed on the use of an ERP system.

TQM is a philosophy with a system science point of view that focuses on continuous improvement within the organization so as to provide superior value to customers.

The current generation of TQM concepts is based on the quality theory and approaches suggested by Deming (1981–1982), Feigenbaum (1983), and Garvin (1988). The central theme of TQM stresses three principles, i.e. customer satisfaction, employee involvement, and process improvement.

An Enterprise Resource Planning System is an integrated information technology, which employs the system concept. ERP streamlines business processes to facilitate the flow of data and information among all supply chain processes of a firm and among trading partners (Li et al., 2008; Warfield, 2007; Xu, 2007).

A number of empirical studies reported the positive effects of applying the TQM paradigm in manufacturing settings (Kaynak, 2003; Samson and Terziovski, 1999; Sousa, 2003; York and Miree, 2004). Equally, many empirical studies reported the results of ERP implementation (Akkermans et al., 2003; Choi et al., 2007; Ifinedo and Nahar, 2007; Li et al., 2008; Sun et al., 2005; Umble et al., 2003). However, there are only a few studies that directly focus on the linkage between TQM and ERP. Our extensive search reveals two comprehensive studies with a strong emphasis on the relationship between TQM and ERP

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implementation. One is the study conducted by Schniederjans and Kim (2003). They analyzed the relationship between ERP implementation and TQM implementation using Pearson correlation analysis, and concluded that implementing both ERP and TQM together would achieve predominant success. However, they did not indicate which program should be implemented first to achieve better results. The other study is commissioned by Laframboise and Reyes (2005). They focused on ERP implementation in the aerospace industry and applied a case study method. Their result indicates that ERP implementation positively affects a firm's performance when the enterprise information system implementation directly interacts with other resources such as quality improvement systems. The shortcoming of this study is that it only considers one industry and the result may not be generalized to other industries.

This study intends to advance the existing literature on the causal relationship between TQM and ERP implementation by including various manufacturing industries and using a large sample size. The key research questions addressed in this study are (i) Is TQM a predecessor of ERP implementation? (ii) How well do TQM focus and ERP implementation contribute to a firm's production/operations management and customer satisfaction commitment? And (iii) Will better performance of production/operations management and customer satisfaction contribute to a firm's better performance?

This paper is organized as follows. Section 2 presents a literature review and the conceptual model. Section 3 discusses the research plan and methodology. Results of the study are provided in Section 4. Section 5 provides a discussion. Conclusions and limitations are provided in Section 6.

## 2. Literature and the research model

This study aims at validating the causal effects of TQM and ERP implementation and the market performance of manufacturing firms. An extensive literature review and direct discussion with a number of manufacturing plant managers suggest a representative view of the components comprising TQM focus and ERP implementation. The conceptual research model is shown in Fig. 1. The concept of TQM philosophy first emerged in the book, *Quality Control: Principles, Practice, and Administration*, authored by Armand Feigenbaum (1951) and later, the book was published under the title, *Total Quality Control* (1961).<sup>1</sup> Deming (1981–1982), Juran (1992), Crosby (1996), Garvin (1988) and a number of Japanese quality management masters such as Kaoru Ishikawa and Genichi Taguchi also developed either theories or methods that contributed to the TQM body of knowledge. The American Society for Quality<sup>2</sup> stated that TQM was first used by the US Naval Air Systems Command to improve performance through the work of Juran, Crosby, and Ishikawa. ERP

systems arrived onto market in the 1990s. TQM is a philosophy that emphasizes process improvement, whereas an ERP system is an IT mechanism that implements enterprise-wide process management. Based on the conceptual development and timeline, we hypothesize that TQM implementation precedes ERP implementation. Both TQM and ERP are strategic business initiatives and strive to improve production/operations management and customer satisfaction performance (Laframboise et al., 2005; Schniederjans et al., 2003). Consequently, better operations management and customer satisfaction lead to improved performance.

### 2.1. Total quality management focus

TQM is an essential cultural framework and a foundation for ERP implementation (Schniederjans et al., 2003). TQM necessitates organizational changes and seeks to improve all processes and every business activity. ERP is a process-based technology initiative. As such, implementing an ERP system requires changes in all processes. In this sense, TQM and ERP are complementary and share many common areas. TQM also precedes ERP implementation in establishing an organizational infrastructure for ERP initiatives.

Good quality management is the source of competitiveness. In order to achieve better performance, TQM initiatives not only put customer satisfaction at the center of organizational enterprise (Deming, 1981–1982), but also prefer a flattened organizational structure to a hierarchical firm because an organization with many levels of supervision suffers reduced speed of communication and agility. A flattened organization, which is required by ERP implementation, offers direct communication channels to the various functional groups in the organization and is able to react quickly to the needs of the market and customers (Li et al., 2008; Ptak et al., 1999; Stratman and Roth, 2002).

Both TQM and ERP initiatives require the commitment from the senior leadership (Deming, 1981–1982). Top management's guidance is expected to lead continuous quality improvement and enterprise-wide information technology management. Senior management's involvement in visible activities, such as planning, coordinating, reviewing, and directing are an important part of ensuring the success of ERP implementation.

TQM puts a heavy emphasis on employee involvement and recognizes the need to advance people's mindset and change people's behavior, attitude, and philosophy of doing business. Having a commitment to life-long learning, having enterprise thinking, being willing to adopt new information technology, and new business processes are the corner stone of TQM philosophy. The same concepts are applied to ERP implementation. The implementation of ERP will be successful if the commitment to process change is enhanced in the organization. As Sun et al. (2005) suggest, ERP implementation is perhaps a never-ending cycle of continuous improvement.

While implementing a new technology, people who install the IT infrastructure and operate the ERP system on

<sup>1</sup> [http://en.wikipedia.org/wiki/Total\\_Quality\\_Management](http://en.wikipedia.org/wiki/Total_Quality_Management).

<sup>2</sup> <http://www.asq.org/learn-about-quality/total-quality-management/overview/overview.html>.

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