

# **The Effects of Total Quality Management on Business Performance: Evidence from Taiwan Information-Related Industries**

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# The Effects of Total Quality Management on Business Performance: Evidence from Taiwan Information-Related Industries

## **ABSTRACT**

*Total quality management (TQM) has been proposed to improve business performance and received considerable attention in recent researches. This study empirically examines the extent to which TQM and business performance are correlated and how TQM impacts various levels of business performance. In this study, a TQM framework is developed according to a comprehensive literature review. This framework demonstrates the relationship between TQM and business performance through examining the direct and indirect effects of seven TQM constructs on three different levels of business performance. The proposed model and hypotheses were tested by using data collected from information-related small- and medium- size enterprises in Taiwan. The results of this aforementioned model support the proposed hypotheses. The implications of research findings for researchers and practitioners are discussed and the suggestions for further studies were also provided.*

**Key Words and Phrases:** Total quality management (TQM), Business performance, Information-related industries

# **The Effects of Total Quality Management on Business Performance: Evidence from Taiwan Information-Related Industries**

## **Introduction**

In such a competitive environment resulted from world globalization and liberalization, firms survive with much difficulty unless they create the competitive advantage over their competitors (Adam *et al.*, 2001; Samson & Terziovski, 1999; Terziovski & Samson, 1999). With the increasing competitive, business survival pressure and the dynamic, changing customer-oriented environment, total quality management (TQM) has been recognized as one of the important issues and generated a substantial amount of interest among managers and researchers (Ahire *et al.*, 1995; Benson *et al.*, 1991; Flynn *et al.*, 1995; Powell, 1995; Samson & Terziovski, 1999; Sousa and Voss, 2002; Terziovski & Samson, 1999). Since 1980s, TQM has been regarded as one of effective ways for firms to improve their competitive advantage (Kuei *et al.*, 2001). Leading pioneers in the quality area, such as Deming (1986) and Juran (1993), asserted that competitive advantage can be gained by providing quality products or services. Additionally, Eng and Yusof (2003) argued that quality holds the key competitiveness in today's global market. In addition, TQM has widely considered as an effective management tool to provide business with stability, growth, and prosperity (Issac *et al.*, 2004).

The benefits of quality improvement can not only be reflected on decreasing costs, but also on maximizing business profits. In terms of quality improvement, what really counts for a firm is not just cost minimization, but the effect of superior quality has on maximizing profits (Freiesleben, 2005). Thus, the study of the relationship between quality management and firm performance is critical for firms and researchers to better understand the effects of quality management onto different levels of firm performance.

In order to accomplish the requirement of quality, firms have to spend time and effort on the implementation of TQM. To this end, firms will introduce quality management practice by communicating TQM philosophy and/or principle effectively. In addition, the application of TQM can be implemented to enhance the relationship between firms and their suppliers. Moreover, the implementation of TQM can also increase customer satisfaction by providing preeminent products or services. According to the CEO's view of quality which is displayed on Intel's website, quality is actually one of Intel's six important company values. In other words, Intel strives for pursuing world-class quality through the adoption and/or implementation of its quality systems. By doing so, Intel dedicates to maintain the highest standards and ship product that meet the stated goals of Intel (Otellini, 2006).

According to prior researches (Alkhafaji *et al.*, 1998; Mandal *et al.*, 1999), TQM

philosophy can be applied to any organizations, including manufacturing, services, and information-related industries. The mature development of Taiwan information-related industries has made it possible for a stabilized global economy (Einhom *et al.*, 2005). In order to make Taiwan information-related industries more prosperous and competitive, it proves to be worthwhile to investigate how TQM may affect business performance. From the discussion above, this study attempts to examine the relationship between TQM practices and various levels of business performance and with a special focus on information-related industries in Taiwan. The objective of this study is to provide empirical evidences on whether or not implementation of TQM practices affects various levels of firm performance. The contribution of this study is to propose a model which can study TQM effects more effectively and hence, implement TQM in a more efficient manner. The findings obtained from this study can be useful for researchers and practitioners in the quality management area.

## **Literature Review**

### ***The Effects of TQM on Business Performance***

The benefits of an effective TQM implementation can be studied with three different perspectives. Firstly, from the operating angel, the reason that TQM has become a hot topic in both industry and academia is that it can be applied to improve/enhance

global competitiveness (Flynn *et al.*, 1995; Samson and Terziovski, 1999). Firms with effective TQM implementation can accomplish the internal benefits such as improving quality, enhancing productivity enhancement, or realizing better operating income (Corbett *et al.*, 2005; Hendricks and Singhal, 1997). Secondly, from the financial performance perspective, careful design and implementation of consistent and documented quality management systems can contribute significantly to superior financial performance (Corbett *et al.*, 2005). Further, firm with an effective TQM implementation can significantly outperform on the stock price performance (Hendricks and Singhal, 2001). Finally, from the knowledge management (KM) viewpoint, the implementation of TQM can also increase and enhance organizational knowledge, which in turn helps more understanding of how quality management practices can affect firm performance (Linderman *et al.*, 2004). Compared with TQM and KM, there are many similarities between these two management philosophies. If properly planned, they can complement one another effectively (Hsu & Shen, 2005)

Recent studies have examined the relationship between total quality management and various levels of business performance (Das *et al.*, 2000; Kaynak, 2003; Mohrman *et al.*, 1995). Although many results of prior studies supported the positive effects of TQM on organizational performance (Hendricks & Singhal, 1997; Kaynak, 2003; Madu *et al.*, 1995; Sun, 2000; Terziovski & Samson, 1999), there were several

researches which found the implementation of TQM might lead to ineffectiveness of firm performance (Choi & Eboch, 1998; Dale *et al.*, 1998; Lemak *et al.*, 1997; Reed *et al.*, 1996). Kaynak (2003) indicated the reasons that the results of these aforementioned studies have different outcomes probably resulted from the nature of the research designs such as using TQM practices or business performance as a single construct. In this study, the authors examine the relationship between seven important TQM constructs and various levels of firm performance and measure how each TQM constructs affects other TQM constructs.

### ***Hypotheses Development***

Base on the result of literature review, this study concluded seven factors to be the key driving force to an effective implementation of TQM. Namely, these seven factors include: customer focus, management leadership, human resource, quality data & reporting, suppliers' management, design management, and process management (Ahire *et al.*, 1995; Flynn *et al.*, 1994; Kaynak, 2003; Samson & Terziovski, 1999; Sousa & Voss, 2002). Further discussions about the aforementioned seven factors are provided below.

#### ***1. Customer focus***

For business enterprises, the significant driving force to establish the quality goals basically originates from customer needs. Generally speaking, customer needs

identify the operational goals for firms to meet. And this type of quality goals is also referred as market-driven (Juran, 1992). Oakland (2005) mentioned that quality started with the understanding of customer needs and ended when those needs were satisfied. In order to meet the requirement of customers, top management should clarify the expectations of its customers. Further, organizational strategy should also be developed based on customers' needs. Samson & Terziovski (1999) pointed out that customer focus is the underpinning principles for firms to implement TQM programs. Since senior management may have the influence and authority to dominate the entire TQM implementation, dedicated commitment from top management about implementing TQM is certainly a necessity. Therefore, this study proposes that customer focus is positively related to management leadership.

H1: Customer focus is positively related to Management Leadership

## *2. Management leadership*

Management leadership is considered to be another major driver of TQM and it has a significant influence on determining whether or not a TQM program can be implemented effectively (Soltani, 2005). Management leadership in fact, refers to how management level guides and supervises personnel of a firm in an appropriate manner. Management level provides the necessary resources for training employees to meet the new requirements and/or changes that are resulted from TQM

implementation, and consequently, creates a work environment which is conducive to employee involvement in the process of changes (Kaynak, 2003; Wilson & Collier, 2000). In addition, effective management leadership is critical to influence the decision of selecting qualified suppliers and certifying suppliers for quality material (Flynn *et al.*, 1995; Trent & Monczka, 1999). Management level is also responsible for mentoring product design and considering market demands & consumer needs (Deming, 1986; Flynn *et al.*, 1995). In other words, the focus of management is essential for firms to produce goods that are manufacturable and meet the needs of customers (Flynn *et al.*, 1995; Juran, 1981). In conclusion, management level plays a significant role on conducting organizational operation and also highly influences the decision-making and resource allocation processes for supplier management and design management, respectively. Therefore, the authors propose that management level has positive effects on human resource, suppliers' management, and design management.

H2a: Management Leadership is positively related to Human Resource

H2b: Management Leadership is positively related to Suppliers' Management

H2c: Management Leadership is positively related to Design Management

### *3. Human resource*

In terms of quality management, employees must be able to measure and utilize quality data efficiently and effectively (Ahire & Dreyfus, 2000; Ho *et al.*, 1999). The study of Ho *et al.* (2001) indicated that human resource, which includes employee training and employee relation, was positively related to quality improvement, which was mediated through utilizing quality data and reporting. Thus, whether or not a TQM program will be successfully implemented mainly depends on the collaboration and coordination among a firm's workforce. An effective implementation of TQM can be derived from employees' understanding of the philosophy and principle of TQM implementation. Furthermore, if employees have high consciousness of TQM, the data and reporting of quality control prepared by working staffs will be easy to uncover the reality and thus, can be used to correct quality flaws or mistakes immediately and effectively. In this way, the authors propose that better human management will result in more positive effect on producing quality data and reporting.

H3: Human Resource Management is positively related to Quality Data & Reporting

### *4. Quality data & reporting*

Quality data and reporting utilize quality reports and control charts to identify explicit & potential quality problems and provide timely information for correcting &

improving problems explored (Ho *et al.*, 1999). In other words, a good data and reporting system can timely and correctly reflect the actual circumstance/situation to management level. It can also provide management level adequate information to make timely decisions. With regard to quality data and reporting, it can help management or employee to identify and solve problems stemming from input materials that are supplied by cooperative suppliers (Adebanjo & Kehoe, 1999). In addition, several studies indicated that the goals for firms to implement TQM were mainly focused on building quality into the products rather than merely inspecting quality into the finished products or removing defective products (Flynn *et al.*, 1995; Handfield *et al.*, 1999; Tan, 2001). Since effective design management requires various resources to support, such as considering the requirements of customers or coordination of procurement function, design function, production function & supply function, design management can be effectively implemented only if quality data and reporting are collected and shared throughout the organization in a timely manner (Ahire & Dreyfus, 2000; Easton & Jarrell, 1998; Flynn *et al.*, 1995; Handfield *et al.*, 1999; Ho *et al.*, 1999). Additionally, quality data and reporting can provide employee timely information to deal with changes or problems occurred and further examine the results with the improvements made (Flynn *et al.*, 1995; Handfield *et al.*, 1999; Ho *et al.*, 1999). Thus, an effective quality data and reporting system will have positive

impacts on enforcing suppliers' management, design management, and process management aspects (Kaynak, 2003). Therefore, the authors propose that quality data and reporting is positively related to suppliers' management, design management, and process management.

H4a: Quality Data & Reporting is positively related to Suppliers' Management

H4b: Quality Data & Reporting is positively related to Design Management

H4c: Quality Data & Reporting is positively related to Process Management

##### *5. Suppliers' management*

With regarding to suppliers' management, an effective suppliers' management will enforce the cooperation between suppliers and firms by allowing suppliers' involvement and/or participation not only in the design process but also in the production process, and help the procurements of materials or parts meet firm's requirements and be efficiently utilized (Flynn *et al.*, 1995; Shin *et al.*, 2000; Tan, 2001). The research findings of Kaynak (2003) showed that suppliers' management, which emerged as an important component of TQM implementation, had directly positive effects on both design management and process management. In addition, the quality of materials provided by suppliers is important and the starting point for firms to produce quality products. Eventually, a good quality of raw materials will reduce

the occurrences of rework, scrap, and/or defective outputs. Ultimately, it can result in a good operational performance. From the discussion above, suppliers' management can be used to streamline the suppliers' base to facilitate the following tasks such as managing suppliers' relationship, developing strategic alliances with suppliers, cooperating with suppliers to ensure meeting the customers' expectations, involving suppliers early in the product development process, and enhancing the process management (Flynn *et al.*, 1995; Kannan & Tah, 2005). Therefore, the authors propose that suppliers' management is positive related to design management, process management, and operating performance.

H5a: Suppliers' Management is positively related to Design Management

H5b: Suppliers' Management is positively related to Process Management

H5c: Suppliers' Management is positively related to Operating Performance

## *6. Design management*

Effective design management can increase the efficiency of process management and improve operating efficiency. The study of Ahire & Dreyfus (2000) showed that design management has positive impacts on process management, internal quality, and external quality. The empirical results of Kaynak (2003) showed that product/service management had significantly positive effects on process

management and quality performance, which in turn influenced operating performance. Thus, the authors hypothesize that design management may have positive impact on process management and operating efficiency.

H6a: Design Management is positively related to Process Management

H6b: Design Management is positively related to Operating Performance

### *7. Process management*

Inferior quality manufacturing process will result in higher scrap rate and rework rate which will lead to more resource consumed to produce qualified products (Ahire & Dreyfus, 2000). The goal of process management is to reduce process variation by building quality into the production process (Flynn *et al.*, 1995; Handfield *et al.*, 1999). The effects of reducing process variation will increase the quality of outputs as well as decreasing the occurrences of unnecessary costs such as rework costs and waste costs by finding and correcting quality problems immediately (Ahire & Dreyfus, 2000; Anderson *et al.*, 1994; Forza & Flippini, 1998). Thus, the effectiveness of process management implementation has been cited as one of the major dimensions of integrated quality efforts (Anderson *et al.*, 1995). As a result, the authors can draw the following hypothesis:

H7: Process Management is positively related to Operating Performance

## 8. Firm's performance

There are plentiful studies investigated the relationship between TQM and firm performance. Kaynak (2003) indicated that quality improvement had positive effects on improving a firm's financial and market performance. However, as the effects of TQM have different impacts on internal quality and external quality, TQM implementation that directly and positively improves firm's operating performance by increasing quality performance (Kaynak, 2003), has indirect effects on increasing customer satisfaction as well as market share (Handfield *et al.*, 1998; Hendricks & Singhal, 1997). It is further noted that quality management can improve operating efficiency by reducing defect rate, scrap rate, and the occurrence of rework. The improvement of operating efficiency will improve customers' satisfaction and eventually the company's financial performance. In addition, the improvement of customers' satisfaction and loyalty may sustain or enlarge market share, which can be eventually transformed into better firm's financial performance (Ahire & Dreyfus, 2000; Choi & Eboch, 1998). Thus, the authors propose that operating performance resulting from TQM implementation will increase customers' satisfaction and improve financial performance, respectively. In the meantime, the improvement of customers' satisfaction will also have positive effect on improving financial performance. So, hypothesis H8 is proposed below.

H8a: Operating Performance is positively related to Customers' Satisfaction

H8b: Operating Performance is positively related to Financial Performance

H8c: Customers' Satisfaction is positively related to Financial Performance

Based on discussion above, this manuscript establishes the research model, which examines the relationship among seven TQM constructs and various levels of firm performance, to measure the direct and indirect effects of TQM on firm performance. Figure 1 illustrates this research model and Table 1 tabulates the hypotheses that this study proposed and clarified the relationship between TQM and firm performance.

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Insert Figure 1 and Table 1 around here  
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## **Research Methodology**

### ***Development of the survey instrument***

This study hypothesizes that firms with TQM practices should have better effects on various levels of firm performance. In order to examine the relationship between quality management and business performance, this study takes small- and medium-size enterprises from the information-related industries in Taiwan to be the sampling target to investigate the effects of TQM implementation. A total of seven constructs which are considered to be important for effective TQM implementation are proposed

to form a questionnaire. The questionnaire developed in this study consisted of three main sections, including the background of the company, the motivation and implementation situation of TQM practices, and specific questions designed to investigate TQM constructs developed from the proposed research model. A five-point Likert scale was employed with a score of 1 indicating “strongly disagree” and 5 representing “strongly agree” to represent different attitude of respondents. The questionnaire was pre-tested by two professionals in practice. According to the opinions of professionals, several questions were rewritten consequently.

### ***The sample***

A total 600 information-related companies were randomly selected from Information Service Industry Association of R.O.C. and Taiwan Electrical & Electronic Manufacturers Association. The survey, through the mailed questionnaire, was carried out within one and half months in late 2005. Although the response rate was initially not encouraging, the authors used several techniques to improve the response rate. These techniques include providing a stamped self-addressed envelope and promising to mail final results for sampling companies’ future reference. As a result, 96 questionnaires were finally received and the final response rate was 16%. After eliminating incomplete survey, 95 questionnaires were kept with the 15.83% of valid returned rate.

## **Findings and Discussion**

This study first applies the descriptive statistics to explore the general profile of the respondents. Out of 95 valid respondents, 52% were software-related companies and 48% were hardware-related companies. In addition, 67% reported that the existence of their companies were over 16 years. As to the company size, 30% of respondents reported that the number of employees was over 200 people. Finally, this study finds that 40% of respondents have over 76% of products exported.

Secondly, in order to examine the motivation for companies to implement quality management, this study classified the motivation of quality management into nine factors and they are: increasing quality of products, improving goodwill, improving firm's competitive advantage, the requirement of management, following the trend, facing the pressure of competitors, and expanding market share. It is worthwhile to note that the top two strong motivations for companies to implement quality management are increasing quality of products and improving firm's competitive advantage. The possible explanation may be that one of main characteristics of information-related industries is that, on average, the level of employee's educational background is higher than other industries. Because of the better level of educational background, the employees appreciate the importance of TQM. In addition, the export ratio of high-tech industry is also higher than other industries. In order to maintain

and expand global market share, high-tech industries emphasize much on the implementation of quality management. In addition, the higher an employee's educational background, the more understanding of the meanings of quality management. Consequently, global market share expansion and higher educational background provide a continuous momentum to implement TQM.

As for how long a firm has been introduced quality management practices, 33% respondents have implemented quality management over 16 years. However, 56% respondents implement quality management by themselves. In order to further investigate the actual implementations of quality management, the authors investigate the dollar investment on quality management in 2003 and 2004. The results showed that, on average, 57% of respondents invested less than NTD \$500,000 (USD \$16,129) dollars in implementing quality management activities. For 41% respondents, the employee number of quality management sector to total employee ratio is less than 5%. And for the adoption of quality management standard, 51% of respondents chose to install ISO 2000 version.

The results of descriptive analysis are listed in Table 2. The means and standard deviations of seven constructs range from 3.69 to 4.11 and from 0.56 to 0.78, respectively.

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Insert Table 2 around here  
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Next, this study examines the validity and reliability analysis and the corresponding results are shown in Table 3. Principal Component and Varimax are used to extract 7 constructs of TQM. The criterion for extracting critical factors is based on whether or not Eigen value is greater than 1. In addition, the authors use Cronbach's Alpha to examine internal consistency which is mainly used to assess the reliability of the proposed 7 constructs. If the value of Cronbach's Alpha is greater than 0.6, the reliability of the responding survey's results proves to be acceptable.

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Insert Table 3 around here  
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Further, this study uses Pearson and Spearman analyses to test the coefficients and correlations among seven TQM constructs including customer focus, management leadership, human resource, quality data & reporting, suppliers' management, design management, and process management. As shown in Table 4, it can be noted that the relationships among these seven constructs are all positive to each other.

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After aforementioned reliability and validity analyses, this study employs structural equation modeling to examine the proposed research hypotheses by using SPSS Amos

5.0. The empirical results are illustrated in Figure 2. Figure 2 shows the relationship among TQM practices and various levels of firm's performance. The authors divide the research model into three sections for detailed discussion. The first section is developed to examine the effects of essential key factors on effective implementation of TQM philosophy. The authors choose to examine the relationship between customer focus and management leadership, which is a prerequisite for firms to implement TQM effectively. The second section is constructed to examine the relationship among seven TQM constructs and operating performance. Finally, the third section is used to thoroughly examine the improvement effects of operating performance (resulted from the implementation of TQM) on customers' satisfaction and financial performance, respectively.

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Insert Figure 2 around here  
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From the first section, which is shown from the left side of Figure 1, the relationship between customer focus and management leadership is used to examine the effect of customer-oriented operating strategy established by management level on the effectiveness of TQM implementation. The results show that customer focus is positively related to management leadership since the coefficient is 0.731 significantly at 0.01 significant levels. As the competitive pressure of business

environment is increasing, firms must emphasize on improving customers' satisfaction and expectation to maintain their current market share or strengthen their competitive edges. To this end, management level will focus on meeting customers' expectation while considering adequate operating strategy. In addition, the main goal of TQM implementation is to satisfy customers' need by providing quality products or services to them. Therefore, the authors can say that management level should take customers' requirements and needs into account when implementing TQM activities.

Next, from the second section of Figure 1, which includes management leadership, human resource, quality data & reporting, suppliers' management, design management, process management, and operating performance, the relationship among seven TQM constructs and operating performance will be studied. Results from this study reveal that all the correlation coefficients of management leadership with respect to human resource management (the coefficient is 0.745 significantly at 0.01 significant levels), suppliers' management (the coefficient is 0.215 significantly at 0.1 significant levels), and design management (the coefficient is 0.387 significantly at 0.01 significant levels) are significant. Since resources allocation is dominated/controlled/influenced by top management level, the commitment of top management level can significantly influence whether or not TQM activities are successful. If top management level supports TQM implementation, more resource

can be allocated to the rest three external and internal management practices (customer focus, quality data and reporting, process management). In addition, human resource management, suppliers' management, and design management have significant impacts on whether or not quality management can be effectively accomplished. Moreover, as human resource management, suppliers' management, and design management are all assisted by effective communication and collaboration processes, management level can, then, make good decision in a real-time manner.

Further, it can be noted that human management has significantly positive effect on generating quality data and reporting (the coefficient is 0.738 significantly at 0.01 significant levels). The main purpose of human management function is to recruit high-level talents to complete the assignment effectively. Talents recruited by human management function can ensure that the goal to provide quality products or service to customers can be achieved. Additionally quality data and reporting systems are supported by quality working force. The empirical results from this study show that the effect of quality data and reporting on suppliers' management (the coefficient is 0.441 significantly at 0.01 significant levels), design management (the coefficient is 0.571 significantly at 0.01 significant levels), and process management (the coefficient is 0.564 significantly at 0.01 significant levels) are all significantly positive. Generating quality data and reporting can ensure the quality of the entire

production process ranging from design to manufacture and including inputs provided by certain suppliers can be monitored and controlled in a timely and appropriate manner. In other word, a well-designed quality data and reporting can be employed to control the entire production procedure effectively and further improve quality flaws in a timely fashion.

As for suppliers' management, the results of this finding show that the coefficients of suppliers' management has a positive relationship to design management (the coefficient is 0.607 significantly at 0.01 significant levels), process management (the coefficient is 0.172 significantly at 0.1 significant levels), and operational performance (the coefficient is 0.382 significantly at 0.01 significant levels). It is also proved that firm's competitive advantages come from establishing good cooperation relationship with qualified suppliers. Suppliers with superior reputation can provide quality products to meet the requirements set by buyers. Moreover, suppliers having good collaboration with buyers can also meet buyer's future needs by attending buyer's meetings/conference including product design process and continuous improvement. As a result, the authors can reasonably conclude that good collaboration between suppliers and buyers has positive effects for buyers to implement design management and process management. In addition, the quality of products provided by good-reputation suppliers can reduce defect ratio or reworks in the production

process which will result in increasing firm's operating performance. However, the effects of design management and process management on operational performance are both insignificant (the coefficient is 0.0.116 and 0.210, respectively). The possible explanation may be that, at present, design management is still not strongly emphasized by Taiwanese firms in the product development process. Therefore, since the implementation of design management is ineffective, its effects on improving process management and operational performance are not significant. With regard to process management, the coefficient of process management and operational performance is 0.598 significantly at 0.01 significant levels. The objective of effective process management is to reduce defects ratio in a cost-efficient manner. Therefore, superior process management can enhance operating efficiency by controlling quality aspect in the production process.

Finally, this manuscript examines the effects of improving operating performance, which are resulted from the implementation of TQM activities, on customers' satisfaction and financial performance. From the right side of Figure 1, it can be noted that improvement of operating performance resulting from implementing TQM effectively is significantly positive associated with customers' satisfaction (the coefficient is 0.809 significantly at 0.01 significant levels) and financial performance (the coefficient is 0.397 significantly at 0.01 significant levels). It is obvious that

improving operating efficiency can bring in customers' satisfaction by delivering finished products on time and providing quality products to meet customer requirements and/or needs. Thus, the improvement of operating performance by cutting down the rework and waste can enhance customers' satisfaction and financial performance as well. In addition, improving customer satisfaction is also beneficial for a firm to maintain or further expand its market share. In addition, the coefficient of customers' satisfaction is 0.350 significance at 0.01 significant levels. The superior qualified products provided by firms can improve customers' satisfaction and further create a competitive advantage by attracting customers' attention and penetrating additional market share. The implication of improvement of customers' satisfaction is that the quality products that meet customers' requirements can be beneficial for a firm to retain or further dominate its market. Consequently, the results of improving customers' satisfaction can be transformed into better financial performance.

## **Conclusions**

This study contributes to prior TQM literature by establishing a comprehensive research model to examine the relationship among TQM practices and various levels of firm's performance. By reviewing prior TQM literatures and identifying important TQM practices, the authors examine the relationship among TQM practices and measure how these TQM practices influence different levels of firm's performance.

The findings of this research show that an effective management leadership can positively influence human resource management, supplier management, and design management. In addition, findings obtained from this study provide evidence that the influence of TQM practices onto firm's performance should be measured at different levels of performance. The findings support that TQM practices have direct effects on operating performance. Then, improving operating performance brings in better customers' satisfaction and improved financial performance. However, this study only examines the effects of TQM on firm's performance in Taiwan information-related industries. Further research can be performed to expand research scope to different industries or investigate the implementation situation in public companies rather than the small- and medium- size companies. Moreover, quality management can integrate firm's internal and external processes with knowledge creation processes. Thus, future researchers can be performed to consider integrating the relationship, studying the synergies between TQM practices and knowledge management, and measuring how the economic effects of knowledge integration on added firm's value.

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**Table 1.** Hypotheses of TQM constructs and firm performance

<b>No.</b>	<b>Hypotheses</b>
H1	Customer focus is positively related to Management Leadership
H2a	Management Leadership is positively related to Human Resource
H2b	Management Leadership is positively related to Suppliers' Management
H2c	Management Leadership is positively related to Design Management
H3	Human Resource Management is positively related to Quality Data & Reporting
H4a	Quality Data & Reporting is positively related to Suppliers' Management
H4b	Quality Data & Reporting is positively related to Design Management
H4c	Quality Data & Reporting is positively related to Process Management
H5a	Suppliers' Management is positively related to Design Management
H5b	Suppliers' Management is positively related to Process Management
H5c	Suppliers' Management is positively related to Operating Performance
H6a	Design Management is positively related to Process Management
H6b	Design Management is positively related to Operating Performance
H7	Process Management is positively related to Operating Performance
H8a	Operating Performance is positively related to Customers' Satisfaction
H8b	Operating Performance is positively related to Financial Performance
H8c	Customers' Satisfaction is positively related to Financial Performance

**Table 2.** Descriptive Analysis of TQM constructs

Factor Name	Mean	Standard deviation
Customer Focus	4.07	0.56
Management Leadership	4.11	0.59
Human Resource	3.79	0.66
Quality Data & Reporting	3.97	0.66
Suppliers' Management	3.69	0.67
Design Management	3.98	0.78
Process Management	4.11	0.63

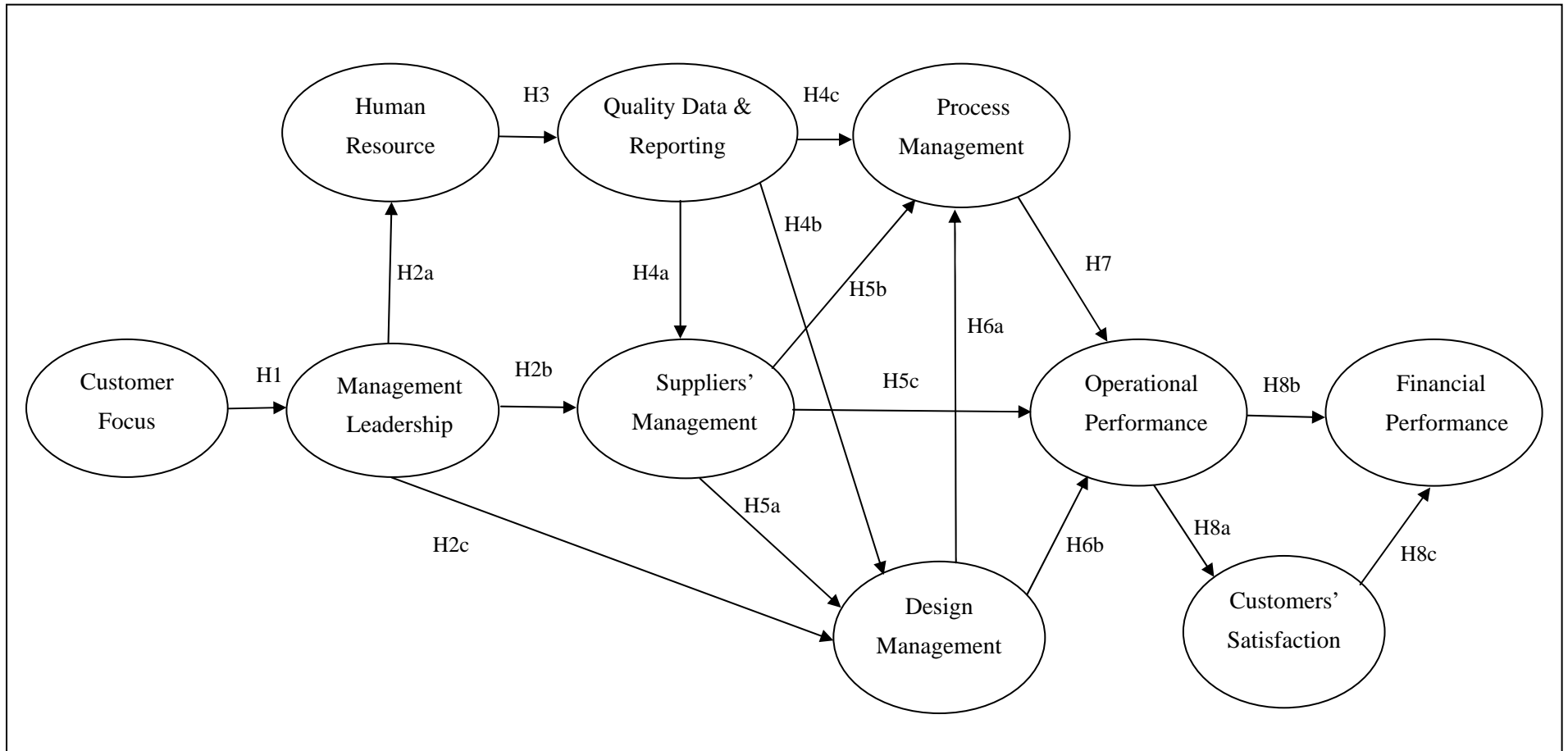
**Table 3.** Validity and reliability Analyses of TQM constructs

Factor Name	Eigen Value	Cronbach's Alpha
Customer Focus	2.66	0.78
Management Leadership	2.01	0.88
Human Resource	4.89	0.90
Quality Data & Reporting	4.83	0.90
Suppliers' Management	2.51	0.74
Design Management	3.45	0.85
Process Management	4.08	0.94

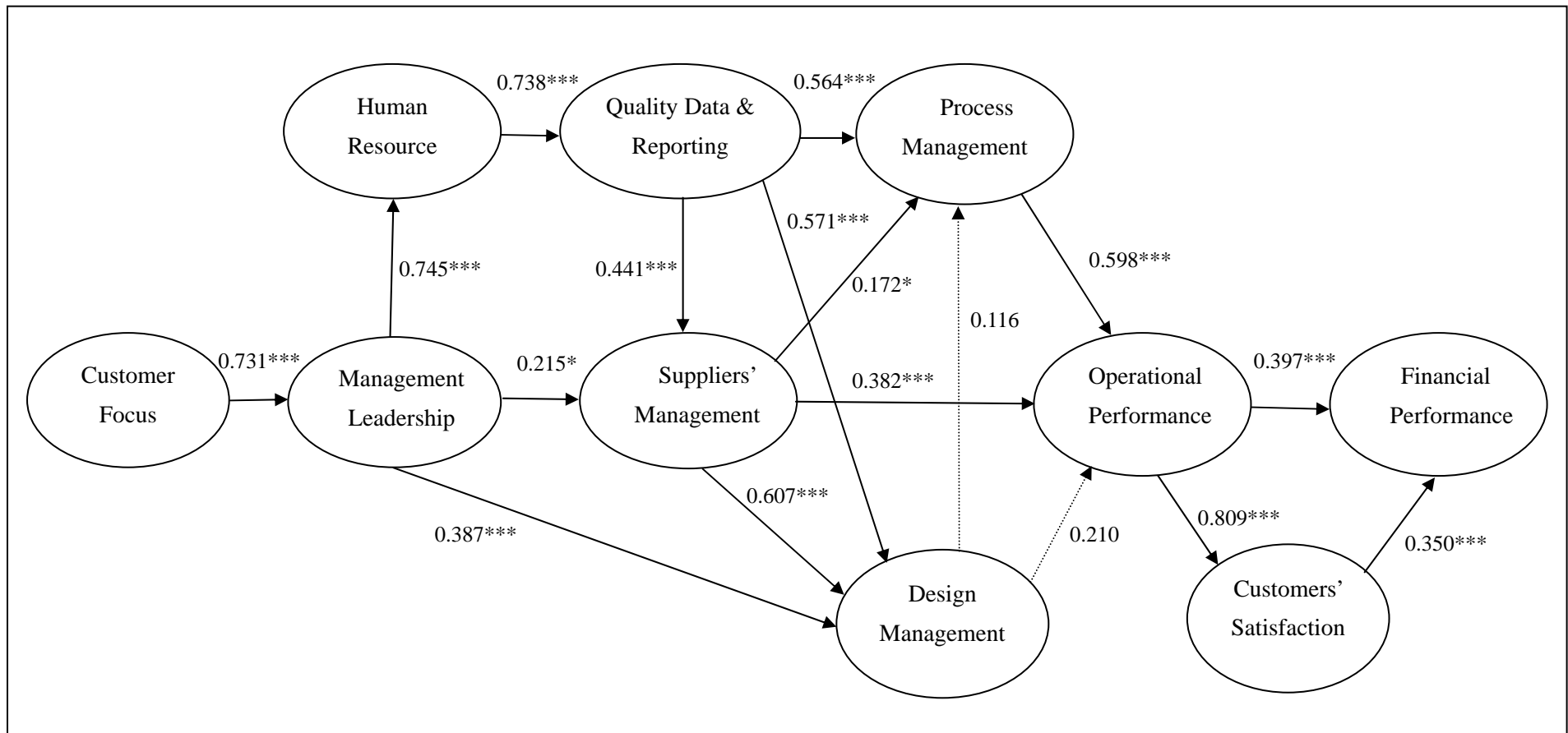
**Table 4.** The Results of Pearson correlation and Spearman correlation

Factor Name	CF	ML	HR	QDR	SM	DM	PM
Customer Focus (CF)		0.731	0.680	0.605	0.394	0.331	0.527
Management Leadership (ML)	0.721		0.745	0.661	0.520	0.387	0.657
Human Resource (HR)	0.638	0.759		0.738	0.531	0.453	0.679
Quality Data & Reporting (QDM)	0.638	0.681	0.675		0.587	0.571	0.734
Suppliers' Management (SM)	0.400	0.534	0.531	0.595		0.607	0.586
Design Management (DM)	0.344	0.381	0.370	0.494	0.546		0.556
Process Management (PM)	0.561	0.659	0.653	0.703	0.578	0.464	

Note : The upper right values are Pearson correlation coefficients. The lower left values are Spearman correlation coefficients.



**Figure 1.** Research model of TQM constructs on various levels of firm's performance



Note : \*\*\*:  $p < 0.01$ ; \*\*:  $p < 0.05$ ; \*:  $p < 0.1$

**Figure 2.** The effects of TQM constructs on various levels of firm's performance