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An integrated framework for ISO 9000 motivation, depth of ISO implementation and firm performance

The case of Taiwan

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Abstract

Purpose – The purpose of this study is to empirically examine whether business can benefit from ISO 9000, and examines how motivation impacts the depth of ISO 9000 implementation and how the depth of ISO 9000 implementation impacts a firm's performance in Taiwan.

Design/methodology/approach – A survey questionnaire was mailed to the 1,668 companies with ISO 9000 certification, and a total of 441 usable responses were returned. Using a structural equation model, this study empirically examines the relationship between ISO 9000 motivation and ISO 9000 implementation depth and how implementation depth influences firm performance.

Findings – The results demonstrate that a positive relationship exists between the extent to which companies implement ISO 9000 and firm performance. Additionally, internal motivation fully mediates the relationship between external motivation and ISO implementation depth. Furthermore, the implementation of ISO 9000 directly and positively influences operational performance and indirectly affects market performance, in turn positively impacting business performance.

Originality/value – This study represents a first attempt to construct a conceptual framework that integrates the motivations behind implementing ISO 9000 certification, the implementation depth underlying processes, and ISO 9000 performance.

Keywords ISO 9000 series, Motivation (psychology), Business performance, Taiwan

Paper type Research paper

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Introduction

The application of standardized quality system models (e.g. ISO 9000) in business is considered to be a most important phenomenon in recent times in quality management development and globalization (Dick, 2000). According to, the latest statistics released by the (ISO, 2006), as of the end of December 2005, 161 countries accounted for 776,608 certifications. Such an impressive number does indeed make ISO 9000 a universal and significant phenomenon.

While the nature and scope of ISO 9000 is well understood, several issues remain unaddressed. First, some studies suggest, that the most prominent reason for implementing ISO 9000 is that customers prefer to buy from suppliers that are ISO certified (Carlsson and Carlsson, 1996; Rao *et al.*, 1997; Jones *et al.*, 1997; Casadesús *et al.*, 1998, 1999; Huarng *et al.*, 1999; Acharya and Ray, 2000; Yahya and Goh, 2001; Najmi and Kehoe, 2001; Terziovski *et al.*, 2003; Costa and Lorente, 2004; Bhuiyan and Alam, 2005). Other studies, however, show that internal motives are the most important consideration in certification (Idris *et al.*, 1996; Najmi and Kehoe, 2001; Gotzamani and Tsiotras, 2002). Obtaining ISO certification does not automatically lead to improvements in the processes of organizations. The literature reveals that organizations that pursue ISO 9000 certification willingly are more likely to report improved organizational performance than those that only obtain ISO 9000 certification under customer pressure (Lee, 1995; Jones *et al.*, 1997; Douglas *et al.*, 1999; van der Wiele *et al.*, 2000; Singels *et al.*, 2001; Yahya and Goh, 2001; Llopis and Tarí 2003; Terziovski *et al.*, 2003; Park *et al.*, 2007). Therefore, it is necessary to examine the question: "What is the relationship between internal and external motivations, and what is the influence of motivation on the depth of ISO 9000?" Studying the relationships among the internal and external motivations and the depth of ISO 9000 implementation could help clarify the reasons for the failure of some externally-driven companies.

Second, there has been considerable debate in the literature as to whether ISO 9000 has a positive impact. Many studies (Elmuti, 1996; McAdam and McKeown, 1999; Huarng *et al.*, 1999; Lipovatz *et al.*, 1999; Yahya and Goh, 2001; Arauz and Suzuki, 2004; Casadesús and Karapetrovic, 2005a; Briscoe *et al.*, 2005) have demonstrated the benefits of implementing ISO 9000. These studies have claimed that the implementation of ISO 9000 standards has improved operational and business performance. However, Rao *et al.* (1997), Terziovski *et al.* (2003) and Naveh and Marcus (2005) have indicated that while implementing the ISO 9000 standards led to improved operational performance, it did not give rise to better business performance. Corrigan (1994), Stephens (1994) and Lima *et al.* (2000) found that the implementation of ISO 9000 standards did not result in improved productivity, quality, or profitability. In light of these inconsistent findings, Terziovski *et al.* (2003) stated that whether or not ISO 9000 is beneficial is likely to be the major determinant of the degree to which managers will embrace or reject ISO 9000 certification in the twenty-first century. Therefore, it is important to also consider the question: "Does ISO certification guarantee a better performance for organizations, and, if so, how does the depth of ISO 9000 implementation impact a firm's performance?" Investigating these issues could be of benefit to practitioners in deciding whether to pursue ISO 9000 and the depth to which the standards are implemented.

Judging from the above, it is important to integrate the motivations behind implementing ISO 9000 certification, the depth of implementation, and the performance of ISO 9000. Our contention is that these constructs have some close relationships, for the motivations create an environment where the ISO 9000 implementation can take place, and the implementation affects ISO 9000 performance. Other researchers who support our contention are Gotzamani and Tsiotras (2002), Brecka (1994) and Kochen (1993). Gotzamani and Tsiotras (2002) reviewed the literature (Brecka, 1994; Kochen, 1993) and summarized the potential of the ISO 9000 standards and their contributions, by stating that:

> . . . the long-term effectiveness and real value of the quality assurance standards is not based on their content and requirements but on the way that companies adopt and implement these requirements. The key for their success lies in the companies' real commitment to quality improvement and their true motives for certification, which finally dictate the way and depth to which the standards are implemented.

The literature on ISO 9000 contains considerable research that focuses on the respective impacts of motivations and implementation processes on ISO 9000 performance. However, there is a lack of systematic empirical evidence integrating the motivations behind the implementation of ISO 9000 certification, the depth of implementation, and ISO 9000 performance. Thus, the framework needs to be empirically tested. Therefore, by using the structural equation model (SEM), this study empirically examines the relationship between the ISO 9000 motivation and ISO 9000 implementation depth and looks at how implementation depth influences firm performance.

Several important reasons exist for focusing research efforts on Taiwan. The Taiwanese economy has passed through a transition, having been transformed from an agricultural economy to become, as a result of an export processing phase, a worldwide OEM/ODM powerhouse. According to the Global Competitiveness Report 2004-2005 completed by the World Economic Forum (WEF), Taiwan was ranked fourth globally and first in Asia in terms of the growth competitiveness index (GCI) rankings. Moreover, Taiwan was ranked 17th in the business competitiveness index (BCI) rankings and 12th in the sophistication of company operations and strategy rankings.

Taiwan is well known to be heavily dependent on exports. The above rankings suggest that the strength of Taiwan as an exporter lies in its business adaptability and efficiency. According to the ISO (2006) report 76 percent of ISO member countries are developing economies or economies in transition. The experience of a developing country with a strong international orientation, business adaptability and efficiency, should be valuable to ISO 9000 practices as it may provide directions for firms in developing countries intending to globalize. It is for this reason that this study focuses on Taiwan, and based on the experiences of Taiwan in terms of ISO 9000 implementation offers important insights into ISO 9000 practices.

The remainder of this paper is organized as follows. The next section introduces a research model and related hypotheses based on a literature review. Followed by the section, that describes the research methodology, including the sample and data collection procedures, the operationalized measures of variables, the statistical approach adopted, and the tests for reliability and validity. Followed by the section, that presents the results of testing the structural model. The penultimate section discusses the implications of the results for researchers and practitioners and

reevaluates the validity of the findings. The paper concludes with further research implications for this study.

Conceptual framework and research propositions

The conceptual framework on which this study is based is aimed at integrating the motivations behind implementing ISO 9000 certification, the depth of implementation, and ISO 9000 performance, and is shown in Figure 1. The model proposed in this study includes three components. The first component describes the effect of motivations on the depth of implementation of ISO 9000. The concept occurs alongside the concept whereby "motivation increases the likelihood of employees to work hard" (motivations → the depth of implementation) proposed by Deci (1971), and the concept whereby "intrinsic motivation mediates the effect of external factors" (external motivations → internal motivations → the depth of implementation) proposed by Ambrose and Kulik (1999). The second component describes the effect of the depth of ISO 9000 implementation. It was derived from a number of studies on ISO 9000 standards in the quality management area. For example, Joubert (1998), McAdam and McKeown (1999) and Terziovski *et al.* (2003) have shown the existence of a positive relationship between the implementation of ISO 9000 and firm performance. The third component describes the relationships among different dimensions of firm performance, and is derived from a number of studies on ISO 9000 standards, quality management and the marketing literature. For example, Elmuti (1996) believed that ISO 9000 enables firms to improve their organizational and market performance, and hence results in increased market share and even improved business performance. Besides, Naveh and Marcus (2005) have claimed that "more attention is needed to this important issue of the relationships between operating and business performance."

A literature review in relation to each of these three components is more extensively discussed below and then the hypotheses of this study are presented.

Motivations for certification and the depth of ISO 9000 implementation

Kunda (1990) informally defined motivation as "any wish, desire, or preference that concerns the outcome of a given reasoning task." Deci (1971) proposed his Cognitive Evaluation Theory and suggested two motivational subsystems: an intrinsic

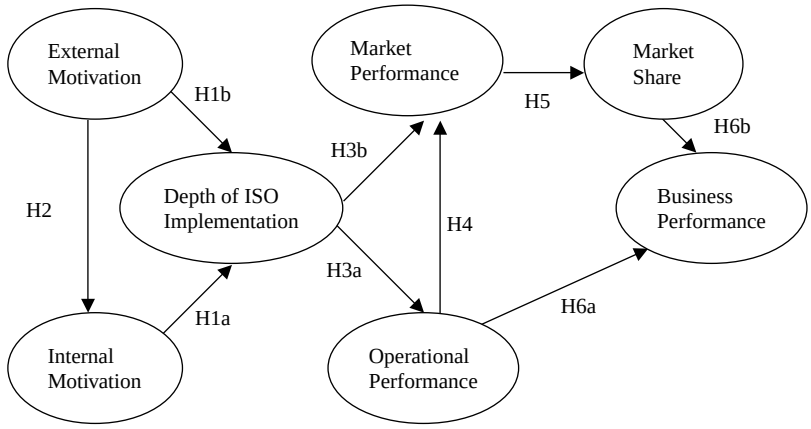


Figure 1.
Conceptual model

subsystem and an extrinsic subsystem. Intrinsic motivation refers to engaging in an activity for its own sake, and the pleasure and satisfaction derived from participation; that is, the rewards are inherent in the activity itself (Deci, 1971; Deci and Ryan, 1985). People are said to be more intrinsically motivated when they perceive themselves as the source of their behavior. Contrary to intrinsic motivation, extrinsic motivation pertains to a wide variety of behaviors performed to achieve particular objectives and not engaged in for their own sake (Deci, 1971). de Charms (1968) concluded that the dichotomy of intrinsic motivation versus extrinsic motivation characterizes their different loci of causality. Intrinsically motivated behaviors are said to represent internal causality, whereas behaviors induced by external forces are said to represent external causality. This study uses the empirical results of Llopis and Tarí (2003) as a basis for classifying motivations for ISO 9000 certification into internal and external motivations. Internal motivations describe organizations wishing to become certified because the members feel the need to do so; external motivations refer to organizations gaining ISO 9000 certification owing to external pressures (Singels *et al.*, 2001).

Part of the literature has concluded that internal motives are the most important motives for certification (Idris *et al.*, 1996; Najmi and Kehoe, 2001; Gotzamani and Tsiotras, 2002). For example, a Greek survey by Gotzamani and Tsiotras (2002) found that Greek companies seek ISO 9000 certification mainly to improve their internal operations and their products (internal ones), and much less to satisfy market demand and pressure (external ones). van der Wiele *et al.* (2000) have revealed that external motivations are positively correlated with customer relationships and organizational control, and that internal motivations were found to be positively correlated not only with customer relationships and organizational control, but also with financial aspects and market share. Terziovski *et al.* (2003) observed that, the internal motivations for certification have a highly significant effect on business performance and the reduction of waste. Arauz and Suzuki (2004), in a study on 292 ISO 9000 certified companies in Japan, showed that internal motivation was the critical factor in terms of cost and quality performance. Various surveys have revealed that firms that are certified due to internal motivations achieve higher profits than those that seek certification for external reasons (Lee, 1995; Jones *et al.*, 1997; Douglas *et al.*, 1999; van der Wiele *et al.*, 2000; Singels *et al.*, 2001; Yahya and Goh, 2001; Llopis and Tarí 2003; Terziovski *et al.*, 2003). Based on research by Minkler (2004), intrinsic motivation increases the likelihood of employees honoring agreements to provide effort and is one of the most important reasons why workers agree to work hard. This provides a basis for developing the following hypothesis:

H1a. Internal motivation is positively related to the depth of ISO 9000 implementation.

On the other hand, numerous studies have reported that the majority of certified companies only concern themselves with ISO 9000 certification in relation to their marketing strategy (Carlsson and Carlsson, 1996; Rao *et al.*, 1997; Jones *et al.*, 1997; Casadesús *et al.*, 1998, 1999; Huarng *et al.*, 1999; Acharya and Ray, 2000; Yahya and Goh, 2001; Najmi and Kehoe, 2001; Terziovski *et al.*, 2003; Costa and Lorente, 2004; Bhuiyan and Alam, 2005) and not in order to truly improve the level of quality management. For example, Blackham (1992) and Tennant (1993) carried out an investigation of UK organizations and found that the external forces driving

certification, such as tender eligibility, customer satisfaction and marketing advantages, were more important than the internal forces. van der Wiele *et al.* (2000) revealed that the external motivations were positively correlated with customer relationships and organizational control. Terziovski *et al.* (2003) noted that external motivations for certification had a significant effect on business performance and no effect on the reduction in waste. Based on research by Arauz and Suzuki (2004) on 292 ISO 9000 certified companies in Japan, it was shown that external motivation was the main driver behind internationalization. According to research by Nalbantian and Schotter (1997), extrinsic motivation contributed to a significant improvement in labor productivity and firm performance. Thus, the following hypothesis is suggested:

H1b. External motivation is positively related to the depth of ISO 9000 implementation.

Although there is evidence to suggest that companies seek ISO 9000 certification mainly for external reasons, Casadesús *et al.* (1998, 1999) asserted that, the path is also accompanied by an improvement in internal organization. Moreover, firms seeking certification owing to internal motivations encounter fewer difficulties in implementing ISO 9000 (Yahya and Goh, 2001). One possible explanation for this finding is that external motivations stimulate quality awareness among employees. This idea also echoes Ambrose and Kulik's (1999) assertion that intrinsic motivation mediates the effect of external factors on employee behavior. Therefore, we formulate the following hypothesis:

H2. Internal motivation mediates the relationship between external motivation and ISO 9000 practices.

The depth of ISO 9000 implementation and firm performance

Whether or not the long-term effectiveness and real value of ISO 9000 is related to the depth to which it is implemented deserves further investigation. Quality studies have identified two main routes through which quality impacts business performance: the manufacturing route and the market route (Everett and Adam, 1994; Flynn *et al.*, 1994; Garvin, 1984). In terms of the manufacturing route, improved internal process quality, greater employee quality awareness, reduced production costs and increased productivity, resulting in fewer defects and less wastage and reworking, combine to improve operational performance. In regard to the market route, improved product quality, increased on-time delivery and increased customer satisfaction, result in improved market performance. This study develops the following hypothesis to investigate how the depth of ISO 9000 implementation influences firm performance evaluations based on two facets, namely, the operational and market angles.

Over the past few years, numerous studies have demonstrated the operational performance of ISO 9000 certification. Since, ISO 9000 is a structured and documented quality system, good documentation can create more effective work instructions and control all aspects of the manufacturing process, leading to reduced costs and better control of the business (Huarng *et al.*, 1999; McAdam and McKeown, 1999). Joubert (1998) presented evidence that ISO 9000 positively impacts product/service quality, saves costs, reduces manufacturing lead time, and improves the overall efficiency of operations. According to Yahya and Goh (2001), the dimensions of operational benefits for ISO 9000 include: scrap/rework, inter-company communications,

departmental/cross functional cooperation, documentation, measurement systems, cultural change, quality awareness and prevention. Furthermore, Lipovatz *et al.* (1999) noted that one important perceived benefit in companies with ISO 9000 certification is the improvement in the production process. Additionally, van der Wiele and Brown (1997) pointed out that the major significant improvements reported by small manufacturing enterprises seeking ISO 9000 certification are related to internal improvements, such as greater quality awareness, improved awareness of problems within the organization and improved product quality. According to Beattie and Sohal (1999), reducing production costs is one of the main benefits of implementing ISO 9000 standards. Based on a survey conducted in Saudi Arabia, Magd (2006) showed that the three most important benefits achieved from implementing ISO 9000 are the improved efficiency of the quality system, better documentation procedures, and increased quality awareness within the firms. Naveh and Marcus (2005) concluded that the use of ISO 9000 is positively related to operating performance. Following on from the above findings, this study examines the following hypothesis:

H3a. The depth of ISO 9000 implementation is positively related to operational performance.

Numerous studies have demonstrated that ISO 9000 certification can lead both existing and potential customers to believe that a company has superior product quality and can meet their requirements (Douglas *et al.*, 1999; Huarng *et al.*, 1999). Companies with ISO 9000 certification receive fewer customer complaints and can more easily win the confidence of both new and existing customers (McAdam and McKeown, 1999). Mo and Chan (1997) identified market benefits as including better control of suppliers and increased customer satisfaction. According to Lipovatz *et al.* (1999), the external benefits of globally-accepted uniform standards for manufacturers are quality improvement and customer satisfaction. Moreover, according to Yahya and Goh (2001), the external benefits associated with ISO 9000 certification are customer satisfaction, perceived quality, competitive edge and time to market. Simmons and White (1999) confirmed that any company that lacks an ISO certificate of compliance finds itself at a marketing disadvantage. Thus, the following hypothesis is tested:

H3b. The depth of ISO 9000 implementation is positively related to market performance.

Relationships among different dimensions of firm performance

Elmuti (1996) believed that ISO 9000 enables firms to improve quality, operational efficiency and internal communication, provide uniform products and achieve a competitive edge, and hence results in greater customer loyalty and market share, and even higher stock prices. This view suggests that different dimensions of firm performance are related.

When implemented well, Hackman and Wageman (1995) suggested that effective quality management may improve operational performance, resulting in several competitive advantages, including better business performance. Flynn *et al.* (1995) found that better operating performance indicates lower defect rates, reduced cost of quality, higher productivity, on-time delivery and customer satisfaction. Additionally, the empirical findings of Ahire and Dreyfus (2000) and Forza and Flippini (1998)

showed that process management directly and positively affects product quality. Therefore, this study tests the following hypothesis:

H4. Operational performance is positively related to market performance.

The beneficial effect of perceived quality on market share is a consistent finding in the market literature (Craig and Douglas, 1982; Jacobson and Aaker, 1987; Phillips *et al.*, 1983). Since, ISO 9000 standards are considered to be universally accepted quality standards that are recognized worldwide, companies that have achieved ISO 9000 certification have a significant competitive edge over companies that lack such certification in terms of international marketing (Joubert, 1998; McAdam and McKeown, 1999). Lipovatz *et al.* (1999) indicated that the benefits of the global acceptance of uniform ISO 9000 standards experienced by manufacturers include increased productivity, improved quality, efficiency, customer satisfaction and ultimately a competitive edge that can help to increase market share. According to Huarng *et al.* (1999), the direct benefit from ISO 9000 lies in systemization. Systemization is expected to bring better product quality, in turn improving sales. Therefore:

H5. Market performance is positively related to market share.

Tarí and Molina (2002), Heras *et al.* (2002) and Naser *et al.* (2004) found an association between ISO 9000 registration and the business performance of companies. Corbett *et al.* (2005) tracked financial performance from 1987 to 1997 in the USA, and found that the ISO 9000 certification was indeed followed by significant abnormal improvements in financial performance. Firm profits clearly depend upon costs and sales. First, improving product quality by reducing waste and improving efficiency increases the return on assets, which in turn increases profitability (Handfield *et al.*, 1998). Second, improvements in quality increase customer satisfaction, thus leading to increased market share and profit growth (Craig and Douglas, 1982; Jacobson and Aaker, 1987; Phillips *et al.*, 1983). Heskett *et al.* (1997) indicated that, with better operational performance, the products or services the organization offers should become more attractive to customers and the firm should have better business performance, which in turn increases sales and profitability. Devos *et al.* (1996) stated that ISO 9000 certificated companies are perceived to have better profit, return on investment, sales per employee, and asset turnover. Consequently, this study hypothesizes the following:

H6a. Operational performance is positively related to business performance.

H6b. Market share is positively related to business performance.

Research methodology

This section discusses the sample and data collection procedure, the operationalized measures of variables as well as the statistical approach used in this study. Moreover, the results of the tests performed for reliability and validity are also presented.

Sample and data collection procedure

The Bureau of Standards, Metrology and Inspection (BSMI) under the Ministry of Economic Affairs is the authority responsible for standardization, metrology, product

inspection and the provision of management system certification services in Taiwan. A list of 1,668 companies with ISO 9000 certification was obtained from the BSMI. A survey questionnaire was mailed to the 1,668 companies. Of all these companies, a total of 441 usable responses made up the survey, yielding a 26.44 percent response rate. Approximately, 34.3 percent of the firms had fewer than 100 employees, 46.4 percent of the firms had between 100-499 employees, and 19.3 percent of the firms had 500 or more employees.

To assess the non-response bias, the comparisons with known values for the population approach recommended by Armstrong and Overton (1977) were utilized. Non-response bias resulting from the sampling and mailing procedures was tested by comparing the survey results with known values for the population related to the demographic characteristics of industry structure. There is no significant evidence to show that our data were unduly biased in regard to industry structure. The respondents' sample was reasonably representative of the population for the industry structure tested (Table I). As the percentage of missing data were calculated to be relatively small, occasional missing data on variables were handled by replacing them with the mean value.

Operationalized measures of variables

The instruments used followed the standard scale development procedures, which started with a review of the extant academic literature followed by a series of interviews with various organizations. Additionally, the interview items incorporated comments from practitioners who participated in executive education sessions in ISO 9000.

Motivation variables. This study used the empirical results of Llopis and Tarí (2003) as a basis for classifying motivations for ISO 9000 certification into internal and external motivations. Three items for each motivation were developed based on studies by Anderson *et al.* (1999), Huarng *et al.* (1999) and Llopis and Tarí (2003). The respondents were asked to indicate the motivation of their company in seeking ISO 9000 certification. A five-point Likert scale was used to assess every question statement, with one being not important at all and five being highly important. These empirical results can be treated as interval data. Table II lists the specific items, as well as the means and standard deviations for each item measured.

Implementation variables. Based on the ISO 9000 literature (Anderson *et al.*, 1999; Huarng *et al.*, 1999; Joubert, 1998; Vloeberghs and Bellens, 1996) and field interviews, eight items were designed to represent the depth in terms of the firm implementing ISO 9000. The respondents were asked to indicate the perceived depth of ISO 9000 implementation. A five-point Likert scale was used to assess every question statement, with one being no implementation at all and five referring to full implementation. The results were able to be treated as interval data. Table II lists the specific items, as well as the means and standard deviations for each item measured.

Table I.
Breakdown of samples by industry type

Industry subdivision	Percent of companies	
	Population	Sample
Manufacturing	92.2	92.8
Non-manufacturing	7.8	7.2

Sample items	Mean	SD	Cronbach's α	Factor loadings	*t*-value
Internal motivation	3.93	0.64	0.73		
Cost reductions	3.50	0.92		0.80	[a]
Quality improvements	4.36	0.68		0.82	10.04
Capturing employees' knowledge	3.94	0.77		0.74	9.54
External motivation	3.74	0.84	0.73		
Marketing advantage	4.03	0.86		0.74	[a]
Customer demands	3.81	0.95		0.84	10.00
Avoid export barrier	3.45	1.21		0.77	10.38
ISO 9000 implementation	4.11	0.56	0.88		
Identification of quality aspects	4.15	0.70		0.68	[a]
Defining standard procedures	4.29	0.69		0.78	12.23
Documentation	4.28	0.65		0.72	10.18
Training	3.98	0.80		0.76	10.26
Top management support	4.07	0.82		0.72	9.51
Employees' involvement	3.71	0.86		0.74	9.89
Periodic auditing	4.24	0.72		0.75	10.50
Corrective action	4.10	0.75		0.79	11.00
Operational performance	3.36	0.70	0.83		
Increased productivity	3.26	0.88		0.84	[a]
Cost reductions	2.95	0.96		0.75	16.36
Improved internal procedures	3.91	0.72		0.70	12.47
Improved employees' morale	3.34	0.84		0.80	14.98
Market performance	3.69	0.68	0.80		
Improved on time delivery	3.40	0.88		0.74	[a]
Improved perceived quality	3.86	0.75		0.81	12.52
Improved customer satisfaction	3.81	0.78		0.80	13.46
Market share (increased market share)	3.13	1.00			
Business performance (increased profitability)	3.08	0.93			

Note: [a]Item fixed for scaling

Table II.
Measurement model statistics

Performance variables. Quality studies (Everett and Adam, 1994; Flynn *et al.*, 1994; Garvin, 1984) have identified that quality impacts two dimensions of firm performance, namely, operational and market performance, based on the literature (Anderson *et al.*, 1999; Huarng *et al.*, 1999; McAdam and McKeown, 1999). This study used four and three items, respectively, to examine these two aspects of ISO 9000 performance. The respondents were asked to indicate the perceived benefits of ISO 9000 certification. Firm performance was defined as the achievement of financial and market share objectives (Das *et al.*, 2000). In addition, this study that is based on the literature considers another two variables in order to more completely assess firm success and achievements. One variable is the growth of market share. The respondents were asked to indicate their perceptions of market share growth after ISO 9000 certification. The other variable was business performance growth. The respondents were asked to indicate their perceptions of profit growth following ISO 9000 certification. A five-point Likert scale was used to assess these two questions, with one being not at all and five being greatly. These results can be treated as interval data. Table II lists the specific items, as well as the means and standard deviations for each item measured.

Statistical approach

The hypotheses were tested using SEM techniques. SEM is a linear cross-sectional statistical modeling technique which includes covariance structure analysis, latent variable analysis, confirmatory factor analysis (CFA), path analysis (PA) and regression analysis (Botha *et al.*, 1999), and it is also widely applied in the social and behavioral sciences.

In the behavioral sciences, research issues are more complicated in that one dependent variable may be an independent variable in other dependence relationships. In addition, researchers are often interested in studying theoretical constructs that cannot be observed directly. These abstract phenomena are termed latent variables, constructs, or factors. CFA and classical PA can be viewed as the two parts of the SEM used here. SEM, CFA allows us to incorporate latent variables, such as our motivation constructs, and their measured variables. Within the framework of SEM, CFA represents what has been termed a measurement model. In addition, PA is a multivariate method based on linear regression that allows us to examine the manner in which particular latent variables directly or indirectly influence (i.e. cause) changes in the values of certain other latent variables in the model which is referred to as the SEM. The primary advantage of SEM over other multivariate statistical techniques is that an analyst can validate a factor structure, adjust for measurement error, examine relationships among latent variables, and simultaneously estimate all parameters in the model (Bollen and Long, 1992).

SEM was used in this study because:

- it casts CFA in the tradition of hypothesis testing, with explicit tests of both the overall quality of the factor solution and the factor loadings composing the model;
- it allows for the specification and testing of more rigorous and more flexible relationships, such as mediational relationships (rather than simple bivariate prediction) or causal processes; and
- it provides a flexible and powerful analysis whereby it simultaneously assesses the quality of measurement and examines the predictive relationships among constructs.

Tests of reliability and validity

Once a model, which consists of some hypothesized relationships, has been designed, the next step is to assess the reliability and validity of the measures employed. This section assesses the quality level of the measurement scales used. The reliability and three components of construct validity, namely, unidimensionality, convergent validity and discriminant validity, are used to test the measure of each construct separately. This study also uses the first stage of the SEM analysis, the measurement phase, to validate all measures together at one time.

To establish the unidimensionality of the measurement scale, an exploratory factor analysis using principal component extraction with a varimax rotation was performed separately for each construct. Evidence of the unidimensionality of each construct included appropriate items with a loading of at least 0.50 on their respective hypothesized components and with a loading not exceeding 0.30 on other components

in factor analysis (Steenkamp and van Trijp, 1991). The factor loadings associated with this model are listed in Table II, and all factor loadings support unidimensionality.

Reliability is the measure of the internal consistency and homogeneity of the items comprising the scale (Churchill, 1979). This study assessed the reliability by calculating Cronbach's α (Cronbach, 1951). For a scale to possess good reliability, the composite reliability must exceed 0.70 (Bagozzi and Yi, 1988). The Cronbach's α associated with this model is listed in Table II. All scales exhibit good reliabilities.

Convergent validity is exhibited when a set of alternative measures accurately represents the construct of interest (Churchill, 1979). A test of the factor loading of each item was used to assess the convergent validity. If all the item factor loadings are significant, then this provides evidence of convergent validity (Anderson and Gerging, 1988). The factor loading and *t*-value of each retained item are listed in Table II, and all of the *t*-values are significant, indicating high convergence validity.

Discriminant validity can be assessed using a series of χ^2 difference tests between the original and constrained measurement model (Segars and Grover, 1993). In the original measurement model, free correlation was permitted among the latent constructs. In the constrained model, the latent constructs were constrained to one. This study compared a series of nested confirmatory factor models, in which the χ^2 value of the original measurement model was subtracted from that of the constrained model to yield the χ^2 difference. Table III lists the χ^2 difference values calculated for all possible construct pairs. All χ^2 differences are significant ($p < 0.01$) and, thus, the discriminant validity is supported.

The first-stage of the SEM analysis, which validates all measures together at one time, is reported in Table IV (Jöreskog and Sörbom, 1993). Table IV lists different types of goodness-of-fit statistics associated with the priori measurement model. The χ^2 statistic is significant ($\chi^2 = 365.21$, df $= 202$, $p < 0.05$). However, the χ^2 estimate has been shown to be over-sensitive to small-model discrepancies when sample sizes are larger than 200, or when the model contains a large number of variables (i.e. the model is complex) (Bagozzi and Yi, 1988; Byrne, 1998; Hair *et al.*, 1995). When this is the case, alternative methods of fit must also be taken into consideration. The ratio χ^2/df is indicative of an acceptable fit between the hypothetical model and the sample data. With a value of 1.83, it was much smaller than the threshold value of 3.00 as suggested by Carmines and McIver (1981). Similarly, the root mean square error of approximation (RMSEA) is a measure of model fit that is not dependent on sample size. The index RMSEA was below the 0.08 minimum acceptable level (Jöreskog and Sörbom, 1993), with a value of 0.05. Additionally, the goodness-of-fit index (GFI) and the adjusted goodness-of-fit (AGFI), which measure the percentage of total variance and covariance explained by the hypothesized model, were greater than the minimum acceptable 0.90 level (Jöreskog and Sörbom, 1993; Byrne, 1998) with values of 0.99 and 0.91, respectively. Overall, the fit indices provide evidence of an adequate fit to the data.
In sum, the measurement model is clean, with evidence of reliability, unidimensionality, convergent validity and discriminant validity. It thus facilitates the evaluation of the structural model.

Substantive test results

By using the validated scales, the research propositions were tested using a SEM to represent the causal relationships specified by our hypotheses. This stage of the

Table III.
χ^2 differences matrix

χ^2 differences matrix	Internal motivation (1)	External motivation (2)	Depth (3)	Operational performance (4)	Market performance (5)	Market share (6)	Business performance (7)
(1)	–						
(2)	72.20	–					
(3)	99.59	121.30	–				
(4)	65.22	63.50	9.95	–			
(5)	72.65	79.53	111.10	51.54	–		
(6)	57.65	35.01	100.95	35.38	45.77	–	
(7)	60.32	50.57	106.79	35.64	52.56	0.76[a]	–

Notes: All χ^2 difference tests are significant at p-value < 0.01. (Critical value of χ^2 for one degree of freedom at p-value $= 0.01$ is 6.63). [a]Market share and business performance are single item, and their correlation coefficient is 0.76

Goodness-of-fit statistics	Measurement model	Structure model	Recommended values for fit
χ^2	365.31	447.20	
Degrees of freedom	202	212	
χ^2/degrees of freedom[A]	1.83	2.12	<3.00
RMSEA[B,a]	0.05	0.06	<0.08
Parsimony normed fit index[C]	0.77	0.81	<0.50
CFI[B]	0.99	0.98	<0.90
GFI[C]	0.91	0.90	<0.90

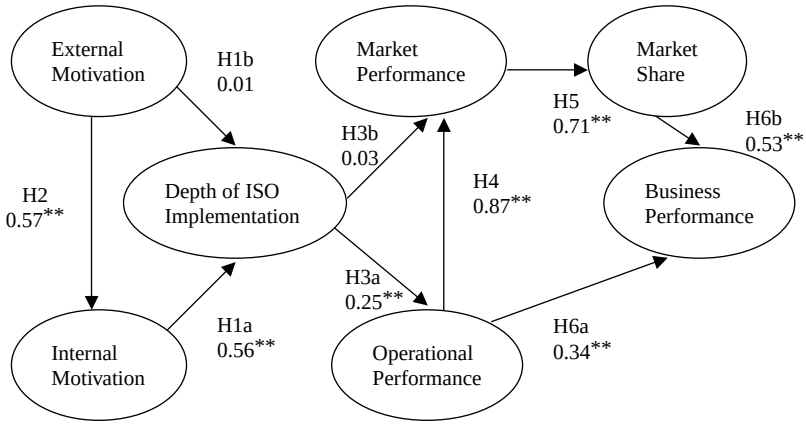
Note: [a]Root mean square error of approximation
Sources: [A]Hair *et al.* (1995); [B]Jöreskog and Sörbom (1993) and [C]Byrne (1998)

Table IV.
Goodness of fit statistics

analysis involved the evaluation of the relationships between the latent constructs. The estimated standardized parameters for the SEM are shown in Figure 2, along with the levels of significance. Overall, the results presented here indicate that the structural model has a good fit with the data ($\chi^2 = 447.20$, df $= 212$, $p < 0.05$; RMSEA $= 0.06$, Comparative fit index – CFI $= 0.98$, and GFI $= 0.90$). The goodness of fit statistics are listed in Table IV and the covariances among the latent constructs are shown in Table V. With regard to the tests of the individual research propositions, these parameters are reported as shown in Table VI. All of the paths in the model are supported, except for paths *H1b* and *H3b*. The test of the proposed hypotheses is based on the direct and indirect effects in the structural model. The path coefficients between constructs provide an indication of the relative strength of each relationship (Jöreskog and Sörbom, 1993). Both hypotheses were tested at $p \leqq 0.05$, the two-tailed significance level.

Discussion

The primary purpose of this study was to investigate the relationships among ISO 9000 certification motivations, as well as the implementation depth and performance. The results and their implications are discussed throughout the remainder of this section.



Note: **Significant at the 0.05 level

Figure 2.
Parameter estimates for conceptual model

Table V.
Covariance among latent constructs

Covariance matrix	Internal motivation (1)	External motivation (2)	Depth of implementation (3)	Operational performance (4)	Market performance (5)	Market share (6)	Business performance (7)
(1)	0.45						
(2)	0.20	0.33					
(3)	0.09	0.13	0.17				
(4)	0.27	0.27	0.16	0.45			
(5)	0.22	0.23	0.14	0.38	0.33		
(6)	0.27	0.27	0.17	0.45	0.39	0.96	
(7)	0.25	0.26	0.16	0.43	0.37	0.67	0.82

Path	Path description: From	To	Standardized coefficient	*t*-value	Significant
H1a	Internal motivation	Depth of ISO implementation	0.56	5.50	Yes
H1b	External motivation	Depth of ISO implementation	0.01	0.12	No
H2	External motivation	Internal motivation	0.57	6.56	Yes
H3a	Depth of ISO implementation	Operational performance	0.25	3.61	Yes
H3b	Depth of ISO implementation	Market performance	0.03	0.53	No
H4	Operational performance	Market performance	0.87	10.27	Yes
H5	Market performance	Market share	0.71	11.43	Yes
H6a	Operational performance	Business performance	0.34	6.50	Yes
H6b	Market share	Business performance	0.53	11.02	Yes

Table VI.
LISREL structure model

Discussion of results

First, the internal motivation was found to be positively correlated with the implementation depth (*H1a*, standardized coefficient = 0.56). No significant relationship was found to exist between the external motivation and the implementation depth (*H1b*, standardized coefficient = 0.01), but the external motivation was positively related to internal motivation (*H2*, standardized coefficient = 0.57). That is, these exploratory results seem to indicate that internal motivation is important to ISO 9000 implementation depth, and internal motivation mediates the relationship between external motivation and ISO 9000 implementation depth. Gotzamani and Tsiotras (2002) stated that companies seek certification mainly for advertising purposes, and those that obtain certification only in response to their customers are doomed to fail. In the end, we can conclude that external driven companies could gain advantages from ISO 9000 depending on whether external motivation can be transformed into internal motivation or not. If the standard is externally driven, so that it is not really integrated into the daily activities, it is likely that its impact on performance will remain uncertain. Nevertheless, if the standard is internally driven, it is reasonable to expect that the necessary measures will be implemented to improve ISO 9000 performance. The findings of this study suggest that, if a standard is externally induced, the benefits can be achieved only if the external motivation results in the company promoting and demanding that all employees focus on quality assurance. Therefore, the company should transform the external motivation into a desire to internally improve.

Second, the depth of implementation is positively correlated with operational performance (*H3a*, standardized coefficient = 0.25). This result supports evidence elsewhere in the literature (Elmuti, 1996; Rao *et al.*, 1997; McAdam and McKeown, 1999; Huarng *et al.*, 1999; Lipovatz *et al.*, 1999; Yahya and Goh, 2001; Terziovski *et al.*, 2003; Arauz and Suzuki, 2004; Casadesús and Karapetrovic, 2005a; Briscoe *et al.*, 2005; Naveh and Marcus, 2005), indicating that ISO 9000 is a structured and documented quality system and that effective implementation can improve operational performance. Furthermore, the different depths of implementation yield different levels of operational performance.

Third, the depth of ISO 9000 implementation is not found to significantly affect market performance (*H3b*, standardized coefficient = 0.03), and only indirectly affects market performance (contrary to *H3b*). Its influence is mediated by operational

performance (*H4*, standardized coefficient = 0.87). This finding is consistent with the results of Rao *et al.* (1997), Terziovski *et al.* (2003) and Naveh and Marcus (2005). This finding of full mediation is quite interesting since it does not indicate that the ISO 9000 implementation depth has no effect on market performance. The mediation effect of operational performance on the relationship between the depth of ISO 9000 implementation with market performance suggests that implementation depth leads to better operational performance and better operational performance leads to better market performance. These findings provide an empirical basis for arguing that it is not ISO 9000 implementation, *per se*, which improves market performance, but it is rather the associated improvement of all aspects of the operational process, which in turn improve customer perceptions of quality, and as a result enhance market performance.

Fourth, the findings of this study indicate that market performance is positively related to market share (*H5*, standardized coefficient = 0.71). Moreover, operational performance and market share are positively related to business performance (*H6a*, standardized coefficient = 0.34; *H6b*, standardized coefficient = 0.53). These results confirm that making efforts to implement ISO 9000 will increase market share, thus providing companies with a competitive edge.

Implications for researchers and practitioners

The results of this study have significant theoretical and managerial implications. From a theoretical perspective, the proposed model has addressed four important implications:

(1) Unlike the extant literature, this study integrates ISO 9000 motivations, implementation and performance. Existing studies of implementation, moreover, are not usually based on theoretically grounded models. In this paper, we developed and tested a model from a research point of view, and it could be used by management.

(2) In the past, little attention was paid to investigating the impact of ISO 9000 motivation on the depth of ISO 9000 implementation. A major implication of the findings of this study is that the impact of external motivation on the depth of ISO 9000 implementation is fully mediated by internal motivation. This finding provides a possible explanation for the failure of some externally driven companies.

(3) The model clarifies the process by which ISO 9000 implementation leads to performance, and this study concludes that the implementation of ISO 9000 practices directly and positively impacts operational performance and indirectly impacts market performance. This finding provides a possible explanation as to why some cases of ISO 9000 implementation are perceived to bring about lower benefits.

(4) The findings suggest that a positive relationship exists between the extent of the implementation of ISO 9000 and firm performance.

This validation is important for ISO 9000 studies. It resolves some controversies that appear in the literature concerning the implementation of ISO 9000 and firm performance. Furthermore, this overall result corroborates the results of studies (Arauz and Suzuki, 2004; Huarng *et al.*, 1999) that investigate both the impact of motivations

on ISO 9000 performance and the impact of the implementation process on ISO 9000 performance. As Palich *et al.* (2000) point out, it is important to obtain consistent research results among multiple studies using a variety of research methods to make strong statements "about the strength and generality of the findings."

The confirmed positive effect of ISO 9000 implementation on business performance here is encouraging for managers. This is likely to be the major determinant of the degree to which managers will embrace or reject ISO 9000 certification in the twenty-first century (Terziovski *et al.*, 2003). While this study focuses on the 1994 version of ISO 9000, Casadesús and Karapetrovic (2005b) have conducted an empirical investigation comparing the 2000 and 1994 versions of ISO 9000 in terms of the motivation for implementation and the associated challenges, as well as the costs and benefits of registration. They concluded that the evaluation, the motivation, the implementation process and the costs associated with both standards are quite similar. Therefore, this study assumes that the experience of the companies with the 1994 version of ISO 9000 can provide a reference to those interested in implementing the 2000 version of the ISO 9000 series. The empirically validated positive relationship between ISO 9000 and firm performance, for example as documented in this study, can be very useful for leaders who take the initiative in quality improvement to promote and obtain the resources needed for ISO 9000 implementation.

In many instances, managers may recognize the need for ISO 9000 implementation in response to external motivation. Firms should not be discouraged by accounts of specific and individual less than successful efforts to implement ISO 9000, since the problems might lie in the implementation of ISO 9000 rather than in the ISO 9000 practices themselves. First, external motivation does not guarantee that firms will fully support ISO 9000 implementation. Managers should not adopt ISO 9000 standards only symbolically. Effective and successful ISO 9000 implementation is dependent upon the attitude of the managers. The results can only be achieved when managers have a clear and explicit commitment. Then, managers should create awareness of the importance of ISO 9000, and "sell" the ISO 9000 message to employees. Employees should pay attention to ISO 9000 standards, and not just consider ISO 9000 standards as documented work or just prepare for external audits. They must internalize ISO 9000 standards as daily practices. Following the transformation from external to internal motivation, employees will implement ISO 9000 voluntarily, and thus they will implement ISO 9000 in depth. Second, the implementation of ISO 9000 does not have a direct effect on market and business performance. The firm should examine whether employees are being well trained and educated, ISO 9000 processes are being correctly identified and defined, and ISO 9000 documentation is being properly maintained and audited. Furthermore, an organization must continue with its internal audits, management review and corrective actions. When all of the above are done, the implementation can improve operational performance, which in turn will improve product quality, reduce delivery time, promote customer satisfaction, and improve market share and business performance.

Limitations and avenues for further research

Several limitations of this study must be mentioned. These limitations also indicate worthwhile avenues for further research.

First, the sample was restricted to Taiwan. While this sample is valuable for some developing countries, the ability to generalize these results regarding ISO 9000 to other countries remains limited.

Second, our study uses perceptual measures of the magnitude of operational, market and business performance. To make more precise predictions of how ISO 9000 affects business performance, additional research could develop objective measures of these constructs.

Third, this study focuses on the motivation and implementation of ISO 9000 as drivers of ISO 9000 effects. Future conceptual development and empirical research can consider a broader array of antecedent factors and examine their effects, such as company size, industry, information technology or the existing quality system.

Fourth, this work investigates overall ISO 9000 implementation performance. However, ISO 9000 implementation comprises numerous practices. Researchers should be encouraged to further identify the relationships among ISO 9000 practices, as well as which ISO 9000 practices are directly or indirectly related to business.

To summarize, this study contributes to of the body of literature on ISO 9000 by examining the motivation behind implementing ISO 9000 certification, the implementation depth and ISO 9000 performance. We hope that this study can foster further debate and research in this area.

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