BENEFITS OF ISO 9001:2000 CERTIFICATIONS – EVIDENCE FROM MALAYSIAN CONSTRUCTION INDUSTRY

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ABSTRACT

Quality management literature abounds with anecdotal evidence that real benefits are gained through ISO 9000 certifications. From a nationwide survey carried out from 14th February to 30th May 2008 on all key players in the Malaysian construction value chain, including the quantity surveyors, this paper (a) reports the benefits gained by 100 ISO 9001-certified companies, and (b) proposes to reclassify the benefits gained into three categories, namely: company competitiveness, customer satisfaction and business performance. Based on structural equation modelling, the findings confirm the contentions made: (a) in ISO 9000 family of standards that the application of the eight quality management principles may impact the competitive advantage of ISO 9001-certified companies through improved organizational capabilities, and financial results such as increased revenue, market share and profitability; and (b) by CIDB Malaysia that effective implementation of ISO 9001 as a quality management system will result in improved client's satisfaction, increased profitability and increased competitiveness. The findings are significant, as ISO 9001 certification can be used as an innovative administrative tool to enhance company competitiveness, which in turn enhances customer satisfaction and business performance.

Keywords: Business Performance, Company Competitiveness, Customer Satisfaction, Quality Management System Practices, Registration Efforts.

1. INTRODUCTION

The ISO 9000 series of standards, first issued by the International Organisation for Standardisation (ISO) as a quality assurance standard in 1987, have been revised in 1994 and upgraded to become a standard for quality management system in December 2000. In November 2008, it is revised again. The eight quality management (QM) principles and the five clauses for ISO 9001 certification remain intact in the ISO 9001:2008 version. Application of the eight QM principles provides potential benefits as given in ISO 9004:2000, and makes an important contribution to managing costs and risks, which are important considerations for the overall performance of an organization. These considerations may impact, among others, customer loyalty, repeat business and referral, operational results such as revenue and market share, flexible and fast responses to market opportunities, and competitive advantage through improved organizational capabilities. To improve productivity and quality in the Malaysian construction industry, CIDB Malaysia (2004) is actively promoting the adoption of ISO 9000:2000. All players within the construction industry, especially the G7 contractors, are encouraged to adopt the ISO 9001 as a quality management system. According to CIDB Malaysia, effective implementation of ISO 9001 standards would result in improved client's satisfaction, increased profitability and shareholder's value, increased competitiveness and improved motivation to the workforce. This paper reports the findings from an existing doctoral research on the organizational improvements experienced by ISO 9001-certified companies in the Malaysian construction industry; and the causal

relationships among registration efforts, quality management system (QMS) practices, company competitiveness, customer satisfaction and business performance.

2. LITERATURE REVIEW

Companies are motivated to pursue ISO 9000 certification for various reasons. The three main motivations, according to Kam (2000), for civil and structural engineering firms in Hong Kong to seek ISO 9001 certifications are: (a) the mandate from the Government, (b) to improve the firm's efficiency and management, and (c) to improve the firm's quality image in the construction industry. According to Dissanayaka et al. (2001), the six main motivators for Hong Kong constructors to implement of ISO 9000-certified quality systems are: (a) to qualify to tender for public projects, (b) to meet customer expectations, (c) to improve the quality of work done, (d) to gain competitive advantage, (e) to increase efficiency and productivity in all areas of operation, and (f) as part of a larger improvement strategy. In their comparative empirical study of the benefits and costs between ISO 9001:2000 and ISO 9001/2/3:1994 certified companies, Casadesús and Karapetrovic (2003) find that there are no significant differences in terms of the main motivation factors and implementation challenges.

Abundant anecdotal evidence is available on the real benefits gained through ISO 9000 certifications. Buttle and Jayne (1999), using the findings obtained from a multi-sectoral survey (Buttle, 1997) into the impacts of ISO 9000 on UK business, report that companies in the real estate sector are generally satisfied with the contribution made to their organisations. Between the contributions to real estate sector and the larger sample, results from statistical analysis confirm that there are no significant differences. In fact, they conclude that the results from 66 respondents in the real estate sector reflect those across the entire population of 1220 respondents. However, according to Casadesús and Karapetrovic (2005), ISO 9001:2000 registered companies report lower levels of satisfaction with the benefits of the standards, coupled with the higher levels of implementation and maintenance costs, as compared with the ISO 9001/2/3:1994 registered companies. This is due to the fact that the perceived benefits of ISO 9001/2/3:1994 implementation have also decreased over time. The benefits obtained from ISO 9000 certifications have been classified into external and internal benefits. Vloeberghs and Bellens (1996) classify the benefits into four categories, namely: operational results, financial results, and benefits related to customers and workers. Using the findings from Han (2000) on the organizational improvements experienced as a result of ISO 9000 registration efforts, this paper classifies the benefits gained into three categories, namely, company competitiveness, customer satisfaction and business performance. For this purpose, the competitiveness model (Momaya and Selby, 1998) for competitiveness in construction industry is adopted. There are three facets in this model, namely, competitive assets/resources, competitive processes and competitive performance. With this reclassification, the benefits related to workers are replaced with competitive assets, and the operational results are replaced with competitive processes and competitive performance.

Due to the requirements to attain and maintain certifications, ISO 9001-certified companies are required to practise the eight QM principles. As a result of time sequence effect (Blunch, 2008), there are indications that the registration efforts in ISO 9001 certification is a cause of the eight QM principles being practised in ISO 9001-certified companies, in addition to the three consequential improvements. The structural model, shown in Figure 1, illustrates the causal relationships among the five latent constructs identified, namely, registration efforts, QMS practices, company competitiveness, customer satisfaction and business performance. The causal relationships are investigated by using structural equation modelling (SEM), with AMOS 16.0 of SPSS 16.0 (Statistical Product and Services Solutions) as the statistical software package. There are ten arrows in the path diagram, representing the ten hypotheses to be tested in this research. They are (a) H1: ISO 9001 registration efforts enhance QMS practices, (b) H2: ISO 9001 registration efforts enhance company competitiveness, (c) H3: ISO 9001 registration efforts enhance customer satisfaction, (d) H4: ISO 9001 registration efforts enhance company business performance, (e) H5: QMS practices enhance company competitiveness, (f) H6: QMS practices enhance customer satisfaction, (g) H7: QMS practices enhance business performance, (h) H8: company

competitiveness enhances customer satisfaction, (i) H9: company competitiveness enhances company business performance, and (j) H10: customer satisfaction enhances company business performance.

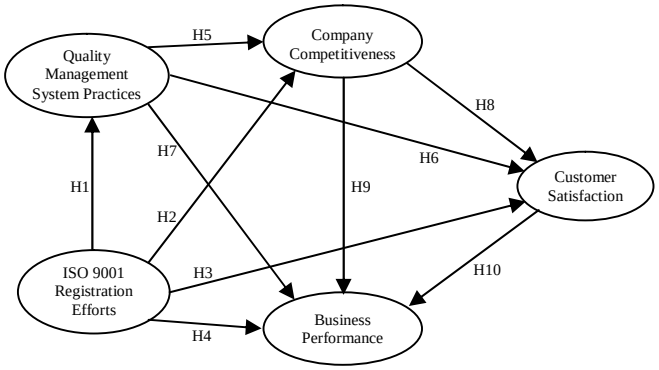

Figure 1: Conceptual Model (Adapted from Han, 2000)

3. METHODOLOGY

SEM consists of two components: (a) a measurement model linking a set of observed variables to a usually smaller set of latent constructs, and (b) a structural model linking the latent constructs through a series of recursive relationships. To verify a structural model, Blunch (2008) mentions that two conditions must be met, namely, (a) the constructs must be defined conceptually, and (b) the constructs must be defined operationally through a measurement instrument.

3.1 Identification of Observed Variables

A. Observed Variables for ISO 9001 Registration Efforts Construct

Han (2000) uses the twenty quality system requirements in ISO 9000:1994 for registration efforts. Annex B of ISO 9001:2000 tabulates the correspondence between the twenty quality system requirements in ISO 9001:1994 and the five clauses for QMS registration in ISO 9001:2000. Hoyle (2001) concludes that there is little difference between the new structure in ISO 9001:2000 and the 20 elements in ISO 9001:1994. Hence, the ISO 9001:2000 standard contains measurement items that cover all aspects of the registration efforts construct to be measured. This research proposes to use the five clauses specified a priori in ISO 9001, namely, QMS requirements, management responsibility, resource management, product realization, and measurement, analysis and improvement as the measurement indicators for registration efforts construct. The five indicators are in turn measured by 29 observed variables extracted directly from ISO 9001 standards, on a 5-point Likert scale.

B. Observed Variables for QMS Practices Construct

As the eight QM principles are taken into consideration in the development of ISO 9001:2000, and integrated into the clauses in ISO 9004:2000, the ISO 9000 family of standards has measurement items that cover all aspects of the QMS practices construct to be measured (Feng et al., 2008). The eight QM principles are customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision making, and mutually beneficial supplier relationships. This research proposes to use the eight QM principles specified a priori in ISO 9000 family of standards as the eight measurement indicators for QMS practices construct. The eight indicators are in turn measured by 56 observed variables extracted directly from ISO 9000 family of standards, on a 5-point Likert scale.

C. Observed Variables for Company Competitiveness, Customer Satisfaction and Business Performance Constructs

The three facets in the competitiveness model mentioned above are adopted as the measurement indicators for company competitiveness construct. The three indicators for company competitiveness construct with eighteen observed variables, five observed variables for the customer satisfaction construct, and four observed variables for business performance construct are measured on a 5-point Likert scale. The observed variables for the three latent constructs are identified from literature review.

Figure 2 is the full model obtained by incorporating the measurement indicators and some of the observed variables identified above into Figure 1, with ISO 9001 registration efforts, QMS practices, company competitiveness, customer satisfaction and business performance as the five latent constructs. In structural equation modelling, the latent constructs are indicated by ovals. The observed variables are indicated by rectangles, and the causal relationships are represented by arrows. Due to space constraints, the observed variables for registration efforts, QMS practices and company competitiveness constructs are not shown.

3.2 Research Design

This research employs the mailed survey method to collect primary data. A survey questionnaire is developed to collect quantitative data to assess the conceptualized research variables used for testing the research hypotheses. Based on the premise that ISO 9001:2000 is a model for QMS, the eight QM principles embedded in it are used to develop a questionnaire to measure the practice of ISO 9001 in ISO 9001-certified companies. Based on the five clauses for accreditation of the QMS, the questionnaire being developed contains also items to measure the amount of registration efforts put in by companies to obtain and maintain ISO 9001 certifications. The questionnaire also requests respondents to indicate the improvements experienced by companies as a result of ISO 9000 certifications, in terms of customer satisfaction, company competitiveness, and business performance. The population of this study is the ISO 9001-certified companies, irrespective of their scope of registrations, within the construction value chain in the Malaysian construction industry. The key respondent of the research is chosen to be the "person to contact" as listed in the CIDB Malaysia directory, or quality management representative, managing director, director, or general manager of the ISO 9000-certified companies since these key personnel are expected to be the most knowledgeable people who are involved with the QMS of the company. The formal survey is carried out from 14th February to 30th May 2008. A total of 456 questionnaires are sent out. Of the 338 ISO 9001-certified contractors which are registered with CIDB Malaysia (as on 14th April 2008), a total of 303 contractors are identified. They are mainly Grade 7 contractors. Care was taken so that no multiple sets of survey questionnaire are sent to companies registered under the same address or in the same group of companies. The full details of the survey are shown in Table 1.

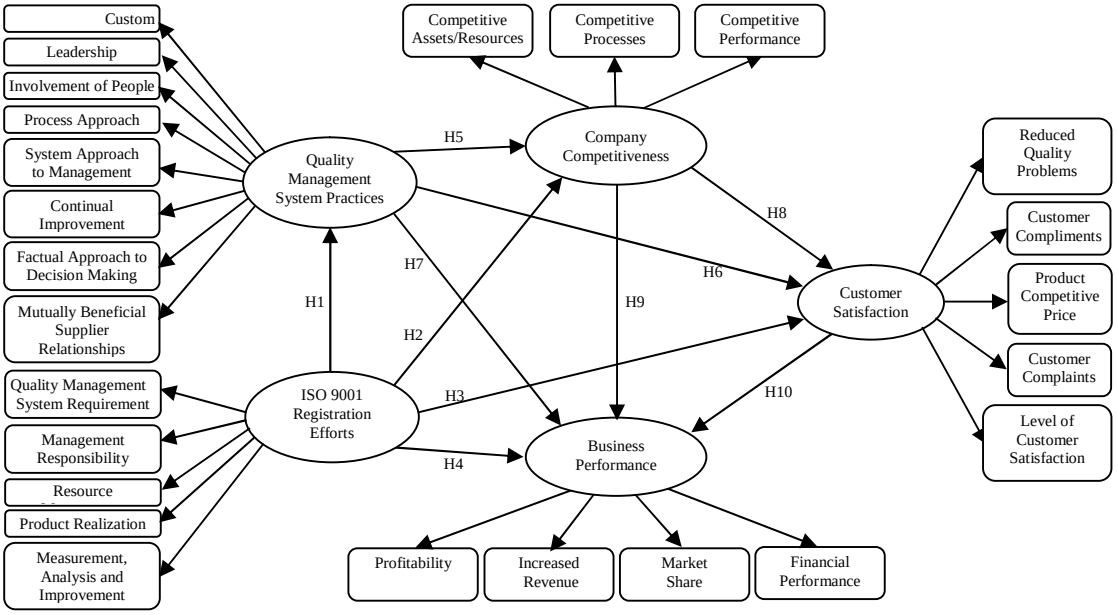

Figure 2: Hypothesized Model of Causal Relationships among Registration Efforts Construct, QMS Practices Construct, Company Competitiveness Construct, Customer Satisfaction Construct and Business Performance Construct.

4. RESULTS AND DATA ANALYSIS

4.1 Descriptive Statistics

The designations of respondents in their organizations are given in Table 2. 25% of the respondents are directors or of higher designations, 33% are managers, quality management representatives or QA/QC executives who are directly involved with the quality management systems, and 23% are in the managerial or higher positions. From these percentages, it appears that the management of these companies place a high emphasis on the ISO 9001 certifications in their organizations. 90 respondents (90%) opine that ISO 9001 certification is important to their companies' success. 7 respondents do not answer this question.

Table 1: Details of Questionnaire Survey

Locations			Peninsular Malaysia, Sabah and Sarawak
Number of Questionnaires Sent			456
Number of Questionnaires Returned Unanswered			12
Telephone calls received on non-certification status			2
ISO 9001-Certified Companies	CIDB Directory	Contractors of all trades	303
	Trawled from Google	Contractors and developers	99
		Civil and Structural Engineering Firms	28
		Quantity Surveying Firms	17
		Architectural Firms	9
Number of Questionnaires Received			108
Incomplete Questionnaires			8
Useable Questionnaires for Data Analysis			100
Response Rate (%)			22.6

Table 2: Designations of Respondents in Their Organizations

Designations in Organizations	Number	Percentage (%)
Vice President	1	25.0
Managing Directors (MDs)	5	
Directors (of various designations)	18	
Director (Quality Assurance or Management)	1	
Managers (QA/QC)	11	33.0
Quality Management Representatives	16	
QA/QC Executives	6	
Head of Operation	1	23.0
General Managers (GMs)	10	
Managers (of various designations)	12	
Senior Quantity Surveyors	2	16.0
Engineers	4	
Document Controllers	1	
Secretaries	2	
Others (Executives, Clerk, etc.)	7	
*Not Available (Responded that they have experience in ISO)	3*	3.0
* The respondents highlighted that their organizations are ISO 9001-certified, but the names of the organizations were not mentioned.		

The respondents are asked to indicate the reasons which motivated their organizations to establish ISO 9001. The top six common motivations for ISO 9001 certifications are, in descending order, the desire to improve the quality of work done (87%), the intention to increase efficiency and productivity in all areas of operation (86%), the need to meet customer expectations (85%), as part of a larger improvement strategy (80%), to gain competitive advantage (77%), and to qualify to tender for public projects (54%). The respondents are also asked to indicate the reasons for them to obtain and maintain ISO 9001 certifications status in their organizations. The top five reasons chosen, in descending order, are: (a) quality improvements (100%), (b) corporate image (99%), (c) customer pressure / customer demands (94%), (d) marketing advantage (92%), and (e) capturing workers' knowledge (92%). Table 3 gives the proposed reclassification of benefits gained from ISO 9001 certifications. The tabulated results reveal that companies adopt ISO 9001 certifications mainly to enhance their competitive processes and competitive performance.

4.2 Inferential Statistics

The first component in SEM is specification of the measurement model, which is concerned with the confirmation of indicators that define each latent construct. According to Anderson and Gerbing (1988), this can be performed by a two-step approach. First, an exploratory factor analysis is conducted to assess the underlying factor structure of the scaled items. Subsequently, confirmatory factor analysis is performed to confirm the indicators which load onto each identified factor. The goodness-of fit measures are the major criteria to test the hypothesized model. Absolute fit measures are used to determine the degree to which the measurement models and hypothesized model fit the sample dataset collected. SEM models can never be accepted, they can only fail to be rejected. Because the specified model in SEM represents the theoretical expectations about the data structure, the null hypothesis is that the model fits the data (Han, 2000).

A. Exploratory Factor Analysis (EFA)

EFA is used to determine the factor structures of QMS practices and registration efforts in ISO 9001, and company competitiveness. Using Kaiser's criterion, only components with eigenvalues of more than 1.0 are selected for further confirmatory factor analysis (Han, 2000; Skrabec, 1999). Varimax orthogonal rotation is used to determine the pattern of loadings for easy interpretation, which assumes that the variables are not correlated and helps to maximize the variance of factor loadings by making high scores higher and minimizing the low ones. Items that load higher than 0.4 are retained. Missing values are replaced by means for analysis. The following criteria are used for factor purification and improvement:

(a) a factor loading of +0.50 or greater is chosen as the cut-off, and (b) variables with cross loadings of 0.40 or greater are eliminated (Skrabec, 1999).

Table 3: Proposed Reclassification of Benefits Gained from ISO 9001 Certifications

Benefits From ISO 9001:2000 Certification	% Total (SWA/ A/SA)	Rank	Company Competitiveness			Customer Satisfaction	Business Performance
			Competitive Assets	Competitive Processes	Competitive Performance		
			Worker Related	Operational Results		Customer Related	Financial results
Continual improvement of operation	98	1		√			
More systematic record keeping	98	1		√			
Greater client satisfaction	97	2				√	
Stronger customer focus	94	3				√	
Higher efficiency in operation	94	3		√			
Improved internal communication	94	3		√			
Client perceives higher quality of work done	93	4			√	√ *	
Improved internal performance appraisal systems	93	4		√			
Enhanced competitiveness of company	91	5			√		
Improved external communication	91	5		√			
Valuable marketing tool	89	6			√	√ *	
Higher productivity	89	6			√		
Increased staff motivation	86	7	√				
Less rework or repair	86	7		√			√
Improved supplier relations	84	8		√			
Better risk management	84	8			√		
Less problems in defects liability period	83	9			√		
Better access to domestic markets	80	10			√		
Better access to overseas market	78	11			√		
Better flexibility in operation	76	12		√			
Lower overall project cost	72	13					√
Shorter project completion time	64	14		√	√		

SWA = Somewhat Agreed; A = Agreed; SA = Strongly Agreed. * See Schuurman (1997)

1) Factor structure of QMS Practices Construct.

Using principal component analysis with varimax orthogonal rotation, ten components are initially extracted. Factor purification and improvement are then carried out, where components with only one loaded variable were rejected, observed variables which cross-loaded on more than one component are also rejected, and the observed variables for leadership principle which loaded on three components are forced to load on one component. EFA is carried out again to extract six factors only, with process approach principle and system approach to management principle loaded together as one component, and continual improvement principle and factual approach to decision making principle loaded together on another component.

2) Factor Structure of Registration Efforts Construct.

Five components are indeed extracted by principal component analysis with varimax orthogonal rotation.

3) Factor Structure of Competitiveness Construct.

EFA is carried out to determine the factor structure of the observed variables used to assess organizational improvements in the questionnaire. Five components are identified, with three components for company competitiveness construct, one component for customer satisfaction, and one component for business performance.

B. Confirmatory Factor Analysis (CFA)

Based on the components extracted from EFA, AMOS 16.0 is used to carry out CFA to assess the fit of the measurement models to the empirical dataset. Assessments of model fit for the following are conducted, namely: (a) first-order measurement models for each of the five components for registration efforts construct with their respective observed variables, and the second-order measurement model for registration efforts constructed from the five components; (b) first-order measurement models for each of the six components of QMS practices construct with their respective observed variables, and the second-order measurement model for QMS practices constructed from the six components; (c) first-order measurement models for each of the three facets of company competitiveness construct with their respective observed variables, and the second-order measurement model for company competitiveness constructed from the three facets; (d) first-order measurement model for customer satisfaction construct with its observed variables and (e) first-order measurement model for business performance construct with its observed variables. The measurement models are then combined to form the hypothesized model to assess the fit of the structural model to the empirical dataset.

C. Structural Equation Modeling (SEM)

The initial structural model is constructed from the three second-order measurement models for QMS practices construct, registration efforts construct and company competitiveness construct; and the two first-order measurement models for business performance and customer satisfaction constructs. The initial model does not fit well because its probability level is significant at 0.000 (< 0.05). Moreover, due to the occurrence of a standardized coefficient exceeding 1.0 between company competitiveness and business performance constructs, the offending estimate needs to be fixed at 1.0 (Han, 2000). The model is evaluated again by looking at the modification indices to remove constraints on certain model parameters in order to improve the overall model fit (Albright, 2007). The final unconstrained structural model fits well. The χ^2 test yields a value of 1.056 (≤ 3) (Kline, 1998) which, evaluated with 571 degrees of freedom, has a corresponding *p*-value of 0.172. This *p*-value is too high to reject the null hypothesis of a good fit (Albright, 2007). Corroborating evidence is provided by the Root Mean Square Error of Approximation (RMSEA) fit statistic- the obtained value of 0.024 is well below the desired 0.06 cut-off (Hu and Bentler, 1999). Similarly the Tucker-Lewis index of 0.980 and comparative fit index of 0.982 are above the 0.95 threshold (Hu and Bentler, 1999). These tests suggest that the model is a good fit to the data. The proportion of variance that is explained (a) in business performance is 0.56, (b) in company competitive is 0.62, (c) in customer satisfaction is 0.36, and (d) in QMS practices construct is 0.58.

D. Testing of Hypotheses

For testing of hypotheses, the regression weights are used to examine the extent of effects of exogenous latent variables on endogenous latent variables. According to Chin (1998), standardized regression weights should be at least 0.20 and ideally above 0.30 in order to consider the strength of structural relationships among the latent constructs. The results, shown in Table 4, supports the following four hypotheses: (a) H1: registration efforts enhance QMS practices, (b) H5: QMS practices enhance company competitiveness, (c) H8: company competitiveness enhances customer satisfaction, and (d) H9: company competitiveness enhances business performance. The other six hypotheses are not supported.

Table 4: Hypotheses Testing – Analysis from Standardized Regression Weights

Hypotheses	Results from Present Research	
	Parsimonious Model[(1)]	Full Unconstrained Model
H1: ISO 9001 registration efforts enhance QMS practices	0.763***	0.764***
	Supported	
H2: ISO 9001 registration efforts enhance company competitiveness	0.211ns	0.208ns
	Not supported	
H3: ISO 9001 registration efforts enhance customer satisfaction	---	0.050ns
	Not supported	
H4: ISO 9001 registration efforts enhance company business performance	– 0.033ns	– 0.059ns
	Not supported	
H5: QMS practices enhance company competitiveness	0.613***	0.618***
	Supported	
H6: QMS practices enhance customer satisfaction	---	– 0.122ns
	Not supported	
H7: QMS practices enhance business performance	---	0.037ns
	Not supported	
H8: Company competitiveness enhances customer satisfaction	0.585***	0.653**
	Supported	
H9: Company competitiveness enhances company business performance	0.738***	0.731***
	Supported	
H10: Customer satisfaction enhances company business performance	0.052ns	0.044ns
	Not supported	

[1] Non-significant paths being removed in the parsimonius model were the same as that in Han (2000)

ns Not-significant; *** Significance level at $p < 0.001$; ** Significance level at $p < 0.01$.

5. CONCLUSIONS

This research successfully evaluates the research objectives set out earlier, namely:

a) The existence of three categories of organizational improvement experienced by ISO 9001-certified companies in the Malaysian construction industry.
b) The factor structures of QMS practices and registration efforts constructs in ISO 9001. From CFA, there appear to be six orthogonal components encapsulating the eight quality management principles in the ISO 9000 family of standards, and five orthogonal components representing the five clauses for accreditation of ISO 9001 certifications.
c) The causal relationships among the five latent constructs as mentioned earlier.

This research confirms that registration efforts for ISO 9001 certifications enhance the practices of QMS embedded in ISO 9001; and QMS practices enhance company competitiveness, which in turn enhances customer satisfaction and business performance. This research confirms also the claim made in ISO 9000 family of standards that the application of the eight QM principles may impact the competitive advantage of ISO 9001-certified companies through improved organizational capabilities, in terms of competitive resources or assets, competitive processes and competitive performance; and financial results such as increased revenue, market share and profitability. The research results confirm also the contentions made by CIDB Malaysia (2004) that effective implementation of ISO 9001 as a QMS will result in improved client's satisfaction, increased profitability and increased competitiveness.

This research is developed from the theoretical foundation of ISO 9000:2000 family of standards. The strategic implications of these findings are:

a) ISO 9001-certified companies which practise the QMS are more competitive in terms of resources, processes and performance. The work environment and competency of human resources have been identified as the competitive resources of ISO 9001-certified companies. Product development strategies and process performance have been identified to influence competitive processes, and product reliability and product quality have been identified to be associated with competitive performance. ISO 9001-certified companies are more competitive because they practice continual improvement in their operations, and have higher efficiency in their operations because of improved internal performance appraisal systems. Their relationships with suppliers are better.

b) Through the mediating effect of company competitiveness, the business performance of ISO 9001-certified companies is better in terms of profitability, revenue and market share. This is because productivity is higher and they have better risk management. Moreover, it is a valuable marketing tool to be ISO 9001-certified and their clients perceive higher quality in the work carried out. As a result, they have better access to domestic markets. In fact, 90% of the respondents opine that ISO 9001 certifications are important to their companies' success.
c) Through the mediating effect of company competitiveness, the customer satisfaction of ISO 9001-certified companies is better in terms of customer complaints, rework or repair, and noncomformity reports or quality problems. The client satisfaction is greater because they are more customer-focussed. With more systematic record keeping, they have better internal and external communication.

In conclusion, the findings from this empirical research are significant and relevant to the top management of ISO 9001-certified companies in Malaysian construction industry as the QMS practices in ISO 9001 family of standards contribute positively to company competitiveness. ISO 9001 certification can be used as an innovative administrative tool (Ravichandran, 2000) to enhance company competitiveness; consisting of competitive resources, competitive processes and competitive performance; which in turn enhances customer satisfaction and business performance. This, invariably, depends on effective implementation of ISO 9001 certification in the company. When implemented for the right reasons, e.g. for internal benefits and for quality system processes, McAdam and Canning (2001) conclude that ISO 9000 could help towards solving the issues of time, cost and quality surrounding quantity surveyors, other building professionals and the construction industry in general.

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