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CAUSAL EFFECTS OF REGISTRATION EFFORTS ON BUSINESS PERFORMANCE OF ISO 9001-CERTIFIED COMPANIES IN THE MALAYSIAN CONSTRUCTION INDUSTRY USING SEM

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A thesis submitted in full fulfilment of the requirements for the degree of Doctor of Philosophy (Engineering)

Centre for Graduate Studies
Open University Malaysia

2010

DECLARATION

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I hereby declare that this thesis is the result of my own work, except for quotations and summaries which have been duly acknowledged.

Signature: Date:

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October 2010

ABSTRACT

ISO 9000:2000 family of standards, the theoretical foundation of this research, was formulated based on the accumulated knowledge and collective experience of quality experts with Deming's quality management theory encapsulated. In order to investigate the effects of registrations on the competitiveness and business performance of ISO 9001-certified companies, five latent constructs which are facets of ISO 9001 standard were first identified. The five latent constructs are registration efforts, quality management system (QMS) practices, company competitiveness, customer satisfaction and business performance. Due to the requirements to attain and maintain registrations, ISO 9001-certified companies were recommended to practise the eight QM principles and the process-based approach in ISO 9001 standard. As a result of time sequence effects, the registration efforts taken were reasons for and causes of QMS practices being implemented, in addition to organisational improvements gained, namely company competitiveness, customer satisfaction and business performance. A conceptual model was proposed to depict the hypothesised relationships among the five constructs. Measurement models were then developed for the five constructs and incorporated into the conceptual model to obtain a structural model. Subsequently, to operationalise the five constructs, a measurement instrument was designed to collect quantitative data. The target population for this research was the ISO 9001-certified companies in the Malaysian construction company. A total of 456 survey questionnaires were sent out, and 100 usable replies were received. The response rate was about 22.6%. The data collected were first collated and analysed for descriptive statistics related to the motivations for ISO 9001 certifications, the extent of registration efforts taken to obtain and maintain ISO 9001 certifications, the importance assigned to registration efforts taken for successful implementation of ISO 9001 certifications, the extent of QMS practices in ISO 9001-certified companies, the benefits gained and the organisational improvements experienced from ISO 9001 implementations. For inferential statistics, the QMS framework used to identify the indicators and factors of the five latent constructs was first established using exploratory factor analysis, where unidimensionality and reliability for internal consistency were investigated. The QMS framework was then validated using confirmatory factor analysis to assess the convergent validity and construct reliability of the measurement models. Structural equation modelling was performed on the final structural model to establish model fit and construct validity. Finally, the significance, direction and magnitude of each hypothesised causal path were assessed through parsimonius model. The results showed that there was significant positive relationship between registration efforts and QMS practices. There was also strong evidence that QMS practices significantly enhanced company competitiveness, which in turn enhanced customer satisfaction and business performance. The research findings have practical relevance to the top management of ISO 9001-certified companies in the Malaysian construction industry, as effective and

systematic implementation of ISO 9001 registrations are important tactically for gaining increased company competitiveness and strategically for improved business performance. The knowledge gained from the application of SEM in quality engineering and construction management research is also a significant contribution to the body of theoretical knowledge in quality management.

Keywords: Business performance, competitiveness, quality management practices, registration efforts, structural equation modelling.

KESAN USAHA PENGIKTIRAFAN KE ATAS PRESTASI PERNIAGAAN SYARIKAT BERTAULIAH ISO 9001 DARI INDUSTRI PEMBINAAN DI MALAYSIA DENGAN SEM

SIA MAL KONG

Oktober 2010

ABSTRAK

Siri piawaian ISO 9000:2000, asas teori bagi penyelidikan ini, adalah dirumus berdasarkan kepada pengetahuan terkumpul dan pengalaman bersama pakar-pakar kualiti dengan teori pengurusan kualiti Deming disebatikan sebagai inti. Untuk menyiasat kesan-kesan pensijilan ISO 9001 ke atas dayasaing dan prestasi perniagaan yang dialami oleh syarikat-syarikat bertauliah ISO 9001, lima konstruk yang merupakan faset bagi piawaian ISO 9001 telah dikenalpasti, iaitu usaha-usaha pengiktirafan, amalan-amalan sistem pengurusan kualiti (QMS), dayasaing syarikat, kepuasan pelanggan dan prestasi perniagaan. Disebabkan oleh keperluan untuk memperolehi dan mengekalkan pengiktirafan, syarikat-syarikat bertauliah ISO 9001 disarankan untuk mengamal kelapan-lapan prinsip pengurusan kualiti dan pendekatan yang berdasarkan proses. Akibat kesan-kesan turutan masa, usaha-usaha pengiktirafan yang diambil adalah sebab dan akibat kepada amalan-amalan QMS dilaksanakan, di samping kemajuan organisasi seperti dayasaing syarikat, kepuasan pelanggan dan prestasi perniagaan. Satu model konsepsual dicadangkan untuk menggambarkan perhubungan di antara kelima-lima konstruk ini. Model pengukuran bagi kelima-lima konstruk ini kemudian dikembangkan dan digabungkan ke dalam model konsepsual untuk memperolehi model struktural. Selanjutnya, kelima-lima konstruk ini dioperasionalkan dengan satu instrumen pengukuran direkabentuk untuk mengumpul data kuantitatif. Sasaran populasi adalah syarikat-syarikat yang bertauliah ISO 9001 dari industri pembinaan di Malaysia. Sejumlah 456 soal selidik telah dihantar, dan sebanyak 100 balasan dengan jawapan yang lengkap telah diterima. Kadar balas adalah 22.6%. Data yang dikumpul mula-mula disusun dan dianalisis untuk statistik deskriptif yang berkaitan dengan motivasi untuk pensijilan ISO 9001, peringkat usaha pendaftaran yang diambil untuk mencapai dan mengekalkan pensijilan ISO 9001, kepentingan diberi kepada usaha pendaftaran yang diambil supaya pensijilan ISO 9001 dapat dilaksanakan dengan berjayanya, peringkat amalan-amalan QMS oleh syarikat-syarikat bertauliah ISO 9001, manfaat yang diperolehi dan kemajuan organisasi yang dialami dari implementasi ISO 9001. Untuk statistik inferensial, kerangka QMS yang digunakan untuk mengenalasti penunjuk dan faktor bagi kelima-lima konstruk ditubuhkan melalui analisis faktor eksploratori, dengan unidimensionaliti dan kebolehpercayaan untuk kekonsistenan dalaman diselidiki. Kerangka QMS kemudian dikesahkan dengan menggunakan analisis faktor konfirmatori untuk menaksir kesahihan konvergen dan kebolehpercayaan konstruk model pengukuran. Pemodelan persamaan struktural (SEM) kemudian dilaksanakan ke atas model struktural akhir untuk menegakkan kesepadanan dan kesahihan model. Akhir sekali, kesignifikanan, arah dan magnitud setiap jalan kausal (*causal path*) ditaksir dengan menggunakan model parsimonius. Keputusan yang diperolehi dari pengujian hipotesis menunjukkan bahawa terdapat perhubungan positif yang bererti (*significant*) di antara usaha-usaha penauliahan dan amalan-amalan QMS dalam piawaian ISO 9001. Terdapat juga bukti yang kukuh bahawa amalan-amalan

QMS dalam piawaian ISO 9001 meningkatkan dayasaing syarikat secara bererti, dan seterusnya meningkatkan kepuasan pelanggan dan prestasi perniagaan. Keputusan dari penyelidikan ini mempunyai kerelevanan amali untuk pengurusan atasan syarikat-syarikat bertauliah ISO 9001, kerana implementasi ISO 9001 secara berkesan dan sistematik adalah penting secara taktikal untuk meningkatkan dayasaing syarikat dan secara strategik untuk memperbaiki prestasi perniagaan. Pengetahuan yang diperolehi dari penggunaan SEM dalam kejuruteraan kualiti dan penyelidikan pengurusan pembinaan juga merupakan satu sumbangan bererti kepada *body of theoretical knowledge* dalam pengurusan kualiti.

Kata Kunci: Prestasi perniagaan, dayasaing, amalan-amalan pengurusan kualiti, usaha-usaha pengiktirafan, pemodelan persamaan struktural.

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LIST OF ABBREVIATIONS

ACEM	Association of Consulting Engineers Malaysia
AMOS	Analysis of Moment Structures
ANOVA	Analysis of Variance
C&S	Civil and Structural
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CIDB	Construction Industry Development Board
CGS	Centre for Graduate Studies
CONQUAS	Construction Quality Assessment System
CR	Critical Ratio
CSF	Critical Success Factor
DF / Df / df	Degree of Freedom
DIY	Do it yourself
DSM	Department of Standards Malaysia
ECIF	European Construction Industry Federation
EFA	Exploratory Factor Analysis
EFQM	European Foundation for Quality Management
EU	European Union
EVA	Economic Value Added
FCF	Free Cash Flow
G7	Grade 7
GDP	Gross Domestic Product
GM	General Manager
GOF	Goodness of Fit
ICT	Information and Communication Technologies
ISM	Institution of Surveyors Malaysia
ISO	International Organisation for Standardization
JICA	Japan International Cooperation Agency
KLSE	Kuala Lumpur Stock Exchange (now is known as Bursa Malaysia)
KMO	Kaiser-Meyer-Olkin
LS	Lender Security
MBAM	Master Builders Association Malaysia
MBNQA	Malcolm Baldrige National Quality Award
MD	Managing Director
MITI	Ministry of International Trade and Industry
NPC	National Productivity Corporation
NPM	Net Profit Margin
OUM	Open University Malaysia
PAM	Pertubuhan Akitek Malaysia
PDCA	Plan-Do-Check-Act
PhD	Doctor of Philosophy
QA	Quality Assurance
QC	Quality Control
QLASSIC	Quality Assessment System in Construction
QM	Quality Management
QMS	Quality Management System
RMSEA	Root Mean Square Error of Approximation

R&D	Research and Development
ROA	Return on Assets
ROE	Return on Equity
ROS	Return on Sales
S.E.	Standard error
SEM	Structural Equation Modelling
SIRIM	Standard and Industrial Research Institute of Malaysia
SIRIMEX	SIRIM Excellence
SPC	Statistical Process Control
SMEs	Small and Medium Enterprises
SMIs	Small and Medium Industries
SPSS	Statistical Product and Service Solutions (formerly Statistical Package for the Social Sciences)
SWOT	Strength, Weakness, Opportunity and Threat
TC	Technical Committee
TLI	Tucker-Lewis Index
TQM	Total Quality Management
UK	United Kingdom
US / USA	United States / United States of America
UTEM	Universiti Teknikal Malaysia Melaka
UTHM	Universiti Tun Hussein Onn Malaysia
VE	Variance extracted

CHAPTER 1

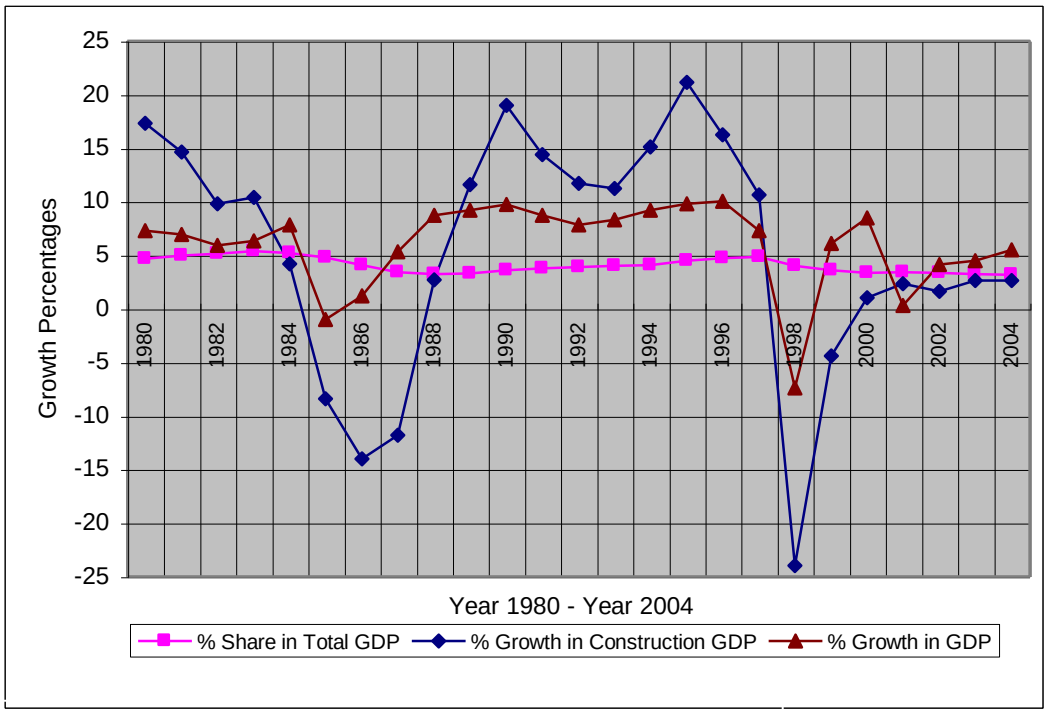
INTRODUCTION

1.0 Introduction

Quality is commonly considered and accepted as one of the critical factors by many construction companies to be successful in the competitive market place (Ahmed & Azhar, 2006). The benefits obtained from effective implementation of quality management (QM) in construction industry have been widely reported and documented (Tang, Ahmed, Aoieong & Poon, 2005). Many construction companies throughout the world have adopted ISO 9001:2000 standard as a quality management system (QMS) to improve quality and productivity (Thorpe & Sumner, 2004). The ISO 9001:2000 standard has also gained acceptance among the various players in the Malaysian construction industry as a key component in the successful management of construction projects. In order to generate the research statements, this chapter: (a) briefly mentions the importance of construction industry in the socio-economic development of Malaysia and the growth of Malaysian construction companies; (b) examines in-depth the characteristics of construction products and the construction industry; and (c) reviews the various critical issues generally encountered due to these unique characteristics. Research questions and objectives are then formulated to investigate the causal effects of ISO 9001 registrations on QMS practices, company competitiveness, customer satisfaction and business performance of ISO 9001-certified companies in the Malaysian construction industry. A conceptual model is then proposed for this purpose.

1.1 Importance of Construction Industry in Socio-Economic Development

Construction sector is vital for the development of any nation. Malaysia, as a developing country, depends on the construction industry as a catalyst for developmental growth (Megat Rus Kamaarani, 2002). In addition, the construction industry is also a barometer of economic development (Zakaria, 2004). Figure 1.1 shows the close correlation between construction trend and Malaysian economic growth for year 1980 to third quarter of 2003. Although the construction industry accounts for less than five per cent of total Malaysian GDP (gross domestic product), it is a strong growth push because of its extensive linkages with the rest of the economy (MGCC, 2004), as it supports a multitude of downstream activities that provide opportunities to small and medium scale enterprises (Megat Rus Kamaarani, 2002). It was reported that the Malaysian construction industry supported some 120 related industries (theSun, 2009). In terms of percentage share of employment contributed by construction sector,



(Source: Series of Economic Reports, Ministry of Finance, Malaysia)

Figure 1.1: Malaysian Economic Growth and Construction Trend (1980 – 2004)

the figures for the period from 2000 to 2003 were 8.1%, 8.1%, 9.5% and 8.0% respectively. In 2003, the industry employed over 500,000 workers in some 54,500 local companies, with 80% of these firms being small- and medium-sized companies (MGCC, 2004).

1.1.1 Growth of Construction Companies in Malaysia

The importance of Malaysian construction industry in socio-economic development is reflected in the growth of construction companies. The breakdown of the various grades of Malaysian contractors from G1 to G7 registered with CIDB (Construction Industry Development Board) Malaysia is shown in Table 1.1. The classification of Malaysian contractors by CIDB Malaysia is given in Table 1.2(a). Table 1.2(b) shows the number of contractors registered with CIDB Malaysia, which grew from 41,500 in 2001 to 63,835 as on 12th December 2005. There were altogether 1,643 G7 contractors in 2001, and the number of G7 contractors was 3,201 in December 2005. The growth of G7 contractors was slow, as given in Table 1.2, from about 3.65% in 2001 to 5% in 2005 in a span of 4 years.

Table 1.1: Breakdown of Local Contractors (as on 12/12/2005)

States	Grades							Total
	G1	G2	G3	G4	G5	G6	G7	
Johore	4052	994	1083	225	208	84	174	6820
Kedah	2601	604	411	105	122	43	133	4019
Kelantan	2418	206	296	70	134	42	95	3261
Labuan	244	26	40	4	8	4	8	334
Melaka	1367	229	307	57	80	25	56	2121
Negeri Sembilan	2529	337	410	64	86	26	48	3500
Pahang	2375	356	452	103	123	36	74	3519
Perak	2867	637	612	119	165	51	84	4535
Pulau Pinang	1821	605	628	109	143	59	151	3516
Perlis	1065	77	75	16	23	10	13	1279
Sabah	3564	517	599	126	159	76	210	5251
Sarawak	1164	415	456	106	157	54	179	2531
Selangor	5891	1321	1940	368	553	224	722	11019
Terengganu	2475	230	394	92	116	43	100	3450
Wilayah Persekutuan	2429	1190	2179	519	854	355	1154	8680
Total (in numbers)	36862	7744	9882	2083	2931	1132	3201	63835

(Source: CIDB Malaysia Directory @ http://www.cidb.gov.my)

Table 1.2(a): Classification of Malaysian Contractors

Grade	G1	G2	G3	G4	G5	G6	G7
Value of Projects (in Ringgit Malaysia)	Not exceeding 0.1 million	Not exceeding 0.5 million	Not exceeding 1 million	Not exceeding 3 million	Not exceeding 5 million	Not exceeding 10 million	No Limit

(Sources: Said, 2005, p. 18; Yeoh & Lee, 1996, p. 194)

Table 1.2(b): Growth of G7 Contractors in Malaysia

Year	Total Number of Contractors	G7 Contractors	
		Number	Percentage
[1]2001	41,500	1,643	3.65%
[2]As on 12/12/2005	63,835	3,201	5.01%

(Sources: [1]Lim, Abdul Aziz, Ang, Wong & Wong, 2002, p. 260; [2]CIDB Malaysia Directory)

1.2 Nature of Construction Industry

The construction industry is amorphous and diverse, as it comprises of a multitude of professions, occupations and organisations in delivering a project (Kanji & Wong, 1998; Low & Peh, 1996; Low & Teo, 2003; Wong & Fung, 1999). The diversity and amorphousness are reflected in the characteristics of construction products and the construction industry as explained below.

1.2.1 Characteristics of Construction Products

Lange and Mills (1979) summarised the following characteristics for construction products, namely: (a) assembly at a particular site selected by the purchaser; (b) high degree of product specificity, including detailed plans and specifications drawn up for each unit to be produced; (c) each facility is designed to order, on a custom basis; (d) a unique price is determined for each project; and (e) the customer contracts with a construction firm to build the project for a fixed price on a cost-incurred basis.

Hillebrandt (2000) noted the following additional characteristics for construction products: (a) the physical nature of each final product of the industry is large, heavy and expensive; (b) they are required over a wide geographical area; (c) they are made

especially, for the most part, to the requirements of the individual customers; and (d) most of the components of the industry are manufactured elsewhere. Hillebrandt (2000) commented that these product characteristics actually determine the structure of the industry, the large number of dispersed contracting firms and the usual separation of design from construction.

1.2.2 Characteristics of Construction Industry

From the various characteristics of construction products mentioned above, it can be seen that the construction industry can be described as amorphous, fragmented or segmented, and characterised by activities which are discontinuous, dispersed, diverse and distinct in nature (Low & Tan, 1996). These characteristics of the construction industry are further discussed below.

a) Diversity: In terms of the nature of its products, the types of organisations and the process by which construction is organised, construction is a diverse industry (Hillebrandt, 2000). The diversity of the construction industry can also be seen from the nature of construction activities and the features of the industry's products, as well as the various professional stages involved in the construction process and the sectors involved in construction. According to Lange and Mills (1979), construction products involved a high diversity of technological requirements of varying degrees of complexity. Moreover, the number of people involved in a construction project and their specific tasks vary widely. In addition, the industry is a combination of innumerable persons, firms, organisations and operations, which perform a group of intricately related, but very different activities (Liebing, 2001). The building process, therefore, is an elaborate collaboration between numerous suppliers (of construction

resources) and people of different skills from the early design stage to completion of construction (Liebing, 2001; Oakland & Marosszeky, 2006).

(b) Dispersion/Fragmentation: The construction industry is also characterised by the presence of a small number of large sophisticated construction firms among a large number of relatively smaller construction firms (Abdullah, 2004; Lange & Mills, 1979; Myers, 2004; Ofori, 1993). This phenomenon is largely due to the nature of construction activities involving discrete projects which are dispersed, location-specific, varied in scale and predominantly small in size (Ofori, 1993). The Malaysian construction industry is also fragmented (CIDB Malaysia, 2004), and follows the characteristics of construction industry in many developed and other developing countries (Abdullah, 2004). An example is the presence of various grades of contractors located in different states of Malaysia as shown earlier in Table 1.1.

c) Distinct: According to Liebing (2001), every project has a unique set of demands, as construction is a process influenced by materials available, knowledge and innovation of the contractor, skills available in the labour force, needs and functions of the proposed structure, requirements of the client, climate and continual research and development of new technology. Moreover, building projects are rarely similar, with identical projects practically non-existent because of factors such as soil type, weather and code requirements (Finkel, 1997). Because of the physical nature of the project, the structure of the industry and the characteristics of demand, Hillebrandt (2000) commented that the method of price determination is usually a discrete process for each project and for each piece of work subcontracted.

d) Discontinuity: Construction work is seasonal (Hillebrandt, 2000). According to Mills (1979), the volume of construction in progress fluctuates, often within short

periods. Occasionally, a few large projects are launched in smaller towns that have not experienced any major construction for many years previously. However, after the completion of these projects, there is hardly any sizeable construction for many years thereafter. Larger cities may continue to experience a continuing volume of work. However, even in these places, certain types of construction may decline in importance while others pick up due to demand. Due to the seasonal nature of construction work and distinct nature of the construction product, each construction project often represents a large proportion of work for the contractor at any one time, causing substantial discontinuities in the flow of activities. Due to its product characteristics, the life of the project site is limited by contractual obligations. As a result, teams specially formed for the project may cease to exist with the end of the contract (Sommerville, 1994). Furthermore, due to the presence of various parties in the construction value chain, the design process is usually separated from construction. Moreover, there are various stages in the life cycle of a construction project. As a result, the progress from one stage to another can hardly be continuous, which often resulted in project delay, time overrun and quality issues.

1.3 Critical Issues in Construction Industry

Construction industry has one of the worst public images among the industrial sectors (Samuelsson, 2003). This is because it is amorphous and diverse, as explained in Section 1.2, and consists of multifarious professions, occupations and organisations in the construction life cycle. This poor image is mainly due to problems caused by safety, project delay and quality issues, which according to Oakland and Marosszeky (2006), are remarkably similar all over the world. As a result, the construction industry has become an adversarial business (Love, Edward & Sohal, 2004). Oakland and

Marosszeky (2006) listed the following specific issues that created problems for the construction industry, namely: (a) extreme fragmentation of the construction supply chain; (b) short term nature of relationships within them; and (c) discontinuity of individuals involved in the procurement process, due to long time frame taken from conception to completion of construction products. Sommerville (1994) argued and elaborated that there are five categories of barriers to the implementation of total quality management (TQM) within the construction industry, namely product differentiation/ diversity, organisational stability, holonic networks and change, contractual relationships and teamwork and management behaviour. According to Murray and Langford (2003), there are three areas in the British construction industry with overarching recurring themes, namely: (a) procurement, which includes contractor selection, nomination, serial tenders, partnering; (b) relationships, which include clients, main contractors, subcontractors and suppliers and teamwork, trust and cooperation; and (c) performance, which includes design, prefabrication and standardisation, quality and value for money.

The Malaysian construction industry, like its counterparts in other countries, is also fraught with problems of time and cost overruns, and abounds with quality problems (Megat Rus Kamaarani, 2002; Zakaria, 2004). CIDB Malaysia (2004) listed seven critical issues faced by the Malaysian construction industry in its "*Master plan framework for 2005–2015*". These are low quality, low productivity, fragmentation, bureaucratic delays, lack of ethics in some parts of the industry, shortage of skilled manpower and lack of data and information. The issues of low quality and low productivity in construction products are pervasive within the industry, permeating through the construction value chain from the design stage to the operation and maintenance stage (CIDB Malaysia & APEC, 2000). There is thus an urgent need for

the management of quality in construction industry (Oakland & Marosszeky, 2006). To improve the overall quality in the Malaysian construction industry, CIDB Malaysia has embarked on various programmes, one of which is the promotion and adoption of ISO 9001 standard in the Malaysian construction industry (CIDB Malaysia & Chan, 2004).

1.4 Research Statements

The first academic paper on TQM in Malaysia published in journal of international status was written by Hamzah and Ho (1994). They attempted to capture the thinking and development of TQM in Malaysia (Ahmad & Mohd Zain, 2000). They presented the findings carried out by JICA (Japan International Cooperation Agency) on the approaches to QM by Malaysian SMIs (Small and Medium Industries), summarised the key elements of TQM philosophy and outlined the SIRIMEX (SIRIM Excellence) model for quality management and assurance to be practised by Malaysian companies in order to improve customer satisfaction through TQM. Ahmad and Mohd Zain (2000) commented that TQM was widely practised in Malaysia, as exemplified by the prestigious Prime Minister's Quality Award which was launched in 1990, and the Ministry of International Trade and Industry's (MITI) Quality Award. They concurred with the comment by Hamzah and Ho (1994) that many Malaysians were well-equipped with the knowledge of quality, as evident from news and writings that were of foreign origin which could be found readily in local newspapers or popular magazines, quality-related articles which appeared in local newspapers and magazines, and quality-related courses which were offered by numerous local colleges and universities in their academic programmes. However, Ahmad and Mohd Zain (2000) expressed their concern in the lack of coverage on quality-related research as not much has been written and published internationally about TQM as practised in Malaysia.

Abdul Aziz (2002) mentioned that research findings on the measurement of performance of Malaysian contractors were inadequate. Ahmad and Mohd Zain (2000) claimed that earlier research in QMS in Malaysia concentrated mainly on the solution of quality and organisational problems in the manufacturing, electronic and public sector. Said (2005), and Said, Zainal Abidin and Mohd Shafiei (2006), in their study on management responsibility and business performance between ISO 9000 and non-ISO 9000 certified contractors in Malaysia, argued that there was a need to study the implementation of ISO 9000 QMS and business performance in the construction industry, whether locally or internationally, because the understanding between the two seems to be very limited. Moreover, they revealed that earlier researches conducted in Malaysian construction industry concentrated on the development of standards of building materials, project delay, labour management and risk. There is thus a general lack of literature on the measurement of Malaysian contractors' performance in general, and lack of relevant theories and empirical evidences governing the issues of QM based on ISO 9000:2000 and business performance of Malaysian contractors in particular. The information given above and earlier has prompted the following research statements:

a) Due to problems of low productivity and low quality, there is a need to reform the Malaysian construction industry through the ingenious application of engineering tools (Megat Rus Kamaarani, 2002). One of the available tools and techniques which can be used to improve the performance of construction companies is ISO 9001 (Delgado-Hernandez & Aspinwall, 2005; McCabe, 1998; Samuelsson, 2003). Hughes and Ryall (1997) found that possession of the ISO 9000 certificate did provide a measure of quality. Langford, El-Tigani and Marosszeky (2000) opined that formally assured organisations used fewer resources to create the same output, indicating that quality improvements led to productivity benefits and improved

performance. There is thus a need to adopt ISO 9001 for improvement of quality, productivity and business performance.

b) Quality is an integral element in construction project, from its inception to completion (Alcock, 1994). Oberlender (1993) argued that quality is an integral element of construction project management, as scope represents the quantity and quality of work of a project to be accomplished sequentially within stipulated schedule or time, and budget or costs allocated. Due to its diverse and amorphous nature, and the existence of adversarial relationships among the various parties within the construction industry, a coordinated effort is needed to promote and implement ISO 9001 in construction industry. It is also necessary to identify the motivations for accreditation and benefits of ISO 9001 certification as causal relationships exist between them (Häversjö, 2000; Santos & Escanciano, 2002). According to Hughes and Ryall (1997), the relationships between organisational motivation, implementation approach and system efficiency appear to be of paramount importance in order to achieve improvements in organisational efficiency.

c) There is a need to investigate the extent to which quality-related knowledge is applied due to the lack of documented quality-related efforts in Malaysia (Ahmad & Mohd Zain, 2000). Because of this, Said (2005), and Said *et al*. (2006) contended that it is necessary to study the implementation of ISO 9001 certifications and the relationship with the business performance of ISO 9001-certified companies in the Malaysian construction industry. According to Thiagaragan, Zairi and Dale (2001), the lack of theory and research in QM warrants the study of QM as a valid topic for research in order to increase its existing body of knowledge.

d) Although many efforts have been put in by the industries in Malaysia to obtain ISO 9001 certifications, no attempt has been taken to verify whether implementation of ISO 9001 leads to any increase in company profitability (Jabnoun & Kanapathy, 1998). It is reported by Naser, Karbhari and Mokhtar (2004) in their paper that very few studies were undertaken to identify the factors that influence corporate performance and to establish the relationship between ISO 9001 registration and corporate performance.

1.5 Research Questions and Objectives

Based on the research statements presented above, therefore there is a need to adopt ISO 9001 standard for improvement of quality, productivity and business performance and to study the implementation of ISO 9001 certifications and the relationship of ISO 9001 certifications with the business performance of ISO 9001-certified companies in the Malaysian construction industry. The ISO 9000:2000 family of standards was developed with eight QM principles encapsulated to assist organisations to implement and operate effective QMS. CIDB Malaysia (2004) claimed that effective implementation of ISO 9001 QMS by ISO 9001-certified companies may result in increased competitiveness and improved motivation to the workforce, improved client's satisfaction, increased profitability and shareholder's value. In addition, ISO 9000:2000 family of standards claimed that application of the eight QM principles will provide direct benefits mentioned in ISO 9004:2000, and makes an important contribution to managing costs and risks, which are important considerations for the overall performance of an organisation. These considerations may impact, among others, competitive advantage through improved organisational capabilities, customer loyalty, repeat business and referral, and operational results such as revenue and market share.

Moreover, ISO 10014:2006 standard contended that effective application of the process approach in ISO 9001 standard together with the PDCA methodology represented by the eight QM principles may result in the realisation of financial and economic benefits. In order to confirm these contentions, the following research questions emerge:

a) What are the organisational improvements experienced by ISO 9001-certified companies in the Malaysian construction industry from implementing ISO 9001?
b) Do ISO 9001 registrations have a positive impact on QMS practices, company competitiveness, customer satisfaction and business performance of ISO 9001-certified companies?

To address some of the issues raised in the research statements and to answer the research questions mentioned above, the objectives for this research are:

a) to identify the motivators for ISO 9001 certifications;
b) to identify the reasons to obtain and maintain ISO 9001 certifications;
c) to identify the benefits gained from ISO 9001 implementations;
d) to determine the extent of registration efforts taken to obtain and maintain ISO 9001 certifications;
e) to ascertain the importance assigned to registration efforts taken for successful implementation of ISO 9001 certifications;
f) to assess the extent of QMS practices in ISO 9001-certified companies;
g) to determine the organisational improvements experienced by ISO 9001-certified companies, in terms of company competitiveness, customer satisfaction and business performance;
h) to establish and validate a QMS framework used to identify the indicators and factors for registration efforts taken, QMS practices, company competitiveness, customer satisfaction and business performance; and

i) to develop a model to investigate the causal effects of ISO 9001 registrations on QMS practices, company competitiveness, customer satisfaction and business performance of ISO 9001–certified companies in the Malaysian construction industry.

1.6 Conceptual Model

To account for the causal effects implied in the statements made by CIDB Malaysia (2004), the ISO 9000:2000 family of standards and ISO 10014:2006 standard, it is hypothesised that due to the requirements to attain and maintain registrations, ISO 9001-certified companies are recommended to practise the eight QM principles and the process-based approach in ISO 9000:2000 family of standards. As a result of time sequence effects, there are indications that the registration efforts taken for registration of ISO 9001 standard are reasons for and causes of QMS practices being implemented in ISO 9001-certified companies, in addition to the consequential improvements or benefits obtained, namely company competitiveness, customer satisfaction and business performance. Five constructs which are research variables and facets of the ISO 9001 standard have thus been identified. The five constructs are registration efforts, QMS practices, company competitiveness, customer satisfaction and business performance.

According to Vloeberghs and Bellens (1996), the benefits obtained from ISO 9000 certifications could be classified into four categories, namely operational results, financial results, and benefits related to customers and workers (cited in Casedesús & Karapetrovic, 2003, p. 295). Han (2000) classified the organisational improvements gained from ISO 9000 certifications into three categories, namely organisational competitiveness, customer satisfaction and business performance. To show consistency between the categorisation of benefits by Vloebergs and Bellens (1996) and the

classification of organisational improvements by Han (2000), the three facets for company competitiveness in the competitiveness model for construction industry proposed by Momaya and Selby (1998) were adapted. The three facets are competitive assets or resources, competitive processes and competitive performance. For this reclassification, operational results were replaced by competitive processes and competitive performance, and workers-related benefits were replaced by competitive resources or assets. Using this proposed reclassification, the benefits gained from an integrated application of the process approach and the PDCA continual improvement methodology as outlined in ISO 10014:2006 is shown in Table 1.3. It can be seen that the benefits gained from ISO 9001 registrations can be classified into company competitiveness, customer satisfaction and business performance.

Table 1.3: Reclassification of Benefits Outlined in ISO 10014:2006 Standard

Benefits Outlined in ISO 10014:2006	Company Competitiveness			Customer Satisfaction	Business Performance
	Competitive Assets	Competitive Processes	Competitive Performance		
	Worker Related	Operational Results		Customer Related	Financial results
Improved profitability					√
Improved revenues					√
Improved budget					√
Reduced costs					√
Improved cash flow					√
Improved return on investment					√
Increased competitiveness		√	√		
Improved customer retention				√	
Improved effectiveness of decision making		√	√		
Effective use of available resources	√				
Heightened employee accountability	√				
Improved intellectual capital	√				
Improved processes		√			
Improved supply chain performance			√		
Reduced time to market		√	√		
Enhanced organisational performance, credibility and sustainability			√		

(Source: Developed for this thesis)

The conceptual model, shown in Figure 1.2, was proposed to investigate the causal effects of ISO 9001 registrations on QMS practices, company competitiveness,

customer satisfaction and business performance. There are ten arrows in Figure 1.2, representing the ten hypotheses to be tested in this research. These are:

H1: ISO 9001 registration efforts enhance quality management system practices;

H2: ISO 9001 registration efforts enhance company competitiveness;

H3: ISO 9001 registration efforts enhance customer satisfaction;

H4: ISO 9001 registration efforts enhance company business performance;

H5: Quality management system practices enhance company competitiveness;

H6: Quality management system practices enhance customer satisfaction;

H7: Quality management system practices enhance business performance;

H8: Company competitiveness enhances customer satisfaction;

H9: Company competitiveness enhances company business performance; and

H10: Customer satisfaction enhances company business performance.

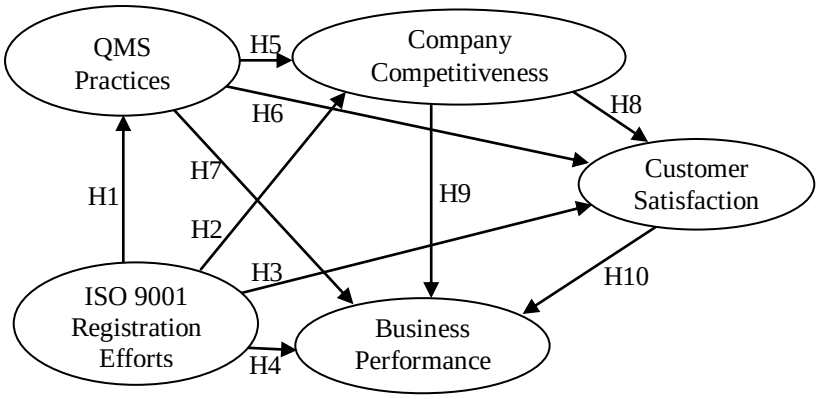


Figure 1.2: Conceptual Model on the Causal Effects of ISO 9001 Registrations
(Extension from Han, 2000, p. 26; Han, Chen & Ebrahimpour, 2007, p. 7)

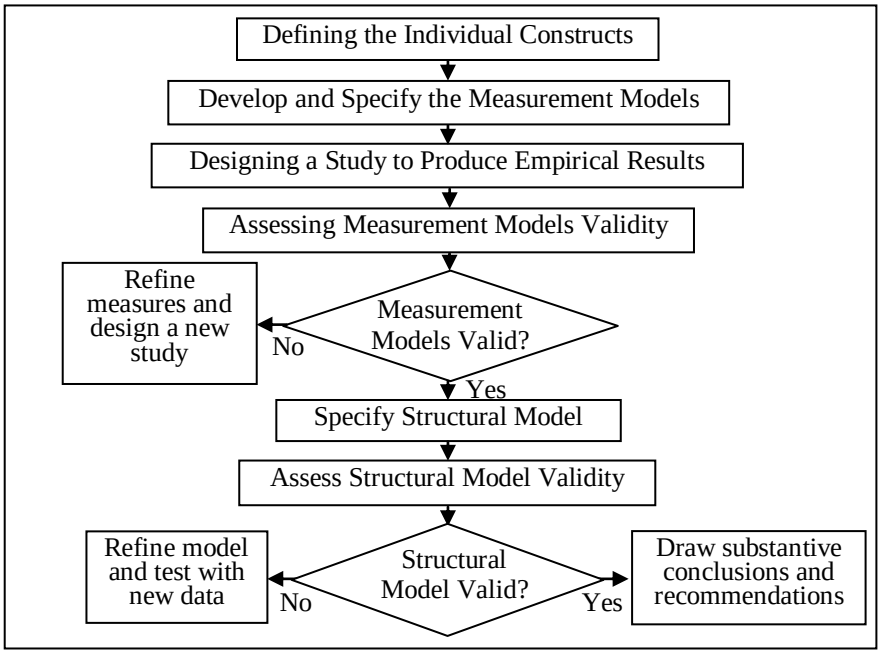
The theoretical foundation of this research was the ISO 9000:2000 family of standards. According to Oakland and Marosszeky (2006), the ISO 9000:2000 family of standards brought together the concept of Deming's cycle of continual improvement (the Plan-Do-Check-Act or PDCA cycle) and QMS. In fact, Goetsch and Davis (2010) acknowledged that the PDCA cycle is the operating principles of ISO 9000 family of

standards, which functions in a never-ending loop to result in continual improvement for products/services, processes, and systems of processes.

The process-based QMS of ISO 9000 is structured in theory around the Deming loop (United Nations, 2001). Therefore, the underpinning theory for this research is the Deming's QM theory encapsulated in the ISO 9000:2000 family of standards. A theory is a number of hypothesised relationships among latent constructs (Blunch, 2008). According to Hetherington (2000, p. 38), "the roles of theory in scientific research are two folds. As its explanatory role, a substantive theory helps to explain the phenomenon of interest by identifying critical variables and specifying their interrelationships. As its instrumental role, theory helps in formulating research design, outlining strategy for data analysis, interpreting the meaningfulness of research findings and generating additional hypotheses to stimulate further research".

The conceptual model depicting the causal effects of ISO 9001 registrations shown in Figure 1.2 was investigated by structural equation modelling (SEM). According to Hair, Black, Babin, Anderson and Tatham (2006), a model can be taken as a representation of a theory. If a theory can be expressed in terms of relationships among latent constructs and measured variables, SEM will provide a conceptually convincing way to test how well the theory fits reality as represented by empirical data collected from survey questionnaires. SEM is a combination of path analysis and confirmatory factor analysis that explores measured variables, establishes measurement models by linking latent constructs to their indicators, and investigates the relations among these latent constructs in the form of a structural model (Burnette & Williams, 2005). In this research, SEM was carried out following the six stages recommended by Hair *et al*. (2006), as shown in Figure 1.3. The ISO 9001 registration efforts construct was a

second-order measurement model operationalised by five first-order factors which were measured by 29 observed variables. The QMS practices construct was a second-order measurement model operationalised by eight first-order factors which were measured by 56 observed variables. The company competitiveness construct was a second-order measurement model operationalised by three first-order factors which were measured by 18 observed variables. The customer satisfaction construct was a first-order measurement model which was measured by five observed variables. The business performance construct was a first-order measurement model which was measured by four observed variables. To apply SEM for testing the ten hypotheses, it was necessary to incorporate the measurement models for the five latent constructs into Figure 1.2 to produce a structural model. The statistical software used for SEM was AMOS 16.0 of SPSS (Statistical Product and Service Solutions).



(Source: Hair *et al*., 2006, p. 759)

Figure 1.3: Six-Stage Process for SEM

1.7 Conditions for Causality

In order to establish the causal effects of ISO 9001 registrations through SEM, four types of evidence are needed for the quantitative data collected from questionnaire survey (Blunch, 2008; Hair *et al*., 2006; Yang & Trewn, 2003). These are:

a) co-variation, which indicates the possible existence of a causal relationship between two constructs;
b) time sequence effect: the occurrence of a construct is generally followed by the occurrence of another construct is an indication for the first construct being a cause of the second construct;
c) non-spurious relationship: there is a 'true' relationship between the two constructs which appear to be related, and remains unaffected when additional predictors are added to the two constructs; and
d) theoretical support: there is theoretical support for the relationship between the cause and effect.

1.8 Premise of Research

The Deming's QM theory underpinning the ISO 9000:2000 family of standards was the theoretical foundation of this research. Eight QM principles have been identified in ISO 9000:2000 which can be used by top management to lead an organisation towards improved performance. The eight QM principles which form the basis of the QMS standard within the ISO 9000 family 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. These eight QM principles have been taken into consideration during the development of ISO 9001. They were integrated into the clauses in ISO 9004:2000 to be used by top

management to manage an organisation successfully in a systematic and visible manner towards improved performance. As such, the ISO 9000 family of standards has measurement items that cover all aspects of the QMS practices construct to be measured (Feng, Terziovski & Samson, 2008). Similarly, based on the five clauses for ISO 9001 accreditation, the ISO 9001 standard also contains measurement items that cover all aspects of the registration efforts construct to be measured. Based on these revelations, the five clauses for ISO 9001 certifications, the eight QM principles and the benefits gained from registrations were used to develop a questionnaire to measure QMS practices and to investigate the causal effects of ISO 9001 registrations on QMS practices, company competitiveness, customer satisfaction and business performance of ISO 9001-certified companies.

1.9 Scope of Research

ISO 9001-registered companies in the Malaysian construction industry which practised quality improvement programs were included in this research. They were located throughout the whole of Peninsular Malaysia, Sabah and Sarawak. The companies included: (a) selected local construction companies with ISO 9001 certifications from the Construction, Infrastructure, and Properties sectors listed on Bursa Malaysia; (b) foreign construction companies having construction jobs in Malaysia; (c) ISO 9001-certified construction companies registered with CIDB Malaysia; (d) ISO 9001-certified quantity surveying firms; (e) ISO 9001-certified Civil and Structural (C&S) consulting engineering firms; (f) ISO 9001-certified Architectural firms; and (g) ISO 9001-certified local property developers. All these companies are vital players in the Malaysian construction value chain.

1.10 Limitations of Survey Method

This research used the mailed survey method to collect primary data. The limitations for mailed survey method are:

a) The postal mail questionnaires do not allow the opportunity for probing. As such, it is an inflexible technique. Nevertheless, the time taken for researcher is short, the cost involved is inexpensive, quality of information is rich and the data and information are easy to analyse (Naoum, 2007).

b) The respondents of this study may complete the survey questionnaires without careful consideration due to lack of comprehension (Jung, 2007; Naoum, 2007).

c) Due to lack of control over the environment (Jung, 2007; Naoum, 2007), the results may not reflect the opinions of actual adopters of ISO 9001 certifications regarding the motivations to seek ISO 9001 certifications, registration efforts taken to obtain and maintain ISO 9001 certifications, extent of QMS practices and organisational improvements experienced by the respondent companies. The respondents may answer generally to a question seeking a response on a specific level of analysis, or may not answer according to their corporate reality (Naoum, 2007).

d) The findings of this study may not be generalised to any other industries/countries.

e) Due to industry fatigue, where companies received a steady stream of questionnaires, questionnaires from research students were of less priority (Naoum, 2007). This might affect the response rate.

To minimise the effects arising from the limitations mentioned above, a preliminary survey was carried out with an initial questionnaire. The formal survey questionnaire was then carefully designed and sent to the key respondent of the targeted respondent company. The steps taken are further elaborated in Section 3.8.2 and Section 3.8.4. Additional research limitations are presented in Section 5.5.1.

1.11 Research Assumptions

Due to the limitations for mailed survey method mentioned above, the assumptions made in this research were:

a) The respondents would understand the content of survey questionnaires.

b) The respondents would answer all survey questions in an honest manner.

c) The data would be collected and compiled from all participants in the same manner.

d) The unit of analysis for this research was at company level. Since the number of ISO 9001-certified companies in the Malaysian construction industry as on 14th April 2008 was comparatively small, all the 338 ISO 9001-certified companies registered with the CIDB Malaysia were targeted in the survey. The remainder were trawled randomly from Google. The sample of 456 respondent companies selected for the survey therefore nearly represented the whole target population. The sample size of 100 companies obtained from a sample of 456 respondent companies was therefore representative of the target population as the survey could be considered as a census survey which did not need sampling (Henry, 2009).

The ISO 9000:2000 family of standards formed the core of this research. The eight QM principles which are the basis of QMS in the ISO 9000 family of standards were used to develop a questionnaire to measure QMS practices in ISO 9001-certified companies. The ISO 9001:2000 standard also specified a set of minimum requirements for certification of the QMS. The following additional assumptions were made:

a) Irrespective of the scope of ISO 9001 registrations and nature of business, all the ISO 9001-certified companies selected for this research practised the eight QM principles and the recommendations as advised by ISO 9000 family of standards.

b) All respondents who had responded to the survey questionnaires were directly involved in the implementation of the QMS adopted by their companies. They fully understood the requirements for ISO 9001 registrations, the motivations for ISO 9001 certifications, the eight QM principles in the ISO 9000 family of standards and the benefits obtained from ISO 9001 implementations.

c) The causal relationships among the five latent constructs shown in Figure 1.2 were linear. According to Tabachnick and Fidell (2001), if there is multivariate normality in ungrouped data, then each variable is itself normally distributed and the relationships between pairs of variables, if present, are linear and homoscedastic. The data are homoscedastic when the variance of the error terms appears constant over the range of values of the independent variable.

1.12 Significance of Research

The ISO 9000 family of standards was first released in 1987. The Malaysian industries only realised the benefits of ISO 9000 certification when five companies from the manufacturing industry were certified with ISO 9000 registration in 1988 (Idris, McEwan & Belavendran, 1996). These were mainly the large companies from the USA, UK and other European countries which had taken the challenge. Quality awareness in the Malaysian construction industry was relatively recent. It was only in 1994 that the first Malaysian company from the construction industry was awarded with ISO 9000 registration.

The first paper on TQM in the Malaysian construction industry was written by Abdul Aziz (2002). He presented his findings on the practice of TQM by Japanese contractors in Malaysia through a two-stage approach. He commented that the implementation of

TQM in the construction industry was constrained by national markets where the clients, sub-contractors and site operatives were not imbued with the same quality culture. Nonetheless, as demonstrated by the Japanese contractors in his study, TQM could still be implemented provided local norms and contracting practices were accommodated.

The present research could be considered as the first nationwide study on ISO 9001-certified companies in Malaysian construction industry. This research is important since it started just after the ISO 9000 family of standards was upgraded in December 2000. While a considerable body of knowledge have been developed to examine the relationships between ISO 9000 certifications and business performance around the world, however, little is known about the effects of ISO 9000 registrations in this area from Malaysia, particularly from the context of Malaysian construction industry. Since the Malaysian construction industry is considered as one of the major contributors to the Malaysia's economy, correct implementation of the ISO 9000 certifications is tactically and strategically important for ISO 9001-certified companies in the Malaysian construction industry to gain competitiveness and improve business performance. This research, therefore, has relevance to the top management of ISO 9001-certified companies because of the practical implications of systematic and effective implementation of ISO 9001 certifications on increased company competitiveness and improved business performance. This research is also a significant contribution to the existing body of knowledge in terms of understanding: (a) the theoretical foundation of ISO 9001 standard as a QMS and for performance improvement, as Deming's QM theory is the underpinning principle of ISO 9000:2000 family of standards; and (b) the importance of an effective integration of the process-based approach in ISO 9000:2000 family of standards with the Deming's PDCA continuous improvement cycle to

improve QMS practices, company competitiveness, customer satisfaction and business performance. It also helps to address the issue of lack of data and information within this field. Based on the data collected from ISO 9001-certified companies, the research findings confirmed the contentions made: (a) 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 organisational capabilities, and financial results such as increased revenue, market share and profitability; (b) by CIDB Malaysia that effective implementation of ISO 9001 as a QMS may result in improved client's satisfaction, increased profitability and increased competitiveness; and (c) in ISO 10014:2006 that effective application of the process approach in ISO 9001 standard together with the PDCA methodology may result in the realisation of financial and economic benefits. Even though the ISO 9001:2000 standard was amended in November 2008 for clarity, the eight QM principles and the five clauses for ISO 9001 certification remained intact in the ISO 9001:2008 standard. The findings of this research are therefore still valid and applicable. The ISO 9004:2000, however, has been technically revised to ISO 9004:2009 to focus on managing for the sustained success of an organisation through quality management approach.

1.13 Thesis Organisation

Based on the research statements delineated in Section 1.4 and the research questions and objectives outlined in Section 1.5, a conceptual model was proposed to investigate the causal effects of ISO 9001 registrations on QMS practices, company competitiveness, customer satisfaction and business performance of ISO 9001-certified companies in the Malaysian construction industry. For this purpose, the QM theory encapsulated in the process-based model and embodied in the eight QM principles of

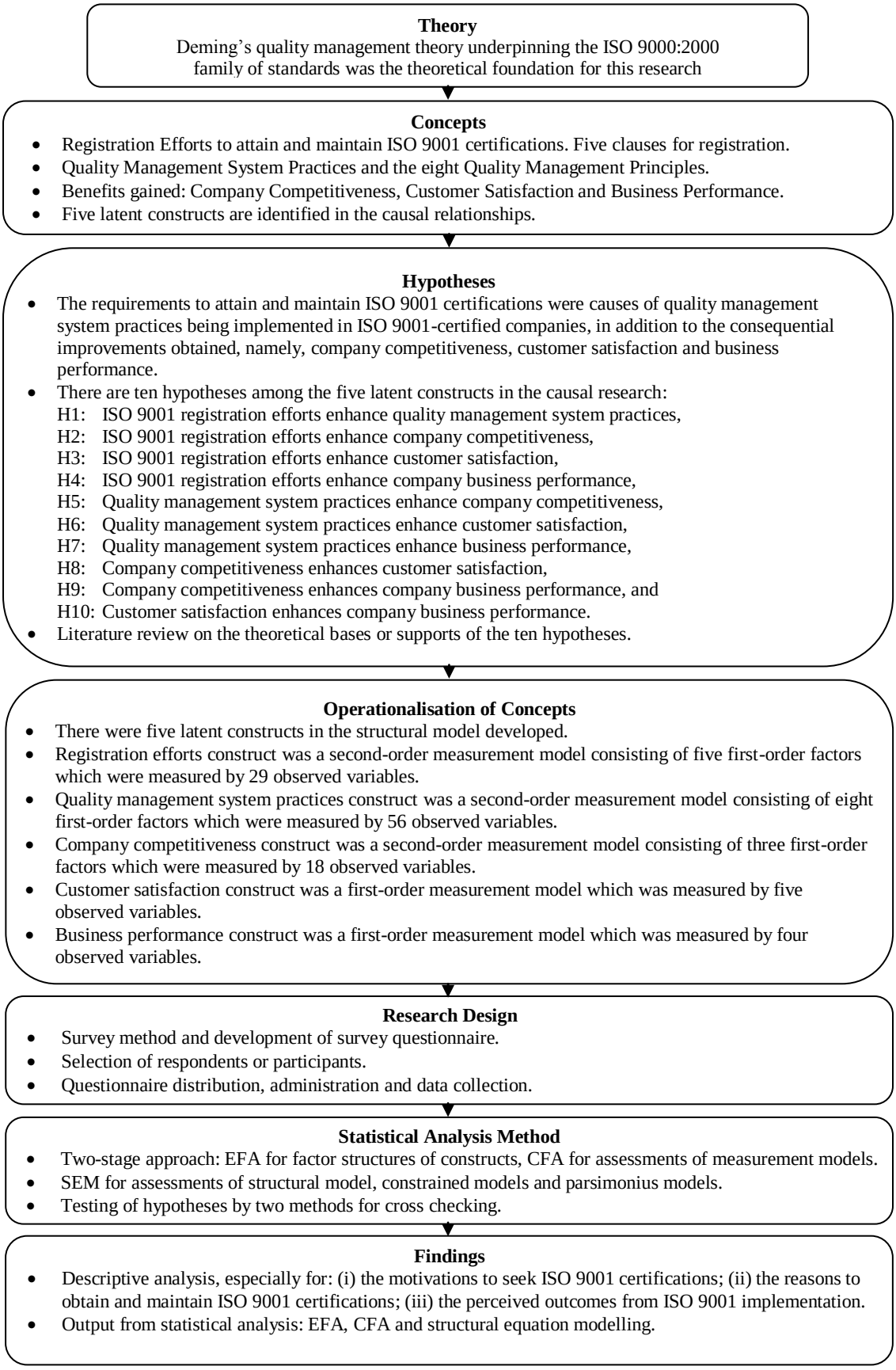
the ISO 9000:2000 family of standards formed the theoretical foundation of this research.

The need to manage quality in construction industry was discussed mainly through three aspects, namely: (a) the various approaches to and definitions of quality; (b) the characteristics of construction industry which are discontinuous, dispersed, diverse and distinct; and (c) the various stages and aspects where quality should be defined and present in the construction value chain. The following information obtained through literature review in Chapter 2 was also needed to achieve the research objectives outlined in Section 1.5, especially: (a) the quality constructs in TQM and the eight QM principles in ISO 9001; (b) the motivators for registrations of ISO 9001 certifications; (c) the benefits gained by ISO 9001-certified companies through ISO 9001 implementations; (d) the causal effects of ISO 9001 registrations on business performance; and (e) the existing conceptual models proposed by various researchers to investigate the causal effects of ISO 9001 registrations on business performance.

The ISO 9000 family of standards was developed to assist organisations to implement and operate effective QMS, and it was adopted as the Malaysian Standard MS ISO 9000. CIDB Malaysia encouraged the local construction companies to be certified with ISO 9001 to improve the overall quality in the industry. Due to the requirements to attain and maintain registrations, ISO 9001-certified companies were recommended to practise the eight QM principles and the process-based approach in ISO 9000 family of standards. As a result of time sequence effects, the registration efforts taken for ISO 9001 certifications were reasons for and causes of QMS practices being implemented in ISO 9001-certified companies; as well as the organisational improvements obtained, namely company competitiveness, customer satisfaction and business performance.

From literature review, it was found that the benefits obtained from ISO 9000 certifications could be classified into four categories, namely, operational results, financial results and benefits related to customers and workers. This research proposed to reclassify these benefits into three categories, namely company competitiveness, business performance and customer satisfaction, consistent with the three categories of organisational improvements revealed by Han (2000). Five constructs were thus identified in the causal relationships. A conceptual model was then developed based on the model proposed by Han (2000) and Han *et al*. (2007) to investigate the causal relationships among the five latent constructs by using AMOS 16.0 as the structural equation software package. The research process is outlined in Figure 1.4.

In Chapter 3, the theoretical supports for the causal relationships among the five latent constructs were discussed. According to Blunch (2008), two conditions must be met in order to verify a hypothesised model, namely: (a) the constructs making up the model must be defined conceptually; and (b) the constructs must be defined operationally. The measurement models for the five latent constructs, together with the observed variables, were identified, defined and specified in Chapter 3. As the eight QM principles are 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). Similarly, as a set of minimum requirements for registration of QMS is provided in ISO 9001:2000, the ISO 9001:2000 standard contains measurement items that cover all aspects of the registration efforts construct to be measured as well. Hence the observed variables for these two latent construct were extracted directly from the ISO 9000:2000 family of standards. The competitiveness model proposed by Momaya and Selby (1998), which encompasses competitive assets or resources,



(Sources: Developed for this thesis. Based on Bryman & Cramer, 2001, p. 3; Silverman, 2005, p. 100)

Figure 1.4: Research Process

competitive processes and competitive performance, was adapted to measure the company competitiveness construct. The measurement models for customer satisfaction and business performance constructs were developed based on literature review. For operationalisation of the conceptualised variables, a survey questionnaire was developed to collect the quantitative data needed for assessments of the conceptualised variables selected in the measurement models and testing of the research hypotheses. The survey questionnaire, given in Appendix A, was developed based on: (a) an initial questionnaire used in a preliminary survey for field pretesting (Fowler & Consenza, 2009); (b) the data and information collected from literature review; (c) the questionnaire developed by Pan (2003); (d) the questionnaire developed by Dissanayaka, Kumaraswamy, Karim and Marosszeky (2001); (e) the questionnaire developed by Han (2000); and (f) the recommendations in the ISO 9000 family of standards for QMS practices and accreditation of ISO 9001 standard.

In Chapter 4, descriptive analysis was carried out on the quantitative data collected to provide results for the objectives outlined in Section 1.5. Statistical analysis was conducted using SPSS and AMOS 16.0 for SEM. There were two components in SEM: (a) measurement models linking sets of observed variables to a smaller set of latent constructs; and (b) a structural model linking the latent constructs through a series of recursive relationships. Specification of measurement model was performed through the two-step approach. First, exploratory factor analysis (EFA) was conducted to establish the underlying factors of the scaled items. Subsequently, confirmatory factor analysis (CFA) was performed to confirm the indicators which loaded onto each identified factor. The aim in developing the measurement models before the full structural model was to assess the validity and reliability of the constructs before their use in the full model. The goodness-of fit measures were the major criteria to assess the structural

model. Absolute fit measures were used to determine the degree to which the measurement models and hypothesised structural model fit the sample dataset collected. The final structural model was subsequently assessed for construct validity. In this research, two methods were used for testing of hypotheses, namely: (a) regression weights in the parsimonius model to examine the extent of effects of exogenous latent variables on endogenous latent variables; and (b) R-squared values, and the change in R-squared values when one of the measurement models was left out from the structural model.

The discussions on the descriptive and inferential statistics obtained in Chapter 4 for the answers to the objectives outlined in Chapter 1 were presented in Chapter 5. The implications, as well as the theoretical, methodological and practical contributions of the research were presented too. The limitations of the present research and suggestions for further study were delineated as well. The finale section was the conclusion of this research.

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