

CONCEPTUAL MODEL OF ENGINEERING CONSULTANCY PRACTICE (ECP)
PERFORMANCE MEASUREMENT FACTORS IN MALAYSIA

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To my beloved WIFE and PARENTS

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ABSTRACT

The implementation of liberalization in Malaysia has offered opportunities to the local companies to expand businesses. The salient point of liberalization in the context of Engineering Consultancy Practices (ECP) is the opening of the flood gate for non-professionals (including foreigners) to register and operates consultancy practices. This would create an excessive competitive environment to the local consulting firms. The aim of this study is to identify the successful business model to be adopted by Engineering Consultancy Practice (ECP) for building its capacity and competitiveness. This study is important in the sense that it serves as one of the pioneer studies focusing on the Engineering Consultancy Practices, from the perspective of business model. Principal Component Analysis (PCA) was employed to analyze data from a quantitative survey. Three components were extracted through PCA approach: (1) Profit Structure factor, (2) Management Capability factor and (3) Stakeholder Relationship factor. Next, Structural Equation Modeling (SEM) was utilized to perform analysis on the data extracted from PCA. Two (2) Business Model Index equations were formed to examine the business performance in terms of business model criteria. Through the data validation, it is found that ECP Business Performance Measurement model developed in this study is the best model to evaluate the ECP business performance. Understanding the core values related to the ECP could help the local stakeholders to have better preparation and planning to face a greater challenge lies as a result of the liberalization.

ABSTRAK

Pelaksanaan liberalisasi di Malaysia telah menawarkan peluang kepada syarikat tempatan untuk memperkembangkan perniagaannya. Liberalisasi dalam konteks Praktis Perunding Kejuruteraan (ECP) telah membuka peluang kepada golongan bukan professional (termasuk warga asing) untuk mendaftar dan menjalankan amalan perundingan. Situasi ini akan mewujudkan persaingan yang terlalu kompetitif kepada firma perundingan tempatan. Matlamat kajian ini adalah untuk mengenalpasti model perniagaan yang sesuai digunakan oleh Praktis Perunding Kejuruteraan (ECP) untuk membina kapasiti dan daya saing dalam industri ini. Kajian ini penting dan menjadi antara kajian terawal yang fokus kepada Praktis Perunding Kejuruteraan berdasarkan perspektif model perniagaan. Analisa Principal Komponen (PCA) telah digunakan untuk menganalisis data daripada kajian soalselidik kuantitatif. Berdasarkan PCA, tiga komponen telah diekstrak: (1) Faktor Struktur Keuntungan, (2) Faktor Kapasiti Pengurusan dan (3) Faktor Hubungan Pihak Berkepentingan. Seterusnya, Pemodelan Persamaan Struktur (SEM) diaplikasikan untuk menganalisis data yang diekstrak daripada PCA. Dua (2) persamaan Indeks Model Perniagaan telah dibentuk untuk menilai prestasi perniagaan dari segi kriteria model perniagaan. Melalui pengesahan data, didapati model Pengukuran Prestasi Perniagaan ECP yang dibangunkan dalam kajian ini adalah terbaik untuk menilai prestasi perniagaan. Memahami nilai-nilai teras yang berkaitan dengan ECP boleh membantu pihak berkepentingan tempatan untuk bersedia dan merancang untuk menghadapi cabaran yang lebih besar akibat daripada liberalisasi.

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LIST OF SYMBOLS

χ^2	-	Chi-Square
δ_M	-	Degree of misspecification of the proposed model
df	-	Degree of freedom
V_{residual}	-	Residual variance in covariance matrix (variance that unable be explained by the model)
V_{total}	-	Total variance in the covariance matrix
N	-	Sample size
δ	-	Degree of misspecification of the baseline model

LIST OF ABBREVIATIONS

ACEM	-	Association of Consulting Engineers Malaysia
AFTA	-	ASEAN Free Trade Area
AMOS	-	Analysis of Moment Structure
ANOVA-		Analysis of Variance
AVE	-	Average Variance Extracted
BEM	-	Board of Engineers Malaysia
CEO	-	Chief Executive Officer
CFA	-	Confirmatory Factor Analysis
CFI	-	Comparative Fit Index
CR	-	Composite Reliability
ECP	-	Engineering Consultancy Practice
GATS	-	General Agreement on Trade in Services
GDP	-	Gross Domestic Product
GFI	-	Goodness of Fit Index
GOF	-	Goodness of Fit
IEM	-	The Institution of Engineers' Malaysia
KMO	-	Kaiser-Meyer-Olkin
MANOVA	-	Multivariate Analysis of Variance
MC	-	Management Capability
MIDA	-	Malaysian Investment Development Authority
NNFI	-	Non-normed Fit Index
PCA	-	Principal Component Analysis
PS	-	Profit Structure
RMSEA -		Root Mean Square Error of Approximation
SEM	-	Structural Equation Modeling

SME	-	Small Medium Enterprises
SPSS	-	Statistical Package for Social Sciences
SR	-	Stakeholder Relationship
TLI	-	Tucker-Lewis Index
WTO	-	World Trade Organization

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CHAPTER 1

INTRODUCTION

1.1 Introduction

It is realized that the service sector has evidently become one of the major contributors to the Gross Domestic Product (GDP) in Malaysia. It recorded a remarkable performance in 2014, whereby 6.4 per cent of the total investment was contributed by the services sector (Department of Statistic Malaysia, 2014). The services sector is expected to grow at 7.2% annually until 2015, raising its contribution to GDP to 61% by the end of the 10th Malaysian Plan. The estimated new investment of RM44.6 billion is required for the services sector to achieve the targeted GDP contribution, with an increasing portion from foreign direct investment (MIDA, 2015). The services sector covers a wide array of activities including hotels, restaurants, transportations, storage, communications, financing, insurances, real estates, business services, social services and personal services. Based on the World Trade Organization (WTO), construction is also included (Union Budget, 2013).

The construction embedded in service sector refers to the engineering consultancy which includes architectural, civil and structural, mechanical and electrical consultancy and so forth. Engineering consultancy services play a vital role

in the construction industry. It is of paramount importance to ensure that the construction project is able to be constructed accordingly. In accordance with that, business management in engineering consultancy is crucial to enhance its own performance and hence improve the performance of the entire construction industry.

According to the Registration of Engineers Act, only professional engineers are permitted to own Engineering Consultancy Practice (ECP). This regulation has restricted the expansion of ECP in Malaysia and limited the growth of the construction market. The lack of ECP choices available in the construction market has resulted in unhealthy competition among ECP (MIDA, 2015). Therefore, Malaysian Government has taken initiatives to amend The Registration of Engineers Act in 2012 by opening the ownership of ECP to the public. The amendment was gazetted earlier in February 2015 (Registration of Engineers Act 1967, amendment 2015)

In October 2011, the announcement of Malaysia Budget 2012 highlighted the enforcement of the liberalization for seventeen (17) service sub-sectors in phases, including architectural and engineering services (Malaysian Budget 2012, 2012). Liberalization offers opportunities to the transfer of capital, expertise, and technology to domestic firms. It provides opportunities for domestic firms to join venture with foreign firms with the intention to expand their business not only within Malaysia but also foreign countries. However, the shortcoming of this scenario is the chances of inefficient, unproductive or uncompetitive local firms being eliminated from the business.

As liberalization generates competitive challenges, local firms are forced to improve their competitiveness by retrenching unnecessary cost components, exploiting external economies of scale and scope and adopting more innovative technologies and better management practices. The adoption of successful business model will certainly accelerate the expansion of local ECP and local firms will be all geared up to face this challenge.

1.2 Problem Statement

In order to enjoy greater business opportunities arisen from the global liberalization of services, Malaysian services industries have to adapt to an open market competition. In this context, the services sector has to build up their efficiency, productivity, and competitiveness by all means to increase foreign participation while adopting the best global practice standards. The biggest challenge faced by the local services sector is the ability to attract foreign investment, especially Engineering Consultancy Practice (ECP) firms.

The majority of the ECP services sector is categorized under Small Medium Enterprises (SME) with an annual turnover of less than RM20 million and number of employees ranging from 5 to 75 persons (SEM Corp, 2013). In general, SMEs are having common difficulties in the lack of skills, insufficient resources, strategic planning and inspiring vision, standard and quality control and low productivity. These weaknesses are believed to have been caused by the minor size of the firms, limited staffs, rapid rate of human resource turnover and the highly competitive consultancy market. Therefore, it is essential to explore what is the existing ECP business model practiced in Malaysia.

“Thousands of engineers in the country will have to wind up their enterprise if the Government allows non-professionals to own and operate consultancy practices”, such was the concern of The Institution of Engineers’ Malaysia (IEM), expressed through the mass media on 12th December 2012. The IEM president commented that if anyone is allowed to own 100% equity in an engineering consultancy practice, even a fish monger can establish a consultancy firm and hire engineers to work for him. Professional engineers, especially those from micro or small-scale firms will face greater challenges due to the liberalization of service sub-sectors (The Star, 2011).

According to a survey done by the Board of Engineers Malaysia (BEM) and the Association of Consulting Engineers Malaysia (ACEM) in the year 2003, 97% of Engineering Consultancy Practice (ECP) is categorised under SMEs (BEM, 2013). In view of that, competitiveness becomes an inevitable issue for ECP as a result of liberalisation of service sub-sectors in phases. Building capacity of ECP will be paramount not only towards enhancing the skills and productivity of ECP, but also to ensure the resilience of ECP in sustaining their businesses over the long term amidst an uncertain external environment and competition resulted from the liberalization of markets.

Although there are numerous business models available in the academic arena, they are mainly used for manufacturing, product-based, information system and networking business. This can be seen from the following research gaps analysis in Figure 1.1.



Figure 1.1: Research Gaps

Figure 1.1 illustrated the research gaps of the study. It is discovered that there is no existing business model that can be harnessed to improve Engineering Consultancy Practice (ECP). Consequently, the ECP in Malaysia suffers from poor business performance, which is why BEM proposes that liberalization might be an effective way to bring positive changes to the current scenario (BEM, 2013). Therefore, this research is aimed to develop a business model that can be particularly used in Engineering Consultancy Practice (ECP). As mentioned earlier, the absence of a concrete business model that is exclusively meant for ECP in Malaysia has led to incompetent, unsystematic and poor performance in the country. Moreover, the suggestion to measure the ECP business performance is first introduced in body of knowledge by developing the ECP Business Performance Measurement. Also, the critical factors to improve ECP business performance will be identified throughout the research in order to facilitate better business performance. The formation of the ECP Business Performance Measurement is validated by the experts to ensure its workability in the housing industry.

Therefore, it is important to identify a successful business model to be adopted by ECP for it to build its capacity and competitiveness to face the great challenges brought about by the liberalization of services sub-sector.

1.3 Aim and Objectives

The aim of this study is to improve the business performance of Engineering Consultancy Practice (ECP) to build its capacity and competitiveness in local services sector. For that reason, it is integral to introduce an innovative business model in ECP to enhance the performance of ECP business in Malaysia. Therefore, the study will undertake three specific objectives as follows:-

- i. To identify the existing Engineering Consultancy Practice business models;
- ii. To identify the critical success factors in Engineering Consultancy Practice;
- iii. To develop conceptual model of Engineering Consultancy Practice Business Performance Measurement factors.

1.4 Scope of Study

A few considerations have been taken into account while carrying out this study. Due to resource and time constraint, the following are the limitations which have been imposed on the study:

- i. The study is limited to Civil & Structure Engineering Consulting firms in Malaysia.
- ii. Data collection will be carried out through questionnaire survey conducted in Malaysia.

1.5 Research Methodology

The proposed study is to be carried out in three (3) stages as shown in Figure 1.2. The three stages are: (1) topic selection; (2) study proposal and (3) data gathering and processing. As for Stage 1, problems faced by EPC are discussed. This is followed by the identification of scope of study before proceeding with the literature review, which is explained in greater details in the following chapter. Apart from that, the aim and objectives of this study are formulated, respectively. Finally, the methodology of this study is proposed.

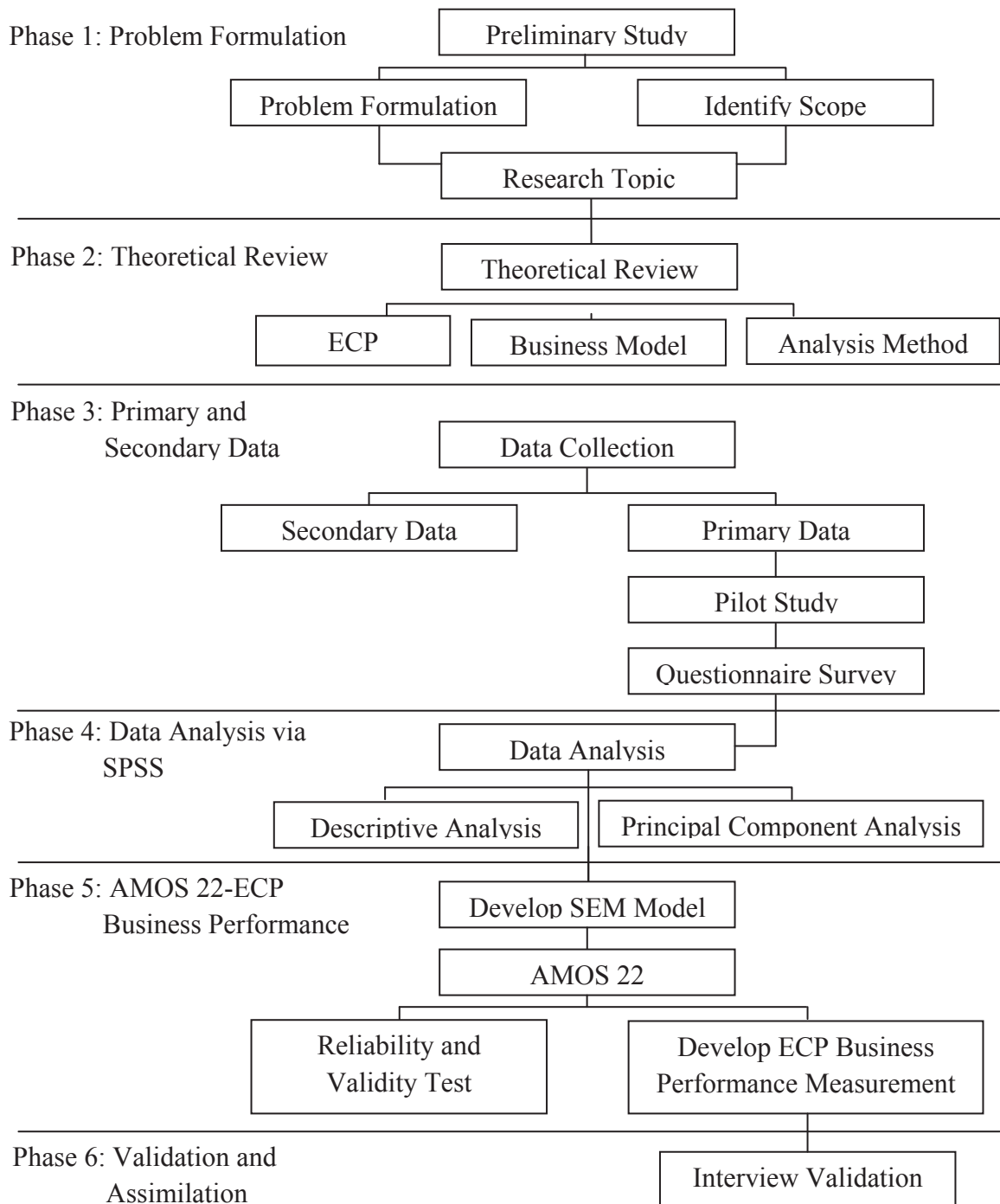


Figure 1.2: Flow Chart of Research Methodology

1.6 Expected Findings

Stated below are the expected findings upon completing this research:

- (i) The existing business models that are being practiced in Malaysian ECP are identified. At the same time, the most effective business model is recognized.
- (ii) The critical factors that lead to ECP's success are identified.
- (iii) An ECP Business Performance conceptual model is developed.

1.7 Significance of Study

The significance of this study can be seen from both the theoretical and practical aspects. From the theoretical aspect, it covers mainly the field of academics and educations. The result of this study is able to enrich the context of business management in academia and management philosophy. In addition, despite the fact that this study only focuses on the Malaysian ECP, it can be served as a solid basis upon conducting an international comparative study of the business performance in Southeast Asia or even Asia. This could further broaden the horizon on how to manage a business performance in different geographical locations.

From the practical aspect, the outcome of this study, a causal relationship framework is developed to draw attention to the ECP practitioners, thereby improving the general understanding business management in ECP. Meanwhile, understanding the criteria of ECP's success could help to evaluate the success of a business. The criteria of business management are complex in nature and multifaceted. It is also impossible to totally focus on all aspects of a business. Therefore, understanding the success factors and criteria could provide assistance to

focus the restrained resources on certain aspects of the business (input), thereby enhancing the output.

1.8 Structure of the Research

Chapter One presents the research background, formulates problem statements, discusses the issues, objectives and the fundamental flow of the study. Heaps of Engineering Consultancy Practice (ECP) issues are tackled to achieve the aim and objectives mentioned earlier. This chapter gives an essential overview of the study and introduces the study to the public. The significance of the study to ECP is discussed at the end of the chapter.

Chapter Two elaborates the newly introduced liberalization in Malaysian service sector. A detailed discussion on liberalization in Asia and in Malaysia is thoroughly explored. The discussion consists of the exploration of liberalization in Engineering Consultancy Practice (ECP) in Malaysia, advantages and disadvantages of liberalization in ECP and the procedures to apply for ECP.

Chapter Three explores the business models used in ECP Malaysia. This chapter reviews the existing ECP business models in practice. The strengths and weaknesses of each business model are studied, setting out to ensure that the ECP in Malaysia is able to enhance its performance by implementing suitable business model.

Chapter Four explains the procedures and processes involved in this study. The study consists of six main research activities; literature review, critical review, questionnaire survey, data analysis, model formation and data validation. These

activities are equally critical in terms of accomplishment of the research objectives. Moreover, the concept of Structural Equation Modelling (SEM) through Analysis of Moment Structure (AMOS 22 for Windows) software is discussed thoroughly in this chapter. The clarification of modelling techniques helps to formulate the required ECP Business Performance Measurement at the end of the study. A series of systematic procedures of study is elucidated in order to guide and control the quality which leads to the success of this study. In addition, the preliminary analysis on demographic background of respondents is presented in this chapter.

Chapter Five presents the analysis gathered from the questionnaire survey. A quantitative analysis software, Statistical Package for Social Sciences (SPSS 16.0 for Windows) is used to analyze the data collected. The analysis adopted includes the Principal Component Analysis (PCA), reliability test, Cronbach Alpha and so forth. Both Exploratory Factor Analysis and Confirmatory Analysis are discussed in details for the purpose of forming SEM model.

Chapter Six models the ECP Business Performance in Malaysia. It discusses the application of the business models in ECP. Structural Equation Modelling (SEM) is conducted to formulate interrelationship modelling for the data set. Moreover, the relationship of each business model core values is defined through SEM model. Finally, ECP Business Performance Measurement is delivered from SEM model.

Lastly, findings and conclusions derived from the study are presented in Chapter 7. This chapter also highlights the recommendations for future researchers who intend to extend the existing study.

studies from countries of different geographical locations should be encouraged to compare the issues related to ECP worldwide.

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