UNIVERSITI PUTRA MALAYSIA

BARRIERS AND ASSESSMENT OF READINESS TOWARDS MITIGATION TO CONSTRUCTABILITY IMPLEMENTATION IN MALAYSIA

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BARRIERS AND ASSESSMENT OF READINESS TOWARDS MITIGATION TO CONSTRUCTABILITY IMPLEMENTATION IN MALAYSIA

By

RIADH G HASAN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Doctor of Philosophy

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DEDICATION

I dedicate this work to all those who share
the joy of its completion

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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Constructability is one of the new directions in the field of construction management. The application of constructability concepts in developed countries such as USA, UK and Australia has been proven to yield tangible benefits to the construction project stakeholders and in turn has leveraged the improvement of the construction industry in these countries.

The Construction Industry Institute (CII) in USA stated that there are barriers that impede the implementation of constructability and designated the identification of these barriers as one of the steps in the first milestone of constructability implementation roadmap.

Recent researches in constructability conducted in Malaysia showed that this concept is not yet adopted by the Malaysian construction industry. The lack of implementation of constructability by the construction project's stakeholders in

Malaysia indicates that there are barriers that oppose its adoption. Consequently the this research aimed at identifying those barriers together with their causes and studying the existence of the barriers among the main construction project stakeholders in addition to the readiness of the stakeholders to overcome the barriers.

Based on the available literature twenty six potential barriers were formulated forming the basis for the broad questionnaire type survey research that was carried out to study the barriers to constructability implementation in Malaysia. The survey research was augmented by four case studies that were chosen to cover construction projects of different types and sizes. The cases also served as means of identifying the main causes behind the existence of the major barriers.

The research findings showed that fifteen out of the twenty six barriers were major barriers that were claimed to exist by more than fifty percent of the respondents. The highest ranking barrier in the study was the absence of systematic documentation and retrieval of "lesson learned".

Furthermore, the three main categories of the construction project organization types were found to have nearly equal number of barriers with designers and the contractors' organizations having slightly higher number of existed barriers than the owners. The designers and contractors had sixteen barriers compared with fourteen in the owners' organizations.

Finally, this research concluded that the Malaysian main project stakeholders have an understanding of the need to remove severe barriers. And as an indication of the high readiness of the Malaysian construction industry to mitigate the barriers, the research showed that the probability of high readiness of the construction project stakeholders to overcome the barriers was more than 50 percent for 11 out of the 15 major barriers.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

RINTANGAN DAN KESEDIAAN UNTUK MENGATASINYA KEPADA PELAKSANAAN KEBOLEHBINAAN DI MALAYSIA

Oleh

RIADH G. HASAN

Disember 2007

Pengerusi: **Profesor Madya Mohd Razali Abdul Kadir, PhD**

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Kebolehbinaan adalah salah satu perkembangan dan tujuarah baru dalam bidang pengurusan binaan. Pengunaan konsep kebolehbinaan di negara-negara maju seperti USA, UK dan Australia telah terbukti menghasilkan faedah yang amat ketara kepada mereka yang terlibat dalam projek-projek pembinaan. Hasil dari kebolehbinaan ini dapat memajukan industri pebinaan di negara-negara tersebut.

Institut Industri Binaan (CII) di Amerika Syarikat menyatakan terdapat rintangan-rintangan yang menjadi sekatan kepada pelaksanaan konsep kebolehbinaan ini lalu menjadikan pengenal pastian rintangan-rintangan ini sebagai langkah-langkah awal didalam peringkat kearah halatuju pelaksanaan kebolehbinaan.

Beberapa kajian kebolehbinaan yang telah dilaksanakan baru-baru ini menunjukkan bahawa konsep lagi belum digunapakai didalam industri binaan di Malaysia. Ia jelas menunjukkan bahawa terdapat banyak rintangan yang menghalang perlaksanaanya.

Justeru itu matlamat kaji selidik ini adalah untuk mengenal pasti rintangan rintangan serta dengan sebab musababnya. Juga ia bertujuan untuk menyelidik kewujudan rintangan rintangan dikalangan organisasi utama projek pembinaan dan kesediaan mereka untuk mengatasi rintangan rintangan tersebut.

Merujuk kepada hasil penulisan yang sedia ada, terdapat dua puluh enam jenis rintangan yang dikenalpasti dijadikan asas tinjauan soal selidik yang menyeluruh bagi mengkaji rintangan rintangan kebolehbinaan yang dilaksanakan di Malaysia. Kaji selidik ini diperkuat dengan empat kes kajian dipilih mengikut perbedzaan jenis projek dan saiznya. Kes-kes ini juga berguna sebagai pendekatan mengenal pasti sebab sebab yang paling penting terhadap kewujudan rintangan rintangan utama.

Kajian ini menunjukkan bahawa lima belas daripada dua puluh enam rintangan tersebut disenaraikan sebagai rintangan utama yang didakwa wujud oleh lebih dari lima puluh peratus responden. Rintangan yang diberikan “ranking” tertinggi dalam kajian ini adalah ketiadaan dokumen yang sistematik dan maklumat “lesson learned”.

Tambahan pula, tiga kategori utama didalam jenis organisasi projek pembinaan didapati mempunyai hampir sama bilangan rintangan rintangan, hanya pereka-bentuk dan organisasi kontraktor mempunyai rintangan rintangn lebih sedikit dari organisasi pemilik. Pereka-bentuk dan kontraktor organisasi ada enam belas rintangan rintangan berbanding empat belas di dapati didalam organisasi pemilik.

Sebagai rumusan, kajian ini mendapati bahawa kesemua mereka yang terlibat secara langsung didalam industri pembinaan di Malaysia mempunyai kefahaman yang sama dimana keperluan untuk menghapuskan rintangan rintangan yang dianggap mempunyai impak yang besar amat mendesak. Dalam hal ini, kajian ini telah menunjukkan bahawa kesediaan oleh mereka untuk mengatasi rintangan rintangan tersebut berada pada tahap yang cukup tinggi dimana dalam 11 dari 15 rintangan besar yang dikenalpati, 50 peratus dari responden telah menunjukan kesediaan yang tinggi untuk melaksanakannya.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
BR	Business Roundtable, USA
CAD	Computer Aided Design
CIDB	Construction Industry Development Board, Malaysia
CIC	Computer Integrated Construction
CII	Construction Industry Institution, USA
CIIA	Construction Industry Institution, Australia
CIRIA	The Construction Industry Research and Information Association, UK
CSI	Construction Specification Institute
CM	Construction Management
ECI	European Construction Institute
EPC	Engineering, Procurement and Construction
EPCM	Engineering, Procurement and Construction Management
I&C	Installation and Commissioning
IT	Information Technology
QA/QC	Quality Assurance/Quality Control
SPSS	Statistical Package for Social Science
2D	Two Dimensional Drawing
3D	Three Dimensional Drawing

CHAPTER 1

INTRODUCTION

1.1 Introduction

The Malaysian construction industry plays a significant role in the economic growth of the nation. Records showed that the contribution of the construction industry constitutes 3-5% of the national gross domestic product (GDP). Furthermore the contribution is not limited to economical aspects only but it also participates in the creation of wealth and quality of the population (CIDB, 2000).

According to Zin (2004) this industry is criticized for being slow in improving the approach to develop and deliver the facilities to the client in addition to being fragmented and lacks the integration between design and construction. Furthermore the Malaysian Construction Industry Development Board (CIDB), in its technology foresight report, stated that the industry is suffering from low productivity and low technology construction methods. The board also indicated that their vision of the Malaysian construction industry in year 2020 to be one that is productive, safe and healthy, of quality and sustainability, and benefiting from globalization (CIDB, 2000).

Constructability which is generally the integration of design and construction is one of the new concepts in construction management that improves the construction process and in turn enhances the performance of the construction industry to make it

more efficient.

In developed countries like USA, UK and Australia, the benefits accrued from implementing constructability are well documented. Implementing constructability can lead to significant quantifiable improvements in project performance in terms of time, cost and quality besides that constructability can also lead to qualitative improvements in the project process as well as the building product (McGeorge, 1997). Many examples for the quantifiable benefits can be found in literature. In USA, the Business Roundtable (1982) quoted that savings between 10 to 20 times the costs of constructability program implementation. The Construction Industry Institute (CII) in USA reported that projects utilizing constructability resulted in 6 to 10% saving in construction costs (CII, 1986). Another research mentioned that benefits/cost ratios of 10:1 in addition to 10% reduction in project duration can be achieved by applying constructability program (Russell, 1993).

Thus implementing constructability in an industry that is fragmented and of low productivity like the Malaysian construction industry will help in diminishing those shortcomings. In addition to that, applying the concept will participate in sustaining the natural resources of the country by minimizing wastages resulting from inefficiency of the current construction industry practices. Building on the above, the road should be paved for the implementation of constructability.

Furthermore the study by Low and Abeygoonasekara (2000), in an attempt to gauge the readiness of the construction industry in Singapore to adopt a legislation of

buildability requirements, concluded that the industry in Singapore appears to be ready to receive this legislation which makes buildability, which is the UK equivalent of constructability, mandatory for building plan approval. In addition to that the research also recommended that Malaysia, where the construction practices are similar to Singapore, can similarly explore the readiness of her construction industry to embrace constructability concept with a view of legislating constructability requirements in the near future. It is worth to mention here that the legislation in Singapore is in effect since 2001. Moreover, the CIDB in Malaysia considered conducting research in constructability as one of the means to enhance the construction industry quality and productivity as one of its 2020 foresight priority areas (CIDB, 2000).

Finally the CII constructability implementation guide designated the identification of barriers as one of the steps in the first milestone of its constructability implementation roadmap. The guide also stated that the barriers are widespread and quite diverse from organization to other and regardless of what one organization's barriers are, it is imperative that such barriers are identified and addressed appropriately so that they can be removed for successful constructability implementation (CII, 1993).

1.2 Problem Statement:

As stated in the previous section research carried out in USA indicate that identifying and assessing the barriers to constructability implementation is one of the significant parameters to successful constructability program implementation. Furthermore, the studies indicated that the barriers are more abundant in cases where the level of application is very low or where constructability is not implemented at all (O'Connor, 1994 a & b).

A couple of studies in constructability that were conducted in Malaysia recently showed that this concept is not yet adopted by the Malaysian construction industry (Nima, 2001 and Zin, 2004). The lack of implementation of constructability by the construction project's stakeholders in Malaysia, despite the fact that constructability has many benefits to the construction industry of the country as highlighted in the previous section, suggests that there are barriers that oppose its adoption. Besides that the available literature shows that there is no prior attempt to study the barriers to constructability implementation in Malaysia. Consequently those barriers together with their causes must be identified. The existence of the barriers among the main construction project stakeholders should also be studied in addition to the readiness of the stakeholders to overcome the barriers. This will lead to better understanding of the current status of the industry concerning constructability so that priorities are set to facilitate the wide constructability implementation in the Malaysian construction industry.

1.3 Research Objectives:

Based on the discussion presented in the previous section the objectives of this study are:

- To identify the major barriers to constructability implementation in the Malaysian construction industry and their causes.
- To prioritize the strategies to be adopted in overcoming the barriers in the relevant sectors of the construction industry.
- To assess the readiness of the main construction project stakeholders in overcoming the major barriers to constructability implementation.

1.4 Scope of the Research

The scope of this study included the followings:

- Due to time and resource limitations the scope of this study was confined to cover only the main construction project stakeholders as representative of the Malaysian construction industry.
- In line with the above the engineers and architects were taken as the representatives of the main construction project stakeholders.
- The project types presented in the available case studies covered only building and highway types of projects.
- The questionnaire based survey, due to resource and time limitations, only included Kuala Lumpur and Selangor areas.

1.5 Significance of the Research

The Construction Industry Development Board (CIDB) in Malaysia considered conducting research in constructability as one of the means to enhance the construction industry quality and productivity (CIDB, 2000). Furthermore, it was mentioned earlier in this chapter that the CII constructability implementations guide designated the identification of barriers as one of the steps in the first milestone of its constructability implementation roadmap. Besides that the available literature showed that there is no prior attempt to study the barriers to constructability implementation in Malaysia. In addition to that there were no attempts by previous works to assess the readiness of each of the main construction project stakeholders to mitigate the barriers and to examine the effect of severity of the barrier on their readiness. Moreover, the available literature is still meager to works that give sufficient explanation and elaborated description of the listed texts of the barriers in literature and in line with this Nima (2001), in his study of the constructability factors in Malaysia, acknowledged the scarcity of documented cases concerning constructability implementation issues in Malaysia and recommended further studies to be carried out to bridge this gap.

This study contributed in narrowing this gap by extensively addressing the major barriers to constructability implementation affecting the Malaysian construction industry and providing assessment of the readiness of the main construction project stakeholders to mitigate the major barriers as a step towards constructability implementation in Malaysia.