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Holistic BIM Adoption in Malaysia: A Stock Flow Diagram of Education Institution Precedence

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Research Highlights

The government has allocated substantial budget for the National Key Economic Areas (NKEA) to increase productivity in the construction sector by focusing on increasing technology adoption. However, the Construction Industry Transformation Plan (CITP) has reported that Building Information Modelling (BIM) in Malaysia is low in uptake. It is estimated that only 10 per cent of construction stake players have adopted the technology. In order to encourage BIM adoption in the Malaysia construction industry, the government strategy is to impose level 2 BIM for all government projects from 2019 onwards. Therefore, the research objectives of this paper are to identify the main BIM driving factor and to simulate the intervention model of low BIM adoption in Malaysia. Primary data were collected through questionnaire survey and analysis of the mean value shows that education institution scored the highest value as a potential driving factor to holistic BIM adoption. Consequently, using the stock flow diagram in system dynamic modelling, the paper reveals the novelty of the development of intervention model among the education institution enablers. The use of the intervention model has the potential to assist the Malaysian government in improving the uptake the CITP and reach for the Fourth Industrial Revolution.

Research Objectives

This paper aims to examine the extent of education institution precedence towards holistic BIM adoption in Malaysia. The final part recommends the potential enablers for holistic BIM adoption from education institutions. It also presents the formulating simulation model has the potential to assist the Malaysian government in improving the BIM uptake in line with the CITP and the Fourth Industrial Revolution

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Methodology

In this study shown by figure 1, the questionnaire was used to validate the conceptual model derived from literature review and structured interviews analysis findings during Phase One of the study, and further acquire more insight into the current reality of issues under investigation. This is supported by Vennix (1996) who propose the use of a questionnaire in validating causal model. Phase Two study adopted a proportionate stratified random sampling method to select samples from the aggregate population of respective groups that make up the population of the study. A total of 415 questionnaires were administered, of which 125 were returned (approximately 30% response rate). The respondents surveyed represents a spectrum group including 32% government agencies, followed by 16% private clients, 18% consultant organisations and 34% contractors. The data collection was considered successful because it met the 30 per cent response rate benchmark to produce reliable and convincing research result (Gillham, 2000). This paper only discusses the findings of the Phase Two study, whereby the Phase One study was discussed at an antecedent publication.

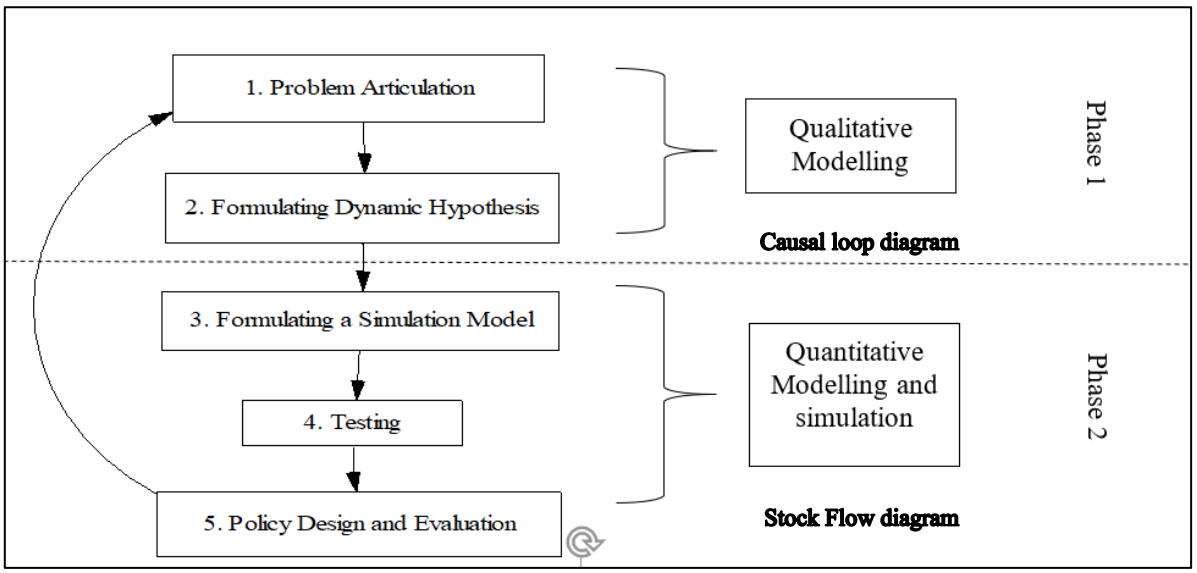

Figure 1: Study methodology using system dynamic modelling according Sterman (2000)

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Results

Based on the findings, 45.6% of the respondents had 10 years and above experience in the construction industry, but only 4 % of respondents had 6 years and above of BIM experience. This show the BIM adoption is still impeding and not holistically adopted by construction stake players. The most of the respondents (72.8%) had BIM experience. 45.6% of the respondents had 1 to 2 years BIM experience, 23.2% of the respondents had 3 to 5 years BIM experience and 4.0% of the respondents had more than 6 years BIM experience. It can be safely assumed that the respondents had adequate experience to supply reliable data for the study. Further reveals that the respondents claimed confident level knowledge and skill in BIM; 33.6% from respondents claimed not confident, 34.4% from respondents claimed in between and 32% from respondents claimed confident.

In depth analysis compares between three theme of driving factors which could form holistic BIM adoption. The analysis convincingly shows that the education institution has the highest mean score value as a potential driving factors to holistic BIM adoption. Therefore, consideration in developing this stock flow diagram model to reflect a framework in giving the guideline to enhance the holistic BIM adoption among construction players.

Findings

System Dynamic Modelling (SDM) was used in this study to capture the interactions and causal relationships of the enablers for holistic BIM adoption from education institution. SDM was initially developed by Forrester (1961) to reflect the view that the dynamics of industrial systems result from the underlying structure of flows, delays, information, and feedback. Accordingly, *Vensim* software was used as SDM software which provides a simulation tool applying the basic principles and equations of System Dynamics. The parameter values used in this stock flow diagram model were obtained from head of programme of one of education institution (A) in Malaysia. As a constraint, the stock flow diagram model describes only data from one educational institution. The programme was selected because the BIM syllabus was implemented in 2014. Findings suggest in figure 2, the stock flow diagram depicts the recommendation of the enablers for the holistic BIM adoption from education institution.

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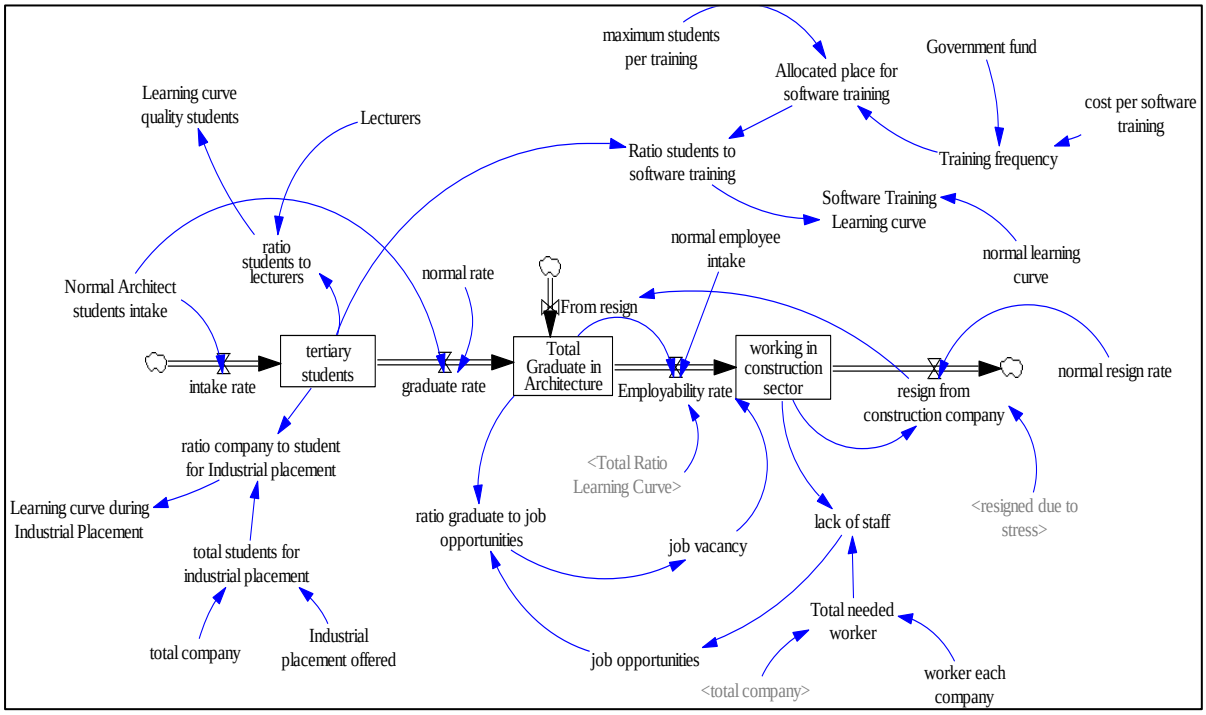

Figure 2: Recommendation of the enablers for holistic BIM adoption from education institution A

Precedence of educational institution was considered the main driver factor for adopting holistic BIM in Malaysia. In addition, the inability to overcome the low BIM uptake due to lack of mechanisms and methodologies that can help facilitate the root causes of low BIM uptake. Finally, the prototype intervention simulation model used to facilitate low BIM adoption Malaysia by revealing the pertinent enablers for holistic BIM adoption from education institution. The stock flow diagram model has also been registered and gets intellectual property (IP) for declaration of intellectual property from MyIPO. Nevertheless, the simulation model has the potential to assist the Malaysian government in improving the uptake the CITP and reach for the Fourth Industrial Revolution.

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