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INDIVIDUAL READINESS OF CONSTRUCTION STAKEHOLDERS TO IMPLEMENT INTEGRATED PROJECT DELIVERY (IPD)

WAN NADZRI OSMAN[1,*], MOHD NASRUN MOHD NAWI[1], FAISAL ZULHUMADI[1], MOHD WIRA MOHD SHAFIE[2], FAZDLIEL ASWAD IBRAHIM[3]

[1]School of Technology Management and Logistics, Universiti Utara Malaysia
[2]School of Housing, Building and Planning, Universiti Sains Malaysia
[3]Faculty of Engineering, Universiti Malaysia Perlis
*Corresponding Author: wannadzri@uum.edu.my

Abstract

The Malaysian government has taken the initiative of implementing the Industrialized Building System (IBS) in which components are manufactured in mass production under a controlled environment (on or off site), transported, positioned, and assembled into a structure with minimal additional site work. It is hoped that IBS can improve the performance of the construction industry. However, the main barrier in IBS implementation is the project delivery process. In order to overcome this barrier, Integrated Project Delivery (IPD) as a project delivery system using a multi-party contract was introduced. IPD is defined as a project delivery approach that integrates people, systems, business structures, and practices into a process that collaboratively harnesses the talents and insights of all project participants to optimize the results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction. The aim of this research was to assess the readiness of individuals involved in the Malaysian construction industry toward IPD implementation. This research used a quantitative study design that involved a literature review, data collection, framework development, validation, and recommendation stages. This research obtained data based on multidisciplinary IBS stakeholders' perspectives where the respondents included project managers, resident engineers, architects, and contractors. Respondents directly involved in the construction industry said they are willing to change and implement IPD, with their readiness was recorded at the moderate mean value. It can be noted that each individual involved as respondents are ready to implement IPD.

Keywords: Individual readiness, Construction stakeholders, Integrated project delivery.

1. Introduction

In an attempt to develop sustainable development in the construction process, the Malaysian government took the initiative of implementing a modern construction method called Industrialized Building System (IBS). IBS (known as offsite manufacturing in the UK construction industry) is a construction technique in which components are manufactured in mass production under a controlled environment (on or off site). These components are then transported, positioned, and assembled into a structure with minimal additional site work [1].

Although IBS had been introduced 40 years ago with well-documented benefits and staunch support from the government, the pace of implementation and usage of IBS is still relatively slow and below the government target [2]. Investigation by some researchers identified that one of the main barriers of IBS implementation in the Malaysian construction industry is related to the traditional project delivery process [3-6]. As a result of this fragmentation, the traditional construction process tends to incur additional costs from rework stemming from errors, quality issues, inefficiency of project delivery times [7], poor performance [8], and client dissatisfaction of product delivery [9]. Furthermore, this practice only allows manufacturers and contractors to be involved after the design stage, thus creating problems for the supply chain process (such as delays, late supply, etc.) and constructability related issues [10]. This practice is worsened by the knowledge that M&E is not aligned with C&S and architectural drawings thus resulting in the issue of redesign drawings during the design stage of IBS projects [1].

In an attempt to overcome this issue, many industry-led reports [9,11-13] have all called on the industry to change from its traditional modus operandi (fragmented approach) and perform better through increased integration. Recent follow-up reports such as the UKCG [14], challenged the construction industry to create a fully integrated service capable of delivering predictable results to clients through processes and team integration.

Many researchers proved that Integrated Project Delivery (IPD) as a project delivery system using a multi-party contract (involving more than two parties) has a major impact on the state of the industry to improve team integration in current construction project delivery [15-17]. IPD is defined as a project delivery approach that integrates people, systems, business structures, and practices into a process that collaboratively harnesses the talents and insights of all project participants to optimize the results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction.

Despite the above benefits, IPD faces some barriers or difficulties of implementation in construction projects. According to Ghassemi [15], a number of criteria must be fulfilled to achieve fully integrated projects requiring companies to have procurement ability and to be inherently structured.

Based on the literature, it showed that the findings of previous studies and tangible examples of readiness assessment models, especially in the Malaysian construction industry, are limited. By highlighting the key factors which underpin the dimensions of the model will expectedly help IBS stakeholders to get some overview of current practice without having to learn lessons the hard way (i.e., by trial and error). Furthermore, this researcher believes that readiness assessment for IPD will provide a significant step forward for the IBS industry toward improving

the performance of project delivery. More importantly, IBS stakeholders need to ensure that the assessment is properly structured for effective implementation and monitoring, so as to avoid introducing too many new techniques at once without having to identify the current situation or level of integrated practices before implementing a new strategy in the future.

This research aimed to explore the development of a tool or metrics which could be used to investigate the readiness of the construction industry to improve its project delivery process through the implementation of Integrated Project Delivery (IPD), and formulate strategies for the effective implementation of IPD within the industry. This study was conducted to observe the readiness of stakeholders from various aspects involving individual attributes.

2. Research Questions

- What are the existing tools and metrics for assessing the readiness of an organization for IPD implementation?
- How to assess the readiness of an individual involved in the Malaysian construction industry toward IPD implementation (by using the tools and metrics resulted from objective 1)?

3. Computer Programme: Validation and Verification

This study embarks on achieving the following objectives:

- to investigate the existing tools and metrics for the readiness assessment of organizations for IPD implementation; and
- to assess the readiness of individuals involved in the Malaysian construction industry toward IPD implementation (by using the tools and metrics resulted from objective 1).

4. Research Method

This research involved collecting the stakeholder perception based on their experiences in implementing IPD in their IBS projects. The study was conducted with the intention to obtain a good grasp of IPD among the construction stakeholders in IBS projects. More specifically, the purpose of this research was to investigate the existing tools and metrics for assessing the readiness of organizations for IPD implementation, to assess the readiness of the construction industry in Malaysia for IPD implementation, and develop a readiness assessment model to implement IPD in IBS construction projects.

This study was cross-sectional where the data was gathered only once through a survey method. For this study, the unit of analysis was the IBS stakeholder. Each respondent was chosen to represent their organization in the readiness measurement of implementing IPD in their IBS construction projects. The respondents consisted of project managers, resident engineers, architects, contractors, and other similar job positions in the same category. The data were collected from March 2016 to September 2016.

5. Population and Sample

The population of this study comprised construction stakeholders operating in Malaysia. The list of the companies was obtained from Real Estate and Housing Developers' Association Malaysia (REHDA), Construction Industry Development Board (CIDB), Association of Consultants Engineer Malaysia (ACEM), Board of Architects Malaysia (PAM), and Board of Quantity Surveyors Malaysia.

Only companies involved in IBS and in Peninsular Malaysia were selected. Sabah and Sarawak based companies were excluded because of the geographical scope of the study. To be more representative, it was decided that the samples were obtained from northern, central, southern, and eastern regions of Peninsular Malaysia.

This research applied the stratified data sampling method to highlight a specific subgroup within the population. This technique is also used when the researchers want to observe existing relationships between two or more subgroups.

6. Measurement of Variable

There are one independent and one dependent variables involved in this study. The dependent variable was readiness assessment for implementation IPD, while the independent variable was Malaysian IBS projects. All variables were subjected to validity and reliability tests (pilot test) before the main survey was carried out. The Center for Teaching and Learning stated the benefits for performing a pilot test, which are;

- It permits preliminary testing of the hypotheses that leads to testing more precise hypotheses in the main study.
- It provides the researcher with ideas, approaches, and clues that may not have been foreseen before conducting the pilot study.
- It saves a lot of time and money.
- The researcher may try out a number of alternative measures and then select those that produce the clearest results for the main study.

The pilot test is very important because it is difficult to get the response from the developers to cooperate in the study. This is due to the nature of the construction industry where time is very limited compared to the workload. With exception of demographic factors, all other variables included in this study were measured by using multiple items drawn from previous research. However, phrasing of these items was modified to suit the sample and local setting.

To ensure that the dimension is applicable to the construction industry, this study performed a pilot test. The study instrument (questionnaire) employed a five-point Likert-type scale to measure the items representing the variables for this study, namely 1 = strongly disagree, 2 = disagree, 3 = neutral, 4= agree, and 5 = strongly agree for sections 2 and section 3. The purpose of using this rating scale is to enable respondents to express the direction and strength of opinion on the statements in the questionnaire. The use of five-point scale in this study was considered appropriate because it has been found to increase the reliability of the measure, reduce social desirability bias among respondents, make respondents aware of what was being examined, give respondents the option to typically skip

the scale in case of ambiguity, and it had been used extensively by previous researchers (Garland, 1991).

7. Questionnaire Design

The questionnaire design for this study was based on the single measure, namely the five-point Likert-type scale. The items were collected and adapted from diverse sources, and compiled into the three sections, as follows;

i. Section 1: General Information,
ii. Section 2: Readiness Towards Integrated Project Delivery (IPD), and
iii. Section 3: Individual Readiness.

A five-point Likert-type scale ranging from 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree was designed to ensure the respondents easily capture the objectives of the questions.

8. Descriptive Summary of Respondents

The descriptive summary of respondent demographic characteristics is presented in Table 1. Briefly, the respondents involved in this research consisted of 36 (60%) males and 24 (40%) females. The respondents participated in this study consisted of 57 (95%) Malays, 2 (3.3%) Chinese, and 1 (1.7%) others. There were 15 (25%) respondents in the age range of 20 to 24 years old, 14 (23.3%) respondents in the age range of 25 to 29 years old, 13 (21.7%) respondents aged between 30 and 34 years old, 11 (18.3%) respondents were between 35 to 40 years old, 1 (1.7%) was within 41 to 45 years old, 3 (5.0%) were within 46 to 49 years old, 1 (1.7%) was within 50 to 54 years old, 1 (1.7%) was within 55 to 60 years old, and 1 (1.7%) was more than 60 years old. In terms of job position, 8 (13.3%) respondents were managers, 11 (18.30%) respondents were senior executives, 21 (35%) respondents were engineers/quantity surveyors/land surveyors, and 20 (33%) respondents were classified as others. In terms of educational background, 2 respondents held a PhD (3.3%), 12 respondents held a Master Degree (20.0%), 41 respondents held a Bachelor Degree (68.3%), 3 respondents held a Diploma (5.0%), 1 respondent held a Certificate (1.7%), and 1 respondent held a Malaysian School Certificate (SPM) (1.7%). In terms of work experience, 33 respondents (55%) had experience of 1 to 5 years, 12 respondents (20%) had experience of 6 to 10 years, 8 respondents (13.3%) had experience of 11 to 15 years, 1 respondent (1.7%) had experience of 16 to 20 years, 3 respondents (5%) had experience of 21 to 25 years, and 1 respondent each (1.7%) had experience for 31 to 35 years and more than 36 years, respectively. The type of companies participated in this study exhibited the following statistics; 8 companies (13.3%) were public listed companies, 33 companies (55%) were private limited companies, 1 (1.7%) was a partnership company, 3 (5%) were corporation companies, and the balance of 14 companies were classed as others (23.3%). In terms of the years of company establishment, 17 companies (28.3%) were in the construction industry for 1 to 10 years, 20 companies (33.3%) were in the industry for 11 to 20 years, 11 companies (18.3%) were in the industry for 21 to 30 years, 6 companies (10%) were in the industry for 31 to 40 years, 1 company (1.7%) was in the industry for 41 to 50 years, and the balance of 4 companies (6.7%) were in the industry for more than 51 years. The companies used of IBS components with the

following statistics, 34 (56.7%) companies used 0 to 25% of IBS components, 13 (21.7%) companies used 25 to 50% of IBS components, 11 (18.3%) companies used 51 to 75% of IBS components, and 2 (3.3%) companies used 76 to 100% of IBS components in their construction projects.

Table 1. Background information of the respondents.

Variables	Companies	
	Frequency	**Percentage (%)**
Gender		
Male	36	60
Female	24	40
Race		
Malay	57	95
Chinese	2	3.3
Others	1	1.7
Age		
20 to 24	15	25
25 to 29	14	23.3
30 to 34	13	21.7
35 to 40	11	18.3
41 to 45	1	1.7
46 to 49	3	5
50 to 54	1	1.7
55 to 60	1	1.7
60 and above	1	1.7
Marital status		
Single	31	51.7
Married	28	46.7
Widowed	1	1.7
Job position level in the company		
Manager	8	13.3
Senior Executive	11	18.3
Engineer/QS/Land Surveyor	21	35
Others	20	33
Educational level		
SPM	1	1.7
Certificate	1	1.7
Diploma	3	5
Degree	41	68.3
Master	12	20
PhD	2	3.3
Work experience		
1 to 5	33	55
6 to 10	12	20
11 to 15	8	13.3
16 to 20	1	1.7
21 to 25	3	5
26 to 30	0	0
31 to 35	1	1.7
36 and above	1	1.7

Type of company		
Public	8	13.3
Private	33	55
Partnership	1	1.7
Corporation	3	5
Others	14	23.3
Years of company establishment		
1 to 10	17	28.3
11 to 20	20	33.3
21 to 30	11	18.3
31 to 40	6	10
41 to 50	1	1.7
51 and above	4	6.7
Fulltime employee		
1 to 10	17	28.3
11 to 20	20	33.3
21 to 30	11	18.3
31 to 40	6	10
41 to 50	1	1.7
51 and above	4	6.7
Involvement in IPD project		
Yes	18	30
No	41	68.3
Use of IBS components		
0 to 25%	34	56.7
26 to 50%	13	21.7
51 to 75%	11	18.3
76 to 100%	2	3.3

9. Existing Tools and Metrics for Assessing the Readiness of Individuals Involved in Malaysian Construction Industry Toward IPD Implementation

This proposed research aimed at appraising Malaysian construction stakeholders' view of their readiness to implement IPD based on individual attributes.

A survey method was employed. For this study, the unit of analysis was the construction stakeholders' organization. Each respondent was chosen to represent his or her organization. Therefore, the targeted respondent was someone who is involved in the operation of the organization. The respondents consisted of project managers, engineers, quantity surveyors, and other relevant individuals, who responded on behalf of the construction stakeholders.

To assess the readiness of the organization in implementing IPD, this study used mean analysis. The scores for the variables under this study were presented based on the descriptive statistics related to mean and standard deviation for individual readiness. These scores were arranged into four categories to show the level of readiness, as shown in Table 2. These scores give an illustration of the respondent's feedback from the data obtained, as presented in Table 3.

Table 2. Criticality assessment criteria.

Mean Factor Score Range	Significant Level
1.0 – 1.99	Least ready towards IPD success
2.0 – 2.99	Mildly ready towards IPD success
3.0 – 3.99	Moderately ready towards IPD success
4.0 – 5.0	Mostly ready towards IPD success

Readiness Assessment of the Construction Industry in Malaysia for IPD Implementation. Based on Table 3, six elements were observed as significant to the implementation of the IPD, involving the willingness of individuals who participated in this study. Overall, six elements recorded with the mean values of greater than 4.00, which were between 4.02 to 4.08. In terms of individual attributes, it can be noted that each individual involved as respondents are ready to implement IPD. More importantly, they believe that IPD will benefit their organization that they represent. They also believe IPD will have a positive impact on their organization. Other elements under individual attributes also recorded values exceeding 3.00. The mean values obtained were between 3.12 to 3.98 and this indicated that all elements available under individual attributes were significant to ensure a more efficient implementation of IPD.

Table 3. Mean analysis for individual readiness.

	Mean Factor Score Range	Items
Mostly ready towards IPD success	4.08	I am willing to change the way I work if my company decides to adopt changes towards IPD
	4.08	I generally consider change towards IPD to be a positive thing
	4.07	I think that the change adopted towards IPD will benefit my company
	4.05	I think that the change adopted towards IPD will improve my company's overall efficiency
	4.05	I believe there are many things for me to gain if my company adopts the change towards IPD
	4.02	I am willing to do things in new ways if my company adopts the change towards IPD
Moderately ready towards IPD success	3.98	In the long run, I believe it will be worthwhile for me if the company adopts the change towards IPD
	3.88	I feel it does make sense for the company to initiate the change towards IPD
	3.87	My professional relationship with the existing clients will not be disrupted because of IPD adoption
	3.83	I am willing to find ways to make the change towards IPD
	3.82	I think that the change adopted towards IPD matches my company's priorities
	3.77	I do not feel stressed if I were informed that my company is going to adopt changes regarding the way things are done at work
	3.73	I do not tend to resist if the directors force me to adopt any changes regarding IPD

3.63	I am willing to take responsibility in my designated area if the change towards IPD fails
3.58	I do not feel any hassles if my company changes plan in order to adopt IPD
3.57	I feel comfortable if my company changes the performance criteria to be closely aligned with IPD even I will need to do extra work
3.50	I do not feel stressed if IPD changes adopted in my company do not go according to plan
3.25	I am not worried I will lose some of my job status in the company if my company adopts any changes towards IPD
3.12	I am willing to work more without extra payment if my company adopts the change towards IPD
3.78	**Average Mean**

10. Conclusion

Based on individual attributes, the respondents agreed to implement IPD in their future projects. The respondents believed that change towards IPD is a positive decision and it will bring benefit to their company. Respondents also agreed that they are willing to change the way they work towards IPD to achieve something better. Mean values recorded by all these elements were more than 4.00. Overall, the study found that in terms of the willingness of individuals in the construction industry, they are ready to implement IPD if it is a necessity for the company's success. This research showed that individuals are ready to change the way they work towards IPD.

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