Management Factors for Successful IBS Projects Implementation

Faridah Ismail*, Norazian Mohamad Yusufwan, Har Einur Azrin Baharuddin

Faculty of Architecture, Planning & Surveying Universiti Teknologi MARA, Shah Alam, Malaysia

Abstract

In recognition to the importance of management, this paper aims to establish the management factors contributing to successful implementation of IBS projects from the contractor’s point of view. With a response rate of 12%, findings from the questionnaire survey disclose that good working collaboration, effective communication channel and team member involvement during the design stage are the top three (3) most influential management-related factors towards the successful implementation of IBS projects in Malaysia. The result reinforced that good coordination between all parties play the main role towards successful implementation of IBS project.

Keywords: Management factors; industrialised building system; successful project implementation; IBS processes

1. Introduction

An industrialised Building System (IBS) is a construction system that is built using pre-fabricated components. The manufacturing of the components is systematically done using machine, formworks and other forms of mechanical equipment. The components are manufactured off-site and once completed will be delivered to construction sites for assembly and erection. IBS can be defined as a construction system which components are manufactured in a factory, on or off-site, positioned and assemble into structures with minimal additional site work (CIDB, 2003a). Since the first project of IBS in year 1964 till today, IBS in Malaysia is not well accepted by the construction parties because of failure to

* Corresponding author. Tel.: +603-55-444-350; fax: +603-55-444-353.
E-mail address: farid346@salam.uitm.edu.my.
adequately deal with risks in the IBS projects. Failure to keep in cost estimate in the IBS projects is still common in Malaysia and it is one of the reasons that limit the development of IBS (Hassim, 2009).

Management factors are important to ensure successful implementation of IBS project. A successful IBS project may be measured by rapid construction, quality production, completion within budget, extensive planning and scheduling, low risk handling, flexibility of design, technology of plant and equipment used etc. It is essential for the contractor to take into consideration all these success factors in order to achieve success in the IBS project implementation.

2. Management Factors towards Successful Project Implementation of Ibs Process

The construction of an IBS building has different stages according to type of project and demographic. Shukor, Mohammad, Mahbub & Ismail (2011) stated five processes of IBS which are initial works, components production at factory, transported to construction site, installation, and finishing. In each stage the critical success factors are categorised based on management factors, government policies and initiatives, design and construction and technical factors. This paper highlighted the success factors influencing the successful implementation of IBS project specifically the management-related factors. The management factors are the niche of the whole supply chain system in industrialised building system. It demonstrates a process of controlling and how something is done or used. In contrast to the management process of IBS, the systematic installation of each beam, column, wall or plank is carried out after the successful production of components. The management factors towards successful IBS project implementation will be identified and discussed in this paper. Such factors are good working collaboration, effective communication channel, team members involved during the design stage, extensive planning and scheduling, risk management, management of supply chain and logistics, top-down commitment, strategy and business approach, industry marketing strategies and environmentally friendly methods.

2.1. Good working collaboration

Collaboration is a recursive process where two or more people or organizations work together to realize shared goals (Marinez-Moyano, 2006). The related personnel can be divided into the following parties by their functions: design, manufacturing, management, supervision, construction, inspection, and support. At a construction site, there are personnel such as a project manager, a project engineer, site engineers, foreman, mobile crane operators, workers, and inspectors. Research conducted by Charnwasununth, Yabuki and Tongthon (2009) analysed that problems of team collaboration arise due to lack of information storing, sharing, and management among different types of personnel at the site and other personnel at the main and branch offices. Good working collaboration between all parties in the initial works of IBS process is crucial to ensure the success of IBS project implementation (Rahman & Omar, 2006). This is more than the intersection of common goals seen in co-operative ventures but a deep, collective, determination to reach an identical objective. Rashid (2009) suggests that collaborative approach between designer and manufacturer to make joint decision making in finalisation of IBS design is significant. Good working collaboration according to Kamar et. al (2010) will solve the problem related to complex interfacing between systems and ensure efficient process sequence in manufacturing plant and at site.
2.2. Effective communication channel

Communication process in an organisation especially in construction project involves information flows forwards, backwards, and sideways. Communication channels refer to the way this information flows within the organization and with other organizations. In construction, effective communication channel between all parties in the initial works of IBS process is important to ensure the success of IBS project implementation. Aziz (2007) recommended that an understanding of factors, such as communication and knowledge, which impact the decision making on the adoption of IBS in Malaysia, is crucial. Ochieng and Price (2010) viewed communication as a professional practice where suitable tools and regulations can be applied in order to improve the utility of the data communicated, and is a social process of interaction between individuals. According to Kamar et. al (2010) effective communication channel in supply chain need to be established in order to coordinate the process and deal with critical scheduling from the beginning until the project completion (Pan et al, 2008). At design stage, improvement is needed in communication and integration among the IBS team player such as designer team, construction team and manufacturers (CIDB, 2009). Lack of communication in IBS project will lead to the unnecessary need for redesign of plans and working drawings resulting in additional costs and time (Kamar et. al., 2009; CIMP; 2007).

2.3. Team members’ involvement during the design stage

Designing is an activity that carries a certain responsibility that, at times, weighs heavily on some designers’ shoulders (Onyeizu and Abu Bakar, 2011). They added these responsibilities in still fear of design possibility for IBS designers because IBS application is new to the industry. When deciding to commence with IBS project, project manager should select co-operative team members to make sure the project run smoothly. The design stage in IBS is in the initial works. In general, the design process has five stages including conceptual, preliminary design, final design, tender preparation and construction administration. It is the most important stage as the planning by all team members will portray the completed IBS project (Nawi, Abdul-Nifå, Abdullah & Yassin, 2012). Differences in conceptualisation and idea among team member affect their perception of design and technological system (Onyeizu and Abu Bakar, 2011). The differences in conceptualization and ideology that exist among stakeholders affect their perception of design and technological systems (Onyeizu and Abu Bakar, 2011). Thus, given that the outcome of every design is influenced by the stakeholders’ interest in the project, the application of IBS in building design can also be influenced by the perception of the stakeholders that are involved in the design process of most IBS projects. Therefore it is vital to integrate the team member in IBS project at early design stage to overcome the problem at later stage.

2.4. Extensive planning and scheduling

In term of planning scheduling, all stages including initial works, components production at factory, transported to construction site, installation and finishing is involved to ensure successful IBS project implementation. Well planned schedule could ensure all parties to understand their own task. Effective planning and scheduling as opposed to spreadsheets as a step above legal pad and pencil methods has produced impressive results for olefins producers but such practices can yield significant benefits for virtually any organization within the process industries. This effective planning and scheduling is important towards successful IBS implementation (Cheung, Chan & Kajewski, 2012).

The planning and scheduling process is highly complex, but making improvements leads to significant bottom line benefits. Planning traditionally takes a longer view and is based on averages with larger
amounts of time. Meanwhile, scheduling is the process of developing and maintaining optimal tactical and operational plans (daily and weekly), with the objective of extracting maximum value (variable margin) from the envelope of available options. All of this must be done by taking into consideration the true constraints of the market, the manufacturing plants and logistics. Doing so provides a critical link between corporate planning and plant operations. To improve planning scheduling, all stages including initial works, components production at factory, transported to construction site, installation and finishing is involved to ensure successful IBS project implementation (Cheung et al, 2012).

2.5. Risk management

Risk management is the identification, assessment, and prioritization of risks (defined in ISO 31000 as the effect of uncertainty on objectives, whether positive or negative) followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events (Hubbard, 2009). Risk management is essential in all stages of IBS process including initial works, components production at factory, transported to construction site, installation and finishing ensuring successful IBS project implementation. Contractor has to identify possible risk the project will facing such as safety risk, fundamental risk and particular risk (Grossman & Helpman, 2005).

2.6. Management of supply chain and logistic

Supply chain management (SCM) is the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers (Harland, 1996). Supply chain management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption. Hence, a supply chain system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer (Nagurney, 2006). The supply chain and logistics is crucial in all stages of IBS process including initial works, components production at factory, transported to construction site, installation and finishing ensuring successful IBS project implementation.

Problems relating to manufacturer’s requirement have been identified as one of the hurdles of IBS adoption in the Malaysian construction industry (Fikri, 2005 cited in Nawi et al. 2011). The implementation of logistics management with just-in-time (JIT) delivery may also be useful in reducing warehouse and storage cost, reducing lead time, improving productivity, and improving quality it is important to forecast materials demand before purchasing them from the suppliers in order to make sure that the materials are delivered at the right time and place (Berawi, Berawi and Hadwart, 2012). Traditionally, the contractor or his purchasing department will be responsible for this task (Berawi et.al, 2012). However, due to the growth of project delivery, project manager or the owner himself will be the decision maker in selecting materials and suppliers (Sobotka et al., 2005).

2.7. Top down commitment

Commitment from project manager to workers is also an important item to ensure successful IBS project implementation. It includes active modelling and championing of desired behaviours and values, active sponsorship of and involvement in learning system and change efforts, willingness to share power and authority (while still holding people accountable) and willingness to live with the inevitable ambiguities and conflicts that come with organizational change. Top-down commitment is important in all stages of IBS process including initial works, components production at factory, transported to construction site, installation and finishing (Harjeev et al, 2011).
2.8. Strategy and business approach

In general terms, there are two main approaches which are opposite but complement each other in some ways, to strategic management. The approaches are industrial organizational and sociological. The industrial organizational approach is based on economic theory. It deals with issues like competitive rivalry, resource allocation and economies of scale. Meanwhile, the sociological approach deals primarily with human interactions (Hubbard, 2009). The strategy and business approach had to commence from initial works until finishing stage of IBS process as the management will influence the project.

2.9. Industry marketing strategy

The current shift in the marketing strategy is work by multinational construction companies. It is now high-end (rather than adaptive) development that is being carried out by leading companies. Increasingly, other companies are finding themselves competing against or working with new innovation-based companies. Industry marketing strategies is important from initial works to ensure the use of IBS is accepted by public (Saxena, 2010). Since 1980’s there are intensive marketing strategy launched by the Malaysian government to introduce modular coordination, its acceptance has received poor responses for the building industry. Previously in the 7th Malaysian Plan, the country intended to construct about 800,000 units of houses for its population using the IBS construction. Indeed, 585,000 units were planned for the low and low medium cost houses. However the achievements are disappointing with only 20% completed houses reported due, to use of conventional construction method. On the other hand, the government introduced numerous incentives and promotions to encourage housing developers to invest in such housing category (Ismail, 2001). The enforcement by the local authorities did not apply to all the parties involved in the construction contribute to the failure of the implementation in Malaysia. Furthermore, the incentives that promised to be given to developers by the government does not clearly stated in the law of Malaysia.

2.10. Environmentally friendly methods

Research findings by Lu (2009) indicated reducing negative environmental impact of construction operations in the building sector of U.S. construction industry perceived the significant benefits of using offsite construction techniques. Jaillon, Poon and Chiang (2009) assert that tidier and safer working environment on site are promoted by prefabrication system as compared with conventional construction.

The researcher claim that fabricated components manufactured in factory environment which enable higher quality control compared to wet construction on-site. The components which trades generating on-site are carried out off-site. Thus, according to Jaillon et.al (2009) reduced waste on-site and it is easier to reuse and recycle waste generated at the manufacturing plant. Research findings by Jaillon et.al (2009) suggest that the use of prefabrication construction with considerable benefits, such as waste and construction time reduction, increase in quality, onsite safety, and better construction management through quality control.

3. Methodology

Survey method by means of questionnaire survey is employed as a data collection method for this study. Management related factors for successful IBS implementation were first being identified through a comprehensive literature review on the previous research published locally and internationally supported by preliminary interviews with industry practitioners specifically those who are involved with
IBS project. As a result, a list of various management-related factors contributes to successful project implementation were listed for further examination. A set of questionnaire comprising three (3) sections was formulated aimed to identify perceived management-related factors that highly related to the successful IBS project implementation. The self-administered questionnaire survey was designed in three (3) Sections elicited information on the respondent’s background, respondent’s previous completed project and respondent’s opinion on factors influencing the successful implementation of IBS projects. Information from the questionnaire was gathered using two styles of questions which are open-ended and close-ended question. Open-ended questions meant to provide an opportunity to the respondents to express their ideas and opinion over their experience being in construction industry, while close-ended question aimed to capture respondent’s agreement on statements provided using five (5) point likert scale where 1 represented strongly disagree and 5 represented strongly agree.

Main contractor, to be specific, those who are directly involved in the IBS construction such as the Project Manager and the management team, has been selected as unit of analysis for this study. The main reason for the selection of the sample is based on the highly involvement of the main contractor from the moment the project starts up to the completion of the project. A total of 314 questionnaires were mailed to IBS contractors listed under Construction Industry Development Board directory. Unfortunately, the writers faced with a low response problem, although follow up by means of phone call and email had been done. To overcome the problem of low response rate, the writers decided to employ by hand method of questionnaire distribution which using series of CIDB seminar and training in relation to IBS as a medium of distribution. The questionnaires were handed over to the seminar participants and they were required to return the complete questionnaires at the end of the seminar. Out of 314 set of questionnaire distributed 39 were satisfactorily completed make up the total response rate of 12.4%.

4. Results and Discussions

Data gathered from the survey were analysed using the mean score. From the survey, it was found that the largest proportion (61%) of the respondents is degree holders, whilst the rest is 26 per cent and 10 per cent having Diploma and Master respectively. Another 3 per cent is made up of those who hold a PhD as their highest level of education. In term of years of experience in construction industry, majority of the respondent (57.9%) have been in the industry for more than ten (10) years. Meanwhile those who had an experience between 5 to 9 years made up the percentage of 29% and the remaining 13% of the respondents have been working in this industry for 1 to 5 years (Figure 1).

The survey result revealed that, more than three-quarters (76%) of the respondents are working in the companies which had completed more than ten (10) projects for the past ten (10) years, while the other 24 per cent of the respondent being attached in the company which already completed less than ten (10) projects for the past ten (10) years (Figure 2).

More than half of the respondents (58%) have been involved in less than ten (10) completed IBS projects, while the rest of 42% have been involved in more than ten (10) completed IBS projects. From the survey result, none of the respondents never been involved in IBS project, hence, the data gathered were considered adequate and reasonable to obtain sound judgment and opinion with regards to the management-related factors that greatly affect the successful implementation of IBS projects.

Following the interpretation of five (5) point likert scales, the analysis of surveyed data indicated top ten (10) management-related factors that influenced the successful implementation of IBS projects with the means score ranging from 3.29 to 4.67 (see Table 1).
The respondents, on the average, strongly agree that good working collaboration is the primary factor contributes to the successful implementation of IBS project. It is crucial for the project management team, to establish a good relationship and collaboration among the project members from the moment the project starts up to the completion to ensure the smooth running of the project. Industry marketing strategies (mean=4.59) and extensive planning and scheduling (mean=4.52) ranked as second and third most influential factors. The fourth ranked factors was effective communication channel (mean=4.50), while the fifth ranked factor was top-down commitment among project members (mean=4.43). Other than these top five (5) factors, the respondents also agreed that environmental friendly method of construction (mean=4.41); that improvement planning and scheduling of the project (mean=4.35); and that strategy and business approach (mean=4.12) are among of the most influential factors towards the successful IBS project implementation, in descending order of agreement. The respondents are slightly agreed that team member involvement during design stage (mean=3.31) and risk management implementation throughout the project implementation (mean=3.29) contributes to the success of IBS project. Overall, as per top five (5) ranking, an established working environment comprising of an effective planning and communication channel blend together with a good marketing strategies will highly contributes to the successful implementation of IBS projects.

Table 1. Mean score of management-related factors

<table>
<thead>
<tr>
<th>Management Factors</th>
<th>Mean</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good working collaboration</td>
<td>4.67</td>
<td>1</td>
</tr>
<tr>
<td>Industry marketing strategies</td>
<td>4.59</td>
<td>2</td>
</tr>
<tr>
<td>Extensive planning and scheduling</td>
<td>4.52</td>
<td>3</td>
</tr>
<tr>
<td>Effective communication channel</td>
<td>4.50</td>
<td>4</td>
</tr>
<tr>
<td>Top-down commitment</td>
<td>4.43</td>
<td>5</td>
</tr>
<tr>
<td>Environmentally friendly methods</td>
<td>4.41</td>
<td>6</td>
</tr>
<tr>
<td>Improvement in planning and scheduling of the project</td>
<td>4.35</td>
<td>7</td>
</tr>
<tr>
<td>Strategy and business approach</td>
<td>4.12</td>
<td>8</td>
</tr>
<tr>
<td>Team members involved during the design stage</td>
<td>3.31</td>
<td>9</td>
</tr>
<tr>
<td>Risk management</td>
<td>3.29</td>
<td>10</td>
</tr>
<tr>
<td>Close relationship with suppliers</td>
<td>3.19</td>
<td>11</td>
</tr>
<tr>
<td>Management of supply chain and logistics</td>
<td>3.13</td>
<td>12</td>
</tr>
</tbody>
</table>
5. Conclusion

In this paper the discussion and interpretation of the results from the questionnaire survey supported by literature was presented. The questionnaire survey was developed, aimed to tap the management factors towards successful IBS project implementation. Consequently, the questionnaire is meant to get the general overview from the construction companies’ regarding the IBS project parallel to the aim and objectives of research. The contractors though claimed to have high emphasis on their beliefs and values to certain extend that portray in its implementation of successful IBS project. The research has successfully achieved its objective. The management factors that are involved and the implementation of the variables in that factors that lead to successful IBS project implementation have been explored. Further, with a respond rate of 12% disclose that the management factors for successful IBS project implementation are good working collaboration, effective communication channel, team members involved during the design stage, close relationship with suppliers, extensive planning and scheduling, improvement in planning and scheduling of the project, risk management, management of supply chain and logistics, top-down commitment, strategy and business approach, environmentally friendly methods, and industry marketing strategies. The result reinforced that good coordination between all parties in management factors for every stages of IBS play the main role as the pulse towards success IBS project.

Acknowledgements

The authors would like to thank Mrs. Mardhati Abdul Rahim and Norahayu Md. Taib for their assistance in data collection process. Special thanks to the Development Department of Universiti Teknologi MARA via the Research Management Institute of UiTM for funding this research.

References


