



Success Factors for Initial Works of Industrialised Building System Process of Projects Implementation

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Abstract

The absence of success factors focusing on the Industrialised Building System (IBS) process of project implementation initiates this study. Therefore, the aim of this research is to establish the success factors within the initial works of the IBS process of project implementation. Comprehensive literature review revealed that success factors are; the management, the government policies and initiatives, the coordination between design and construction, and the technical aspects of project deliverables. Questionnaire survey distributed amongst G7, IBS contractors unanimously agreed on these as success factors for the initial works of the IBS process of project implementation.

Keywords: Management Factors; Industrialised Building System; Successful Project Implementation; IBS Processes

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1.0 Introduction

Previous studies on success factors focus on insurance (York, 1988), project life cycle, human resource (Jeffrey *et al.*, 1988), development program on organizational effectiveness (Colin Coulson-Thomas,1990), hierarchy for construction project success (Robert *et al.* 1995, Chua, *et al.* 1999), TQM implementation (Jiju A. *et al.* 2002, Harjeev K. *et al.* 2011), strategic planning process (Joel K. *et al.* 2002), six-sigma for a manufacturing industry (Yi-zhong M. *et al.* 2008), hierarchical model for competition strategy management (Kwai-Sang *et al.* 2008), IBS contractors (Mohamad Kamar, Abd Hamid and Alshawi,2009), leadership performance (Nixon. P, *et al.* 2012), public private partnership project (Esther C. *et al.* 2012). Thus, studies on success factors covered various discipline and areas. However, generally, success factors are closely related with management, the government policies and initiatives, the coordination between design and construction, and the technical aspects of project deliverables.

The absence of success factors focusing on the Industrialised Building System process of project implementation initiates this study. The IBS process includes the initial works, components production at a factory, transported to the construction site, installation and completion, initiated this study. Therefore, the aim of this research is to establish the success factors within the initial works of IBS process of project implementation.

The current IBS systems used in Malaysia housing projects are large panel systems, metal form systems and modular system. The IBS system is largely used in Shah Alam, Wangsa Maju and Pandan area (Sumadi *et al.*, 2001). In large public and private buildings and infrastructure projects, pre-cast panel, steel frame and other IBS systems were used as hybrid construction technique to build national landmarks such as Bukit Jalil Sport Complex, Kuala Lumpur Convention Centre, Lightweight Railway Train (LRT) and Petronas Twin Towers (Mohamad Kamar & Abdul Hamid, 2011).

There is an agreement among all researchers that IBS involved manufactured products or components (Abd Shukor *et al.*, 2011; Leasing *et al.*, 2005; CIDB, 2003; Warszawski, 1999; Esa And Nurudin, 1998). Junid (1986) and Trikha (1999) used the term “fabricated” and “prefabricated” respectively instead to address the similar characteristics of the products. A systematic approach that involved several processes are also agreed by all researchers.

2.0 IBS Process of Project Implementation

Construction of a conventional building has different stages according to the type of project and demographic. According to Yusop *et al.* (2005), there are five stages involves in the

conventional construction process. Figure 1.0 shows the typical construction process from planning stage until handing.



Figure 1.0: Typical Construction Process (Yusop *et al*, 2005)

Different with 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 substructure of the building would have been meticulously prepared months in advance. After the position of the starter bar has been accurately surveyed with a 'total station', a crane is used to lift the components to position on the starter bar or tie bar. To ensure verticality, temporary supporting stands are used to prop up the column. Grout is then poured into the holes that were prepared during casting for the insertion of the starter bar (Lim & Kadir, 2006). The IBS process of project implementation is illustrated as in Figure 2.0.

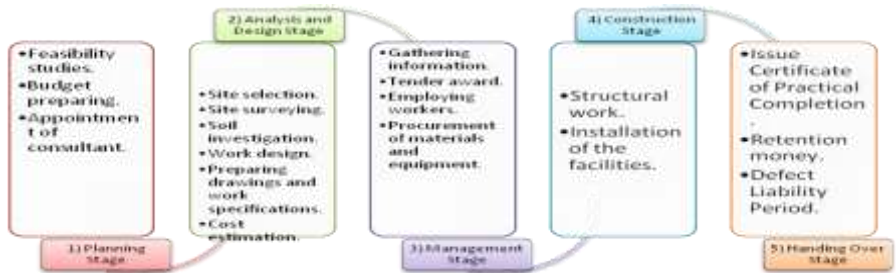


Figure 2.0: The IBS process of Project Implementation (Adopted from Yusop *et al*, 2005)

For every process of IBS project, the four factors for successful project implementation include management, government policies and initiatives, design and construction, and technical. Thus, this research will focus on these factors during the initial works of IBS process.

2.1 Management

The management factors of success in the initial works are good working collaborations,

effective communication channel, team members involved during the design stage, 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, industry marketing strategies. The details on the management – related factors were discussed earlier (Faridah *et al*, 2012).

2.2 Government Policies and Initiatives

The government policies and initiatives factor in the initial works of IBS process include the use of IBS in government projects, reduce foreign workforce, and levy exemption incentives on IBS usage in a project. In line with the target of IBS Roadmap 2003-2010, Budget 2005 declared that all new government building projects are required to have at least 50% IBS content. In order to attract private clients, the second announcement was on the levy exemption for housing projects that have a minimum IBS Score of 50%. Since then, and boosted by the Construction Industry Master Plan 2006-2015 and 9th Malaysia Plan 2006-2010, numerous activities have been executed by the Government (Treasury Circular, 2008). In terms of government policies and initiatives, the use of IBS in government project makes this system well known. Adhere to the policies set is essential during the initial works of IBS process.

The government's multi-pronged effort to reduce the number of foreign workers in the country has been successful with a marked reduction of the foreign worker population in May 2009 from 2.1 million in to 1.9 million at present (NST, 2012). Thus, the engagement of foreign workforce allows the flow of the government budget to an outside country (Shari *et al*, 2003).

Levy exemption incentives will attract contractor to verge the IBS project. As part of the push for the utilisation of Industrialised Building Systems, a number of incentives and regulatory requirements have been put forward. An example of a regulatory requirement is the minimum percentage of utilisation of IBS in a government building projects. Likewise, the minimum percentage requirement is also needed for CIDB levy exemptions. Consequently, some form of IBS content assessment is needed for the purpose. A levy exemption incentive is needed in the initial work of IBS process to ensure successful project implementation (CIDB, 2005).

2.3 Design and Construction

In term of design and construction factor in the initial works of IBS process, include coordination of design, manufacture and construction, key decisions on strategy, application, design, logistic and detail unit should be made as early as possible between all parties. Project Managers and Construction Group personnel work closely from project initiation through final inspection. Coordination between the staffs of these sections is the key to successful project completion. Coordination of

design, manufacture and construction should be well planned to avoid project delayed. The time phase of design, manufacture and construction that involves in IBS process should have small deviation (Rahman & Omar, 2006).

The key decision made by the project manager influenced the success factor of IBS project implementation. It is essential in components production at the factory and installation. Key decisions on strategy, application, design, logistics and detail unit should be made as early as possible between all parties involved (Gibb, 1999 & Neale *et al*, 1993). It should not be used as an afterthought, or as a late solution to shorten construction time, but rather as an integral part of the design from the earliest possible stage of the project (Gibb, 1999 and Blissmas *et al* 2006).

2.4 Technical

Technical factor in the initial works of IBS process includes experienced workforce and technical capability, information and communication technology, continuous improvement and learning, and improvement in procurement strategy and contracting. Experienced workforce and technical capability is an enabler of good production (Lim & Kadir, 2006). In all stages of IBS process including initial works, components production at a factory, transported to the construction site, installation and finishing, experienced workforce and technical capability is important to ensure successful IBS project implementation. In many markets and industries, workforce management is all about assigning the right employees with the right skills to the right job at the right time. The term is differentiated from traditional staff scheduling because staff scheduling is rooted to time management and simply manages the administration of past and future working times. This traditional approach has since evolved into the more integrated, demand-oriented workforce management, which includes changes in personnel requirements and objectives when optimising the scheduling of staff (DMG Consulting, 2009).

Information and communication technology is essential in all stages of IBS process including initial works. Information and communications technology or usually abbreviated as ICT, is often used as an extended synonym for information technology (IT), but is usually a more general term that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers, middleware as well as the necessary software, storage and audio-visual systems, which enable users to create, access, store, transmit, and manipulate information. In other words, ICT consists of IT as well as telecommunication, broadcast media, all types of audio and video processing and transmission and network based control and monitoring functions (Grossman & Helpman, 2005). This information and communication technology is very crucial to enable successful IBS project implementation.

Continuous improvement and learning should be apply in all stages of IBS process including initial works, components production at factory, transported to the construction site, installation and finishing. From continuous learning, all parties could take consideration to improve the production of IBS components. The management philosophy of W. Edwards Deming (1990) with its profound implications for management-led business transformation is

underpinned by the practice of innovation and continuous improvement of systems and processes, based on understanding and knowledge. More recently, business process re-engineering has been adopted by many organizations as a tool for a fundamental review of their key business processes and is providing many opportunities for significant step change improvements. It can also provide the added opportunity to design into the new process the capability of continuous ongoing improvement. Success in this area will depend on the ability of leaders, working in the process, and the overall system in which it operates, to create an environment where learning and innovation can be facilitated (Deming, 1990). This continuous improvement and learning are crucial in order to gain successful IBS project.

During the commencement of IBS project, the procurement strategy and contracting that involved in the initial stage are important as all documentation including project cost are decided. Good planning from an early stage ensures the project to run smoothly. The purpose of improvement contracting and procurement is to maximise the benefit gained for client through robust contract negotiations with service providers, effective performance management of service providers and proactive market management of the service sector, whilst at the same time optimising all available national contracting routes, models and frameworks to achieve the aims of IBS production (Lim & Kadir, 2006). This improvement of procurement strategy and contracting is crucial to achieve successful IBS project implementation. Table 1.0 illustrates the successful factors during the initial works of IBS process of project implementations.

Table 1.0: Success Factors for IBS Process Implementation

IBS Process	Critical Success Factor	Item
Initial Works	Management	Good working collaboration, Effective communication channel, Team members involved during the design stage, 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, Industry marketing strategies.
	Government Policies and Initiatives	Use of IBS in government project, Reduce foreign workforce, Levy exemption incentives on IBS usage on a project.
	Design and Construction	Coordination of design, manufacture and construction, Key decisions on strategy, application, design, logistics and detail unit should be made as early as possible between all parties.
	Technical	Experienced workforce and technical capability, Information and communication technology, Continuous improvement and learning, Improvement in procurement strategy and contracting.

3.0 Methodology

A total of 314 questionnaires were mailed to IBS contractors listed under Construction Industry Development Board directory. Out of 314 set of questionnaire distributed 39 were satisfactorily completed make up the total response rate of 12.4%. Questionnaire survey is employed as a data collection method listing the four successful factors identified through

the literature review exercise. This is also initially supported by preliminary interviews with industry practitioners specifically those who are involved with IBS project. A set of 5 pages of the questionnaire was formulated aimed to solicit their agreement on the factors identified. A five (5) point Likert scale where 1 represented strongly disagree and 5 represented strongly agree are used as the scale of measurement.

4.0 Results and Discussions

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.

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 percent of the respondent being attached in the company which already completed less than ten (10) projects for the past ten (10) years. However, the total number of the completed projects does not represent the total cost of the completed project.

More than half of the respondents (58%) have been involved in less than ten (10) completed IBS projects, while the rest of 42% has 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 by the means score ranging from 3.29 to 4.67 (Faridah *et al*, 2012). 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 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.

Figure 3.0 shows government policies and initiatives factors as successful IBS process project implementation. Less than half of the respondents (40%) agree that use IBS in government project could succeed that kind of project. All of the sub-factors met at an average point where one third of the respondents (25%) rated average to use of IBS in a government project, reduces foreign workforce and levy exemption. In terms of government policies and initiatives, the use of IBS in government project makes this system well known. In addition, levy exemption incentives will attract contractor to verge the IBS project. In all stages, reducing foreign workforce will ensure successful IBS project implementation as IBS involved with high skill in its production and installation.

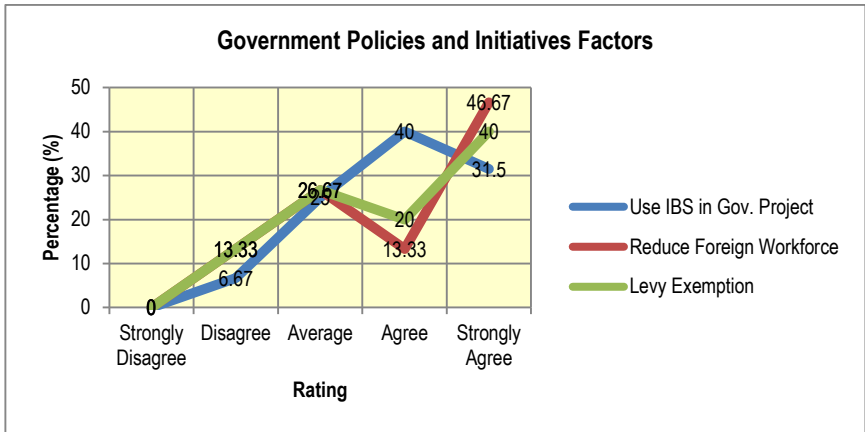


Figure 3.0: Government Policies and Initiatives Factors

Figure 4.0 shows the design and construction factors to successful IBS process project implementation. More than half of the respondents (53.33%) agree that right design process is the critical factor meanwhile less than one third of the respondents (23.33%) agrees with durability as the critical factor. For the balance sub-factors, more than one third of the respondents (33.33%) agree that good appearance, design flexibility, tailor-made appearance, design standardisation, key decisions and coordination of construction are the critical factors for successful implementation of IBS project. Coordination of design, manufacture and construction should be well planned to avoid project delayed. The time phase of design, manufacture and construction that involves in production and installation stage should have small deviation. The key decision made by the project manager influenced the success factor of IBS project implementation. The components should have good appearance and design to produce high quality of IBS. The components also have to be durable, and maintenance requirement should take into account commencing from production at the factory and correct installation at site. During components production at factories, even though the design has to be standardized however repetition should be avoided. High quality tailor made appearance produce by better design is one of the factors in implementing successful IBS project. Flexibility of design increase market demand and the design process at the factory should be well supervised to produce a good product.

Figure 5.0 shows technical factors that lead to successful IBS project implementation. More than half of the respondents (54%) agree that experience workforce leads to a successful IBS project. In the other hand, less than half of the respondents (46.67% and 40%) agree that Information Technology, hi-technology plant and equipment, continues improvement and learning, and skilled labor for site installation is important as a critical factor. More than one third of the respondents (26.67%) agree with quality control and speed as a critical factor. During the commencement of IBS project, the procurement strategy and contracting that involved in the initial stage is important as all documentation including project cost are decided. From continuous learning, all parties could take consideration to improve

the production of IBS components. Experienced workforce and technical capability is also as an enabler towards good production. In terms of technical factor, skilled labor for site installation is very crucial item to ensure successful IBS project implementation.

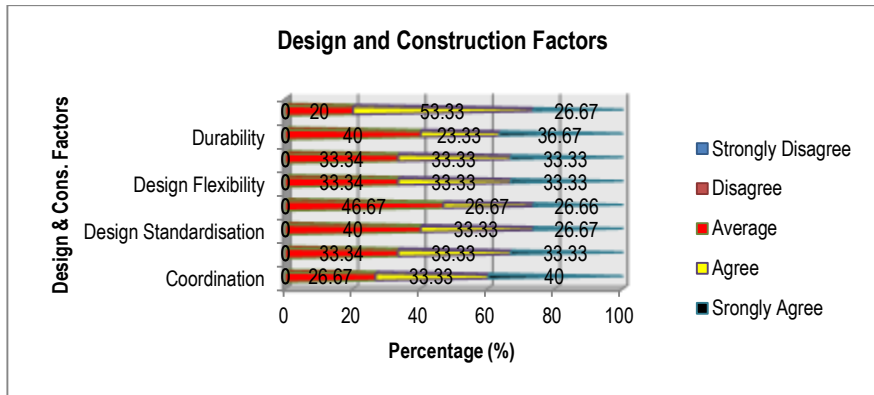


Figure 4.0: Design and Construction Factors

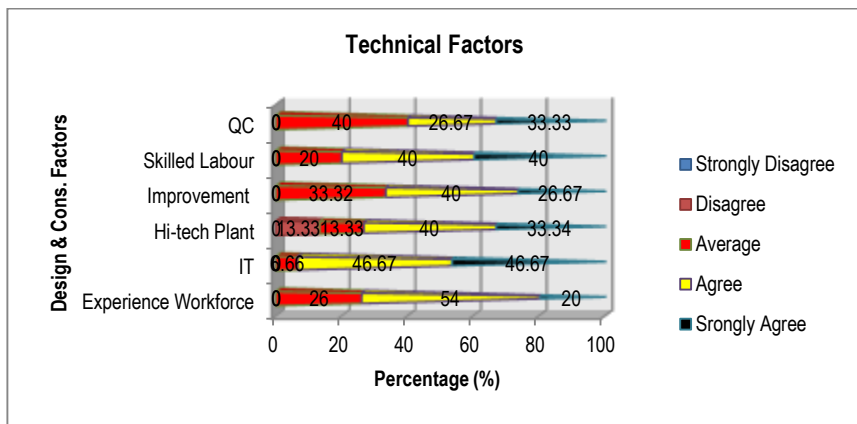


Figure 5.0: Technical Factors

5.0 Conclusion

Industrialised Building System (IBS) in Malaysia is perceived to be a system of construction which can offer benefits of speed, quality and safety to construction projects. IBS in Malaysia is also perceived to have a good technology. IBS, however, is not perceived to be a system which can provide cost reduction compared with traditional in-situ construction. In fact, IBS project proposals are often rejected solely on the basis of cost. There is a strong indication

that many in the industry are reluctant to switch to the IBS method of construction. Consequently, many will not recommend the use of IBS in their future projects. Therefore, four success factors are identified to enable successful IBS process project implementation i.e. management, government policies and initiative, design and construction and technical. The research has successfully elaborate and identifies within the context of the initial works of IBS process.

Further, with a response rate of 12% disclose that the management factors indicated top ten (10) management-related factors. The government policies and initiatives factors show the level of agreement on the use IBS in government projects. However, other sub-factors met on average only in terms of reduction of foreign workforce and levy exemption. The design and construction factors revealed an agreement on the right design process, with the durability and the good appearance, design flexibility, tailor-made appearance, design standardisation, key decisions and coordination of construction are the factors for the initial IBS process project implementation. Technical factor in the initial works of IBS process includes experienced workforce and technical capability, information and communication technology, continuous improvement and learning, and improvement in procurement strategy and contracting are agreed upon among the Malaysian IBS contractors.

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