

Towards Increasing the Use of Pre Fabrication Components in Malaysia Construction Industry

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Abstract

The use of pre fabrication components in the construction industry around the world has long been introduced. Malaysia is also not left behind in introducing the use of this type of construction method. The use of pre fabrication components was started in the 1960s. However, after more than 50 years, the use of pre fabrication components in each of the construction projects is still low and received less attention. This study looks at the main factors that slow the use of pre-fabrication components in the construction industry. This study was conducted by involving a company as respondent. Interview method was used to obtain information and was rewritten in text form. The results of the interview also found that in pre-fabrication, the main problem of stakeholders refused to use this type of construction method due to faster construction time but the payment received was slow and based on progress payment. Most of the projects using pre fabrication will be completed faster but the payments received from the client are a little late.

Keywords

Pre Fabrication Components, Stakeholders Readiness, Team Integration, Construction Industry

1. Introduction

In Malaysia, the pre fabrication components are also known as Industrialised Building System (IBS). Industrialised Building System (IBS) has been recognized as synonymous with industrialisation of the construction industry. In Malaysia, the domination of traditional method in IBS project has gained much attention not only from researchers but also construction industry practitioners as the implementation of IBS through traditional approach always led to the rise of construction problems such as increasing project time and cost, redesigning, ineffective supply chain, and others. As a developing country, Malaysian is currently driving for implementing a new or modern construction method, the Industrialised Building System (IBS), as an alternative towards enhancing construction performance. Currently, most of the IBS project developments in Malaysia are still conducted by using the traditional construction process approach. This traditional construction process has been widely criticised for its fragmented approach to project delivery and its failure to form effective teams thus created a number of issues such as reworks, time delay, rising costs, lack of communication and coordination, and wastages.

The limited take up on pre fabrications components have triggered many research initiatives attempting to scrutinized the barriers and seek the way forward. For contractors, the call to use pre fabrications components is less attractive due to cost and risk issues, lack of professional trained in installing the pre fabrications components, limited Information Technology (IT) adoption and lack of guidance (Pan et al. 2008; Pan et al., 2007 and Blismas, 2007).

According to Eichert & Kazi (2007), the transformation process from traditional practice to IBS has left the contractors with noticeable difficulties in IBS implementation while remain to be competitive and profitable. Early survey in 2003 reported in IBS Roadmap 2003-2010 (2003) and IBS Survey (2003) indicated that only 15% of overall construction projects in Malaysia used IBS. However, recent study in 2006 published in IBS Roadmap Review shows that the percentages of completed projects using more than 70 % of IBS components in the construction project are in the range of 10%. Additionally, less than one - third of total construction projects using at least one IBS product in the year (IBS Roadmap Review, 2007). This percentage is lower than expected despite huge publicity campaign from the government. The actual projection for percentage of completed projects using IBS is in the range of 50 % in 2006 and 70% in year 2008 (IBS Roadmap, 2003). Despite well documented benefits, the take-up so far, while reasonable, is not as high as the government anticipated at this stage. Relatively, the low labour cost in Malaysia is the root cause of the problem (IBS Roadmap Review, 2007). Although the members of the industry are open to the idea, a major portion of the industry stakeholders are indifferent, perhaps due to resistance towards change and insufficient information to support feasibility of change (Hamid et al, 2008). IBS often misinterpreted with negative image due to its unattractive architecture. IBS are not familiar or make a deep impact in the industry due to other factors which include:-

- i. Less popular among designers
- ii. Lack of understanding of among designers, client and contractors
- iii. Slow adoption among contractors - high degree of skills (in term of installation), mechanism, coordination and logistic for transportation and erection of the system.

Thus, the problem of limited IBS take-up in Malaysia has triggered this study to identify the success factors, barriers and seek ways forward. According to the construction industry stakeholders, although it has long been introduced, IBS still fails to change the negative perception among clients in Malaysia. This case study was conducted to determine the cause of negative acceptance and to investigate the use of IBS systems in the country. It is hoped that through this report, readers can understand more about the use of IBS systems and their benefits. Through this report, it is hoped that the use of IBS in Malaysia could be improved as other countries have begun to move towards reducing dependence on general labour resources. Through the 2020 vision, the Malaysian government emphasizes on the development of Malaysian society in various aspects. Vision 2020 aims to build a Malaysian nation that unites people with moral values and strong ethical values. Therefore, the Government of Malaysia created the National Housing Policy to ensure that all Malaysians have a quality lifestyle. This policy helps Malaysians, especially those with low income to have a place to live and have enough facilities.

With the improvement of the Malaysian economy, higher demand for construction activity, particularly the housing industry has also increased. To meet consumer demand, developers of the construction industry need to increase the use of modern technology to address this high demand. Therefore, the Industrial Building System was introduced. IBS means construction techniques that produce structural components in a supervised factory or environment, either off-site or on site, then transported, placed and installed into construction work. IBS is also known as precast or prefabricated construction, and External Construction. Malaysia's Construction Industry Development Board (CIDB) encourages the use of IBS as it will improve the quality and productivity of construction through various training, promotional programs and incentives.

IBS can also be interpreted as an approach or process that allows for less work-oriented construction and faster and meets quality concerns. To demonstrate the continued support of IBS, the government has mandated all government projects to contain 70% of the IBS system in construction work. In Malaysia, there are 5 main IBS groups:

- i. Concrete frames, panels, and concrete boxes
- ii. Steel molding system
- iii. Steel frame system
- iv. Prefabricated wood frame system
- v. Block work system

2. Research Objectives

This case study is to look at innovation factors in the construction industry in Malaysia. This company is a construction company that carries out construction projects based on the Industrialized Building System (IBS). IBS is a component of prefabricated construction of a building. This system has long been introduced in Malaysia due to the construction of the IBS will reduce the country's dependence on general labor. In addition, IBS is also able to ensure that construction sites become cleaner and more manageable as well as prevent accidental issues at construction sites. Overall, the objectives of this study are divided into three:

- i. To determine the factors in the successful implementation of IBS.
- ii. To determine the factors hindering the implementation of IBS in Malaysia
- iii. To see an opportunity to expand the use of IBS in Malaysia

3. Industrialized Building System – A Case Study

This study was conducted by interviewing the owner of the construction company. Some semi structured questions have been prepared for the purpose of fulfilling the research objectives. This company has an extensive experience in the construction field and it has qualified expertise on IBS that requires attention from the government. It is in line with the government's call to create an IBS components producer who have experience in IBS technology to be highlighted and given a chance in the projects government projects using the expertise in the field of IBS. At the moment, this company provides the following services which include design of building structures in IBS, design steel moulds for manufacturing of IBS components, production of the required IBS components (according to structural engineers' design), installation of IBS components including jointing and also advise clients on economical design in the usage of IBS. Currently, this company is expanding and growing according with the needs and necessities in the precast market trends in Malaysia.

4. Obstruction in IBS Project

This company is one of the successful IBS entrepreneurs in Malaysia. However, in order to broaden the use of IBS, various issues arise. Among them are the mentalities of stakeholders in the country who still do not want to use the prefabricated method. According to this company's Managing Director (MD), there are some stakeholders who use IBS small weaknesses as an excuse to continue using conventional methods. For example, the percentage of IBS usage in a construction project is still small compared to the in situ method. There are construction projects that only use 15 percent of IBS components. But when the project fails, the IBS will be blamed. The contractor will make IBS a major source of failure for a project while the percentage of use of IBS components in the project only involves 10 percent to 15 percent.

“The portion of IBS used is very small (in a project). Sometimes in a project, IBS involvement is 15% only. But when the project is in progress and the project failed, IBS will get the blame. IBS is said to be expensive. This failure is said is not a failure of a contractor who carried out the construction work. While 15% of the number of IBS used in a project, actually only 10% are IBS components and the remaining 5% may be cast in situ components and its installation is made by the contractor.”

According to the company's MD, many of the IBS contractors failed. There are several reasons for this failure to occur. Among the major problems that cause the failure of an IBS contractor is the issue of payment. As a "One Stop Center" IBS company, this company is not just a contractor, but they are also a supplier of IBS components and are also involved in providing IBS structural design. The most difficult thing in IBS is to get paid. In terms of payment, there are some issues. There is a debt that has reached 5 to 6 years unpaid. This payable involves the cost of supply of IBS components. To overcome this problem, legal action has to be taken. However, some companies fail to pay off debt to establish new companies to avoid paying debts.

“Among the most difficult things in IBS (which became an obstacle) is about to get the payments. In terms of costs, there are some issues. There is a debt that has reached 5 to 6 years unpaid.. And usually (to overcome this problem), legal action will be taken. But sometimes the owners of the company (the action) established a new company (to avoid paying debts).”

Another problem faced by IBS component suppliers is getting the advanced payment. Most of the IBS component suppliers will face the problem of getting advanced payment from the contractors. While in most construction projects, IBS components only account for 30 percent of the total material used. The difficulty of getting advanced payment causes some suppliers to suffer losses in which in many cases, suppliers are tricked by the contractor when the contractor fails to pay after the project is completed.

“For example in a project, the number of IBS components is approximately 30%. Suppliers will ask for advanced payment as we all know. But in reality, the percentage rate to get the advanced payment is very, very low.”

Advanced payment is required based on several reasons. One of the reasons for advanced payment was applied earlier because the installation of IBS components at construction sites took a very short time. For example, 60,000 square meters of parking space at one project can be completed within 4 months. The short construction period (using IBS) causes no stakeholders to finance the IBS project. Most suppliers or manufacturers will then provide the IBS components in advanced and the supplier then will set the payment period between 30 days, 45 days, 60 days, 90 days or 120 days.

“Why do we ask a down payment? Construction term using IBS is very short. Imagine, the new parking area is 60,000 square meters or about 5 football field can be completed within 4 months. So who can finance a project with duration of 4 months? Indeed, no one is willing to support. Manufacturers will provide the materials in advanced. We'll get the material from the trading arm and supplies to contractors and we set the length of payment time either 30 days, 45 days, 60 days, 90 days or even 120 days.”

Asked on the challenges of globalization in the country's construction industry, especially involving large investments made by major construction companies from China, involving billions of ringgit, the MD of this company gave a brief answer. According to him, at present, investments made by foreign companies on projects worth a billion ringgit have little impact on the local medium size company.

"Outside investors are just concentrating on projects with great value. While we can only run millions of ringgit projects. Those who come from outside do not seem to have care on small or medium scale project. Maybe they are not worth it. So in my opinion, for now, our company as a medium size company has no problem with mega project investment from outside stakeholders. The big company in the country may be affected with this globalization competition".

5. Success Factors of IBS Project

This company is one of the successful companies in implementing construction methods using IBS. IBS is a long-established method of construction and the government through the Construction Industry Development Board (CIDB) strongly encourages the use of this IBS construction method. However, not many construction companies dare to take on this challenge. Many companies failed due to conventional construction methods are seen to be more profitable as a result of the number of foreign workers in the construction industry. Among the secrets and strategies of this company success in using IBS in construction projects is to obtain the preliminary information about any construction project to be carried out. Among the initial information to be investigated is the project funds, the supply chain issues and the subcontractors to be involved.

“To ensure the success of the project (IBS), we need to know in advance information such as the amount of project funds, the issue of supply chain, an existing connection and communication with subcontractors.”

According to this company's MD, 2017 was a challenging year for this company. In 2016, this company also missed some chances of getting a project. In making the company's financial controls, several steps have to be taken. Among the steps taken is to reduce the number of employees in the company. The company will conduct a review of the employee where employees with duplication of work will be categorized. They will be given leave for two months and usually during this holiday, these employees will look for another job. Through this strategy, the company can

optimize the time and capabilities of one's employees more efficiently. According to the MD, this strategy has succeeded in saving the company's finances of RM1 million.

“The year 2017 is quite challenging. We've been in the early days of 2016, many projects we missed. One of our strategies (to control) the company's finances is to make cost cuts. Any work that is redundant, we told our employees to rest. Usually 2 months break. Usually when we rest them, this worker will try to find another job. Through this strategy, in the past year, we can save almost RM1 million.”

Another strategy that has been implemented by this company is to implement cooperation with other contractors; especially those involving design and build contractors. The contractor then will be selected as a collaborator comprises contractors with excellent name and reputation in the local construction industry. Additionally, this contractor also has many networking with various potential clients. With a large number of clients and projects, the contractor will get help from other stakeholders to complete the project that has been acquired. Through this method, this company will benefit some of the projects that have been acquired by other companies. However, a contract will be made to bind the two parties in implementing this project. Through this strategy, every year this company will get a project. Whenever the collaborators get a projects, the company will also get the projects.

“The second strategy is to work with design and build contractors. And usually the contractor we choose (for cooperation) is a high quality contractor and a contractor with multiple networking with a range of potential clients. (Usually) contractors who have many projects will be desperate to complete the project and they need other partner assistance. The contractor will ask for our help. And we will provide the contract. Every year many contractor projects will help in order save us. They got the project, we got the project too.”

It is very important for this company to have a continuous project. As stakeholders in the construction industry, maintaining good relationships with manufacturers and suppliers is very important. In order to maintain this good relationship, the MD of this company will ensure that this company will continuously have a project. Among the advantages of having a project continuously is that the company at the same time maintains a good relationship with the supplier. This good and continuous relationship is very important. One of the advantages is with the goal of getting materials at a cheaper price (through good relationships).

"Among the advantages of having a project continuously is that the company at the same time maintains a good relationship with the suppliers. This good and continuous relationship is very important to continue. One of the advantages is with the goal of getting material prices at a cheaper price (through good relationships). "

Some of the other strategies that have been established for the company's survival are by diversifying the business. According to MD, the company had planned to add another branch of business and try to become a housing developer. However, at present, these proposals are delayed due to economic problems. In terms of internal, the company, saving measures strategy has been taken.

“One of the other strategies is to diversify the business. We used to plan to be a developer. But (we defer it first) we think to focus on the strength that we have...”

The success of a project depends largely on the initial strategy when the company is set up. The initial strategy involved the company's direction within 5 years of its establishment. According to the MD, there are excellent companies within 1 to 2 years of establishment, but lost their competitiveness the following year due to the weakness of the regulated strategy. In addition to a good strategy, one of the key to the success of this company according to MD, is by not making any loan from the bank. According to him, this company did not have any loan from the bank although several times were offered for loan as a capital injection. He stated that for now, this company has a very good financial structure even without the help of the bank.

“(For me), the success of a company depends on the initial strategy, especially involving the earliest 5-year strategy. There was a company that was successful in the first to fourth year of the establishment but had fallen the following year (fifth year) and the company was forced to close. So, one of the key success is by not making a bank loan. This company has no loan from the bank. The banks have offered loans but we refuse them because of this time, our has enough financial resources.”

Apart from the above strategies, the other steps taken by him in developing this company is to entrust the staff. According to him, trust plays a very important role in developing the company. He will also share the knowledge and expertise available to the staff.

"In ensuring this company continues to grow, in managing this company, my goal is to educate. We will teach the workers with good knowledge and us to trust them. We know we've got enough of them, then we believe in them. When there is a problem, they will refer to us and we will try to solve it. In this way, my workload can be reduced and the staff will be delighted with the trust they have. "

6. Conclusion

In the most volatile environment of construction industry, the management of the construction industry needs to be aware of all the signal of any turbulence and uncertainty. This company have been in the industry for a quite number of years have really understand what does in needs to sustain the business. Its not only about the capital that is always be the central issue in any business, but the art in sustaining and setting the future direction of the business is matters. It can be conclude that this company has several key points in making them as one of the successful construction company in Malaysia. The founder of this company highlighted among others, for a construction company to succeed, they should possess advance information, good company finance, cooperation with other contractors, work with design and build contractors, maintain a good relationship, have a good financial structure and finally, trust. For him, these are the key factors for ensuring the success and sustaining their business in construction industry. He mentioned that advance information that is needed in order for them to construct a project includes amount of project funds, the issue with supply chain, existing connection that is required and finally communication with the subcontractors. When all the required information is gathered, then there is chance to get the ball rolling.

Good company finance is meant by making sure the there is no redundancy of work done by the employees. According to the company's MD, redundancy in employees' job can cause a serious damage to the company finance. In order to overcome this issue, he as the Managing Director of the company, will determine who are among the employee that makes multiple redundancy in their job. The moment they take leave, they will be asked not to continue working at the company. The employee then will use the opportunity while having holiday, they will also try to search for a new job. Those remains in the company can be utilize to do their job effectively and efficiently. This strategy alone could save the company finance close to RM 1 million. Cooperation with other contractor is the next strategy used by the company. Cooperation means working together in achieving the same desired goal. Cooperate with other contractor meaning, once they got project, we will also get the project. By doing this, every year, the company will get a project. Maintaining good relationship with manufacturers and suppliers is another strategy for any construction industry to succeed. The advantage when they manage to have a good relationship is through getting material prices at a cheaper price. This can only be achieved if and only if we have good relationships with the suppliers and manufacturers.

Good financial structure can also be obtained through discipline in the company. To achieve this strategy, this company did a good strategy by not making any loans from the bank. Although the company was being approached by the banks to acquire a loan in order to increase their budget capital, this company did not want to make such commitments because they have enough capital to operate their business. It turns up that this strategy work well for them. Finally, the MD also mentioned that trust is a key point in sustaining his construction company. He is a firm believer that trust is not build in one day. For him, sharing his knowledge and experience to his staff is something that be benefitted to his company. Providing trust to his staff in making their job would also ease his burden. But, trust is always one of the key issue for the company to succeed in the long run. With all the above mentioned strategy did by this company, these are their ingredients in making sure that their company can do well in the near future. These ingredients are however can become a benchmark for any business to succeed. May be not all can be implemented, but some are key factors for businesses to succeed.

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7. References

- Agus, M.R. , Urban development and housing policy in Malaysia, *International Journal for Housing Science and Its Applications*, 21(2), 97-106, (1997).
- Azman, M.N.A.; Ahamad, M.S.S.; Majid, T.A.; and Hanafi, M.H., A study on the trend of the use of IBS components and the setting UP of IBS manufacturing factories in the malaysian construction industry. *Malaysian Construction Research Journal*, 9(2), 18-30, (2011).
- Blismas, N., *Offsite Manufactured in Australia: current state and future direction*, Corporative Research Centre for Construction Innovation, Brisbane, (2007).
- Eichert, J., Kazi, A. S., *Open Building Manufacturing – Core Concept and Industrial Requirement*, Manubuild Consortium and VTT Finland Publication, Finland, (2007).
- IBS Roadmap (2003-2010), Construction Industry Development Board (CIDB), Kuala Lumpur, (2003).
- IBS Roadmap Review (Final Report) 2007, IBS Centre, Construction Industry Development Board, Malaysia, Kuala Lumpur (unpublished), (2007).
- Nawi, M.N.M.; Lee, A.; Kamar, K.A.M.; and Hamid, Z.A., Critical success factors for improving team integration in IBS construction projects: The Malaysian case. *Malaysia Construction Research Journal (MCRJ)*, 10(1), 44-62, (2012).
- Pan W., Gibb, A., Dainty, A. R. J., Perspectives of UK housebuilders on the use of off-site modern method of construction, *Construction Management and Economic*, 25, 2, 183-194, (2007).
- Pan W., Gibb, A., Dainty, A. R. J., Leading UK housebuilders utilization of off-site construction method, *Building Research & Information*, 36, 1, 56-67, (2008).
- Senturer, A., Which industrialised systems are appropriate for Turkey. Retrieved March 12, 2009, from www.emu.edu.tr/academic/publicat/archpub/arch-32a.htm, (2001).
- Waleed, T.; Mohd, P.D.; Abdul, S.A.; Abdul Kadir, M.R.; and Abang, A.A.A., Industrialized building systems. *Proceeding of Seminar on Affordable Quality Housing*. Housing Research Centre, University Putra, Malaysia (UPM), (1997).
- Yoke, L.L.; Hassim S.; and Kadir, M.R.A., Computer-based cost control model for industrialised building system construction. *International Conference of Industrialised Building Systems*, Kuala Lumpur, Malaysia, (2003).

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