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Review Article

A Critical Review on The Strategies of Lean Planning to Reduce Construction Wastes at the Construction Sits

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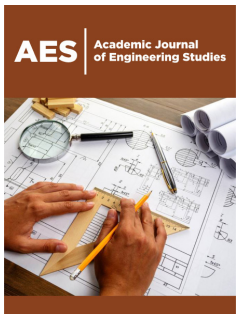

Abstract

The impact of the construction wastes results in project delay, low productivity of construction projects, construction cost overrun, and disputes among construction players. The lean construction offers enormous advantages to reduce construction waste. However, lean construction in Malaysia is still new and not fully adopted. This is due to lack of effective strategy in adopting lean construction at construction phase. The aim of this study is to provide planning strategies for the reduction of construction waste. In conclusion, for a wide range of the implementation of lean construction to be successful, a good push by the government alone is inadequate. All the other teams in the construction sector defined must be well aware of their roles in the development of lean construction at the construction sites.

Abbreviations: ACEM: Association of Consulting Engineers Malaysia; BIM: Building Information Modelling; TQM: Total Quality Management; CM: Conference Management; SCM: Supply Chain Management; IBS: Industrial Building System; KPI: Key Performance Index; HSM: Health and Safety Management

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Problem statement

The low productivity of construction projects construction, cost overrun, low quality of end projects, and project delay are the four main construction problems lead to project failure. Most problems are due to weak waste management in the construction stage, This shows that building waste management is one of the crucial elements that lead to the success of the management of construction projects. As a result, many attempts have been made by construction players particularly by the project team (contractor, architect, developer, and consultant) to improve quality at the construction phase through the implementation of lean construction.

Evaluation of lean construction implementation in the construction

On the basis of construction industry, local contractors, ranging from the smallest to medium class up sized project are not ready yet to utilize lean construction in this country. This is due to the use of LC between them is still low, as well as the LC philosophy that has not yet been fully explained to the public. However, PWD (2016) pointed that the Association of Consulting Engineers Malaysia (ACEM) hopes that LC can be properly practiced by the entire project team, where it reduces construction waste in the construction projects and therefore provides more quality and efficiency for projects in Klang Valley, Malaysia. Lean construction is dominated by an obsession with eliminating waste from all business processes, while the process that adds value to output will maximize to provide satisfaction to customers. The main steps advocated by lean production to cut down waste to achieve customer value can be categorized as follows. First, set up the infrastructure to accommodate variations should they occur (people and equipment) by modularity. Second, the production system should drive design where possible (concurrent engineering). Third, eliminate the variation through production processes in order to ensure time delivery. Fourth, do it right the first time (eliminate rework). Finally, continuous improvement or kaizen (emphasize measurement).

Therefore, for Malaysia construction industry, Building Information System (BIM) is very efficient, and advanced technique for modularity and Industrial Building System and (IBS) is used to drive design where possible. Building Information Modelling (BIM), Supply Chain Management (SCM) and Conference Management (CM) are used to eliminate the variation by insuring ensuring on time material delivery at the construction phase. Also, Total Quality Management (TQM) and Building Information Modelling (BIM) are used to get things at the first time. Lastly, Key Performance Index (KPI) and Health and Safety Management (HSM) are utilized for continuous improvement. Therefore, lean construction principle can only be applied fully and effectively in the construction sector in Malaysia by focusing on the improvement of the whole process as shown in and the detailed explanation of the implementation of these 16 techniques. This means that all parties must be engaged, involved and strive to overcome the obstacles that could arise from traditional contractual arrangements.

Barriers in implementing lean construction

Lean Construction has been involved in providing many benefits to the construction industry in Klang Valley, Malaysia. However, there are many barriers to LC implementation in construction projects, such as fragmentation, legal and contractual issues related to LC, costs of implementing LC, training and skills, lack of knowledge of LC and lack of an effective strategy to implement LC. Detailed explanations of the barriers to the implementation of the LC are given as follows:

Lack of Effective Strategy to implement LC

Lean construction adoption model, processes and guidelines are examples of an effective strategy for using LC in construction sites. Therefore, the lack of use of the standard process is one of the main obstacles that prevent construction teams from adopting LC in their construction sites. In particular, construction teams in a developing country such as Malaysia require a standard guidance form as an assistant or adoption model to help construction teams use LC properly and accurately.

Lack of Top management support

The support of top management, especially senior management, plays a crucial role in obtaining lean construction implementation benefits. Senior management should devote sufficient time and resources to provide an appropriate strategy to implement Lean construction strategy stated that the reluctance of senior management to provide true leadership as a key barrier in the development of LC's model and guidelines. While CIDB (2018) added that the most serious obstacle is existing with middle management rather than the top management of the companies. The full benefits of Lean construction are not as clear to middle-management as they are to top management [1]. In other words, their level of experience and training is generally not sufficient to enable them to make fundamental changes to the conventional method. Their effective role increases productivity accelerates delivery and reduces potential challenges.

Cost Issues

One of the barriers preventing LC from being implemented in construction projects is related to cost issues. The main cost is the cost for training [2]. Most construction firms have refused to implement LC completely and effectively because they need to invest in new LC tools and techniques (Zakaria et al., 2016). This is because the cost of adopting LC tools are very expensive showed that the total cost of adopting BIM technology in the construction project is 1 to 5 percent of the total project budget. As a result, construction firms have refused to adopt BIM software, and they also need to provide some amounts of money to train their staff on BIM.

Skill and Knowledge Issues

Knowledge and skills issues are also known as one of the obstacles to the effective and full implementation of LC. This barrier is related to the knowledge that is required to integrate the implementation of new technologies of LC and its techniques (CIDB 2018). These types of barriers occur when different construction teams refuse to learn and attend Lean construction courses (CIDB 2018). They refuse to pursue LC knowledge because the cost of attending LC or training courses is expensive, and it would take some time to complete the training. Moreover, there is no encouragement from its managers, particularly from the middle management, in the practice LC according to its lack of awareness benefits of LC.

Fragmentation

In the construction industry, the sequential flow contributes only to the fragmentation problem, which leads to serious coordination and communication problems within the project team, which ultimately focuses on project performance. Therefore, as one of the main results for the poor performance of the construction industry in Malaysia, that has to be addressed with team building.

Legal or Contractual Issues relating to LC

The traditional procurement system (design and built) is a crucial barrier that prevents the full implementation of lean construction techniques. It seems to create adverse relationships between the different parties involved in the project (all project teams), and therefore, construction waste could be generated and added to the process (CIDB 2018). These adversarial relationships develop transaction costs that are considered waste, thus hindering the implementation of lean philosophy (CIDB 2018). All of these barriers to LC implementation in Malaysia's construction industry. Participates to prevent the full implementation of LC between construction teams. [3] Therefore, it is crucial to overcome the barriers to increase the implementation of LC in the project.

Barriers to adopting lean construction in other countries

The barriers in adopting LC in several countries were discussed in several published research works. Notably Li et al. (2017) highlighted the lack of appropriate organizational structure as

well as leadership style as the main factors in failing to adopt lean construction techniques in China. Basically, project managers used to follow their superior managers in managing their projects by using the conventional methods in spite of their awareness of the importance of implementing LC to gain the profits into their projects. On the other hand [4] specified contract issues and organizational culture as the preventive factors in adopting lean construction in the United Kingdom. Thus, inappropriate organizational structures prevent the labours to work in a systematic manner in accordance with the decision making within the organization and most often labor problems are directly reported to the project managers reasoned that a lack of staff training is a dominant factor in failing to adopt lean construction in the United States. Therefore, organizations are required to change their management system and provide training to their staff to adopt LC to gain the profit.

Notably, both countries are getting a strong support from their government to get the full benefits from lean construction. Government support has a more significant role to speed up the improve the effectiveness of the implementation of LC at the construction phase. This indicates that in both USA and UK construction phase, the government stimulate and force is a must to adopting modern approaches. Having a full enforcement from the government is crucial. Without the government support, the implementation of LC in their construction industry would be futile. Besides, the private sector also plays a crucial factor in implementing lean construction by encouraging a mutual work to provide a guideline in implementing lean construction. Furthermore, both countries considered that developing leadership strategic of the project manager as a leader who draws on authority that is afforded mostly by informal means is to build an integrated project team and convince top management to adopt lean construction. The PM must identify the range and extent of the sources of influence available to them, so that they can secure an appropriate leadership position to drive the project, and to direct its resources effectively [5]. The aim is always to meet the concerns and needs of the participant, while simultaneously securing the needs of the project. The PM needs to be highly skilled and very political about doing this and must recognize that a very high degree of flexibility will be required [6-33].

Conclusion

The construction industry is less affected by lean construction techniques, due to overwhelming evidence of construction waste during the construction phase, as can be seen in the review. For example, pointed out that, in the case of Bricklaying in Taman Putra Damai 6, which is a residential project at Taman Putra Damai in the Klang Valley, the wasted activity represents 43% of the operator's total time. The significance of the study examined by a brick subcontractor, which employs 50 bricklayers, found that the cost of construction waste in this activity is three times the annual profit obtained by the contractor. Thus, it could be argued that there is still a huge opportunity to assess the level of the implementation of lean construction to reduce construction waste.

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