Towards Producing Best Practice in the Malaysian Construction Industry: The Barriers in Implementing the Lean Construction Approach

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ABSTRACT

Various studies in the construction industry have been conducted to develop the best practice that is only not capable of improving organization profit but also assists in producing a systematic work process which will encourage the optimal use of resources. Concurrently, the emergence of the lean construction concept is seen as a current approach that can be used to produce best practices because it was viewed as an effort to bring construction industry towards a more optimum productivity level with the efficient usage of resources as well as to produce the utmost value. The application of this concept will also introduce a work approach that practices the best implementation in construction procedure and process. Through this research, there is one main objective that was identified to be achieved, which is to identify the factors that were found to hinder the implementation of the lean construction concept within the Malaysian construction industry because until now the application of this concept within the industry is quite limited. The required data was collected and collated through questionnaire survey conducted on 150 professionals who are directly involved in the construction industry, specifically in the east coast region of peninsular Malaysia. A quantitative approach which incorporated the use of frequency analysis and mean analysis were used to analyze the data. The research findings showed that there are four main factors which constrict the application of the lean construction concept. These four factors are lack of attentiveness and commitment from top management, difficulties in understanding the concept of lean construction, lack of proper training and the tendency of construction firms to apply traditional management concepts as opposed to productivity and quality management concept. These findings automatically proved that there are many barriers

that need to be overcome in ensuring the successful implementation of lean construction in the Malaysian construction industry.

Keywords: lean construction, barrier factors

1. INTRODUCTION

Lean construction as discussed and debated by previous researchers is considered as a concept or approach that needs to be introduced within the construction industry, specifically to increase the sector's productivity level through the elimination of activities and actions deemed as being a wastage in the construction process. The emergence of the lean construction concept circa the 1990s as a direct adaption of the lean manufacturing concept has resulted in an innovation of sorts within the construction industry which in turn has caused a positive effect through time. Through the concept of waste elimination and value enhancement in a construction project, this approach is seen as being able to create a process of implementing activities in the project in a systematic and effective manner. The direct application of the lean construction concept in a construction project will bring an effect of change towards the way work is conducted by an organization responsible in realizing the related construction activites. This will then forcibly alter the traditional work practices normally undertaken by the construction firms according to the needs and suitability in line with the objectives and principles established in the lean construction concept itself.

In Malaysia, the use of the lean construction concept in the industry is still considered to be a new and novel approach. In fact, its application within the construction firms of the country is very much limited. However, this situation is seen as being in tandem with the achievements of a number of developed nations. According to Johansen and Walter (2007), the application of the lean concept in the construction industry is still restricted and sluggish. This has been proven through the research done by Common *et al.* (2000) in the United Kingdom as well as the research by Johansen *et al.* (2002) in the Netherlands which clearly staste that the construction industry has been generally slow in taking up lean concepts. Even with the scarce numbers of research done towards the application of the lean concept in the Malaysian construction industry, it has indirectly shown that the usage of this concept is still unpopular within the country's construction firms even though these firms employ learned and skilled professionals well versed in construction processes as well as being aware about the change and improvements that are occurring within the construction industry, whether it is from the aspects of technology, implementation methods, management and others. With this assumption, this study was conducted in the efforts to answer two main questions. Firstly, do the construction professionals recognise any factors which are acting as restriction factors that interfere with the implementation of the lean construction concept in the construction industry? Secondly, what are the circumstances which have contributed towards the occurrences of wastage in the construction industry? Using these questions as the basis,

the anticipated outcomes are hoped to achieve the requirements of the main objective of the study which is:

i. to identify the factors that were found to hinder the implementation of the lean construction concept within the Malaysian construction industry.

2. LITERATURE REVIEW

The construction industry has been heavily criticized for its adversarial nature, the take up of new technologies and issues relating to the management process (Construction Task Force, 1998; Latham Report, 1994). Futhermore, according to Egan (1998) the capabilities and the efficiency of the construction sector needs to be improved to modernize the sector itself and eventually increase user satisfaction. Therefore, the various parties that are involved in the construction sector, including construction firms, non-profit organizations, overseeing administrative bodies as well as academic institutions have undertaken numerous approaches including conducting researches to assist in establishing methods which are believed to be able to improve and subsequently increase the efficiency and effectiveness of this sector.

As commonly known, lean construction is a concept which was adapted from the original manufacturing concept of lean production. According to Koskela and Howell (2002), lean construction is a way to design production systems to minimize waste of materials, time and effort in order to generate the maximum possible amount of value. The lean concept has been introduced in the construction industry in various countries such as Australia, Brazil, Denmark, Ecuador, Finland, Peru, Singapore, United Kingdom, United States of America and Venezuela (Ballard and Howell, 2003) as its application within the industry has borne a lot of benefits. This is because according to Salem *et al.* (2005) the lean construction approach is different from the normal practices within the construction processes as lean construction is based on production management principles and it has better results in complex, uncertain and quick projects. In addition, according to Jorgensen dan Emmitt (2008), common elements as prescribed in the definition of 'lean' itself has expressively shown focus on specific aspects which are proven to be capable of bringing benefits. These elements are (Jorgensen dan Emmitt, 2008):

a. A focus on eliminating/reducing waste and sources of waste in relation to delivery of artifacts or services that represent value to the end customer.
b. End Customer preference is adopted as the reference for determining what is to be considered value and what is waste.
c. Management of production and supply chain from a (customer) demand pull approach.
d. Approaching production management through focus on processes and flows of processes.
e. An (at least to some degree) application of system's perspective for approaching issues of waste elimination/reduction.

The core principles of lean construction are elimination of non value adding flow activities and making conversion activities more efficient (Senaratne and Wijesiri, 2008). With such principles, it can be seen that through the lean concept within a construction process, a systematic and value added practice can be established which will directly increase the performance of the project as well as the related construction firm. In this circumstance, the presence of the lean construction concept can be attributed as an enable towards the development of a best practice in the construction industry. This view is shared by Jarrar and Mohamed Zairi (2000), as they opine that through the Chevron approach, best practices is defined as good practices which are determined to be the best approach for a majority of organizations based on a performance analysis. Furthermore, Cain (2004) suggests that lean construction can be defined by six goals of construction best practice which are finished buildings that will deliver maximum functionality, which includes delighted end users, end users benefitting from the lowest optimum cost of ownership, elimination of Inefficiency and waste in the use of labor and materials, the involvement of specialist suppliers in design from the outset to achieve integration and buildability, a single point of contact in terms of design and construction for the most effective co-ordination and clarity of responsibility, and establishment of current performance and improvement achievements by measurement.

However, as with implementation of other methods or approaches aimed at increasing the performance of the construction sector such as Total Quality Management (TQM), Benchmarking, Balance Scorecard among others, the application process is sure to encounter various hurdles and obstacles. According to Alarcon *et al*. (2002), research findings by the Production Management Center (GEPUC) from the Catholic University of Chile, has shown that the application of the lean construction concept in the industry has faced problems pertaining to time, training, organizational aspects and lack of self-critism. Alarcon *et al.* (2008), in a evaluation study on the effects of implementing the lean construction approach has stated that apart from the barriers mentioned by GEPUC, there are other hindrances that has limited the lean construction implementation. These barriers include situations that exist during the execution of a construction process such as low understanding of the concepts of Last Planner System (LPS), low use of the different elements element of LPS, inadequate administration of the necessary information to generate a learning cycle and to take corrective actions, weak communication and transparency among participants dan finally, lack of integration of the production chain. At the same time, according to the views of Cua *et al.* (2001), Conte and Gransberg (2001) and Castka *et al.* (2004), it was discovered that a major problem in applying the lean construction concept involves the aspects of attitude, internal relationships or co-operation. The obstacles within these aspects are related to lack of organizational culture supporting teamwork, lack of group culture, shared vision and shared consensus, inadequate knowledge and skills and others.

Additionally, Forbes and Ahmed (2004) have stated that there is clearly various hurdles in the efforts to inculcate the concept of lean construction. These hurdles refer to attitude, roles, relationships, actions and communications aming the respective parties involved in the construction industry such as the contractors, sub-contractors as well as the

client/owner. Apart from this, in a study done by Alinaitwe (2009), as many as 31 hurdles were identified as barriers to the successful implementation of lean construction by construction firms in Uganda. From this number, Alinaitwe (2009) subsequently lists down 10 barriers which is considered to be easibly overcome. These barriers are lack of keeping items in the right places, lacking buildable designs, lacking a participative management style for the workforce, not having compatible management leadership, not using standard components, lacking communication within teams, lacking steady work engagement, no understanding of the needs of customers, lacking project team skill and not having a well-defined focus for the team.

As such, referring to these various discourses and opinions stated above, it is clear that there exists various hindrances that are capable of interfering with the process of implementing lean construction. However, for the purpose of this study, these hindrances are categorized according to specific aspects in reference to the direct obstacles faced by the professionals in the construction industry as opposed to other obstacles which are more technical in nature. These hindrances therefore are:

i. Lack of attentiveness and commitment from top management
This barrier actually refers to various aspects that are realted to the support shown by the top management which administer an organization. In other words, this barrier is more towards the aspect of organizational support. According to Kim and Park (2006), from the perspective of a construction project, it was found that many projects face the problem of lack of support from the top management in implementing the lean concept when it is vital such support is needed to reinforce lean implementation. Without the support of the top management, the professionals involved in the construction sector may face numerous difficulties in adapting the lean construction concept.

ii. Difficulties in understanding the concept of lean construction
The lean construction concept in actual fact has been adopted from the lean manufacturing concept. Therefore, there are many principles and elements of lean construction that are referred to the critical principles and elements contained within lean manufacturing. On the surface, there are characteristics which are seen to be similar between the construction and manufacturing sectors but nevertheless, these similarities are not totally identical. These variances in similarities has caused the application of the lean concept in the construction industry to be amended according to necessity. Moreover, according to Bertelsen (2003), the systems within a construction project are immensely complex. As such, in order to clearly understand the concept of lean construction, it is vital that the parties involved in the construction industry have a full comprehension about the lean manufacturing concept beforehand. Without this prior comprehension, it is feared that these concerned parties will not be able to fully understand the concept of lean construction. If the discussions put forth by Jorgensen and Emmitt (2008) is to be taken into consideration, the application of the lean concept in the construction industry has produced the usage of certain and techniques throughout the various stages of the construction project. The emergence of these tools and

techniques are sure to have a distinct difference when compared to traditional tools and techniques. Therefore, these differences have to be fully understood in order for them to be optimally utilized. The difficulty in understanding the lean construction concept needs to be overcome so that it would not be an obstacle towards the implementation of this concept in the construction industry.

iii. Lack of exposure on the need to adopt the lean construction concept

Based on the discussions by Jorgensen and Emmitt (2008), it was discovered that the exposure given towards the application of lean construction concepts is lacking when compared to that of lean manufacturing. This situation has subsequently generated sparse critical discourse regarding the implementation process of lean construction in the industry. This deficiency has caused the parties involved in the construction industry to be less exposed to the actual needs and requirements in realizing the lean construction concept. In addition to this, awareness programmes towards the implementation of lean construction concepts are only actively done in developed countries such as the United Kingdom, USA, Singapore and others as they have specific institutions established to give consultations on the matter. Examples of such institutions are the Constructing Excellence in the UK and the Lean Construction Institute based in USA. Without the existence of programmes that focus on the importance of lean construction, the parties involved in the construction industry are unable to clearly identify or ascertain the necessary requirements prerequisite in establishing this concept within their respective projects.

iv. Lack of Proper Training

As the implementation of the lean construction concept within the industry has been adapted from the manufacturing sector and involves the utilization of certain specific techniques, parties involved in a construction project need to be given ample training to enable them to possess the required knowledge and skill in implementing the concept. The training to be given has to be balanced in terms of understanding the concept and principles of lean as well as comprehending the required tools to undertake the concept. According to Kim and Park (2006), one hurdle that disrupts the success of lean construction is the fact that training is only centred on the lean tools that can improve productivity and performance, but with minimal focus on the lean concepts and principles.

v. Weak communication among clients, consultants and contractors

In construction projects, many participants from different organizations have to work together (Adriaanse and Voordijk, 2005), especially clients, consultants and contractors. These project participants have different requirements and priorities but with a common objective of successfully completing the related construction project. Therefore, according to Terng and Lim (2003), there is a need to establish and improve communication between all parties privy to construction projects. In the process of implementing the lean construction concept, weak communication

between respective parties will lead to the disruption and ineffectiveness of the delivery and co-ordination system. In addition to this, breakdowns in communication contribute to a group of problems that result in low productivity and quality (Al-Reshaid and Kartam, 199). This situation will then result in the concerned parties to fail in fully realizing their responsibilities, which in turn will cause the implementation of the lean concept to be unable to achieve its maximum potential. Through a survey done by Kim and Park (2006) on construction firms in USA, it was found that construction firms which had good communication and mutual coordination were able to successfully implement lean construction concepts.

vi. The tendency of construction firms to apply traditional management concepts as opposed to productivity and quality management concepts.

In the construction sector, the main aim of the respective construction firms is to complete the construction end product within the stipulated time while maximizing profits. When viewed upon within that context, the implementation of the lean construction concept should be fully exploited and utilized as through this concept, the firms would definitely be able to eliminate waste and subsequently reduce construction costs. Furthermore, through the application of the lean construction concept, the level of client satisfaction can also be increased as according to Wright (2000) the implementation of this concept will help in identifying aspects that are deemed of value to the customers or clients. However, if a construction firm feels it is already satisfied with its current management level as well as comfortable in achieving its intended objectives, the firm will be reluctant in executing any changes, even though these changes may be able to increase and enhance their levels of productivity and quality. This situation will then cause any efforts to promote the use of lean construction concepts to fall on the deaf ears of these said companies.

vii. Attitude and ability to work in group (teamwork)

According to Howell (1999), the human attitude factor is one of the main aspects that retard the application of lean construction in the industry, especially during the physical implementation phase. In addition, according to Kim and Park (2006), the attitude of the parties concerned in a construction project towards the lean construction concept is a sensitive factor that in actual fact influences the success of implementing the concept. Attitude as discussed here refers to the tendency regarding intent, commitment and co-operation that need to be present within the parties if they are to successfully implement lean construction. This attitude will consequently influence their capacity to work in and as a team. It is common knowledge that within a firm and the construction project, there are various parties involved and working together as a team. If these parties are incapable of co-operating among themselves, the implementation of lean construction will definitely be negatively affected as it needs commitment and a strong co-operative network within all concerned parties.

viii. Long implementation period of lean concept in construction processes.
The implementation of lean construction by the construction firms in this country is still relatively new and the understanding towards this concept as well as its implementation method is quite limited even among the professionals involved. As a novel approach, the incorportation of this concept is bound to take time to be fully understood before the decision whether to introduce the concept is made. Through the study done by Kim and Park (2006), it was discovered that the implementation of lean construction in construction firms had resulted in too many meetings and too much information that needed discussions. Furthermore, these meetings had to be held repeatedly and took up too much time when poorly managed. These circumstances show that in the initial stages, the implementation of lean construction may require a lengthy period. If unmanaged, this situation will definitely become a hindrance towards the implementation of the lean concept within the construction firms as the stipulated time of a project is within a set duration. More so, the extension of the construction period will surely bring about loss and negative effects to the firm, which in the end will cause damage to the firm's reputation.

3. RESEARCH METHODOLOGY

In this study, data was gathered through a questionnaire survey. For that purpose, as many as 150 professionals working in Class A, B and C registered construction firms in the east coast region of Malaysia (consisting of the states of Kelantan, Terengganu and Pahang) were identified and subsequently given the questionnaires. The questionnaire distribution was done randomly using two approaches, namely via postal mail as well as direct visitations to the respective firms. From this total, only 62 percent of the professionals duly filled and returned the questionnaires. In other words, only 93 numbers of professionals were involved as respondents for this study.

4. DATA ANALYSIS

4.1 Respondents' job position

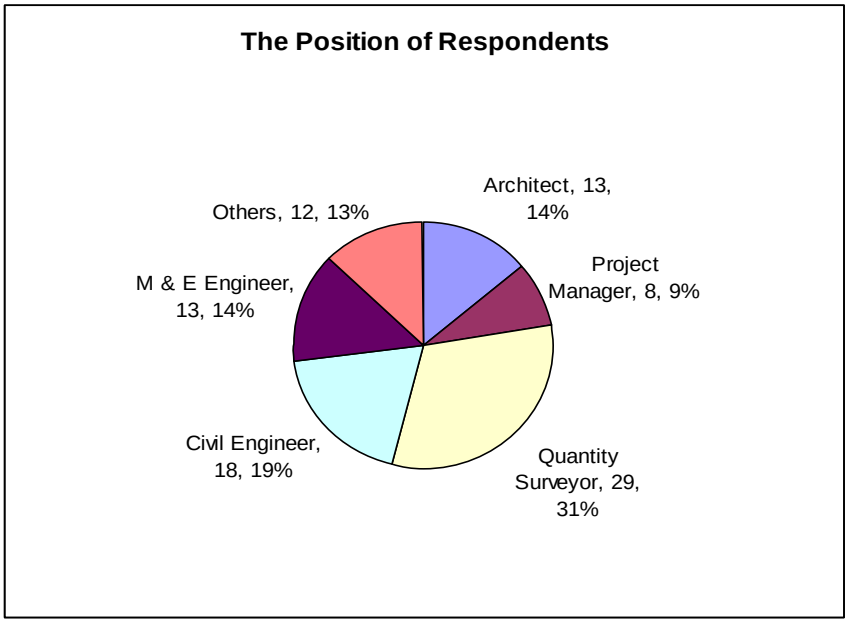

Figure 1: The job position of respondents

In reference to the figure above, it was discovered that a majority of the respondents in this study were comprised of quantity surveyors, namely 29 individuals (31 percent), followed by civil engineers, 18 individuals (19 percent). Respondents representing M&E engineers as well as architects were the third largest, both corresponding to 13 individuals or 14 percent. There were 12 respondents (13 percent) who comprised of various other professions while the remaining 8 individuals or 9 percent were working as project managers.

4.2 Respondents' Work Experience

Based on Figure 2.0, it was found that as many as 32 respondents had a working experience of 7 to 10 years, followed by 27 respondents who possessed working experience of between 5 to 7 years. The number of respondents with more than 10 years experience in the industry amounted to 17 persons, while 12 respondents had working experience of between 3 to 5 years. The minority group of respondents in terms of work experience was those with less than 3 years' experience, constituting 5 individuals.

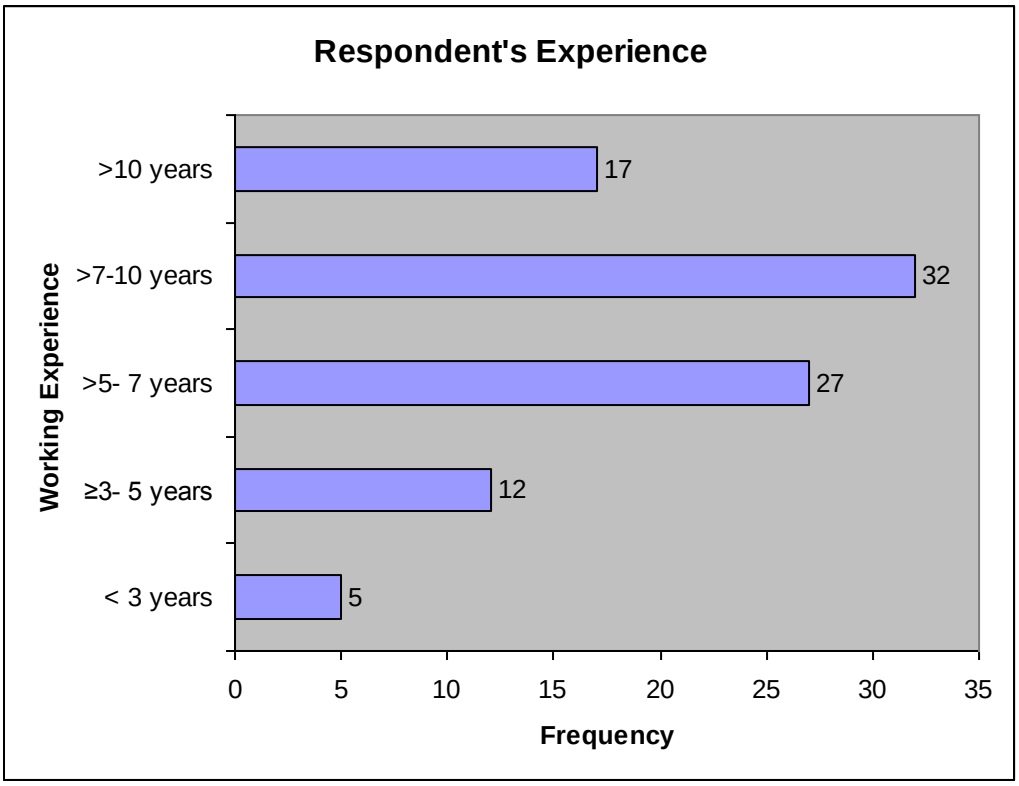

Figure 2: Respondent's experience in construction industry

4.3 Barrier factors

From analysis done on the 93 returned questionnaires, the output that was discovered is as shown in Table 1.0. The table shows that there were only 4 factors which recorded responses in terms of influence with more than 50 percent frequency. From these 4 factors, the factor pertaining to the lack of attentiveness and commitment from top management showed the most frequency in responses at 86 percent, followed by the factor relating to difficulties in understanding the concept of lean construction which recorded the second highest frequency of responses at 84 percent. The factor regarding lack of proper training was the next highest with a frequency score of 66 percent and this was followed by the factor pertaining to the tendency of construction firms to apply traditional management concepts as opposed to productivity and quality management concept which garnered a 58 percentage response frequency.

These findings of the analysis as shown in Table 1.0 also demonstrates that there are 5 factors which had recorded less than 50 percent response in terms of influencing factors. These factors are weak communication among clients, consultants and contractors with a frequency of 48 percent, the factor related to lack of exposure on the need to adopt the lean construction concept resgistering 31 percent, the factor on long implementation period of lean concept in construction processes amounting to 30 percent, the factor regarding lack of information or help from other organizations constituting 14 percent and finally the factor pertaining to attitude and ability to work in group (teamwork) which only managed a response frequency of 5 percent.

Table 1: The frequency output of restriction factors that have interfered during the implementation of lean construction concept

No.	List of Restriction Factors	Answer Scale*					Frequency Score Total	
		1	2	3	4	5	Does Influence (4+5)	Does Not Influence (1+2+3)
1.	Lack of attentiveness and commitment from top management	3	4	6	33	47	80 (86%)	13 (14%)
2.	Difficulties in understanding the concept of lean construction	3	8	4	41	37	78 (84%)	15 (16%)
3.	Lack of exposure on the need to adopt the lean construction concept	18	34	12	16	13	29 (31%)	64 (69%)
4.	Lack of proper training	1	18	13	32	29	61 (66%)	32 (34%)
5.	Weak communication among clients, consultants and contractors	18	27	20	11	17	45 (48%)	48 (52%)
6.	The tendency of construction firms to apply traditional management concepts as opposed to productivity and quality management concept.	6	8	25	29	25	54 (58%)	39 (42%)
7.	Attitude and ability to work in group (teamwork)	41	35	12	3	2	5 (5%)	88 (95%)
8.	Long implementation period of lean concept in construction processes.	33	21	11	17	11	28 (30%)	65 (70%)
9.	Lack of information or help from other organizations	16	11	53	11	2	13 (14%)	80 (86%)

*Scale 3 is considered neutral and is categorized within the non-influencing group

Subsequently, with the same obtained data, further analysis using mean reported findings as illustrated in the table below. Based on this table, it was found that there are only 2 factors that registered a mean of above 4.0. These factors are lack of attentiveness and commitment from top management as well as the factor regarding difficulties in understanding the concept of lean construction. Meanwhile, there were 2 other factors that garnered a mean score of more than 3.0, namely the factors concerning lack of proper training and the tendency of construction firms to apply traditional management concepts as opposed to productivity and quality management concept. The remaining five factors only managed to register a mean score of less than 3.0.

Table 2: The mean score of restriction factors that have interfered during the implementation of lean construction concept

No.	List of Restriction Factors	Mean Score
1.	Lack of attentiveness and commitment from top management	4.26
2.	Difficulties in understanding the concept of lean construction	4.09
3.	Lack of exposure on the need to adopt the lean construction concept	2.70
4.	Lack of proper training	3.75
5.	Weak communication among clients, consultants and contractors	2.80
6.	The tendency of construction firms to apply traditional management concepts as opposed to productivity and quality management concept.	3.58
7.	Attitude and ability to work in group (teamwork)	1.42
8.	Long implementation period of lean concept in construction processes.	2.48
9.	Lack of information or help from other organizations	2.51

5. FINDING AND CONCLUSION

As reported above, there are 2 main questions that were formulated within this study, which are firstly, do the construction professionals recognise any factors which act as restriction factors that interfered with the the implementation of lean constructon concept in the construction process?; and secondly, what are the circumstances which have contributed towards the occurrences of wastage in the construction industry?

Based on the findings of the analysis as shown in Table 1.0, it was discovered that all 93 respondents had managed to identify the response scale of each restricting factor put

forth. Therefore, the varied weightage scale of the responses received shows that the respondents of this study are seemingly aware and knowledgeable about the barriers faced during the implementation of the lean construction concept within the industry. This awareness subsequently leads towards the achievement of the main objective of the study, which is to identify the factors that were found to hinder the implementation of the lean construction concept within the Malaysian construction industry. Referring to the frequency analysis results obtained, it was discovered that there are 4 factors that the respondents perceive as barriers which influence or hinder the implementation process of the lean construction concept in the construction sector. These factors relate to lack of attentiveness and commitment from top management, difficulties in understanding the concept of lean construction, lack of proper training and the tendency of construction firms to apply traditional management concepts as opposed to productivity and quality management concept. This is due to the fact that all four of these factors recorded a response frequency of more than 50 percent. When further refered to the mean analysis findings, it was found that only 2 factors returned a mean score of above 4.0, namely, lack of attentiveness and commitment from top management and difficulties in understanding the concept of lean construction, while two other factors related to lack of proper training and the tendency of construction firms to apply traditional management concepts as opposed to productivity and quality management concept only managed to record a mean socre of 3.75 dan 3.58 respectively. Nevertheless, after rounding off is applied, both these two values are close to 4.0 as both of them exceed 3.5. As such, within this context, it is only prudent that both these two factors be also identified as hindering the implementation of the lean construction concept in the construction industry.

Based on the findings of this study, it is evidently clear that the implementation process of lean construction is being hindered by the presence of certain factors. Therefore, to ensure the successful implementation of this concept, specific action has to be taken in order to eliminate or minimally reduce the effects and influences of these identified restricting factors. The integration of lean construction concepts as a practical application within the construction process can be undertaken with success through the eradication of the related barriers. This apt implementation of this concept will then be able to assist the concerned parties within the construction industry to purge construction wastage which in turn will establish and increase the optimal usage of resources. By formulating the appropriate action and process framework based on the lean construction concept, the ability to curb wastage and increase resource usage effectively will directly result in the development of a best practice approach to the entire construction industry.

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