



¹. Abdelnaser OMRAN, ². Abdulsalam ABDULRAHIM

BARRIERS TO PRIORITIZING LEAN CONSTRUCTION IN THE LIBYAN CONSTRUCTION INDUSTRY

¹. School of Economics, Finance and Banking, College of Business, Universiti Utara Malaysia, 06010, Sintok, Kedah, MALAYSIA

². Engineering Department, Construction Company, Sebha city, LIBYA

Abstract: Engaging in Lean construction efforts could prove to be highly rewarding for building firms in Libya. However, lean construction is risky and can be disastrous if not properly managed. Lean production efforts in some other countries have not been successful due to the many barriers to its successful implementation. This study sets out to explore and identify the barriers that affect the prioritizing of lean construction with the objective of determining the barriers that affect the use of lean construction in the construction industry in Libya. Forty six (46) questionnaires were distributed to various construction firms in Libya. This study presents nine (9) barriers and investigates their influence (strength) on the success of lean construction initiatives. The strongest barrier is the provision of inputs exactly when required. Additionally, the barriers were ranked according to the ease of overcoming each. The easiest barrier to overcome is keeping the required items in the right place. This study indicates that extra efforts still need to be done on the awareness and use of lean construction in the Libyan construction industry. Additionally, a graphical aid is provided to enable decision makers to concentrate their efforts on the influential (strong), yet easy to overcome barriers. A lack of buildable designs and a participative management style for the workforce are the most important barriers to successful waste reduction in terms of strength and ease of overcome. On the other hand, a lack of an organizational culture that supports teamwork, a lack of prefabrication and a lack of knowledgeable and skilled workers are regarded as low in strength, and at the same time difficult to overcome. This therefore shows that efforts still need to be done on the awareness and use of lean construction in the Libyan construction industry.

Keywords: Lean construction, Barriers, Construction industry, Efforts, Libya

INTRODUCTION

The construction industry in Libya faces serious challenges and difficulties due to fast developments and dependence on foreign experts. The current capacity of the Libyan construction industry is unable to meet national housing supply needs. New homes, airports, ports, railway, and roads need to be built and upgraded. Hotels, office building and resorts are required to meet the needs of an expanding tourism industry. The building industry is often described as an industry with many troubles and a lack of efficiency. The solution to all of these evils is said to be in using the concept of lean construction. The word lean was distinct by (Howell, 2001). The lean construction knowledge developed by Toyota is, for many people, regarded as the only path for the building industry. Lean production or manufacturing concept comprises a variety of production systems that share certain principles, including waste minimization, responsiveness to change, effective relationships within the value stream, continuous improvement, and quality from the beginning by (Murman et al., 2002). Lean construction concepts have recently received attention as a modern way to improve construction performance and labor productivity (Abdel-Razek et al., 2007). Lean production is currently a buzzword in many manufacturing industries (Fellows et al., 2002), and some in the construction sector have tried to adapt it. The proponents of lean construction argue that it has the potential of

tapping into new and presented production theories committed to minimizing wasteful activities and values adding. Waste includes overproduction, wait time, transportation, assessment, inventories, movement and production of defective parts and products. To improve on craft and mass production, lean production combines the advantages of both (Sowards, 2006; Koskela, 1992). Koskela (1992) stated that construction is exceptional in the sense that it is one-of-kind nature of projects, site production and provisional multi-organization. However, breakdown of establishing a good management system in the construction project will lead to many problems that would cause cost of project increases, a late conclusion of project and low quality, which finally reduce the profit of the contractor. In order to overcome these problems, lean thinking or lean construction is being introduced in the construction sector. According to Howell, (1999), lean construction is one of the new philosophies that has been implemented by Toyota in their developed process, which is now applied to the construction industry in order to smoothen the construction project and increase the contractor's profit by eliminating waste. This is supported by Ballard and Howell, (1998) who also stated the same facts that lean thinking in construction concerned in waste reduction. Lean concepts have been brought to the construction industries of USA, Australia, Brazil, Denmark, Ecuador, Finland and Singapore (Ballard and Howell, 1998). Lean

construction project is very different compared to traditional construction project management where a lean approach aims to maximize performance for the customer at the project level, set well defined objective clearly for deliverance process, design concurrent product and process and applies production control throughout the life of the project (Howell, 1999). This study therefore intends to determine the barriers that are affecting lean construction in the construction industry in Libya. This work will also contribute to knowledge in that there are no case studies or actual documentation of lean construction being implemented in the local construction industry as this will provide a better and concrete result. To the building firms operating in Libya, this study will present the force and ease of overcoming lean production barriers. This study can be useful to the practitioners in diverse ways.

RESEARCH METHOD

The use of structured questionnaire was employed for data collection and was distributed using a non-probability sampling which is based on the personal judgment of the researchers. The structure of the questionnaire consists of two sections; section “A” is made up of five (5) items which consist of information about the respondent background, while section “B” consist of forty (40) items based on the potential barriers in implementing lean construction, these barriers were listed into nine (9). The aim was to investigate the barriers for prioritizing lean construction in the Libyan construction industry. Data were collected from respondent. The data collection commenced on 1st October 2011 and finished by 15th January 2012. Of the questionnaires that were sent out, only forty six (46) were returned fully filled and therefore used in the analysis.

RESULTS ANALYSIS AND DISCUSSION

On teamwork, inadequate knowledge and skills have the highest mean score of 3.80 (SD= 0.868), while the least problem is the lack of group culture, shared vision and consensus with a mean score of 3.33(SD =1.0). This result agrees with Alinaitwe (2009) where it was identified that inadequate knowledge and skill is a major barrier that strongly influenced worker’s productivity. Annie et al. (2003) had also identified ability to measure performance of the team as one of the elements to achieve a more effective approach to managing the resources function within large construction firms which therefore means that inability of measuring performance will affect the firm, this is achieved here with a means score of 3.58 (SD= 0.866), which shows that it is a strong barrier. The total average mean average means score of 3.53 shows that teamwork is a barrier to the prioritizing of lean construction in the Libyan construction industry.

The next item that was measured is based on Total Quality Management (TQM) in Table (2), the most important items for barriers to TQM in Libya are identified as lack of management leadership first ranked with a mean score of 3.60 (SD= 1.136) and it was documented by Venkatraman (2007) that a common barrier to both industry and education in implementing TQM is lack of proper leadership. Another important item that was identified is Poor

communication with a mean score of 3.58 (SD of 0.891), This is backed up by Sebastianelli and Tamimi (2003), who pointed out that poor communication between departments, was a real barrier to implementation of TQM.

Table 1. Teamwork Barriers to prioritizing of lean construction in the Libyan Construction Industry

Items	Score	Standard deviation
Inadequate knowledge and skills	3.80	0.868
Lack of organizational culture supporting team work	3.60	0.863
Inability to measure performance of the team and to gauge the team progress	3.58	0.866
Individual needs and personal differences of team members	3.53	0.726
Defined focus	3.47	0.968
Lack of capability of team to maintain alignment with other team	3.42	0.965
Lack of group culture, shared vision and consensus	3.33	1.00
Total	3.53	0.894

Table 2. Barriers for Implementing of Total quality Management i n the Libyan Construction Industry

Total Quality Management	Mean Score	Standard Deviation
Lack of Management Leadership	3.60	1.136
Inadequate Teamwork	3.60	0.836
Poor Communication	3.58	0.891
Lack of understanding customers’ needs	3.47	0.842
Lack of continuous improvement	3.40	0.654

Table (3) summarized of all the barriers and their mean scores. Amongst nine barriers provided in the below Table, it was found that “Business Process Review” have the highest mean score of 3.65 (SD= 0.854), this shows that a lack of a defined process at which the construction activities will be reviewed is a strong barrier to the implementation of the concept of lean construction in the Libyan construction industry. This is quite in tandem with Mamish, (2011) where it was identified that under the business review process, inadequate project team skills is one of the factors leading to organizations failing to implement changes. Abdul-Hadi, (2005) also identified organisational culture of the construction firms as being an impediment in Business Process Review. Pull scheduling comes next with a mean score of 3.59 (SD= 0.897), this include inadequate resources and planning. As detailed by Ahlstrom (1998) that organizations need to devote effort and resources to a set of principles in parallel in order to achieve pull scheduling for implementation of lean production, which implies that if the resources are inadequate, it may not be possible to realize lean production. Matthew et al. (2000) on their part in regards to inadequate planning stated that programming and planning on

construction projects are critical to the overall success of the project. Simplification which comprise of incomplete designs and complicated designs have a mean score of 3.58 (SD= 0.775) as it is difficult to use lean construction when the design cannot be understood by the construction workers and in most situations, the design is incomplete leaving room for many variations to come into the design. Alinaitwe (2009) stated that incomplete or complicated designs are barriers to the use of lean construction in the industry. Concurrent engineering consist of four items which are lack of knowledge on how to implement; Lack of management support; Reward system based on individual goals and Lack of client and suppliers involvement in the scheme of events. This have a mean score of 3.55 (SD= 0.852) as where the stakeholders are not carried along and entrenched in the scheme of events, the construction firm may not be able to meet the stakeholders demand, also where the management is not in support of innovation, the project manager cannot achieve much on site, these therefore are barriers that impedes on the implementation of lean construction. Prasad (2000) confirms that lack of management support is a major organizational roadblock in concurrent engineering while Anumba et al. (2000) posited that lack of client and supplier involvement is a barrier to lean construction. Teamwork has a mean score of 3.53 (SD = 0.894) has been previously explained in Table (1). It is made up of seven items. Total Quality Management has a mean score of 3.53 (SD of 0.872) and was explained in Table (2) which included five items. Just in Time have a mean score of 3.48 (SD=0.796), it consists of seven items which are; uncertainty in the supply chain, uncertainty in the production process, high inflation rates, price cuts in case of early purchasing, poor transportation and communication, unavailability of materials in the local markets; and discounts of prices of large amounts of materials. Pheng and Chuan (2001) showed that transportation and communication are an important factor in construction site, and if it not properly managed can become a barrier to JIT, also price cut in case of early purchasing according to Low and Wu (1997) suggested that it was feasible to apply the JIT purchasing system to procure the raw materials, which can significantly reduce the amount of buffer stock on site. Benchmarking consist of five items which are: fragmented nature of the business, cyclic nature of the business, diversity in organizational sizes and structures, ambiguous nature of inputs and outputs; and lack of agreed methodology. These have a mean score of 3.45 (SD=0.796) which portray the issue of benchmarking as a problem in lean construction implementation. Diversity in organizational sizes and structures according to Bergin (2000) is a barrier as small companies will find it difficult to benchmark. While large businesses have taken to benchmarking to gain and maintain the competitive advantage. However, small businesses are slower to adopt benchmarking in their own operations. Lack of agreed methodology as specified by Lee et al. (2005) is to provide the industry with a common set of metric definitions; therefore, if there is no common agreed methodology, then the objectives of the benchmarking will

not be realized. The last barrier that was considered is flow reliability which consisted of four items: use of non-standard components, lack of accurate pre-planning, lack of prefabrication and lack of best practices in the procurement process. These have a mean score of 3.37 (SD= 0.941) reflecting that where best practice is not used for procurement, it will be difficult to use lean construction and also since there are no uniform standard of prefabrication of the materials to be used, it will pose a problem of getting the needed materials as at when needed. Alinaitwe (2009) had also identified the use of non-standard components as a barrier while Haas et al. (2000) also identified the lack of prefabrication. Prefabrication can be approached differently, and these may result in change of the flow of the project. In productivity of construction project, onsite reassembly is ranked first followed by on site prefabrication and construction projects using offsite prefabrication are ranked last.

Table 3. List of the Barriers to Prioritizing Lean Construction in Libyan Construction Industry

Barriers	Mean Score	Standard Deviation	
Business Process Review	3.65	0.854	Accepted
Pull scheduling	3.59	0.897	Accepted
Simplification	3.58	0.775	Accepted
Concurrent engineering	3.55	0.852	Accepted
Teamwork	3.53	0.894	Accepted
TQM	3.53	0.872	Accepted
Just in Time	3.48	0.796	Accepted
Benchmarking	3.45	0.796	Accepted
Flow reliability	3.37	0.941	Accepted

CONCLUSION

In conclusion, this study has been able to identify nine barriers to the prioritization of lean construction in Libya which are; Business process review, pull scheduling, concurrent engineering, team work, total quality management, Just in Time, Benchmarking and Flow Reliability. These are in order of importance to the construction industry in Libya. The findings are in agreement with previous authors who have identified the under listed as barriers to successful implementation of lean construction in the construction industry. The study therefore provides an understanding of the Libyan construction industry such that these problems can be resolved in other to move the industry forward. It is however recommended that training programs about lean construction be provided to industry professionals as these programs will help to upgrade their knowledge, skills, techniques and processes in order to improve on the barriers for prioritizing lean construction in construction industry.

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