



# Overcoming the Challenges facing Lean Construction Practice in the UK Contracting Organizations

Abubakar M. Bashir<sup>1,\*</sup>, Subashini Suresh<sup>2</sup>, David A. Oloke<sup>2</sup>,  
David G. Proverbs<sup>3</sup> and Rod Gameson<sup>4</sup>

<sup>1</sup>Markfield Institute of Higher Education, Leicestershire, United Kingdom

<sup>2</sup>School of Technology, University of Wolverhampton, Wolverhampton, United Kingdom

<sup>3</sup>Faculty of Computing, Engineering and the Built Environment, Birmingham City University,  
Birmingham, United Kingdom

<sup>4</sup>School of the Built Environment, University of Salford, Greater Manchester, United Kingdom

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**Abstract:** Despite the benefits realized from Lean construction practice over the past two decades, the uptake of the Lean concept in the UK seems to be sparse. The UK contracting organizations engaged in Lean construction practice are faced with challenges that need to be addressed to facilitate wider application of Lean concepts so as to gain its benefits. The purpose of the study is to investigate the challenges facing the application of Lean principles in the UK construction industry with a view to proposing solutions that could be used to address the challenges. A qualitative research approach was adopted and semi-structured interviews were conducted with Lean construction practitioners working with 10 contracting organizations in the UK. The study identified 10 different challenges across the organizations that participated in the research and discovered 13 strategies that could be used to overcome the challenges. Findings from this study will lead to a better understanding of the challenges facing Lean construction practice in the UK so that further research could be done on how each challenge could be addressed. The findings could also help practitioners in addressing the different challenges they face in their Lean construction endless journey and facilitate Lean construction practice in the UK.

**Keywords:** Challenges, contracting organizations, lean construction practice, strategies

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## 1 INTRODUCTION

The term *Lean Construction* was first brought up in 1992 by Lauri Koskela. According to Koskela (1992), in order to improve quality and efficiency of construction processes, construction materials, labor and manpower need to be maximally utilized with a view to eliminating waste and any non-value adding activity while delivering value to the client. It is a production management system that continuously strives to eliminate all forms of waste (Dickson et al. 2007). Beyond eliminating waste of time, labor and materials, it also focuses on delivering value to the customer from inception to completion and from design to final handing

over of the project (Fewings 2013). However, after nearly two decades of introduction, the uptake of the Lean concept in the UK seems to be sparse despite its potential benefits (Mossman 2009). Hence, the implementation of *Lean Construction* in the UK needs to be looked at from the challenges facing Lean construction practice and how they can be addressed to gain acceptance and change the volte-face of construction norms and tradition to a new model in rethinking construction and development. Therefore, the research is aimed at investigating the challenges facing Lean construction practice and how they could be addressed by UK contracting organizations engaged in Lean construction practice.

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\*Corresponding author. Email: [a.bashir@mihe.org.uk](mailto:a.bashir@mihe.org.uk)

## 2 CHALLENGES TO LEAN CONSTRUCTION PRACTICE

Several researches have been conducted in various countries to investigate factors that could affect the successful implementation of lean construction concepts among contractors and consultants. The research classified these challenges into six different categories based on the review of literature relating to the uptake of lean practice.

### 2.1 Management Issues

The top management of every organization has a major role to play towards successful implementation of innovative strategies (Salem et al. 2005; Hudson 2007). The success of lean practice lies in their commitment to develop and implement an effective plan and adequately provide the required resources and support to manage changes arising from the implementation. However, some challenges identified in several studies are related to management issues. In a study, poor project definition, inadequate resources and delay in materials delivery were found to be some of the managerial issues hindering the successful implementation of Lean construction (Olatunji 2008). Furthermore, the studies by Alarcon et al. (2002), Mossman (2009) and Abdullah et al. (2009) identified lack of adequate time for innovation and long period of implementation as the challenges faced by some organizations. Additionally, Koskela (1999), Anumba et al. (2002), Polat and Arditi (2005), Alinaitwe (2009) and Forbes and Ahmed (2011) identified challenges such as poor communication, lack of clearly defined plans, lack of client, subcontractor and supplier involvement, lack of transparency, inaccurate preplanning, delay in decision making, unsuitable organizational structure, weak administration and poor procurement strategies, among others. Though some of the challenges appear easy to address, overcoming them is crucial to smooth lean construction practice across various organizations.

### 2.2 Financial Issues

The implementation of innovative strategies like lean construction requires adequate funds to motivate the workers, provide relevant materials and equipment, and in some cases employ lean specialist or consultant to guide both employers and employees in implementing the concept. Finance related issues are among the most common challenges to lean practice across many organizations in various countries. However, nature of these challenges varies across countries. For instance, studies by Olatunji (2008) and Mossman (2009) identified poor professional wages, corruption, lack of incentives and motivation and poor risk aversion to be common challenges. Common et al. (2000) also found some of the financial challenges to include inflation and high implementation cost. Unless adequate measures

are put in place to overcome these challenges, several companies could be discouraged from implementing lean.

### 2.3 Educational Issues

Over the past couple of years, a significant effort has been made to raise awareness, provide guidance and share knowledge relating to lean construction by academics, researchers, practitioners and bodies such as Lean Construction Institutes (LCI), International Group for Lean Construction (IGLC), Construction Lean Implementation Program (CLIP), British Research Establishment (BRE) and Construction Excellence (CE). However, these bodies operate in very few countries. Despite the large number of publications on lean construction, educational issues still appear to be the most common challenges to lean practice as studies by Alarcon et al. (2002), Forbes and Ahmed (2011) and Suresh et al. (2012) found illiteracy/inadequate knowledge among workers, lack of awareness, lack of training and lack of information sharing to be common challenges.

### 2.4 Governmental Issues

Despite the significant economic contribution being made by the construction industry in various countries, it still faces numerous problems that are related to government policies. According to Olatunji (2008) and Alinaitwe (2009), challenges like inconsistency in policies and unsteady price of commodities impede the implementation of Lean construction in some countries.

### 2.5 Technical Issues

The implementation of lean construction may be affected by challenges which are technical because they have a direct impact on application of lean construction principles like reliability, simplicity, flexibility and benchmarking (Koskela 1992). Design related challenges identified in existing studies include incomplete designs, inaccurate designs and lack of design constructability (Koskela 1999; Alinaitwe 2009). Furthermore, Polat and Arditi (2005) identified uncertainty in supply chain while Alinaitwe (2009) found poor performance measurement strategies. The aforementioned technical issues, if not addressed, could hinder holistic implementation of Lean construction.

### 2.6 Human Attitudinal Issues

According to Howell (1999), human attitude is one of the major factors affecting the implementation of lean construction. Some of the attitudinal issues affecting lean construction practice include lack of cooperation by workers, poor understanding of client's brief, misconceptions about lean practice, lack of committed leadership, lack of teamwork, lack of self-criticism, poor house-keeping and fear of unfamiliar practices (Alarcon

et al. 2002; Mossman 2009; Suresh et al. 2012; Common et al. 2000; Cua et al. 2001; Castka et al. 2004; Bechdol 1995).

Whilst the challenges highlighted above affect the entire construction industry across different countries, this paper specifically studies the challenges facing Lean construction practice in relation to the UK contracting organizations and identifies the strategies that could be adopted to overcome them.

### 3 RESEARCH METHODOLOGY

#### 3.1 Research Method

This research is exploratory in nature; hence an interpretive research approach was adopted with the aim of building a holistic picture, based on the interviewees' personal experience, knowledge and understanding. In choosing an interview technique, the semi-structured interview was found appropriate and was thus adopted because of its flexibility and the opportunity for free and detailed discussion with the interviewees (Bailey 2007).

Telephone interviews lasting about 45 minutes each were conducted to save resources and being the preferred medium for the participating organizations.

#### 3.2 The Sampling Technique

A sample is a collection of respondents that are expected to fairly represent the entire population (Denscombe 2010). Purposive sampling technique is one of the most recommended sampling technique for qualitative studies involving interviews (Bryman 2008). It is a strategic technique in which samples are chosen based on their relevance to the research question (Denscombe 2010). For the purpose of this research, a purposive sampling technique was therefore adopted, where only contracting organizations engaged in Lean construction practices participated in the study. A list of such

contracting firms was collected with the assistance of the Lean construction institute (LCI-UK) and through the Construction Lean Improvement Program website (Construction Excellence 2011).

#### 3.3 The Sample

Invitation letters were sent to a total of fifty-four (54) organizations though only ten (10) participated in the interview. The participating organizations consented voluntarily and appointed representatives to speak on their behalf. The representatives, who were lean experts, include contracts manager (R1), project manager (R2), best practice manager (R3), project leader (R4), associate director/ best improvement manager (R5), lean improvement manager (R6), business improvement manager (R7), lean technical manager (R8), operations manager (R9) and project manager (R10).

##### 3.3.1 Organization Operations Area

Because the size of the organizations vary, they were classified based on EU classification of construction organizations into small (1), medium (2) and large (7) organizations based on the number of employees as shown in Table 1. The table shows the roles of the respondents in their various organizations, their years of work experience, and the number of employees, size and operation areas of these contracting organizations. The organizations' geographical area of operations also reflects their sizes. The large organizations focus and operate in wider areas, for example, R3 operates in Europe and Asia; R8 in the whole of England; and R10 and R2 at a global level, while the smaller organizations operate in smaller areas, for example R6 in Greater London. Similarly, R4, the medium size organization, operates in Birmingham, London, Liverpool, Warwick and Manchester. However, the organizations are willing to follow their clients beyond these areas of focus.

Table 1. Sample characteristics

Role	Work experience (years)	Number of employees in organization	Size of organization	Operation areas
R1 Contracts manager	30	352	Large	North-west England
R2 Project manager	4	19415	Large	Global
R3 Best practice manager	18	375	Large	Europe, Asia
R4 Project leader	32	130	Medium	Birmingham
R5 Best improvement manager	34	602	Large	Greater Midlands
R6 Lean improvement manager	5	40	Small	Greater London
R7 Business improvement manager	33	650	Large	Birmingham, London, Warwick, Liverpool, Manchester
R8 Lean technical manager	31	4000	Large	England
R9 Operations manager	19	80	Medium	West and East of Midlands
R10 Project manager	12	19000	Large	Global

### 3.3.2 Work Experience

The level of working experience differs across the interviewees. R1, R4, R5, R7 and R8 have over 30 years of working experience; R9 has 19 years; R3 has 18 years; R10 has 12 years; while R2 and R5 have 4 and 5 years respectively. This reflects their rank in their organizations, with the most experienced among them (R5) being part of the top management. However, being the champions of lean implementation in all the organizations, they were deemed to be in a very good position to discuss the impact of lean construction tools on behalf of their organizations.

## 4 DATA ANALYSIS

The interviewee’s responses were analyzed using the thematic analysis approach of Boyatzis (1998); a method which was described by Aronson (1994) as suitable and flexible for collecting and communicating ideas and the emerging patterns during an interview. It also enables the researcher to get a rich and detailed meaning out of the interview (Braun and Clarke 2006). The Interviews were recorded, transcribed and subjected to repeated study for a good understanding of the content and the identification of the ideas relating to the aim and objectives of the study (Creswell 2009; Flick 2009). The crucial ideas (here referred to as segments) and words were assigned codes, with potential themes generated from these codes. The coded words and segments were studied, reorganized and collated under relevant themes. For instance, data extracts like “unwillingness to change”, “usual work styles”, “change in attitude”, “old mentality”, “behavioral change” and “traditional methods” were coded as “cultural change” and categorized under the theme “Challenges to Lean construction practice”. The different themes that were identified from the interview are “drivers to Lean construction practice”, “the challenges facing Lean construction practice”, “the strategies for addressing the challenges” and “the outcomes of Lean construction

practice in the organizations”. The categorized extracts were further analyzed, with detailed description of the different themes and patterns or relationships among them made. However, this paper is limited to findings related to the challenges facing Lean construction practice in the organizations and the strategies that could be adopted in addressing them.

## 5 FINDINGS AND DISCUSSIONS

This section discusses findings from the interview relating to the challenges to Lean construction practice and the strategies that could be adopted to overcome them.

### 5.1 The Challenges Encountered in Lean Construction Practice

Though the application of lean has yielded a lot of benefits across the organizations, its implementation is facing a lot of challenges. The various challenges, their frequency of occurrence and the different organizations experiencing them are summarized in Table 2. As shown in the table, a total of eleven challenges were identified across the organizations which include resistance to cultural change; complexity; lack of cooperation; lack of long term forecast and investment; lack of Lean knowledge; Old school thinkers not seeing the long term goal; and old school mentality. According to R5, “*You get the impression that well if it is not burst, why try to fix it*”.

Others are cost of implementation; long implementation time; lack of long term forecast and investment; change in attitude and thinking; misconceptions about Lean; lack of management support; and high expectations from the management. According to R4, “*Changing people’s behavior is the most challenging thing*”. These challenges are discussed in detail below.

**Table 2.** Challenges facing Lean practice in the organizations

No.	Challenges	Frequency of Occurrence	Organizations
1	Changing employees’ working culture	8	10, 9, 7, 6, 5, 3, 2, 1
2	Cost of implementation	4	9, 7, 4, 2
3	Lack of Lean knowledge	3	10, 9, 1
4	Long implementation time	2	7, 2
5	Complexity	2	8, 1
6	Lack of cooperation from employees	2	5, 6
7	Lack of incentives	1	4
8	Lack of long term forecast and investment	1	3
9	Low effort to learn	1	9
10	Misconceptions about Lean	1	8
11	High expectations from management	1	3

### 5.1.1 Changing Employees' Working Culture

According to R10, R9, R7, R6, R5, R3, R2 and R1, one of the major problems facing organizations is employees' resistance to change in their working culture. A lot of workers find it difficult to change the way they learned to do things and the way they do things. Despite learning the benefits attached to doing things differently to improve productivity, some workers prefer to do things the traditional way. This is seen as a big challenge to Lean construction practice in most of the organizations.

### 5.1.2 Lack of Long Term Forecast and Investment

R3 see lack of long term forecast of the benefits of Lean construction to the organization, by the top management, as a challenge to Lean construction practice in their organization. Though the organization is engaged in Lean practice, the poor or negative long term forecast of its potentiality could contribute to inadequate support and commitment from the management to full investment in implementing Lean construction.

### 5.1.3 Long Implementation Time

According to R2, Lean construction is a continuous improvement process with an endless journey that may take a long period to be fully implemented. For instance, time is needed to train the workers, apply the principles, select the appropriate tools to use and implement them on site, manage change to working culture, and carry out an evaluation to identify areas for improvement. Therefore, this is seen as a long term investment by R7 and R2.

### 5.1.4 Cost of Implementation

R9, R7, R4 and R2 are of the opinion that one of the challenges of Lean construction practice is the cost attached to its implementation. This involves the cost of training the workers, consultancy fees, conducting workshops, purchasing signs and labels to be used in visual management, alerts and so on. Some of the production hours may also be consumed in daily huddle meetings. The four organizations see these expenses as high and costly.

### 5.1.5 Misconceptions about Lean

R8 noted that one of the challenges facing Lean construction practice is the wrong conception a lot of workers have about the philosophy. Some workers see it as a way of saving production cost by reducing the number of staff, paying fewer wages to them or forcing them to complete a task within a shorter period so that they will be paid for less number of hours. Some staff also misinterpret it as doing the job quicker. This makes some workers to dislike the approach and as such they tend to give inadequate cooperation to achieve its full

implementation. Though only R8 identified this problem, it seems to be a common problem among Lean practicing organizations.

### 5.1.6 High Expectations from Management

As R3 observed, another challenge facing Lean construction practice is management high expectations as soon as Lean construction is implemented. The management of some organizations expect to see sudden, significant and dramatic achievements in terms of productivity, cost, time and other factors that drive them to apply Lean construction. This tends to result in putting pressure on the workers and sometimes slight disappointments when the outcome is below expectation.

### 5.1.7 Lack of Lean Knowledge

According to R9, the fact that Lean construction was adopted from Lean manufacturing, a lot of the workers and even their managers are not familiar with the Lean concepts. Lean construction cannot be practiced without knowledge of the Lean concepts. R1 and R10 suggested that this tends to discourage some organizations from its implementation because they view it as an entirely new project management approach that they have to learn from basics.

Another challenge according to R9 is that the workers are not very keen on learning the Lean construction principles and tools introduced by the organization.

### 5.1.8 Complexity

Lean construction does not just involve applying Lean construction tools on site but also involves developing a culture among the staff for a continuous and endless pursuit of improvement across all units of the organization. In addition to the site environment, Lean is practiced even in administrative activities within the office environment. R8 and R1 observed that this is seen as a too intricate and complex practice to adopt among some workers.

### 5.1.9 Lack of Cooperation from Employees

In order to achieve the objectives of an organization, its employees must work together harmoniously as a team and comply with instructions issued to them. R5 and R6 noted that some workers do not give the necessary cooperation required by site managers and Lean implementation consultants, especially when there is no incentive for doing so. However, this problem does not seem to be common in other organizations.

### 5.1.10 Lack of Incentives

Though workers are paid to do their job, appreciating their efforts with additional rewards especially when they do all that is required motivates them to do better.

Lean construction demands that staff work smartly and efficiently to increase the productivity. According to R4, one of the challenges affecting Lean construction practice in some organizations is that the workers are not given any reward besides their normal wages for being more smart and efficient. Despite improvement in the productivity due to Lean construction practice, no incentives are given to the workers. However, only R4 identified this problem.

## 5.2 Nature of Challenges

A deeper analysis of the challenges identified across the contracting organizations categorizes them based on their nature so as to guide the organizations in using the appropriate strategies to address them. This is presented in Table 3. The table shows that 36% of the challenges are related to human issues, 9% are both educational and financial, 18% are technical, 28% are related to the management and none is related to the government. This shows that most of the challenges facing Lean construction practice are related to the human nature of the worker. The role of the management is critical in addressing the challenges facing lean construction practice. This could also be seen from the strategies identified by the respondents. Though the workers also have a role to play in implementing the strategies, a large number of the strategies are issues that could solely be implemented by the management.

## 5.3 Strategies that Could Be Used to Overcome the Challenges

In order to achieve a smooth application of lean tools and realize its full benefits, the challenges have to be addressed. The study participants identified 13 different strategies that could be deployed to address the challenges. The various strategies, the frequency of their identification and the different participants that identified them are summarized in Table 4. These are; Simplify the language of Lean; Total belief by site team and supply chain; Education; Get clients to insist on lean application; Legislative requirements; and Publi-

cation of results. Other strategies identified from the interview include Site team must buy in; Call it business improvement instead of Lean; Reduce the fear/reservations among workers; top management involvement and support; Persistence; Robust planning; Enlighten people on need for change; Enlightenment on its benefits/ business improvement; Reduce high expectation on outcome; Gradual step-by-step implementation; and Workers involvement and empowerment.

Though none of the challenges identified in the study are related to government issues, some of the strategies relate to government policy makers and legislators. Lean construction researchers also have a major role in developing frameworks for the adoption of these strategies.

### 5.3.1 Enlightenment on Benefits of Lean Construction Practice and Need for Change

According to R5, R8 and R10, organizations should engage their staff in enlightenment meetings, workshops and other events on the benefits of Lean construction practice. Furthermore, R1 and R7 suggested that the workers should be enlightened on the need for change from the traditional practice and should be made to understand the difference between Lean and non-Lean practices. They should be well informed about how they can comply with the demands of lean practices. This strategy could help in addressing challenges like difficulties in changing working culture, misconceptions about lean and lack of cooperation from employees.

### 5.3.2 Simplify the Language of Lean Construction

The terminologies adopted in manufacturing should as much as possible be minimized. In order to achieve a more successful and smooth implementation of Lean construction, R1 suggested that the organization should use terms that are simple to understand. All the instructions, directive and terms should be made easy to understand in order to achieve compliance and successful execution of the assigned task(s).

**Table 3.** Nature of challenges facing Lean practice in the organizations

Challenges	Nature of Challenge
Resistance to culture change	Human related
Lack of cooperation from employees	Human related
Lack of long term forecast and investment	Management related
Long implementation time	Technical issue
Cost of implementation	Financial issue
Lack of Lean knowledge	Educational issue
Lack of incentives	Management related
Misconceptions about lean	Human related
Complexity of lean implementation	Technical issue
High expectations from management	Management related

**Table 4.** Strategies to overcome the challenges

No.	Strategies	Frequency of Occurrence	Organizations
1	Enlightenment on benefits of lean and need for change	5	10, 8, 7, 5, 1
2	Publication of results	5	10, 8, 7, 5, 4
3	Reduce the fear/ reservations	4	8, 5, 4, 3
4	Education	3	10, 9, 2
5	Get clients to insist on lean application	2	8, 2
6	Workers involvement and empowerment	2	5
7	Top management involvement and support	2	5, 3
8	Persistence	2	7, 6
9	Total belief by site team and supply chain	2	4, 2
10	Government policies and legislation	2	10, 2
11	Simplify the language of Lean	1	1
12	Robust planning	1	6
13	Gradual step-by-step implementation	1	9

### 5.3.3 Total Belief by Site Team and Supply Chain

The organization should ensure that the site team and the supply chain have confidence in the new approach. According to R2 and R4, they should be made to have trust in it, mentally accept it and have full conviction that it is a progressive change.

This strategy could help in addressing challenges like difficulties in changing working culture and lack of cooperation from employees.

### 5.3.4 Education

According to R2, R9 and R10, the organizations should engage their staff in a learning process to acquire all the necessary knowledge and skills required to achieve a smooth and full implementation of Lean construction principles and tools. These could involve organizing a workshop or a training session with Lean consultants as the workforce must be adequately trained to fully and successfully accomplish tasks using the new tools and approach. This strategy could help address challenges like difficulties in changing working culture, misconceptions about lean, lack of Lean knowledge, complexity of lean practice and lack of cooperation from employees.

### 5.3.5 Get Clients to Insist on Lean Application

R8 and R2 suggested that the construction industry should get clients to firmly demand for Lean construction approach to managing their projects. They may insist that this is inserted in the contract terms.

### 5.3.6 Publication of Results

According to R4, R5, R7, R8 and R10, the results of studies and benefits of Lean construction practice should be communicated to the staff and even the public as a whole using printed materials like newspapers, building magazines and journals. The organization-

s could also use TV programs and other audio-visual aids to communicate the results and benefits of adopting lean approach.

### 5.3.7 Reduce the Fear/Reservations

The organization should ensure that the fear built in the staff due to misconceptions and misunderstanding of Lean construction practice is cleared from their minds. According to R8 and R3, this is necessary to clear away any reservations they have in their minds.

In order to reduce the fear and reservations, R4 and R5 prefer to call it business improvement in their organizations rather than Lean construction with workers viewing it as an innovative continuous business improvement strategy rather than an entirely new method of doing business.

### 5.3.8 Top Management Involvement and Support

According to R3 and R5, the top management must be fully involved in the implementation of the concepts. They must engage themselves in continuous improvement activities and provide all the necessary facilities and incentives required to support and strengthen the staff. This strategy could help in addressing challenges like lack of long term forecast and investment, high expectations from management, lack of incentives and lack of cooperation from employees.

### 5.3.9 Persistence

In order to achieve a sustainable Lean construction practice, R6 and R7 suggested that the entire staff must put continued effort. Despite the obstacles and inconveniences of changing working culture, they should be firm and steadfast towards satisfying the demands of becoming a Lean organization.

### 5.3.10 Robust Planning

According to R6, the organizations must develop a very rich and strong program to achieve a smooth implementation. A vigorous scheme should be designed to aid the practice so that the goals can be obtained. This may involve making a policy in the organization to achieve the objectives of Lean construction practice.

### 5.3.11 Workers Involvement and Empowerment

R5 suggested that Lean practicing organizations should involve its staff, both senior and junior, in making decisions that relate to Lean construction practice in the organization. The staff should be encouraged to freely express their views and should be authorized and empowered to make suggestions.

### 5.3.12 Government Policies and Legislations

According to R10, to further support Lean construction practice, the UK government could introduce a policy that will encourage construction companies to engage in continuous improvement practices, like Lean construction, to reduce construction waste and minimize waste of resources in construction projects.

### 5.3.13 Gradual Implementation of Lean concepts

R9 suggested that a good way of overcoming the resistance to cultural change exhibited by workers in Lean practice is to avoid sudden one-off implementation of Lean principles and tools. The principles should be gradually taught and implemented in stages over a period of time. Similarly, when the organizations identify the tools that are relevant in achieving their targets, they should apply the tools in stages rather than many tools at a time.

## 6 CONCLUSIONS

An in-depth analysis of the existing literature on the challenges facing the implementation of lean construction across the globe categorized them into financial, educational, governmental, attitudinal, managerial and technical issues. This approach was also used in categorizing challenges identified in the study. This helps identify and share responsibilities in overcoming the challenges among the stakeholders. Besides the challenges identified in the literature review, the study discovered 11 challenges being faced by the 10 contracting organizations. Though 7 of them have already been identified in the literature, 4 appear to be new. The 4 new challenges are high expectations from the management, low efforts to learn from the employees, lack of incentives and non-compliance with instructions. The industry's resistance to change in behavior/practice happened to be the most predominant challenge facing lean construction practice in the organizations. Never-

theless, the research discovered 13 strategies that could be used to address these challenges in order to optimize the benefits of lean application. These include publication of results, persistence, gradual implementation of lean and enlightenment programs. Findings from this study will lead to a better understanding of the challenges facing Lean construction practice in the UK. The findings could also help practitioners in adopting the discovered strategies to address the different challenges they face in their Lean construction endless journey and facilitate Lean construction practice in the UK. However, some of the strategies are not specifically focused on particular challenges. Therefore, further research is needed to determine which strategy could be used in addressing a particular challenge. Hence, a deeper research on each strategy is recommended to see how it could be implemented or applied to overcome a particular challenge or range of challenges in adopting lean construction.

## REFERENCES

- Abdullah, S., Abdul-Razak, A., Abubakar, A., and Mohammad, I. S. (2009). "Towards Producing Best Practice in the Malaysian Construction Industry: The Barriers in Implementing the Lean Construction Approach." M.S. thesis, Universiti Teknologi Malaysia, Malaysia.
- Alarcon, L. F., Diethelm, S., and Rojo, O. (2002). "Collaborative implementation of lean planning systems in Chilean construction companies." *Proceedings of the 10th Annual Conference of the International Group for Lean Construction*, Gramado, Brazil.
- Alinaitwe, H. M. (2009). "Prioritizing lean construction barriers in Uganda's construction industry." *Journal of Construction in Developing Countries*, 14(1), 15-30.
- Anumba, C., Baugh, C., and Khalfan, M. (2002). "Organisational structures to support concurrent engineering in construction." *Industrial Management Data Systems*, 5(6), 260-270.
- Aronson, J. (1994). "A pragmatic view of thematic analysis." *The Qualitative Report*, 2(1).
- Bailey, C. A. (2007). *A Guide to Qualitative Field Research*. Pine Forge, London, 2nd edition.
- Bechdol, P. (1995). "Re-engineering the business of construction." *Construction Business Review*, May/June, 40-42.
- Boyatzis, R. E. (1998). *Transforming Qualitative Information: Thematic Analysis and Code Development*. SAGE Publications, Thousand Oaks.
- Braun, V. and Clarke, V. (2006). "Using thematic analysis in psychology." *Qualitative Research in Psychology*, 3(2), 77-101.
- Bryman, A. (2008). *Social Research Methods*. Oxford University Press, Oxford, 3rd edition.
- Castka, P., Bamber, C., and Sharp, J. (2004). "Bench-



- marking intangible assets: Enhancing teamwork performance using self-assessment." *Benchmarking*, 11(6), 571–583.
- Common, G., Johansen, E., and Greenwood, D. (2000). "A survey of the take-up of lean concepts among UK construction companies." *Proceedings of the 8th Annual Conference of the International Group for Lean Construction*, Brighton, UK.
- Construction Excellence (2011). *Construction Lean Improvement Programme*. Available at <<http://www.constructingexcellence.org.uk/resources/themes/clip/clip.jsp>>.
- Creswell, J. W. (2009). *Research Design; Quantitative, Qualitative and Mixed Methods Approaches*. SAGE Publications, London, 3rd edition.
- Cua, K. O., McKone, K. E., and Schroeder, R. G. (2001). "Relationships between implementation of TQM, JIT and TPM and manufacturing performance." *Journal of Operations Management*, 19(6), 675–694.
- Denscombe, M. (2010). *The Good Research Guide for Small Scale Social Research Projects*. Open University Press, London, 4th edition.
- Dickson, E., Singh, S., Cheung, D., and Wyatt, C. C. (2007). "Application of lean manufacturing techniques in the emergency department." *Journal of Emergency Medicine*, 37(2), 177–182.
- Fewings, P. (2013). *Construction Project Management: An Integrated Approach*. Routledge, London, United Kingdom.
- Flick, U. (2009). *An Introduction to Qualitative Research*. SAGE Publications, London, 4th edition.
- Forbes, L. H. and Ahmed, S. M. (2011). *Modern Construction: Lean Project Delivery and Integrated Practices*. Taylor and Francis, USA.
- Howell, G. (1999). "What is lean construction - 1999." *Proceedings of the 7th Annual Conference of the International Group for Lean Construction*, Berkeley, USA.
- Hudson, M. (2007). *Managing without Profit: The Art of Managing Third-sector Organizations*. Directory of Social Change, London, 2nd edition.
- Koskela, L. (1992). "Application of new production theory in construction." *Report No. Technical Report No. 72*, Stanford University, USA.
- Koskela, L. (1999). "Management of production in construction: A theoretical view." *Proceedings of the 7th Annual Conference of the International Group for Lean Construction*, Berkeley, USA.
- Mossman, A. (2009). "Why isn't the UK construction industry going lean with gusto?." *Lean Construction Journal*, 5(1), 24–36.
- Olatunji, J. (2008). "Lean-in-Nigerian construction: State, barriers, strategies and "go-to-gemba" approach." *Proceedings of the 16th Annual Conference of the International Group for Lean Construction*, Manchester, UK.
- Polat, G. and Arditi, D. (2005). "The JIT materials management system in developing countries." *Construction Management and Economics*, 23(7), 697–712.
- Salem, O., Solomon, J., Genaidy, A., and Luegring, M. (2005). "Site implementation and assessment of lean construction techniques." *Lean Construction Journal*, 2(2), 1–21.
- Suresh, S., Bashir, A. M., and Olomolaiye, P. O. (2012). "A protocol for lean construction in developing countries." *Contemporary Issues in Construction in Developing Countries*, G. Ofori, ed., Spon Press, London, 376–406.