

## **CAPACITY BUILDING IN CONSTRUCTION SMES: A PROPOSAL THROUGH ENABLING LEAN**

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### **Abstract**

Construction Small and Medium Enterprises (SMEs) makes a noteworthy contribution to GDP in national economy despite the challenges faced by them. One of their major problems is increase of non-value adding activities. Hence, construction SMEs need to be responsive to the challenges in implementing lean. Lean is a relatively new approach in the construction industry which minimizes waste, time and creates value. However, implementing lean may encounter challenges. Lack of capacities is the prevalent issue and hence, need to identify necessary capacities to achieve full benefit of lean implementation. Focusing on capacity building to enable lean construction will allow construction SMEs to better perform in the industry. Therefore, this paper attempts to investigate the importance of lean enabling capacity building in construction SMEs. Hence a comprehensive literature review was carried out to discuss the challenges faced by construction SMEs, lean philosophy, lean construction benefits, barriers and capacity building. Although, lean and capacity building related literature exists, there is a lack of research in capacity building strategies that enable lean in construction SMEs. Hence, the paper proposes a conceptual model for lean enabling capacity building for construction SMEs. The developed conceptual model will further guide this research study to identify lean enabling capacity building strategies for construction SMEs.

**Keywords;** *Capacity building, lean construction, construction SMEs, Sri Lanka*

## **1. Introduction**

Construction industry is one of the competitive industries in most of the countries with a dispersed industrial structure and few barriers to entry (OECD, 2008). Therefore, large numbers of firms enter in to the industry and competition in the industry is increasing. Due to high competition, construction industry in many parts of the world suffers from problems such as workmanship defects, time, and cost overrun to name few (Harrington, Voehl & Wiggin, 2012). As globalization proceeds, developing countries and their enterprises face major challenges in strengthening their human and institutional capacities to take advantage of trade and investment opportunities (OECD, 2004). Although an extensive body of literature exists in the area of challenges face by large construction organizations, the issues encountered by SMEs is largely unreported (Hardie & Newell, 2011). According to Harvie (2004), a common characteristic of most of the economies is the significance of a sizeable and rapidly expanding SME sector. Hence, the importance of SMEs cannot be downgraded as they play a great role in the construction industry and making them responsive to solve their problems is paramount. Hence, Lean and capacity building are relatively new approaches in the construction industry which can be implemented by construction SMEs to better perform in the industry. Thus, the aim of this study is to develop a conceptual model for lean enabling capacity building to foster construction SMEs. Moreover, this paper is an early stage output of a postgraduate research.

## **2. Small and Medium Enterprises (SMEs)**

SMEs are one of the backbones of economic growth in all countries which employ the prevalent percentage of the workforce (Agwu, & Emeti, 2014). There is no universally accepted definition for SME, as it seems to vary from country to country and also from industry to industry. Ayanda and Laraba (2011) identified three parameters generally applied by most countries to define SMEs, individually or in combination as; capital investment on plant and machinery, number of workers employed and volume of production or turnover of business.

Harvie (2004) and Harvie and Lee (2003) stated that the majority of SMEs are relatively small and over 95 percent of SMEs in the East-Asian region employ less than 100 people. In the developed and newly developing countries, SMEs generally employ a large percentage of the workforce and are responsible for income generation opportunities. These enterprises can also be described as one of the main drivers for poverty alleviation (Singh, Garg & Deshmukh, 2010; Agwu & Emeti, 2014).

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According to Kadiri (2012), United State of America (USA) employs about 87% of its workforce in the SME sector, where as in German, it is 72.6%. The contribution of Sri Lankan SMEs is vital in many ways as they provide over 60% of the private sector jobs, and generate 50-80% of total employment (Ministry of Finance and Planning, 2010). Hence, rapid growth of SME sector has largely influenced to construction industry as well.

### 2.1. CONSTRUCTION SMES

Construction SMEs can be recognized as one of the pillars of SMEs. According to Harvie (2004), construction SMEs play a greater role in Taiwan, China, Japan, Thailand and Vietnam where they contribute over 70% of employment, than they do in Indonesia or Malaysia, where they contribute only around 40%. According to Saleem (2010), construction SMEs typically account for 10 to 40 percent of all employment in the Middle East and North Africa region. The study of Emine (2012) found that construction SMEs are of high importance to developing countries especially in Arab region as they account for more than 90% of all firms. Moreover, research findings of Opafunso and Adepoju (2014) revealed that there was a 57% increase in the number of construction SMEs in Nigeria between the years 2009-2013.

Hence, the importance of construction SMEs to the economy should not be underestimated. The major advantage of construction SMEs is its employment potential at low capital cost (Agwu, & Emeti, 2014; OECD, 2008). Hence, the relative importance of construction SMEs in advanced and developing countries would continue to reconsideration of the role of construction SMEs in the economy (Ayanda & Laraba, 2011). However, construction SMEs are under pressure to compete in the industry and to maintain their market position due to the monopoly created by the large firms (Pulaj & Kume, 2014; Opafunso & Adepoju, 2014). Therefore, construction SMEs today faces number of challenges to foster in the competitive market place.

#### *2.1.1 Challenges faced by Construction SMEs*

Ofori and Toor (2012) contended the risks faced by construction SMEs in developing countries as lack of job continuity, the deficiencies in construction industry, difficulties in operating environment of the industries and access to finance, newly introduced regulations, greater competition from the larger number of enterprises in the industry offering the same services,. Construction researchers identified low level of technology, lack of skilled workers and management expertise, lack of access to international markets, unsupportive legislations, ineffective incentive policies and lack of

financing as constant issues faced by managers in construction SMEs (Rymaszewska, 2014; Agwu & Emeti, 2014).

The continuous changes that affect the business environment due to the globalization process and the technology innovations, force SMEs to persistently look for new direction to preserve and advance their market position (Aremu 2004 as cited in Ayanda & Laraba, 2011). In order to remain competitive in global context and to be able to meet unprecedented market changes, organizations must not only design and offer better products and services; but need to improve their operations and processes (Rahman, Sharif & Esa, 2013). The concept of value has been commonly related to parameters such as cost, function and quality (Garrido & Pasquire, 2011). Hence, there is a need for construction SMEs to develop and implement new construction processes yielding higher value at lower costs (Bertelsen & Koskela, 2004).

The conventional systems used in the industry pursue the 'task' of project completion, however, neglect minimization of non-value addition and maximization of value (Koskela, Howell, Ballard & Tommelein, 2014). Therefore, a big challenge is in front of construction SMEs to look for new techniques, concepts & strategies to continue moving up the ladder, while increasing the value addition (Bhamu & Sangwan, 2014). As a response, many organizations are seeking to maximize value addition through embedding lean; as one of the most prominent improvement approaches within the construction industry (Nesensohn, Bryde, Ochieng, Fearon & Hackett, 2014). Further, Aziz and Hafez (2013) suggested lean as one of the best approach for improving the value in construction industry. SMEs can also be benefited by converting to lean, providing the process is adjusted accordingly (Rymaszewska, 2014). Hence, enabling lean in construction SMEs will minimize the non value addition and optimize performance in the construction industry.

### **3. Lean Philosophy**

Rahman et al. (2013) defined lean as a set of tools that assist in the identification and elimination of waste that might improve quality as well as production time and cost. Laureani and Antony (2012) defined Lean as a process improvement methodology used to deliver products and services better, faster, and at a lower cost. Dual focus of lean on increasing business value and eliminating the waste made it one of the most popular business performance improvement approaches of the last decade (Jadhav, Mantha & Rane, 2014). Lean will allow companies to face continuous changes and disturbances, by giving them agility, the ability to quickly react to technical or environmental unpredictable problems or difficulties, to cope with such

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environments, companies need proactive workforces, and able, ready and motivated to think and suggest improvements (Alves, Carvalho & Sousa, 2012). Koskela (2004) stated that lean thinking is admirable for construction industry and Jadhav et al. (2014) highlighted that many organizations are implementing or willing to adopt lean principles since the past two decades.

Womack and Jones (1996) codified the essence of Lean Production (LP) into five well known basic principles as specify value, identify the value stream, avoid interruptions in value flow, let customers pull value, start pursuing perfection again. The core concept behind LP is to enable the flow of value creating work steps, while eliminating non-value steps (Marhani, Jaapar & Bari, 2012). This has encouraged many industries to adopt LP as their process improvement and problem solving approach or for improving speed to respond to customer needs and overall cost as part of management strategy to increase the market share and maximize profit (Kumar, Antony, Singh, Tiwari, & Perry, 2006). Hence, there is an increasingly positive trend in the construction industry to implement lean and seek the required improvement targets (Nesensohn et al., 2014).

### 4. Lean Construction

Koskela et al. (2014) introduced two slightly differing interpretations of Lean Construction (LC) as shown in the Figure 1.

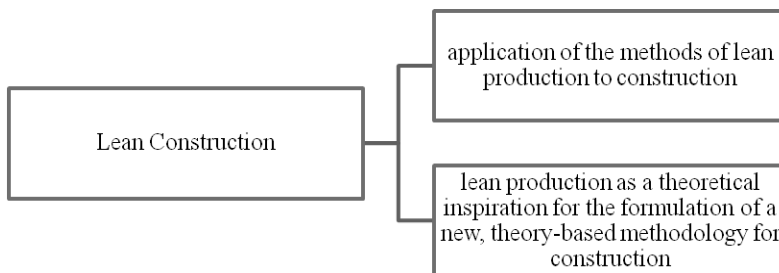


Figure 1: Lean Construction Interpretations (Koskela et al., 2014)

According to Figure 1, one interpretation holds about the application of lean production concepts to construction and the other interpretation views lean production as a theoretical inspiration for the formulation of a new, theory-based methodology for construction, called LC (Koskela et al., 2014). However, Aziz and Hafez (2013) specified that LC is using the same principles as lean production to reduce waste and increase the productivity and effectiveness in construction work. Moreover, Marhani et al. (2012) defined LC as a concurrent and continuous improvement to the construction

project by reducing waste of resources and at the same time able to increase productivity of construction projects.

#### 4.1. BENEFITS OF LEAN CONSTRUCTION

Egan Report (1998), recommending the UK construction industry to adopt lean thinking as a means of sustaining performance improvement in construction projects. However, embedding lean construction in an organization typically requires many changes and is a challenging endeavour (Nesensohn et al., 2014). The concept of lean is still relatively new to SMEs (Pingyu & Yu, 2010). However, many researchers such as Rymaszewska (2014); Laureani and Antony (2012) and Kumar et al. (2006) highlighted the importance of implementing lean concepts in SMEs. Table 1 shows the benefits of lean concepts to construction industry.

Table 1: Benefits of Lean Concepts to Construction Industry

<b>Benefits of Lean Construction</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
Higher quality construction	x		x	x			x
Greater customer satisfaction	x		x				x
Greater productivity	x			x	X	x	
Sustaining Performances				x			
Improved safety	x		x		X	x	
Better risk management	x						
Reduce cost	x		x				
Reduce construction time		x	x				
Reduce waste		x			X	x	x
Reduce rework		x					
(1) Bernstein & Jones (2013); (2) Antony (2011); (3) Aziz & Hafez (2013); (4) Egan Report (1998); (5) Marhani et al. (2012); (6) Umstot, Fauchier & Alves (2014); (7) Kumar et al. (2006)							

Despite the benefits that could be gained from lean implementation, Rymaszewska (2014) highlighted the importance of lean concept to be tailored to the specific needs of SMEs. Hence, it is important to identify benefits in order to promote the concept in construction SMEs.

#### 4.2. BARRIERS FOR LEAN IMPLEMENTATION IN CONSTRUCTION INDUSTRY

A survey conducted by the practitioners of lean implementation revealed that changes to the production environment due to lean have only a 30% success rate and 70% of lean implementations experience decay and return to the original way of doing business (Schipper & Swets, 2010). Implementation of lean systems is not free from barriers (Jadhav et al., 2014).

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Table 2 summarized the literature on barriers for lean implementation in construction industry.

Table 2: Barriers for Lean Implementation in Construction Industry

Barriers for Lean Implementation	1	2	3	4	5	6	7	8	9	10	11	12
Top management resistance	x	x	x							x	x	
Lack of top management involvement	x	x	x						x			
Lack of communication between management and workers		x										x
Workers' resistance to change	x	x	x	x	x	x	x					
Lack of empowerment of employees		x										
Knowledge-level constraints					x							
Lack of consultants and trainers in the field		x										x
Lack of formal training for employees		x										
Cultural difference		x	x	x								
Incompatibility with incentive schemes		x										
lack of resources to invest		x	x					x				
Lack of cooperation from suppliers		x										
Quality problems with supplied material	x	x										
Government policies		x	x									

(1) Rahman et al. (2013); (2) Jadhav et al. (2014); (3) Shang and Pheng (2014); (4) Green, Harty, Elmualim, Larsen, & Kao (2008); (5) Pingyu & Yu (2010); (6) Sawhney & Chason (2005); (7) Larsen, & Kao (2008); (8) Pedersen and Huniche (2011); (9) Hines, Holweg and Rich (2004); (10) Veiga et al. (2011); (11) Hagstrom and Wollner (2011); (12) Cudney and Elrod (2010)

Further, Jadhav et al. (2014) specified that the lack of a long-term philosophy is the most crucial obstacles to lean practice. The transformation towards LC will lead to changes in the culture and in its people (Green et al., 2008). Therefore, lean relies heavily on the skills of the people and how they respond to changes (Sawhney & Chason, 2005).

According to Jadhav et al. (2014), resources are primarily concerned about the human resources (soft resources) such as attitude, capability, knowledge, experience and skill to direct or lead the change and improvements. Physical (hard) resources include dedicated employees' time, allocation of fund, means of communication, information, material, machineries, latest technologies/methodologies, facilities and infrastructure (Jadhav et al., 2014). Lean-based construction requires changes in individual behaviour as well as the resources of the organization (Koskela et al., 2014).

Hence, it is important to identify necessary capacities to be built in order to obtain full benefits of lean implementation in construction industry.

## **5. Capacity Building**

Wal and Marks (2007) defined capacity building as the development of an organization's capabilities, through a coherent set of activities aimed at embedding core skills and functions in order to build the organization's effectiveness and sustainability. Merino and Carmenado (2012) identified capacity building as an abstract and multidimensional concept. Enemark and Ahene (2002) and Groot and Molen (2001) defined capacity building as the development of human resources in terms of knowledge, skills, individual and group attitudes for the purpose of developing and managing certain areas in the community or an organization, which ensure long-term sustainability. Moreover, Boyd and Juhola (2009) reinforced the definition by specifying that capacity building provides an opportunity to understand strengths, weaknesses, threats and opportunities towards a resilient future through identification of broader issues around sustainable development of a particular program, project or process, including their unique cultural, social and ecological characteristics. Having considered the above definitions, capacity building can be defined as enrichment of hard and soft resources of an organization while minimizing the non challenges.

However, majority of local construction organizations in developing countries lack capacity and cannot meet the demand of construction work (Didibhuku & Mvubu, 2008 as cited in Kululanga, 2012: Enshassi, Al-Hallaq & Mohamed, 2006). SMEs in both developed and developing countries today face tough and challenging times in improving performance due to the challenges faced by them from the industry. At the same time, high global competition demands SMEs a higher level of capacity to maintain or increase steadily the performance of the business (Lagace & Bourgault, 2003; Guzman, Gutierrez, Cortes, & Ramire, 2012). To sustain a fair level of competitiveness in both the domestic and global markets, SMEs must strive to utilize tools and new concepts to reach the right markets in cost effective ways (Singh et al., 2010). Further, Harvie (2004) highlighted the significance of promoting more adaptable and flexible strategies by capacity building in construction SMEs.

## **6. Lean Enabling Capacity Building: A Conceptual Model**

Lean is not just a set of tools and techniques, but at its heart is the people (Bhasin, 2012). It is the people whose knowledge, intelligence and desire to improve that steers organizations to new levels of continuous improvement (Bhasin, 2012). Therefore, lean relies heavily on the skills of the people and



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how they respond to changes (Sawhney & Chason, 2005). Further, implementing lean systems is not free from barriers (Jadhav et al., 2014). Therefore, applying LC for design and construction within the industry is becoming a highly pertinent issue (Nesensohn et al., 2014).

According to Groot and Molen (2000), capacity building is the development of knowledge, skills and attitudes in individuals and groups of people relevant in design, development, management and maintenance of institutional and operational infrastructures and processes that are locally meaningful. According to Koskela et al. (2014), lean-based construction requires changes in individual behaviour as well as the resources of the organization. Hence, necessary capacities need to identify in order to optimize the benefits of lean implementation. Figure 2 shows a conceptual model developed by combining lean and capacity building concepts in order to identify lean enabling capacity building strategies and hence to minimize challenges and optimise performance of construction SMEs through lean implementation.

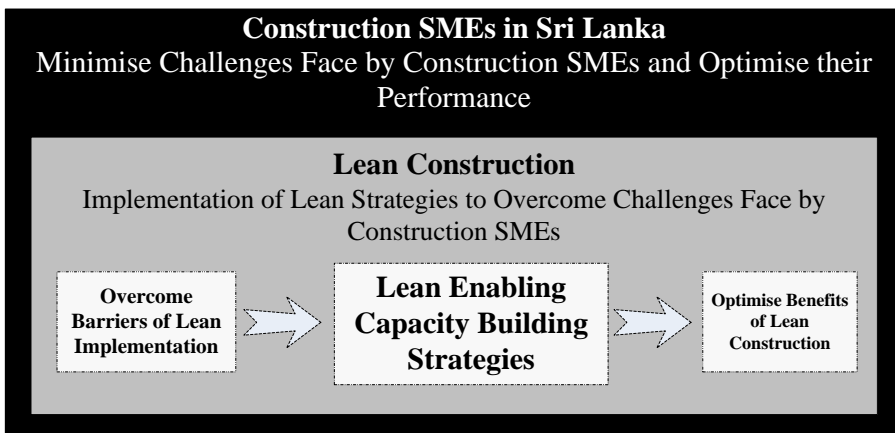


Figure 2: Conceptual model for lean enabling capacity building for construction SMEs

According to Figure 2, outer square of the conceptual model shows the nature of construction SMEs and challenges face by them. Literature review revealed that, construction industry can overcome most of the challenges by lean implementation and it shows in the inner second layer of the model. However, construction SMEs lack capacities to enable lean in the construction industry. Therefore, it is important to investigate lean enabling capacity building strategies. As per the conceptual model, it is expected to overcome barriers of lean implementation while optimizing the benefits of

lean construction through lean enabling capacity building strategies. The strategies needed to be identified from further research.

## 7. Conclusion and Directions for Further Research

Lean construction and capacity building are relatively new approaches to the construction industry. However, there has been a remarkable increase in lean implementation in construction industry during last few decades. Hence, this paper critically reviewed the current state of construction SMEs to identify the challenges faced by them and how lean implementation can solve the aforementioned challenges. Many researchers highlighted the importance of implementing lean concepts and building capacities in construction SMEs. Hence, it is essential to identify capacities necessary to overcome the barriers of lean implementation in the construction industry.

Even though, lean and capacity building related literature is present worldwide, there is a lack of research in lean enabling capacity building strategies that enable lean in construction SMEs. Hence, a proper empirical study required to recognize the real situation. Subsequently, drivers, benefits and barriers for lean enabling capacity building strategies need to be exposed. As better lean practices can be achieved through capacity building, construction SMEs need to focus on lean enabling capacity building in order to be competitive in the construction industry. This paper is based on literature review in order to develop the conceptual model for the study. The developed conceptual model will guide further researches. Our future research will target the development of a lean enabling capacity building model with strategic guidelines for construction SMEs.

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