

# A DISCOURSE ON LEAN CONSTRUCTION IN AFRICA, USING A SUPPLY CHAIN EXAMPLE

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## ABSTRACT

A discourse is defined as a unit of speech or writing longer than a sentence. It is about knowledge and its construction within a group or domain. A discourse therefore tends to focus on how a particular phenomenon is represented within a social group. This special issue on lean construction in Africa (LCiA) is an attempt to highlight how the knowledge and practice of lean construction is understood by researchers in the region. This opening article opens the discourse with why implementation of lean supply chains should be encouraged in a sector where projects are delivered by multiple parties with different interests. The differences in project interests require application of supply chain management and lean principles to avert well-known construction problems. The subsequent articles in this special issue motivate for the use of lean construction concepts, and tools by practitioners in the region.

**Keywords:** construction, contractor, lean, supply chain

## INTRODUCTION

Michel Foucault said that a discourse constitutes

ways of constituting knowledge, together with the social practices, forms of subjectivity and power relations which inhere in such knowledge and relations between them. Discourses are more than ways of thinking and producing meaning. They constitute the 'nature' of the body, unconscious and conscious mind and emotional life of the subjects they seek to govern.<sup>1</sup>

This special issue of the *Journal of Construction Project Management and Innovation* on lean construction in Africa (LCiA) has been compiled to expose the little-known lean construction discourse on the continent. Construction in Africa has a history of poor project performance recorded on various types of immovable built environment assets. The net effect of cost overruns, time overruns, low productivity, accidents, building collapses, and defects is an industry that appears to be broken, when compared to the industry in other parts of the world. Although construction problems tend to be similar in different locations, the degree to which they occur, and their impact, differs from one place to another. Similarly, interventions that have been used to

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<sup>1</sup> See explanations at <http://michelfoucaultotago.blogspot.co.za/2012/09/discourses.html>

tackle construction problems are accessible to most players in the industry worldwide. One such intervention is lean construction.

Since the 1990s, when Lauri Koskela published some of his seminal reports (e.g. Koskela, 1997), lean has been influencing design and production processes in the construction industry. Many regions of the world have, through empirical and industry papers, reported milestones in its implementation, where advances in cost, health and safety, quality, and time project performance have been demonstrated (Björnfot et al., 2011; Forbes and Ahmed, 2010; Rubrich, 2012; Salem et al., 2006). This is, however, not the case in Africa, where the Lean Construction Institute – South Africa (LCI-SA), which was launched in October 2015, is the only known community of practice (CoP) in the region.

The need for “more for less” project delivery paradigm has never been greater in Africa than it is now, where mineral benefaction, economic growth, and population expansion are fuelling activities in the construction industry. Media reports underpin the need for transformation and change, as anecdotal evidence and empirical reports overwhelmingly confirm that there are project delivery problems in the region (Emuze, 2011; Emuze and Smallwood, 2011a, 2011b, 2012, 2013; Flyvbjerg, 2008, 2009).

At either the conceptual and design stage or the construction and handover stage, performance remains a major issue for construction in Africa. It is therefore time to elevate the lean construction discourse in the region. This special issue presents articles that address the “why” and the “how” of lean construction in Africa, and this opening article uses these questions to highlight issues around implementation of the philosophy in the region. This special issue provides good-quality research papers on best-industry practices and case studies. The following is a list of the articles in this special issue:

- “A theoretical review of lean implementation within construction SMEs”,
- “The state of adoption of lean construction in the Tanzanian construction industry”,
- “An investigation into the usage of lean construction techniques in Nigeria”,
- “Traces of lean construction practices in the indigenous building culture of the Talensi of northern Ghana”,
- “The prospect of minimising production flow waste on construction sites in Nigeria through the Last Planner System”,
- “A gemba kaizen model based on business process modelling and notation for small- and medium-scale construction businesses in Nigeria”,
- “Nigerian construction-related professional services firms to adopt lean construction practices”,
- “The influence of culture, beliefs, and experience on the sustainable end-of-life management of buildings in Nigeria”,

- “A continuous improvement framework using IDEF0 for post-contract cost control”, and
- “Modelling a conceptual framework of technology transfer process in construction projects: An empirical approach”.

## **AN EXAMPLE OF WHY LEAN CONSTRUCTION IS NEEDED IN AFRICA**

Supply chain management (SCM) is a system that originated in the manufacturing industry (Vrijhoef and Koskela, 2000). The construction sector adopted SCM to oversee, coordinate, and control the supply chain (SC) in the industry, guided by policy, principles, and specified methods. Although SCM is now common, there is evidence of failures (Deshpande, 2012). Akintoye et al. (2000) suggest that failure in SCM is as a result of workplace culture, lack of commitment by senior management, inappropriate support structures, and a lack of knowledge of the SCM philosophy. In construction, Lin (2011) indicates that experts in the field do not expect successful implementation of SCM without any restrictions being imposed on the system. Bankvall et al. (2010) corroborate this by stating that implementation of an SCM model could be challenging in the construction industry. A challenge cited is poor planning and management of the supply chain, due to project complexity (Cheng et al., 2010; Mehdi Riazi et al., 2011). As an illustration, non-value-adding activities, which are known as waste in the lean lexicon, are a problem that must be addressed by organisations if costs are to be significantly reduced, by ensuring that the production process is mistake-proof (Grozniak and Maslaric 2009, as cited in Wiese et al., 2015).

The rationale for exploitation of SCM principles is based on the premise that the supply chain is a crucial element for the industry, as well as for firms within the industry. SCM has various characteristics, as shown in Table 1 (Pellicer et al., 2014). Among other goals, SCM seeks to promote cost efficiency, coordination of multiple structural activities, cooperation between multiple parties to a project, management of inventory (deployment of just-in-time delivery when required), integrative planning of required project tasks, and mutual sharing of information and knowledge among project parties.

Transformative approaches to the construction process will always be necessary as the industry evolves (Dües et al., 2013). For instance, contractors require effective methods, techniques and opportunities to acquire more work to keep the business afloat, to remain competitive, and to be sustainable in the industry’s activities, apart from productivity improvement, which results from enhanced production planning. The characteristics outlined in Table 1 thus imply (Mentzer et al., 2001)

- A systems approach to viewing the supply chain as a whole, and to managing the total flow of inventory from the supplier to the ultimate customer,
- A strategic orientation towards cooperative efforts to synchronise and integrate intra-firm and inter-firm operational and strategic capabilities into a unified whole, and
- A customer focus, to create unique and individualised sources of customer value, leading to customer satisfaction.

**Table 1: Widely known characteristics of supply chain management**

<b>Characteristic</b>	<b>Description</b>
Cost efficiency	An evaluation of cost, which needs to be conducted to determine total cost advantages. This ensures allocation of savings in a productive manner.
Coordination of numerous levels	Three types of coordination must be considered across SC members, management levels, and functions,
Compatibility of corporate philosophies	Members need to agree on the basic directions of the SC. However, they need not agree on every procedure.
Inventory management approach	This aims to reduce inventory throughout the SC.
Joint planning	Members in the SC must participate in planning the flow of materials, so as to ensure that the SC develops a continuous process of planning, evaluation, and improvement.
Leadership	The SC must have leadership to develop and execute its core objective.
Information and knowledge sharing	Members in the SC must share information and knowledge in order to better manage the SC.
Risk management	Members in the SC must willingly and equally share/manage the risks associated with the SC.
Speedy operations	A reduction in cycle time increases the speed of operations.
Supplier base	The supplier base must be reduced so as to integrate and improve the SC.
Time prospects	This seeks durable time relationships, which will turn members into dedicated partners.

Source: Pellicer et al. (2014: 11).

## **METHOD AND RESULTS**

Based on the highlighted benefits of SCM and lean, this example of LCiA provides a basis for assessing the question “What are the lean supply chain opportunities in South African construction?” The required empirical data were collected qualitatively. The results presented in the following subsection of this article were thus obtained from face-to-face interviews conducted with actors in a construction supply chain. The actors included supply chain managers, adjudication committee members, project managers, contractors and subcontractors, quantity surveyors, and suppliers. The sample comprised actors who represented various construction firms. Nine construction companies were identified from contractors based in Bloemfontein, South Africa. The companies were selected based on contracting capacity and whether they were accessible within the borders of South Africa. The research focused on companies that were engaged in infrastructure-related projects. However, only seven of the nine companies granted access to their facilities to participate in the study. Please see Table 2 for the background

information of the seven interviewees. All the contracting firms that participated in the study had been in the industry for more than 10 years, and most of them had specialised in civil engineering construction.

**Table 2: Demographic information of interviewees**

	Description							
Gender	Male		4		Female		3	
Age range	18–29	2	30–45	5	46–59	0	60+	0
Experience (in years)	1–5	3	6–10	2	11–15	1	16+	1
Qualifications	N6	1	N. Dip	1	Degree	2	Postgrad	3

Source: Author’s own fieldwork, 2016.

### General perceptions of lean in construction

The opening part of the interviews utilised a short questionnaire that examined perceived lean construction implementation challenges. A five-point Likert scale was used for the study, where 1 represented a minor challenge, and 5 represented a major challenge. Table 3 indicates that based on their working experiences, the interviewees rated limited involvement of construction workers as a major hurdle that must be overcome if lean, which is a people-based philosophy, is to make inroads in the sector.

Such limited involvement does not recognise lean principles that are to be applied and emphasised in practice for the full effect of the concept. Implementation challenges that were rated as significant challenges by the interviewees include limited knowhow and buy-in among managers and supervisors, non-integration of the construction supply chain, a poor industrial culture in the working environment, and poor commitment to change and innovation in the industry. Other challenges that were rated as significant were qualifications of work team members, resistance to change the organisational structure, lack of motivation at individual, team and organisational levels, underdevelopment of the enterprise’s vision and goals, and improper conceptualisation of lean construction tools and methods.

Although the recorded mean scores were not that much lower, the lowest-ranked challenges related to the need to tackle challenges. They were lack of leadership and management support, fear of losing job and the cost of retraining, the need for employment and labour-intensive construction, and non-availability of useful local knowledge and expertise, in ascending order of mean scores. It is worth noting that the job-related challenges confirm the findings of earlier empirical work conducted in South Africa (Emuze and Ungerer, 2014; Emuze and Van Linde, 2015), namely that inaccurate perceptions of the fundamentals of lean appear to perpetuate resistance to change.

**Table 3a: Perceptions of lean construction implementation challenges**

<b>Implementation challenge</b>	<b>Mean Score</b>	<b>Rank</b>
Limited involvement of construction workers	4.00	1
Limited knowhow and buy-in among managers and supervisors	3.93	2
Non-integration of the construction supply chain (contractors, designers, subcontractors, etc.)	3.93	3
A poor industrial culture in the working environment	3.87	4
Poor commitment to change and innovation in the industry	3.87	5
Qualifications of work team members	3.80	6
Resistance to change the organisational structure	3.80	7
Lack of motivation at individual, team and organisational levels	3.80	8
Underdevelopment of the enterprise's vision and goals	3.79	9
Improper conceptualisation of lean construction tools and methods	3.77	10
Resistance to change the organisational culture	3.73	11
Resistance to change among experienced artisans	3.71	12
Time constraints due to close deadlines	3.67	13
Resistance to change work processes	3.67	14
Underdeveloped technical competence	3.64	15
Inadequate information within work teams	3.57	16

Source: Author's own field survey, 2016.

To confirm their familiarity with lean concepts, the interviewees were requested to rate their use of 12 lean construction tools. In general, the results show that the tools are not in use in the firms that participated in the study. The tools assessed were weekly work plan, team organisation, flow chart, process planning, brainstorming, problem identification, lookahead planning, cycle time, effective meetings, training plan, failure-prevention analysis, and fishbone diagram. Having obtained general perceptions on lean matters, the researcher engaged individual interviewees in in-depth discussion about lean SCM. As mentioned earlier, lean as a philosophy has been in existence for over six decades. However, the majority of the interviewees in the South African study did not know about lean. Perhaps this is the reason for the non-utilisation of the lean tools mentioned in the questionnaire. It is therefore important to state that before implementation of

lean as a concept, and its tools, people will need to be properly trained, so that the full potential of lean in a project environment can be realised.

**Table 3b: Perceptions of lean construction implementation challenges**

<b>Implementation challenge</b>	<b>Mean Score</b>	<b>Rank</b>
Resistance to change project implementation structure	3.53	17
Lack of training for contractors and their subcontractors	3.53	18
Underestimation of education and training needs	3.50	19
Lack of communication within work teams	3.47	20
Underdeveloped social competence	3.43	21
Poor collaborative working relations between clients, designers, and contractors	3.43	22
The pervasiveness of craft construction	3.43	23
Incorrect interpretations of the Last Planner System (LPS) of production	3.43	24
Inadequate role definition within project teams	3.40	25
Lack of resources – financial and non-financial	3.40	26
Lack of adequate awareness and understanding in firms and the industry as a whole	3.40	27
Behavioural and human-attitudinal issues	3.40	28
Non-availability of useful local knowledge and expertise	3.33	29
Need for employment and labour-intensive construction	3.33	30
Fear of losing job and the cost of retraining	3.27	31
Lack of leadership and management support	3.20	32

Source: Author's own field survey, 2016.

In fact, only two interviewees confirmed that they knew about lean construction. The two interviewees understood it as an application, and a new form of management, which sets goals for project delivery, in the pursuit of performance. Further, they understood it as a concept, which makes construction processes easier, while at the same time reducing operational costs. There was no difference in the poor understanding of lean SCM among the interviewees, where only one interviewee could comment on it. The limited understanding of lean SCM among the interviewees

was confined to processes that need to be changed. These included, but were not limited to, waiting time, with specific reference to waiting time for required information, and approval and issuing of designs and the like. The fact that most of the interviewees were not familiar with lean and its accompanying processes emphasises the need for education and training in lean construction. The single interviewee that appeared to be knowledgeable about lean construction said that opportunities to improve performance could accrue from implementation. The opportunities mentioned by the interviewee included aligning the supply chain with the business strategy, inventory management, procurement optimisation, demand-driven production, supplier selection, and regional distribution centre selection.

### **Factors responsible for resistance to change**

In this section, the interviewees were required to discuss what could be causing resistance to change regarding adoption of processes such as lean construction. The most discussed point related to perceived job losses due to implementation of new methods of work. Interviewee 1 opined that lean construction could potentially lead to redundancies. The interviewee went on to say that there is no need for lean to be implemented at all. Interviewee 4 shared these sentiments, citing the introduction of a particular plant, which this participant feels threatens human employment. Interviewee 5 had similar perceptions to those of interviewee 1 and interviewee 4. This participant was of the view that upon implementation of lean, jobs will be lost, because of optimal use of plants and equipment. Interviewee 2, however, had a completely different perception. The participant perceived that use of new tools and methods is not a bad idea, given the fact that South Africa still has many opportunities to grow. To support the view that introduction of new tools and methods in the sector is not a bad idea, this participant indicated that there will be less wastage, which will, in turn, make it possible for money to be spent on more projects, thus increasing job creation.

In light of the above, it is evident that the majority of the participants are of the opinion that introduction of new tools and methods could potentially lead to job losses. This fear is, however, unfounded, as lean is not about mechanisation, but about people and culture (Rubrich, 2012; Santorella, 2011).

### **AN ILLUSTRATION OF HOW TO PROMOTE LEAN CONSTRUCTION**

From the collected SCM data, the reviewed literature, and the articles in this special issue, it is clear that all stakeholders should endeavour to encourage education and training, so as to promote dissemination of the information required for lean implementation. For instance, none of the interviewees in the SCM example provided in this article had received learning with regard to lean. The learning suggestion is relevant, as all of the interviewees confirmed their readiness to obtain knowhow that will inspire confidence in their employers. Such knowledge should be able to embed practices that break down resistance to change in their firms. Respect for people is a principle of lean that will assist in breaking down barriers.

Respect for people can be seen in action when people are allowed to take initiative on assigned tasks. In particular, the interviewees in the SCM study contended that to ensure that employees improve their level of confidence in their work activities, it is wise to give them room to manage their work, with minimal or no supervision. This idea from the interviewees is a cornerstone of lean construction practice. The implication of this idea is that the region has practices upon which lean construction tools and concepts can be built. Building on what is known will accelerate



transfer of knowledge, while improving on-site project performance. Lean offers a system of project delivery where contractors are allowed to compete in a less fragmented and adversarial manner. In North America, Europe, Asia, Australia, and South America, where lean construction has had a major impact on project delivery, the industry and academia have worked together to realise improved performance. It is therefore time to promote the lean construction discourse in Africa.

What is most important to Africa is employment, and fear of job losses is a reality in practice. Implementation of lean construction does not, however, translate into job losses. Given the people-centred culture of lean construction, the concept should not be seen as a potential source of job losses if it is adopted. Fear of job losses resulting from lean construction is a myth, which proper education and training can debunk in the industry. Realisation of the opportunities inherent in lean can begin with use of its tools on projects by contractors and their supply chain. Although implementation of lean promises to improve practice, by reducing and eliminating waste, it is prudent to also promote the notion of continuous improvement. Future work should begin to report on lean implementation case studies in the region.

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## **REFERENCES**

- Akintoye, A., McIntosh, G. and Fitzgerald, E. (2000). A survey of supply chain collaboration and management in the UK construction industry. *European Journal of Purchasing & Supply Management*, 6(3–4), 159–168.
- Bankvall, L., Bygballe, L. E., Dubois, A. and Jahre, M. (2010). Interdependence in supply chains and projects in construction. *Supply Chain Management: An International Journal*, 15(5), 385–393.
- Björnfot, A., Bildsten, L., Erikshammar, J., Haller, M. and Simonsson, P. (2011). Lessons learned from successful value stream mapping (VSM). *Proceedings of the 19th Annual Conference of the International Group for Lean Construction*, 13–15 July. Lima, Peru.
- Cheng, J. C. P., Law, K. H., Björnsson, H., Jones, A. and Sriram, R. (2010). A service oriented framework for construction supply chain integration. *Automation in Construction*, 19(2), 245–260.
- Deshpande, A. (2012). Supply Chain Management Dimensions, Supply Chain Performance and Organisational Performance: An Integrated Framework, *International Journal of Business and Management*, 7(8), 8-9.
- Dües, C. M., Tan, K. H. and Lim, M. (2013). Green as the new Lean: How to use Lean practices as a catalyst to greening your supply chain. *Journal of Cleaner Production*, 40, 93–100.
- Emuze, F. A. (2011). *Performance improvement in South African construction*. PhD thesis. Port Elizabeth: Nelson Mandela Metropolitan University.
- Emuze, F. and Smallwood, J. (2011a). Criticality of intelligent clients in the infrastructure sector. *Proceedings of the Institution of Civil Engineers: Municipal Engineer*, 164(4), 251–257.
- Emuze, F. and Smallwood, J. (2011b). Improving project delivery in South African construction. *Proceedings of the 27th Annual Association of Researchers in Construction Management (ARCOM) Conference*. 5–7 September. Bristol, UK. pp. 921–930.
- Emuze, F. and Smallwood, J. J. (2012). Bridging public works project performance gaps in South Africa. *Proceedings of the Institution of Civil Engineers: Management, Procurement and Law*, 165(2), 111–118.
- Emuze, F. A. and Smallwood, J. J. (2013). Management concepts and project performance: Perceptions from the South African public sector environment. *Journal of the South African Institution of Civil Engineering*, 55(2), 21–28.
- Emuze, F. A. and Ungerer, H. P. (2014). Change in South Africa construction: Lessons from lean thinking. *Proceedings of the 22nd Annual Conference of the International Group for Lean Construction*. 24–27 June. Oslo, Norway. pp. 1121–1131.
- Emuze, F. A. and Van Linde, C. (2015). Lean construction in South Africa: Myth or reality? *Proceedings of the 8th International Conference on Construction in the 21st Century*. 27–30 May. Thessaloniki, Greece. pp. 455–461.
- Flyvbjerg, B. (2008). Curbing optimism bias and strategic misrepresentation in planning: Reference class forecasting in practice. *European Planning Studies*, 16(1), 3–21.
- Flyvbjerg, B. (2009). Survival of the unfittest: Why the worst infrastructure gets built—and what we can do about it. *Oxford Review of Economic Policy*, 25(3), 344–367.
- Forbes, L. H. and Ahmed, S. M. (eds). (2010). *Modern construction: Lean project delivery and integrated practices*. Boca Raton, FL: CRC Press.
- Koskela, L. (1997). Lean production in construction. In: L. Alarcon (ed.). *Lean construction*. Rotterdam: Balkema. pp. 1–9.
- Lin, L. (2011). *Supply chain quality management for subcontracting systems in the construction industry*. MEng thesis. Wollongong, New South Wales: University of Wollongong.

- Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D. and Zacharia, Z. G. (2001). Defining supply chain management. *Journal of Business Logistics*, 22(2), 1–25.
- Pellicer, E., Yepes, V., Teixeira, J. C., Moura, H. P. and Catala, J. (2014). *Construction management*. Oxford: Wiley-Blackwell.
- Mehdi Riazi, S., Skitmore, M. and Cheng, Y. K. F. (2011). The use of supply chain management to reduce delays: Malaysian public sector construction projects. *Proceedings of the 6th Nordic Conference on Construction Economics and Organisation in Society*, vol. 2. Danish Building Research Institute, Aalborg University, Copenhagen. pp. 403–414.
- Rubrich, L. (2012). *An introduction to lean construction: Applying lean to construction organizations and processes*. Fort Wayne, IN: WCM Associates.
- Salem, O., Solomon, J., Genaidy, A. and Minkarah, I. (2006). Lean construction: From theory to implementation. *Journal of Management in Engineering*, 22(4), 168–175.
- Santorella, G. (2011). *Lean culture for the construction industry: Building responsible and committed project teams*. Boca Raton, FL: CRC Press.
- Vrijhoef, R. and Koskela, L. (2000). The four roles of supply chain management in construction. *European Journal of Purchasing & Supply Management*, 6(3–4), 169–178.
- Wiese, A., Luke, R., Heyns, G. J. and Pisa, N. M. (2015). The integration of lean, green and best business principles. *Journal of Transport and Supply Chain Management*, 9(1), 1–10.