A BETTER PLAN FOR CONSTRUCTION COMPANIES

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ABSTRACT

A failure to adopt measures for improving production has been identified among a number of construction companies in Northeast Brazil, especially in comparison to the south and southeast regions of the country. Studies are being carried out with the aim of understanding the current development of building construction in the city of Recife and its metropolitan area in the state of Pernambuco, Northeast Brazil; and identifying obstacles to the adoption of Lean Construction. The level of knowledge on the issue among companies has also been studied. Limited awareness regarding lean construction has been identified, together with a lack of studies on construction management in engineering courses. This paper shows the results of these research projects, which also investigated aspects of ISO 9000 certification among companies, as well as environmental management, production planning and control. Suggestions are made in an effort encourage the adoption of Lean Project Delivery among construction companies in the state of Pernambuco. The case studies developed here were part of larger research.

KEY WORDS

Construction companies, Northeast Brazil, lean construction.

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INTRODUCTION

For decades industries have pursued the successful experience of the Toyota Motor Company regarding the implementation of the Toyota Production System and the development of the Lean Production concept. Lean Construction adapts this philosophy and its procedures to the construction companies and has been gaining ground due to the consolidation of theoretical knowledge.

In Brazil, some experiences have been carried out in partnerships between companies and research institutes. These procedures assure the connection between theory and practice though they must adhere to the previously consolidated organizational culture of the firm. Most of this type of work is found in the south and southeast regions of the country, and the implantation of Lean Construction in other areas of Brazil is rare. In the city of Recife, Pernambuco, Northeast Brazil, very few construction company executives are aware of Lean Production.

In recent research studies, Barros (2005) and Pontes (2004) discovered that a significant percentage of managers of big construction companies in Metropolitan Recife are unaware of Lean Construction. Others have heard something about the concept, but have little idea of how to use it and try to adopt procedures and tools separately.

This paper shows the state of construction companies in Recife with regard to production system management, identifying imperfections and indicating the best plans for promoting the issue.

LEAN CONSTRUCTION TOOLS AND LEAN THINKING

Recent articles from scientific publications describe the experience of Lean Construction implantation in building construction. A large part of the data regards the adoption of lean tools, generally describing implantation procedures.

Liker (2005) states that in spite of the huge influence of the lean movement, a very significant portion of the attempts to implement the concept have been made superficially. The authors goes on to say that a large number companies concentrate too much on the tools and fail to understand the lean concept as an entire system that must flow through the organizational culture. Most companies that try to implant the concept fail to have their administration team directly involved with the daily transactions and continuous improvement the system constitutes.

Thus, successful experiences in lean construction are few and far between. Construction companies find it difficult to describe their strategic goals. According to Isatto & Formoso (1998), it is hard for them to plan, control, develop or choose a construction technology that fits their competitive priorities and is adequate for the actual situation of the company and country. It is also difficult to find one that allows an effective, continuous improvement process to take place.

The lack of a systematic approach has led to considerable waste among a large number of enterprises. Entrepreneurs who fail to understand the basic principals of lean thinking attempt to adopt isolated parts of the methodology without taking into consideration the concept as a whole.

"The thing is, most companies picked the group of tools as the actual lean thought. The 'lean' way of thinking, based on the Toyota model, involves a bigger and much deeper cultural transformation than most companies can ever imagine". (Liker, 2005).

Such problems have been known since the end of the 1990s. Koskela makes the following statement: "Analysis of practical cases of the implementation of lean production to construction shows that it is important to have a comprehensive approach. Especially, this means that lean

principles should be used both in design, control and improvement of process in construction. Often practical implementation has failed due to the fact that it has been partial, concentrating only on the design of the process". (Koskela, 1998). Moreover, lean production is a break from the old paradigm, a complete transformation in the management, production and thinking of the company and the undertaking.

Taiichi Ohno makes the following suggestion: "Look for a production site without preconceived ideas and with your mind open. Repeat *why* five times for each situation" (Ohno, 1988). Problems identified at these construction companies include the following: the owner (usually an engineer) is too busy for such work; the engineer responsible for the construction site is not encouraged to constantly observe the progress; and neither understands how important this step is for the process.

In the state of Pernambuco, engineering courses do not emphasize the training of the engineer for entrepreneur management. However, most engineers with a minor in building construction are the owners of companies and very few an organizational view of the business. They command their staff from with a fragmented point of view, which is very characteristic of local construction companies. The integrated systemic perspective has yet to reach this branch of activity.

Procedures are worked on separately at the construction site. Addressing the flow balance may result in some success, but this success may be lost due to a lack of understanding with regard to the broad concept of lean thinking.

We must agree with Liker (2005), who states that TPS is not a tool kit. It is not merely a set of "lean" tools, such as just-in-time, cells, 5S, kanban, etc. It is a sophisticated production system where each piece contributes to the whole.

COMPANIES IN METROPOLITAN RECIFE

The specialized literature has brought to the current competitive scene a large number of variables involved in the modernization processes and adequacy of construction company production. It is necessary to understand how companies in Pernambuco have reacted to this movement. Therefore, a research study was defined to address the areas of planning and control, management of the SGQ and environmental management. All the investigated companies have ISO9001 Certification.

Barros (2005), part of the research group of this paper, states that "some managers have never heard of the "Lean" philosophy, although they recognize that the companies are trying to act in agreement with the criteria of the certification and rationalization of the processes. They all consider the production system their companies adopt an important issue, and in some way believe they have always been working with the best solution, but are all the while unaware of the new features and opportunities. This demonstrates a lack of knowledge and connection between enterprise practices and the concepts emerging from universities and research institutes".

This research examined what procedures are adopted in planning. A number of companies do not adopt short-term planning of short term, using only a financial chronogram, which is brought up to date to every 3 months.

Three of the ten companies investigated adopt adjusted systems of planning and control, and also measure performance with the use of indicators. However, the system of indicators adopted is regarded as a company secret and no information is divulged on what is being measured and how it is being done.

The other companies from the sample, although stating their planning as structured and well adjusted, are still far from acceptable standards of planning and control. Company A still exercises the practice of definitions and changes are carried out by the owner of the company upon visiting the building construction, often disregarding the details and specifications of the projects.

With regard to Lean Construction, the companies were asked whether they were aware of the program. For affirmative responses, a follow-up question was asked regarding whether the program has been adopted. The research discovered that only Company I adopts some principles, such as the measurement of losses, training of laborers and the measurement of productivity.

4 companies have consolidated and adjusted to the most recent requirements of the SGQ and ISO9001-2000, which are part of Sections 5 and 8. The others try to fit in, but some see "the certification only as a game which is necessary to win or just to keep their business", Curkovic & Pagell (1999).

The following table displays a synthesis of the interview results, allowing an understanding of the industry situation in Metropolitan Recife in the state of Pernambuco-Brazil.

Table 1: Case studies on 10 companies

Aspect of Company	Planning	Lean Construction	ISO/SGQ Certification	Environmental management
Company A	• Planning based only on physical-financial chronogram, not updated • Does not have formal PCP • Improvisation when contracting laborers • Adopts only 4 indicators	• Some managers are interested in its adoption; however, the level of adopted planning does not yet allow its implantation.	• Special attention to the bureaucratic material of the unified Certification of Quality and Security • Has Ohsas18001	• Intends to get certification ISO14000 in the long term • Measures the solid waste generated, but does not avoid it • Knows about P+L and is interested in implanting it
Company B	• Has short, medium and long term planning • Use of software for planning • Carries out employee training • Adopts the PPC • Adopts continuous improvement • Measurement of performance through indicators	• Does not adopt • Appropriate for the implantation of Lean Construction	• Directing body committed to SGQ	• Preparing for ISO14000 certification • Uses covering residues for lean concrete and counter-floor • Plaster residue is used in the mortar • Knows P+L and is interested in implanting it
Company C	• Has short, medium and long term planning • Adopts the PPC • Carries out employee training • Adopts continuous improvement • Measurement of performance through indicators	• Does not adopt	• Directing body committed to SGQ	• Is concerned about the waste generation, but no action is adopted

Aspect of Company	Planning	Lean Construction	ISO/SGQ Certification	Environmental management
Company D	• Adopts continuous improvement • Carries out employee training • Measurement of performance through indicators	• Does not adopt • Appropriate for the implantation of Lean Construction	• Directing body committed to SGQ, but not yet highly involved	
Company E	• Adopts continuous improvement • Carries out employee training • Measurement of performance through indicators	• Does not adopt	• Directing body committed to SGQ	
Company F	• Has short, medium and long term planning • Use of software for planning • Adopts the PPC • Measurement of performance through indicators	• Does not adopt	• Directing body committed to SGQ	
Company G	• Has short, medium and long term planning • Does not adopt software • Does not have control of performance through indicators	• Not adopted	• Intends to consolidate the SGQ • Works to achieve Ohsas18001	• Intends to get ISO14000 certification in the long term • Does not evaluate the quantity of waste generated • No knowledge on P+L
Company H	• Has short, medium and long term planning • Does not adopt software and PPC • Planning restricted to directing body • Carries out employee training • Uses benchmarking	• Seeks rationalization of the processes • Knows and recognizes the merit, but does not adopt	• Adopts indicators, but restricts them to incomes and costs • ISO9001-2000 Certification is considered enterprise excellence, although effective directing body is not evident	

Aspect of Company	Planning	Lean Construction	ISO/SGQ Certification	Environmental management
Company I	• Has short, medium and long term planning • Does not adopt software • Planning restricted to the directing body • Does not adopt PPC • Carries out employee training • Evaluates the cost of losses • Measures performance through the productivity - function	• Adopts some Lean principles	• Sees the SGQ and certification as competitive advantage.	
Company J	• Intends intuitively to increase the transparency of the process, to make use of Benchmarking, to promote continuous improvement • Has short, medium and long term planning • Adopts software for planning • Does not use PPC • Did benchmarking • Does not have systemized data to evaluate the performance	• Does not have knowledge on the Lean Construction production system	• Sees the SGQ and certification as competitive advantage.	• Environmental concerns, recognizes needs, but still without any accomplished measures

CONCLUSIONS

The companies studied can be separated into two groups based on perspectives regarding the management system adopted. In one, entrepreneurs are committed to the system for its quality and seek improvements, understanding its importance to the performance of the firm. In the other, they merely seek to deceive the auditors and accomplish tasks, completely ignoring the possibilities for advancement with the adoption of lean production practices. Even those who declare having knowledge of lean construction and express a desire to apply it are as yet far from lean thinking.

According to Howell (1999), the basic principles of the Lean Mentality have established a method that implies a production system that delivers an orderly product, maintaining the minimum possible inventory and focusing on clients' needs as well as seeking the elimination of non-necessary activities, the organization of production as a continuous flow, the distribution of decision-making and maximum perfection.

To attain such goals, it is necessary to overcome losses. According to Ohno (1997), there are seven categories of loss. On construction sites, there are four losses that we can easily

identify: loss due to transports, loss due to faulty production, loss due to movement and loss due to delays. It is necessary to identify such losses to prepare for Lean Project Delivery.

San Martin and Formoso (1998) purpose a method to Evaluate Building Systems Based on Production Process Management and Lean Construction Concepts, which uses concepts and principles to perceive construction as a network of cycling production flows that have conversion and non-conversion activities, as well as activities that add and activities that do not add value to the final product or sub-product. This evaluation is a very important process in identifying loss on construction sites and we recommend it to companies.

The evaluation of planning is also necessary, as it is a basic component for the implantation of Lean Construction. Bernardes and Formoso (2002) present methods for evaluating systems of planning and control (items necessary to an adjusted production) from practical verification. As examples, we have: the analysis of the physical flow and the formalization of short-term planning. Many companies do not adopt it, though so some claim to perform such analysis.

Some entrepreneurs still see quality and certification programs merely as a way to improve marketing for the undertaking and win over clients. They consider the entire process to be more bureaucracy and additional costs. Thus, many businesses need to make additional efforts when the auditors responsible for ISO certification come to visit the site. There is no continuous practice and understanding of the need to change the organizational culture.

We believe that most of the management problems in Pernambuco construction companies originate at engineering schools. Engineers are taught either to treat construction in a traditional way, or add every technological innovation that emerges. They are not prepared to act as managers or business executives and therefore are not aware of basic principals of organization regarding production, leadership and motivation.

We can suggest actions to enable the use of Lean Construction among construction companies in Pernambuco, such as including construction management content to school curriculums (especially engineering schools), and disseminating Lean Construction concepts among unions and construction company associations with the aim of educating and convincing companies of the benefits of Lean Project Delivery. Researchers in this field must act jointly with construction project owners for the development of actions that prepare managers and for the adoption of a pilot project for implanting Lean Construction.

REFERENCES

Barros, E. S. (2005). "Um estudo multicaso sobre a aplicabilidade da lean construction em construtoras do setor de edificações da região metropolitana de Recife." Master Diss., Post Graduate Program on Production Engineering, Federal University of Pernambuco, Recife, Brazil.

Bernardes, M. M. S., Formoso, C.T. (2002). "Contributions to the evaluation of production planning and control systems in building companies." Proceedings of the 10th annual conference of the International Group for Lean Construction, Gramado, Brazil.

Curkovic, S. & Pagell, M. (1999). "A critical examination of the ability of ISO 9000 certification to lead to a competitive advantage." Journal of Quality Management.

Howell, G.(1999) "What is Lean Construction." Proceedings of the 7th annual conference of the International Group for Lean Construction, Berkeley

Koskela, L. (1998) "Lean construction". Anais of 7º Encontro Nacional de Tecnologia do Ambiente Construído, Florianópolis, Brazil.

Liker, J. K. (2005). O modelo Toyota. Bookman, Porto Alegre, Brazil.

Ohno, T. Toyota Production System: Beyond large-scale production. Ed. Productivity Press, Cambridge 1988.
Pontes, L. A. C. (2004). "Análise do Impacto do Processo de Planejamento e Controle da Produção nos Princípios da Construção Enxuta: Um Estudo de Caso." Master Diss., Post Graduate Program on Production Engineering, Federal University of Pernambuco, Recife, Brazil.
San Martin, A. P.; Formoso, C. T. (1998). "Evaluating Building Systems Based on Production Process Management and Lean Construction Concepts." Proceedings of the 6th annual conference of the International Group for Lean Construction, São Paulo, Brazil.