LEAN CONSTRUCTION PROFESSIONAL'S PROFILE (LCPP): IMPLEMENTATION IN CHILEAN CONTRACTOR ORGANIZATIONS

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ABSTRACT

Consolidation of lean construction demands the active participation of people able to apply this management system. Therefore, a pioneer research was carried out to define a Lean Construction Professional Profile (LCPP), which identifies three competence areas to develop simultaneously: enterprise vision, technical competence and social competence. This article presents an incipient implementation of the LCPP in Chilean contractor organizations, based on the identification of competences needed by project team's positions. Also, new developments of the model are discussed in order to provide recommendations for implementing the LCPP inside the companies. Results have allowed to visualize the coherence of the model in terms of what the enterprises expect of their project staff and how -through the identification of specific competences- it is possible to address the three elements of lean management: business purpose (enterprise vision), processes (technical competence) and people (social competence). In the future, it is expected to obtain data which allow organizations managing individual performance according to the LCPP and implement the model in other human resource management processes, with the aim of reaching better lean construction implementations.

KEY WORDS

lean construction, lean management, human resource development, competences

INTRODUCTION

The consolidation of lean construction theory demands the application of its concepts and principles in practical situations (Koskela, 2000), but until now most of the implementations have been very fragmented (Picchi & Granja, 2004). They have mainly focused on the improvement of project performance through the application of new tools and methodologies, leaving aside human, organizational and cultural issues. This situation has been widely recognized in the implementation of new management systems or every kind of innovation that involve some changes in the classical ways of acting (Juran, 1990; Kofman, 2006). Therefore, it is necessary to educate people and/or train them to deal with these situations, supporting this course of action by the adequate vision, processes and

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organizational structure (Kofman, 2006; Price & Chahal, 2006; French & Bell, 1996).

In Chilean implementations (Alarcón et al, 2006), this problem has arisen strongly in the last four years and companies decided to guide their collaborative efforts of lean construction implementation to an *organization development* program (French & Bell, 1996). The creation of an adequate profile of competences for the professional staff of the companies (key actors for reaching successful implementations) was one of the main work lines and its purpose was the improvement of lean implementation effectiveness. The Lean Construction Professional's Profile (LCPP) proposed by the authors identifies three competence areas to be developed simultaneously: enterprise vision, technical competence and social competence (Pavez, 2007; Pavez & Alarcón, 2007). For instance, professionals implementing the Last Planner System in a project require technical competences as well as social competences, however, to lead implementation at company level they also need enterprise vision.

An incipient implementation of the LCPP is presented in this document, based on the identification of competences needed by project team's positions in each competence area proposed by the LCPP. Also, new developments of the model are discussed, in order to provide recommendations for implementing the LCPP inside the companies.

In the future, it is expected to obtain data which allow organizations managing individual performance according to the LCPP and implement the model in other human resource management processes, with the aim of reaching better lean construction implementations.

BACKGROUND: LEAN CONSTRUCTION PROFESSIONAL'S PROFILE (LCPP)

The research about the LCPP (Pavez, 2007; Pavez & Alarcón, 2007) arose from the need to fill a gap found in the current literature regarding the role of people in lean management systems and also to help Chilean contractor organizations to improve the effectiveness of lean construction implementations.

This research was carried out from 2004 to 2006 as a line of applied research that the collaborative research group of Chilean contractor organizations - who work with the Center for Excellence in Production Management (GEPUC) - are deploying to implement lean construction in a more effective way.

Results allowed to define a generic profile of competences for lean construction professionals called LCPP, which considered two main elements (Figure 1): (1) Competence Areas (CA) and (2) *Lean Management* (Womack, 2006). The relationship between these elements is that *competence areas* define the "big areas" in which lean professionals need to be competent, and *lean management* provide the focus for the competence areas to be more effective in applying lean construction (and drive the transformation of the lean organization). Figure 1 shows a model of the LCPP and Figure 2 describes the model in a more detailed way.

It is important to notice that if lean management does not involve the competence areas (see Figure 1) the model could be a generic profile of

competences for construction professionals. This is an important consideration, because it allows to speculate that competence areas do not differ in essence, but in the way they are applied according to the paradigm of action in which people are immerse (Pavez, 2007).
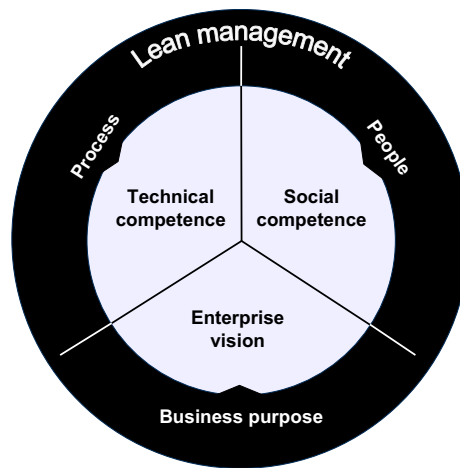

Figure 1. Lean Construction Professional's Profile - LCPP (Pavez, 2007).

IMPLEMENTATION OF THE LCPP IN CHILEAN CONTRACTOR ORGANIZATIONS

The LCPP was presented to the Chilean companies that are implementing lean construction for applying the model in their human resource management processes. Then, from the eight companies that nowadays constitute the group, three o them chose the implementation of the LCPP for their 2007 implementation agenda, achieving complete applications in two of them.

The implementation of the LCPP consisted on the elaboration of a performance evaluation system based on the LCPP. For doing so, a set of work meetings with company's experts were carried out, and specific tools to define the competences associated to each competence area were applied. The research objectives, the research methodology and the main results are presented next.

Competence areas (CA)	Definition	Key elements	Relationship with *lean management*
Enterprise vision	Shared vision of values and goals that employees must have to align people and organization short and large term goals. It implies that people should be able to make decisions based on enterprise objectives (business purpose), that is, enterprise needs should be put over particular needs coming from the different organization actors that influence the decision.	- Understanding of strategical bussiness issues and client needs - Shared organizational values and goals - Organization needs	Bussiness purpose According to the *lean management* concept, this CA sholud be focused on the understanding of bussiness purpose (client needs and internal operation) to align actions and decisions for reaching this purpose.
Technical competence	This is the base of the professional work. It contains concepts, theories, rules, methods, tools and technologies mobilized to carry out the work (in general terms) and solve professional activity problems. For the case of lean construction professionals it implies acquiring competences in construction techniques, project management and lean tools.	- Construction techniques - Project management - Lean tools	Procesess According to the lean management concept, people's technical competence should be focused on how processes can make the value stream more effective, with the aim of delivering to the client what he/she really want.
Social competence	Is the ability to inspire people for directing them to the desired performance scenario by bringing the best of their own capacity. It allows developing the informal organization in the right way by focalizing and taking advantage of the conversations and social networks that the organization produces. It is a key element to create high performance teams and this acquires more relevance as people's hierarchy gets higher. For developing this competence area it is necessary to have a self-domain and social skills (leadership, team work, communication, etc.)	- Self-domain - Social skills	People According to the lean management concept, people's social competence implies the ability to co-build work teams and achieve their commitment to the organization processes to assure delivering to the client what he/she want.

Figure 2. Detailed description of the LCPP (Pavez, 2007).

RESEARCH OBJECTIVES

The main objective of this research is to apply the LCPP with the aim to:

1. Identify the best way to implement it in the companies.

2. Obtain empirical data about the specific competences that each competence area must have, differentiated by positions.

3. Link the LCPP with human resource management processes (personnel selection, performance evaluation, professional development, among others).

RESEARCH METHODOLOGY

Given the need to produce results focused on a real problem that companies face, the *action-research methodology* (French & Bell, 1996) was adopted as a research background. As it name indicates, it is "research in action" whose purpose is to carry out research that is more effective. In other words, it has to solve a real problem, improve the conditions on which the intervention was applied, and at the same time, create a set of scientific knowledge (French & Bell, 1996).

The important characteristics of this approach, relevant to its application in this study are: it possesses elements that links it with the scientific method; there exists close collaboration between researchers and practitioners, and the researcher plays an active role in the system under study, because he/she is not only an observer but an agent of change (French and Bell, 1996; Pavez, 2007). In more concrete terms (according to the approach mentioned before), the research methodology for implementing the PPCL consisted of three phases: (1) definition of general conditions, (2) development of the solution and (3) internal validation.

Phase 1: Defining the general conditions

This is one of the main activities of the *action-research methodology*, because due to the close relationship existent between researchers and practitioners (researchers are change agents), it is necessary to define the working approach and the responsibilities of each part involved. In this sense, three activities are important: (1) to understand and delimitate the problem to solve; (2) to establish a common language (present the technical concepts associated to the work and the way in which people involved must interact); and (3) to define the work-team required to carry out the work (company-team and research-team). Regarding the last point, it is recommended that the enterprise counterpart have one person representing the direction board (enterprise/strategic vision), one person representing the human resource management staff (technical expert), and two people representing the positions involved in the work (in this case the professional staff of the company).

Phase 2: Developing the solution

This phase involved a series of specific activities for working each competence area of the LCPP. It has three stages (analysis of antecedents, fieldwork and collective constructions) with specific activities orientated to the needs of each competence area. Figure 3 shows a summary of each activity applied according to the stage involved.

It is important to notice that in the specialized literature about competences, highlights four models (core/organizational competences, distinctive competences, generic competences and functional competences) (Saracho, 2005; Das Neves, 2006), which coincide in conceptual terms with the generic definition of the competences areas proposed by LCPP. For that reason, the activities carried out take into account the essential aspects of each model, adapting some specific elements to the context and the aims of this research.

Therefore, to define the specific competences of the *enterprise vision* was used the model of *core/organizational competences* (Prahalad and Hamel, 1990; Das Neves, 2006) adding the organizational values promoted by the company; to define *technical competences* the model of *functional competences* (Saracho, 2005) using the *process approach*; and to define *social competences* the model of *generic competences* based on a previous research in the area (Pavez, 2007) and common-used dictionaries of competences (Saracho, 2005; Alles, 2003).

Phase 3: Internal validation and communication

Once the previous phase was completed, the results were conveyed to the relevant agents of the organization to receive their feedback and incorporate their most important recommendations. After that, the results were communicated to the entire organization in order to incorporate them to the work practices of the company (training the key people if it were necessary).

Activities carried out	Competence areas of the LCPP		
	Enterprise vision	Technical competence	Social competence
Analysis of antecedents	• Enterprise strategy • Mission, vision and values of the organization • Core competences	• Organizational structure • Position descriptions • Performance evaluations	• Organizational structure • Position descriptions • Performance evaluations • Dictionaries of generic competences (internal and/or external)
Fieldwork	• Does not exist	• Individual interview to site positions • Group interviews to site positions	• Competences required by construction professionals (Pavez, 2007) • Project Manager's time use (Pavez, 2007)
Collective constructions	• Workshop to define the central competences of the company (with directive board) • Using the model of *core/organizational competences*	• Definition of responsibility matrix for a typical project of the company, based on the central processes carried out by the organization • Using the model of *functional competences* applying the processes approach	• Definition of the social competences applied to the positions analyzed, based on a dictionary of generic competences made by GEPUC • Using the model of generic competences adapted to the reality of construction work

Figure 3. Development of the solution - Phase 2 of the research methodology.

RESULTS

For the purpose of this article, the most important thing is the profile of competences defined in each company, so the specific issues related to the performance evaluation system will be omitted. The results include a table comparing the general characterization of the companies and a brief evaluation of the work-meetings carried out (Table 1). Then, the competences defined according to the LCPP in each one of the companies are presented in detail (Figure 4 and Figure 5).

Case 1: Implementation of the LCPP in Company 1

Company 1 is a familiar and medium-sized firm, with 48 years of existence focused on the social and economic housing market. The work carried out in this firm was focused on their stable project team, it means, *project manager*, *foreman*, *on-site personnel administrator* and *warehouse administrator*.

This firm was the best committed company, bringing to the university team all the facilities to carry out the activities proposed and committing the continuous participation of the whole work-group in all work-meetings. The outcomes regarding the LCPP, separated by positions are showing in Figure 4.

Table 1 - **Characterization of the companies and an assessment of the work-meetings.**

		Company 1	Company 2	Company 3
Description	Specialty	• Housing	• Housing • High-rise building	• Housing • Industrial facilities
	Size	Medium	Medium to large	Large
	Years of life	48	18	27
	Type of company	Familiar	Society	Society
Work-meeting's evaluation	Company's work group	CEO Operations manager Chief of quality assurance Human resources administrator	Project director Chief of quality Human resource management assessor	Operations manager Lean facilitator Project manager Personnel administrator
	Meeting's periodicity	Every week	Every two weeks	Every two weeks
	Meeting's duration	2,5 - 3 hours	1,5 - 2 hours	1 hour
	Number of work-meetings carried out	8	10	18
	Attendance of all participants	100% of the meetings	90% of the meetings	50% of the meetings

	Enterprise vision	Technical competences	Social competences
Project manager		▪ Strategic planning of the project ▪ Cost control ▪ Technical capacity ▪ Orientation to results ▪ Continuous improvement and innovation	▪ Personal effectiveness ▪ Communication ▪ Leadership
Foreman	▪ Organizational alignment ▪ Teamwork ▪ Technology and control	▪ Human and materials resources management ▪ Technical quality and productive process management ▪ Safety prevention ▪ Orientation to results	▪ Personal effectiveness ▪ People guidance
On-site personnel administrator		▪ Fulfillment of administrative processes ▪ Outward administration ▪ Fulfillment of remuneration process	▪ Personal effectiveness
Warehouse administrator		▪ Procurement management ▪ Administration of the on-site warehouse ▪ Control and distribution of materials to site	▪ Personal effectiveness

Figure 4. Results of the implementation in Company 1.

Case 2: Implementation of the LCPP in Company 2

Company 2 is a medium-large sized firm, with 19 years in the market of housing and high-rise buildings. The focus of their work was the on-site professional team (they are considered by the company as the key group to sustain a lean culture), it means, *project manager*, *on-site manager* and *chief of technical office*.

In this case, the company had a profile of competences previously developed, so the work was oriented to review it according to the guidelines of the LCPP. So that, the work carried out consisted on re-define the existent competences regarding the structure of the LCPP and adding some new competences not previously considered by the company.

Regarding the previous work made by the company, the predominant approach to define the competences was the model of generic competences (Saracho, 2005), enriched by the outcomes of a previous study focused on the competences needed by Chilean construction professionals (Pavez, 2007). The results are showed in Figure 5.

	Enterprise vision	Technical competence	Social competence
Project manager			■ Teamwork
	■ Organizational alignment	■ Production and quality management	■ Delegation
On-site manager	■ Client orientation	■ Technical knowledge	■ Time management and personal effectiveness
	■ Social and environmental awareness		■ Negotiation and conflict resolution
Chief of technical office			■ Communication
			■ Leadership and decision making

Figure 5. Results of the implementation in Company 2.

Case 3: Implementation of the LCPP in Company 3

In spite of having begun the work before the other companies, Company 3 didn't achieve a complete application of the LCPP. For that reason, instead of showing partial results, we would like to highlight the importance to have the commitment of the work-group and the upper administration with the research. If the commitment and support of both groups do not exist, it becomes very difficult to reach positive and long-lasting results. Also, the possibilities to take advantage of the action-research methodology are reduced.

CONCLUSIONS AND RECOMMENDATIONS

Lean construction implementation, as an innovation process in a discipline in growth, brings new challenges everyday. Organizations get experience and new abilities, but they are always in need for new approaches to get better results. In the case of Chilean construction companies (Alarcón et al., 2006), but also in the international scenario (Picchi & Granja, 2004), the main needs for reaching better implementations have been associated to the improvement of organizational effectiveness, where the role of people is essential.

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The research about the LCPP takes this challenge by identifying how people could support the creation of a lean culture. The authors propose three competence areas that lean professionals have to develop simultaneously (enterprise vision, technical competence and social competence), according to the three elements of the lean management (business purpose, processes and people) (Pavez, 2007; Pavez & Alarcón, 2006).

In this article an incipient implementations of the LCPP under the action-research methodology were presented. Their outcomes can be analyzed from two perspectives: the *implementation process* and their *results*.

From the perspective of the *implementation process*, the more important discovery was the identification and implementation of the better techniques to use for working each competence area, because it strengthens and enriches the model for future implementations. In the three cases of study in which the LCPP was applied the results obtained were positive, regarding the appropriateness of the techniques used to define the specific competences of each competence area. This situation was facilitated due to the proven tools coming from the well established field of "competences" (Saracho, 2005), that we could apply specifically to work each competence area of the LCPP.

Due to the good results obtained, it is recommended the following: to define the competences associated to *enterprise vision* use the model of *core competences* (Prahalad & Hamel, 1990) or *organizational competences* (Das Neves, 2006); to define the competences associated to *technical*

competence use the model of *functional competences* (Saracho, 2005) applying the process approach (typical of lean systems); and to define the competences associated to *social competence* use the model of *generic competences* (Saracho, 2005) adapted to construction context (currently we are elaborating dictionary of competences based on the competences identified in a previous research – Pavez (2007)), or the model of *distinctive competences* (not applied in this context yet) (Saracho, 2005).

From the *result's perspective*, it is important to notice that the competences identified allow to rescue the essential issues of the three elements of *lean management*, which could facilitate the development of a lean culture (from people perspective) if the LCPP is incorporated to the human resource management processes. Also, it was possible to identify two competences that in most cases are not considered by organizations but the LCPP must have: *organizational alignment* (in enterprise vision) and *personal effectiveness* (in social competence). These two competences are important for the following reasons: the fist one allows to include the organizational values on the expected people behaviour, and the second one allows to include some elements that precede an effective interaction, in other words, the elements of personal effectiveness (Covey, 2007).

Finally, regarding the characteristics of the LCPP, areas of development for future research are: study the differences between positions for each competence area, identify the more relevant competences in each competence area (to reach better performance and/or improve the

creation of a lean culture), develop specific training plans for each competence area, and implement the LCPP in other human resource management processes (selection, incentives, professional development, organizational change, among others).

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REFERENCES

Alarcón L. F., Pavez, I., Diethelm, S., Rojo, O (2006) "Preparing Contractor Organizations For Implementing Lean Construction." *CIB-ASCE 2ⁿᵈ Specialty Conference on Leadership and Mgmt in Const. & Eng. "International Perspectives"*, Grand Bahama Island, Bahamas, May 4-6.

Alles, M. (2003). *Gestión por competencias: el diccionario*. Editorial Adelphi, Buenos Aires, Argentina, 295 pp.

Covey, S. (1997) *Los 7 Hábitos de la Gente Altamente Efectiva*. Editorial Paidos, Barcelona, España, 470pp. Spanish version of *The Seven Habits of Effective People*.

Das Neves, R. (2006) *Desenvolvimento de competências de gerentes intermediários na construção civil através da adaptação da aprendizagem baseada em problemas - ABP*. PhD Thesis, School of Engineering, Programa de Pós-Graduação em Engenharia Civil, UFRGS, Porto Alegre, Brazil, 265 pp.

French, W. y Bell C. (1996) *Desarrollo Organizacional*. Prentice Hall, México D. F., México, 375 pp.

Juran, J.M. (ed.) (1990). *Juran on Leadership for Quality, an Executive Handbook*. Díaz de Santos, Madrid, España, 363 pp.

Kofman, F. (2006). *Conscious Business: How to Build Value Through Values*. Sounds True, Boulder, Colorado, USA, 325 pp.

Koskela, L. (2000). "An exploration towards a production theory and its application to construction", VTT Technical Research Centre of Finland, Espoo.

Pavez, I. (2007) *Human resource development to support lean construction implementation: profile of competences and in-house training* (In Spanish). MSc Thesis, School of Engineering, Department of Construction Engineering and Management, Pontificia Universidad Católica de Chile, Santiago, Chile, 355 pp.

Pavez, I. and Alarcón, L. F. (2006) "Lean construction professional's profile (LCPP): Understanding the competences of a lean construction professional." *Proceedings of IGLC, 15th annual conference*, Michigan, USA, 453-464.

Picchi, F. and Granja, A. (2004) "Construction sites: using lean principles to seek broader implementations." *Proceedings of IGLC, 12th annual conference*, Copenhagen, Denmark, August 3-5.

Prahalad, C.K. and Hamel, G. (1990) "The core competence of the corporation". *Harvard Business Review,* May-Jun, 79-91.

Price, A. D. F. and Chahal, K. (2006) "A strategic framework for change management." *Construction Management and Economics*, Vol 24, 237-251.

Saracho, J. M. (2005) *Un modelo general de gestión por competencias*. RIL Editores, Santiago, Chile, 278 pp.

Womack, J. (2006) "Purpose, process, people." *Lean Enterprise Institute e-letter*, available in http://www.lean.org