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Incorporating Lean Construction Agent into the Building Standards Act: The Spanish Case Study

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Abstract

There is a demand for Lean Construction in Europe; even though it is still emerging, there is a growing interest, but there are no regulations on this topic. The main objective of this research is to regulate this role when in a project, and to define and develop a Building Agent structure, according to the Building Standards Act (LOE by its acronym in Spanish), in order to be able to incorporate it into the Spanish law, protecting it from civil liabilities. In Spain there is jurisprudence in civil jurisdiction based on the LOE to acquit or convict building agents, which are defined in the courts as “constructive managers” or similar. For this reason, courts could establish in the future several liabilities between the Lean Construction Specialist and other agents of the project, depending on their actions and based on the implementation of the Lean Project Delivery System (LPDS), the Target Value Design (TVD), and the Integrated Project Delivery (IPD). On the other hand, it is possible that the level of action of the Lean Construction Specialist may comprise design management, construction management and contract management. Accordingly, one or more building agents should be appropriately incorporated into the LOE according to their functions and responsibilities and based on the levels of action of the Lean Construction Specialist. The creation of the following agents is proposed: Design Manager, Construction Manager, and Contract Manager, definitions that are developed in this work. These agents are loosely defined, since any Project Manager, Building Information Modeling (BIM) Manager or similar, may act as one or as more than one of them. Finally, the creation of the Lean Construction Manager is also proposed, as the agent that takes on the role of the Design Manager, Construction Manager and Contract Manager, but focused on the Lean Production principles.

Keywords: Construction Manager; Contract Manager; Design Manager; Lean Construction; Regulation

1. Introduction

1.1. *Lean Production and Lean Construction*

The Toyota Production System (Lean Production) designed cars based on specific requests by their clients, made significant effort to reduce the time it takes to set up the machine and improve the quality management. It also developed three desired outcomes for the production system: to provide the customer with the highest quality vehicle that also satisfies the customer in every way, to reduce response time, and as such defining a “just in time” approach, and supplying what it’s needed when it’s needed, and as such eliminating waste [1]. All this, in an environment that encourages collaboration between the company itself and independent suppliers based on prior agreements that were, in practice, collaboration contracts.

Since Laurie Koskela published his technical report TR72 in 1992, giving rise to the Lean Construction, this trend has evolved [2]. According to Koskela [3], due to these traditional managerial principles, flow processes have not been controlled or improved in an orderly fashion; this has led to complex, uncertain, and confused flow processes, expansion of non-value-adding activities, and reduction of output value. Koskela defined Lean Construction as “a way to design the production system to minimize the waste of material, time and effort, in order

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to generate the maximum amount of value” [3]. It also mentions that the information and the flow of material, as well as the method of operation in design and construction have to be measured based on waste and their added value.

1.2. Last Planner System (LPS)

LPS comes from combining the central elements of task management and flow management in order to control the production in all areas of construction, and as such improving their performance [4]. LPS is a production planning system designed to produce predictable work flow and fast learning in terms of programming, design, construction and commissioning of projects [5]. LPS was developed by Glenn Ballard and Greg Howell and has five elements [6]: (1) Master Scheduling; (2) Pull planning; (3) Make Work Ready Planning; (4) Weekly Work Planning; (5) Learning.

1.3. Lean Project Delivery System (LPDS)

In 2000, Ballard [7] stated that the LPDS emerged from theoretical and practical investigations, and was in a process of on-going development through experimentation in many parts of the world. *“In recent years, experiments have focused on the definition and design phase of projects, applying concepts and methods drawn from the Toyota Product Development System, most especially target costing and set based design. ... it is necessary to understand customer purpose and constraints expose the customer to alternative means for accomplishing their purposes beyond those they have previously considered, and to help customers understand the consequences of their desires. This process inevitably changes all the variables: ends, means and constraints.”* [8].

1.4. Target Value Design (TVD) and Integrated Project Delivery (IPD)

“Target Value Design (TVD) is a disciplined management practice to be used throughout project to assure that the facility meets the operational needs and values of the users, is delivered within the allowable budget, and promotes innovation throughout the process to increase value and eliminate waste. Target Cost is the cost goal established by the delivery team as the “target” for its design and delivery efforts.” [9]. IPD is a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication, and construction [10]. IPD is an approach of an relational contracting, focusing on the projects main objectives and the major stakeholders, developing an organization capable of applying the principles and main practices of LPDS [11]. The team is invited to participate within a flexible contractual management framework, aimed at building Win-Win relationships of trust. Once the team accepts, it starts interacting through a collaborative routine in which BIM tools are used, which in term will allow to analyze each alternative posed by the stakeholders, seeking not to exceed the target cost of each stakeholder in the event adjustments are required. IPD, TVD and BIM are used simultaneously [2].

1.5. Regulating Lean Construction

“Project & Construction Management” is a practice with international recognition, regulated in United States, as well as United Kingdom, France and Germany [16]. However, each country has contractual restrictions as set in current legislation, in regards with different types of projects, procedures, contract models and forms original to each country or state, or developed to a extend, according to the kind of the construction. The “Lean Construction” agent is internationally renowned, not yet regulated, and it’s very much “in” all over the world, in countries as United States of America, United Kingdom, Brazil, Australia, France, Germany, Chile and Peru, among others. However, depending on each country’s regulation, its responsibilities can overlap with other specialists focused mainly in design or the project’s execution. The main objective of this research is to standardize the Lean Construction agent within the Building Standards Act (Ley de Ordenación de la Edificación, LOE by its acronym in Spanish) in Spain. This could also work in other countries, in Europe or the world, that are in a much similar situation at the moment.

2. Spanish Regulation and Jurisprudence in Civil Jurisdiction

According to Antonio Humero [12], the LOE [13], as per result of a long-term experience process, garners only figures that have been appearing in the construction sector since the final draft of the Civil Code [14] until late last century; therefore, it does not consider other international movements and trends that have been included in such

an area, such as: Project Manager, Facility Manager, Construction Manager, Safety Manager, Risk Manager, Design Manager, and others. Leaving the need of a continuous upgrade of the law, in order to adapt to the changing reality of the real state area. Because it does not exist any type of regulation in Spain regarding the agent in Lean Construction, contracts can be made defining such a special kind of agent in construction. The “Lean Construction” specialist is hired by other agents that deal in areas similar and related to those in “Project & Construction Management”, and both agents’ responsibilities can overlap as if they were “construction manager” or “design manager”. It’s because of the amount of advisers, specialist and agents that participate in the design and execution of the construction process that it’s necessary a regulation for this agent when it participates in each stage of the project. In the other hand, there’s jurisprudence from the Supreme Court [15] that might serve as legal base to establishing a specific regulation within the LOE for the “Project & Construction Management” agent [16]. This, too, can be considered as the “Lean Construction” agent.

3. Methodology

3.1. LOE Analysis

Requirements are analyzed for all different agents that participate along the construction process, out of which we can derive the responsibilities. We also analyze the Spanish Civil Code, and which doctrines still applies. The agents detailed in the LOE include the safety and health coordinators, during the elaboration of the safety and health study as well as during the execution of the building.

3.2. Lean Construction agent analysis

It’s important to note that within the Spanish market the “Lean Construction” and “Building Information Modeling (BIM)” specialists do exist as such [17]. We will proceed to analyze the different meaning and impact that the Lean Construction specialist has, according to its evolution.

3.3. Jurisprudence analysis

Jurisprudence on the construction manager is examined, as dictated by the Justice Supreme Court, and it might even “reach” or “absorb” the Lean Construction specialist. To obtain the jurisprudence, searches have been conducted in Spain’s Judicial Power’s website [15], in the Justice Supreme Court section, using keyword combinations such as “Building Standards Act”, “constructive manager”, “construction manager”, “design manager”, among others. Under the label “constructive manager”, which is an interpretation of article 1591 of the Civil Code [14], the Supreme Court has already dictated civil responsibility against agents that, in all manners, function as Project Manager or similar, which is in direct relation to LOE indication, and will be further detailed in the next chapter.

4. Results and Discussion

4.1. LOE Analysis

For all different agents that partake along the construction process, all obligations are detailed and accounted for, of which we can conclude their responsibilities, detailing the building contractor as the person or company that guarantees the movement of the whole process and whose responsible for quality and material damage that the building might sustain. Within the building contractor’s activities and responsibilities, the onsite manager has a special mention, as well as the obligation of ensuring all subsequent contracts are made within the law. The framework of the law also defines the behavior expected of such agents, as is the project designer, the owner of the site, the execution manager, stabilizing as such their responsibilities. There are other agents also related to those before indicated in LOE, which are defined in the Article 2 of the Royal Decree 1627/1997 regarding Construction Site Safety and Health [18], mainly the Safety and Health Coordinator during the elaboration of the project, and the Safety and Health Coordinator during the execution of the project.

LOE’s Article 17 defines that the legal responsibility of the different agents for property damage liability in a building would be personal, meaning focus on one agent, based on their own actions or on someone else’s that such person is responsible for. Joint liability would be required when responsibility for such actions cannot be narrowed down to one person, or when responsibility is due by the actions of more than one agent, or such responsibility is in any way joined by those agents [13]. LOE’s *Seventh additional disposition, Sue notification request for other agents* [13], it speaks of the “third party intervention principle in legal proceedings, requested by

the defendant”, indicating that “a person who might end up sued as a result of actions or liability based on the obligations of their intervention of the construction process, and purview in the present law, might request, within the time limit the Civil Prosecution Law grants to answer the sue, to notify one or more agents that had had intervened in such process”. Regarding the liability time limits, they are set in groups of one, three and ten years, depending on the different kind of damage done to the construction. The building contractor, during the first year, is responsible for all material damages done to the building because of poor execution; every agent that intervened in the project would be liable for up to three years for damages done to the building, caused by latent defect or defects that affect the building; and for up to ten years, for damages resulting from latent defect or defects that affect the building’s structural integrity.

On the other hand, in Article 1, Section 6, the Spanish Civil Code indicates that the jurisprudence will complement the judicial order with the doctrine that the Supreme Court might establish interpreting or applying the law, practice and general principles of the law [14]. This means that the Supreme Court is the highest authority in applying the jurisprudence, based on the lack of the specific judicial order.

4.2. Analysis of the Lean Construction agent

When the Lean Construction persona appears, as it has been happening in many countries where the trend has taken over, this agent is usually an outside consultant of the owner, different from the agents already included in the law and to the Project Manager, that advises in the organization of the construction work, applying the principles, tools and system techniques. Likewise, he/she can advise the owner in any phase of the project, in the design management, contract management, and material execution management, therefore, they are a figure that has functions and related tasks that, many times, overlap with those of the Project Manager and other agents. When the first evolution of Lean Construction happens, including in such the LPDS, an additional figure is created, that we can define as the design manager, that partakes in the Project Definition and Lean Design phase, including in such the tools, techniques and practices of this philosophy to design the project, ensuring that the needs and requirements of the stakeholders are considered in the design alternatives, selecting the alternative that best suits the purpose and needs of the project, and including the Lean Construction practices from the initial phases. When the second evolution of the Lean Construction philosophy, creating the TVD-IPD, appearing a new figure that we could name in a general way as the Contract Management. This agent, as requested by the owner, collaborates with him in the construction project management, focused on optimizing the contract management in all the phases of the project, in a way that such contracts are a full collaboration. This agent runs and manages the other agent’s contracts’ processes in all the phases of the construction project. Finally, we conclude that the Lean Construction agent can be created, that they will take upon themselves the design management, the construction management and/or the contract management, as per required by the needs of the project.

4.3. Jurisprudence Analysis

We searched and analyzed in the jurisprudence about constructive managers as dictated by the Justice Supreme Court, which could “reach” or “absorb” the new construction agent, the Lean Construction specialist. In order to obtain the jurisprudence, we conduct a search in Spain’s Judicial Power Web [15], in the section Justice Supreme Court, and we use the combination of keywords such as “Building Standards Act”, “constructive manager”, “construction manager”, “design manager”, among others, obtaining , an statistical population of 186 samples, of which only 17 are considered most important for being the closest related with the possible figures of the Lean Construction specialist, that could be determined by the Supreme Court. Table 1 shows the summary of the analysis.

As it’s noted on the item 4.1 LOE Analysis, Section Seventh [13] leaves open the possibility that, of the agents that might be indicted, among them the owner, the building manager and the project manager, the construction manager, the onsite manager, the health and safety manager during the design of the project, and the onsite health and safety manager, and the onsite manager might request, during timeframe the Persecution Civil Law [19] grants to answer this sue, that this they might notify one or other agents that might have intervened in such process. Evidently, in case the Lean Construction agent might not be initially charged as responsible in the building process, it is very like that one of the other agents might request he’d be indicted as well, as he will have advised them on “alternative solutions” than those they were used to.

Table 1: Commentaries on Supreme Court's main rulings on constructive managers

Nº	CODES	CONTENT	COMENTS
1	STS 1256/2004	Constructive manager's liability regarding his actions as Site Manager	The "Lean Construction" specialist works directly with all other specialist and could be confused in that way.
2	STS 2071/2001	Constructive manager's liability as he coordinated, supervised technical matters and made decisions on site.	The "Lean Construction" specialist can perform in this area.
3	ATS 5879/2011	Constructive manager's liability as he participated in other agent's functions.	The "Lean Construction" specialist interacts with other specialists.
4	STS 2676/2009	Responsible as cooperative manager, or owner association manager, or similar	The "Lean Construction" specialist can be included in this area, if he were part of the project from the beginning.
5	STS 1726/2015	Free of Responsibility as cooperative manager or owner association manager or similar.	The "Lean Construction" specialist could be included in this area if he were part of the project from the beginning.
6	STS 4524/1994	Absolved of all responsibility for construction defects.	The "Lean Construction" specialist interacts with other specialists could initially be included in this area.
7	STS 4650/1979	Responsible for damages to third parties and large loses and with interrupted electric supply.	The "Lean Construction" specialist interacts with other specialists and could be included in this area.
8	STS 5950/2009	Responsible for damages in the delayed completion date of the apartments, and agents should be sued equally to all those that participated in the project, in order to correct all damages.	The "Lean Construction" specialist interacts with other specialists and could be included in this area.
9	STS 6563/2011	Responsibility for damages to third parties for unexpected settlement of the neighboring building, of one or more owners, or similar	The "Lean Construction" specialist interacts with other specialists and could be included in this area.
10	STS 7941/2006	Responsibility for latent defect or construction defects.	The "Lean Construction" specialist interacts with other specialists and could be included in this area.
11	STS 8112/2007	Responsibility for damages in the delay of completion date, and all parties should be equally parts liable pending correction of all damages.	The "Lean Construction" specialist interacts with other specialists and could be included in this area.
12	STS 8151/2004	Responsibility for latent defect or construction defects.	The "Lean Construction" specialist interacts with other specialists and could be included in this area.
13	STS 8710/2007	Absolved of all responsibility under the name of manager or cooperative manager, or owner association manager or similar.	The "Lean Construction" specialist interacts with other specialists and could be included in this area.
14	ATS 756/1998	Responsibility for latent defect or construction defects.	The "Lean Construction" specialist interacts with other specialists and could be included in this area.
15	ATS 960/2007	Responsibility as cooperative manager, or owner association manager or similar.	The "Lean Construction" specialist interacts with other specialists and could be included in this area.
16	ATS 1769/2014	Responsibility for latent defect or construction defects.	The "Lean Construction" specialist interacts with other specialists and could be included in this area.
17	ATS 4007/2014	Responsibility as cooperative manager, or owner association manager or similar.	The "Lean Construction" specialist interacts with other specialists and could be included in this area.

4.4. Incorporation of the Lean Construction agent proposal

In this investigation, we have established that the Lean Construction's agent influence, in the design, as per LPDS, TVD or IPD, as well as in the execution itself, can overlap with that of other agents such as the design manager, site manager, construction manager, and safety and health manager during the design of the project, safety and health manager during construction, and onsite manager. Considering that the jurisprudence shows that the law has previously held the "constructive managers" liable, a figure much similar to that of the Project Manager, due to the fact that it acts alone or in association with them, is understandable that because their responsibilities aren't quite clear, the court might also find the Lean Construction professional liable as well for such work.

Ergo, we propose the following construction agents to be added in the LOE:

- The design manager, operative agent that, as requested by the owner and working based on the technical standard, should work alongside the owner in the coordination and managing the agents.
- The construction manager is the chosen agent that, as requested by the owner and working based on the technical standard, works alongside the owner on managing the site manager, execution manager, the onsite health and safety manager and the onsite manager.
- The contract manager is the chosen agent that, as requested by the owner and working based on the technical standard, works alongside the construction and project manager, with the purpose of improving the contract managing in all areas or project stages.

None of this agents is held accountable, in any way or form, in Article 19 of LOE, Guaranties in case of compensatory damage for construction defects. Under no circumstances their actions are to overlay with that of other agents, especially those of the design manger, site manager, execution manager, health and safety manager during the project design, health and safety manager during the execution of the project, and onsite manager. These agents will decide, finally, if the advice given will be taken into account in their actions, under their own responsibility.

5. Conclusions

The duties of the Lean Construction agent might overlap with that of the design manager, responsible for the execution of the project, and even with those of the safety and health project manager. It's of vital importance to regulate this agent, because their responsibilities can be easily mistaken by those of other agents in the construction business. It's of main importance to regulate the construction process, updating and filling in the legal configuration of the agents that intervene in all aspects, separating their obligations in a way that we can define without a shadow of a doubt their own responsibilities, based on a clear definition of a building's basic requirements. In Spanish jurisprudence, we've been able to define some rulings that speak of the "constructive manager", an agent not yet regulated, and who has a combination of functions and obligations already regulated by the LOE to other agents under their own name. In this article, we've confirmed that the agent named "constructive manager", defined in jurisprudence, will broaden at the diversity of agent that start surfacing in all aspects of project. Given everything explained before, it is of vital importance that the "Lean Construction" agent be regulated, in accordance with the positions of Design Manager, Construction Manager and Contract Manager in the Spanish standards in regards with the legal void it holds now.

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