

LEAN DESIGN MANAGEMENT IN ARCHITECTURAL DESIGNS DEVELOPED IN THE CITY OF JOÃO PESSOA – ANALYSIS WITH FOCUS IN THE PROCESS OF ELABORATION AND DESCRIPTION OF THE SOLUTION

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Abstract

The civil construction industry is a sector increasingly marked by the high competitiveness and by the search for profit made from the elevation of productivity, efficiency and quality of the final product. In this context, the architectural design plays a fundamental part, as it determines the principal characteristics of the building to be constructed. However, the architectural design firms are not always prepared to attend all the changes and innovations in relation to the quality and technology that the civil construction companies need. The present research analyzes the current situation of the management quality of architectural designs produced in the city of João Pessoa, with regard to the aspects elaboration process and the description of the solution. In this way, interviews were conducted and questionnaires were applied, in two stages, to the architects who are responsible for ten architectural design firms in the city. The result of the research indicated that many architectural design firms in the city are searching to manage the quality through the study, knowledge and standardization of the design process and the improvement in the design description and presentation of the plans, but it is still necessary to overcome the many difficulties identified for the maturation and development of the quality management

Keywords: Lean management, quality, architectural designs.

INTRODUCTION AND OBJECTIVES

The city of João Pessoa experiences today a property growth originated from strong investments in this sector, in this context the types of edification most explored is the one of multi familiar housing use.

Many residential buildings which number of floors varies from 3 to 30, arise in several neighborhoods, mainly in the coast, they are featured as multi-owner building projects and most of the times under the form of real estate projects.

The elevation of the competition among the companies, the increase of the prices of the materials, the low purchase power of the population and the increase in the level of demanding of the clients implied the reduction of the margins of profit. As a consequence of the high concurrence established in the city, the price of the square meter has become the cheapest among the capitals of the country according to the SINDUSCON – JP.

This way, in João Pessoa as well as in the rest of the country, the builders and the professionals linked to civil building try to retake the profit based on the professional excellence, reduction of waste, technological increase and efficiency.

However, civil building companies from the city attribute the responsibility for failures, delays, errors and reworks in the works to the projects and designers. According to these companies, the projects received present incompatibilities, errors and lack of details enough for the building. This fact oblies the companies to alter elements already executed (like masonries), alter projects of the work, retake projects for redefinition in the office and, consequently delays and changes of schedule in the development of projects in the work.

Several problems coming from the process of Project and process of production in the Industry of Civil Building determine the search form new management methodologies, being for this, fundamental the development of new tools, concepts and techniques aiming to reach the necessary optimization to the processes of the civil building. In this sense, a great contribution of concepts has been observed from the evolution of the Lean Construction, that aims to apply in the civil building the Lean concepts of production.

The International Group for Lean Construction developed and applied several tools of planning like the short and medium term planning. The Short Term Planning aims to identify for a one week period, what can really be done, altogether with the ones involved in each activity, analyzing all the aspects related to the issue. In this case, the Last Planner is used as instrument that, using an index called PPC (Percentual Planned Concluded) it contributes in the implementation of the continuous planning and production process improvement, meaning a real planning of the work to be done. In a similar form, the Medium Term Planning represents an excellent tool largely applied and well succeeded with the IGLC. In this sense, the main instrument is the Lookahead Planning that has the objective of appropriating, in an action planning for six weeks, those activities that can be done in this period.

The practical application of these tools of planning has already proved that generates several positive results, like the ones reported by Ballard (2000), that applied the system Last Planner successfully both to the phases of the project and for the phases of the building in the civil building.

In view of the aspects described above, this work has the function of being a base research and had as main objective analyze the state of management of architectural designs of building projects today in João Pessoa towards the process of elaboration of design and the description of the solution presented.

This research had also as specific objectives: Analyzing the management of projects of architecture, specially the planning, development and control of the process of project; Identifying the existing differences between the process of elaboration/description of the solution of projects and the requisites established for the management of architectural projects and; Propose, based on the theoretical principles of he Lean Construction and by the

Lean Design Management, solutions to optimize the management of architectural projects of real estate undertakings from the city of João Pessoa towards the researched aspects.

METHODS OF RESEARCH

Preliminary research – Ten structured interviews were done in ten architectural design firms of the city. It had the objective of assembling a profile of the quality management in the design firms of building architecture, as well as obtaining information pointed by the local architects that can constitute indicators of design quality in terms of description of the solution and for the process of elaboration.

Multi case research – This research was done in three architectural design firms selected from the first research. The parameters that determined the selection of these design firms were: existence of management procedures of quality, being active in the real estate market of building projects and, have as main clients builders that have management control of processes. This way, a questionnaire was applied aiming to identify the procedures of lean design management already existing in the design firm, afterwards the documents of two architectural designs of each design firm were analyzed to check the design management of description of the solution.

THE PRESENT STATE OF MANAGEMENT IN JOÃO PESSOA'S ARCHITECTURAL DESIGN FIRMS

This initial analysis was done in ten architectural design firms that work or had already worked with the property market. These design firms presented big heterogeneity towards several aspects such as: main type of designs, level of design management into the design firm, management of design firm as an organization, monthly production and work methodology.

Planning of the process of Project – All the offices surveyed informed that do not plan the process of development of project towards to any aspect, related o the time lasting, or related to material and financial resources. The directors of the offices informed that the process of project presents several returns and feedbacks of project that imply in changes, and that for this reason, it is worthless to make a long and complete planning, because there will always be alterations.

Responsibility for the coordination of designs

In this aspect there was a nearly unanimous answer, because nine of the ten design firms researched informed that there was a coordination of designs and that the own architect is the responsible for this task. However, the attributions of the coordinator of designs sum up to the compatibility between the design specialties, not including the role of managing the other design professionals.

Average number of incompatibility among designs

Although some of the design professionals interviewed were aiming to implement the management in its processes of development of the designs, no design firm controls effectively the incompatibilities existing in the designs. Only six design firms pointed the most frequent incompatibilities among the designs, which were identified only from their experiences in the developed works. The biggest quantity of incompatibilities involves the designs of building services (electric and hydraulic systems) and, following, from architecture.

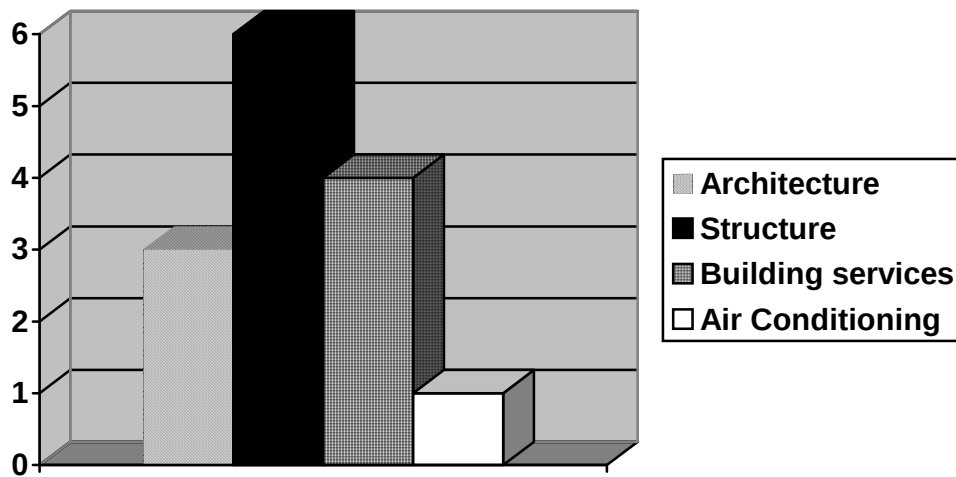


Figure 1: *Frequency of incompatibility between designs*

Integration between the design and building construction works and feedback of information from the construction site

The integration between design and the construction site activities in all the cases is done personally, in the occasion of the visit of the architect to the worksite. There is no clear exposition, by the building firm company, from the building technology used there is only explanation of the few details that influence in the design. Only two design firms informed that there is feedback of information coming from the work about building methodology, even so these information are not formalized in any document.

Modifications and design errors

The modifications and errors of design have direct implications in the costs, waste and rework of the building firms companies. However, although the design firms know that the quantity of modifications and errors of design is reasonably high, these are not effectively registered. In the research several kinds of modifications in the design were highlighted, which origin is equally divided between the architect and the client. Between the design firms which main clients are the building firm companies, the main alterations of the design are related with the number of floors, what cause several other changes, which can be corrected through the briefing stage well matured and studied.

The errors of the design were numbered, again, only by the experience and memory of the designs, as long as there are no registers. The most described were the ones related to dimensions presents in draws, also being highlighted the big consequences of this error, that generates problems to the work and a big cost for all the professionals and companies involved.

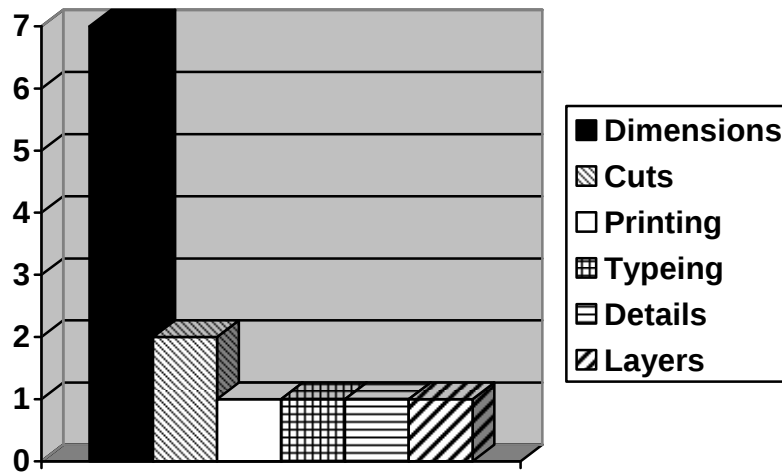


Figure 2: Principal errors of architectural designs

Indicators pointed by the design firms interviewed for the lean design management

This question is particularly important to have a notion about the features of the lean design that the design firms are giving to the designs, as well as to the evaluation of the process of elaboration of designs and in the description of the solution as determining for the lean design. The architects numbered simple indicators and basic to the architecture and building but that if followed, in the context of the city, reduce processes and rework in the design and in the work promoting the lean construction.

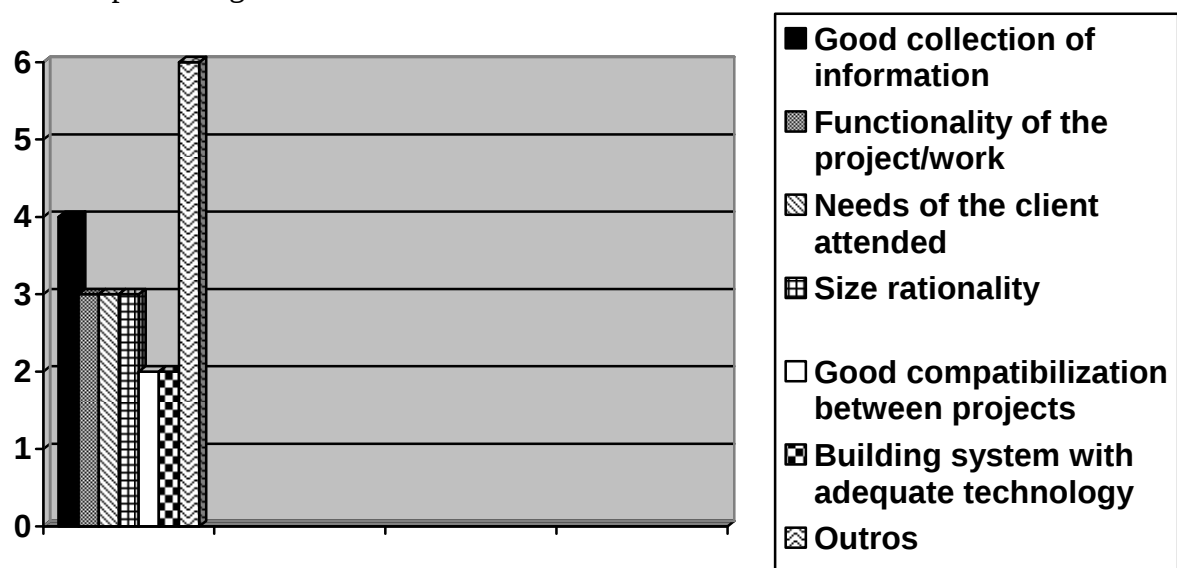


Figure 3: Indicators pointed for the lean design management

Multi case studies: Quality management in architectural design firms

In this stage of the research, interviews were done in three design firms of architecture aiming to check in each of them the procedures of lean design management in the architectural designs. The design firms were selected from the first interview using the criteria of existence of procedures of management of designs. The design firms surveyed in this stage were named design firm “A”, “B”, and “C”. The identification and analysis of the lean design

management was done through interviews and analysis of two designs supplied by each design firm.

In relation to the register of requisites of design established by the client, like establishing of building systems, type of technology used and definition of the material to be used two design firms informed that received these information diluted along the meetings of the team of design, according to the evolution of the design. The third design firm informed that receives all the information of the building firm through an initial briefing that contains all the requirements of the building project, which showed to be an excellent procedure that is being covered and adopted in all the designs developed by the design firm, because this briefing defines, with high power of precision, the product that the architect must conceive.

Design firm	Method of getting information from the design	Method of register of information from the design
"A"	In meetings	In the contract
"B"	Briefing supplied to the clients	In the folder of the design
"C"	In meetings	In the folder of the design

Figure 4: Method of information and register of design information

About the decisions adopted for the promotion of lean construction, the architects informed that these decisions are still very insufficient, although they are efficient for the technological context of the region and for the feasibility of the building project in a situation of low price in the area built in the local market. Thus, the main decisions described were: the rationalization of designs, the contextualization of the materials adopted to the best technologies of low cost available in the market, modular coordination of the design and, standardization of design solutions and design process.



Figure 5: Decisions for lean construction

In the last stage of the research, the documents of designs were analyzed and it was checked the worry with the standardizing of different aspects among the design firms. The result of this stage of research showed a good level of representation and comprehension of the solutions adopted, reflecting the knowledge of the implications of the uses of materials and its interfaces with the other building material/systems, what facilitates the compatibility among designs in the stage of definite design.

CONCLUSIONS AND RECOMMENDATIONS

The architectural design firms of the city are not effectively managed like a company and, so, do not have a concrete policy of research and adoption of new technologies (building systems, materials and techniques) that promote the lean construction for the proposition in new design. This way, the suggestion and the demanding of these new technologies always come from the building firm companies.

Although, many interviewed architects seemed to be interested in the survey and implementation of the lean design management in their design firms. This interest has origin in the demanding of designs done by the clients, principally the building firms for elevation of productivity and reduction of waste and cost. Consequent, there is already a search in the design firms for higher qualification in this area through the acquisition of technical literature and short duration courses, that many times are paid by the own building firm companies.

The lean design management is also searched through the coordination of complementary designs and from the trial of bigger integration among the designers, aiming to reduce the incompatibilities, the errors and the alterations of design. Although these actions become more difficult because, although performing this role, the architect is not, in fact, hired for the service of coordinating designs. The high turn round of the designers team hired by the building firm company also prevents the development of methodologies of work and group management and the search for the excellence in the interaction of the group of design.

A problem with great negative impact in all the project and the work is the absence of planning of the process of project in the offices towards to any aspect (related to the time lasting, related to material or financial resources).

From the researches developed and from the conclusions established above, we can make some recommendation aiming to improve the lean design management in the architectural designs in the context of the city of João Pessoa:

- The lack of planning of the process of project can be sorted with the application of the system Last Planner for the Short Term Planning, aiming to attend to the necessity of planning for a one week planning, always evaluating the PPC (percentual planned concluded) index. The offices of project must also do a Medium Term Planning through the Lookahead Planning, determining this way an action plan to cover the time of six weeks;
- Elaborate and adopt lists and boards that help and number the collection of information of entrance about technology, materials and solutions to be adopted for the elaboration of designs;
- Ask to the building firms, if possible, a briefing containing all (or the main) requirements of design of the building project;
- Increase the interaction among the designers keeping, whenever it is possible, the same teams of design;
- Increase the integration between the architectural design firm and the construction work, promoting the feedback of the in site performance of the architectural solutions and by new technologies adopted;
- Evaluate the satisfaction of direct and indirect clients about the solutions adopted towards the building possibilities, productivity, reduction of wastes, and performance along the use;
- Manage the human resources in the design firms, promoting trainings and courses for designers and trainees aiming to make the able for the practices and methodologies for the lean construction;

- Create methodologies of incentives and rewards for the internal designers of the architectural design firm, aiming to stimulate the creation/adoption of better solutions in lean design.

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