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Linking Central Business Processes of Construction Companies with the Performance of Construction Operations

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Abstract

Many studies have been performed about ways to improve the performance of construction operations, including new technologies, construction methods, and production models. However, not enough attention has been given to the impact of the central business processes and to what would be their required conditions of development to support and promote a high, long-range operational performance effectively. The focus has been mainly on the site level and not at the central business level of a construction company. This study addresses this problem looking first to identify the main central business process of the construction companies and the conditions in which they operate. Second, to the relationships between central business processes and the way those construction operations are performed. The impact of these processes and their characteristics on the production systems used in worksites are being analyzed, including aspects like: culture, governance, people, and information technologies. Finally, the perspective of business process management (BPM) is being adapted to the management of construction companies to check the applicability of this approach to construction and the contribution it can provide to this sector. As a result, it is expected that a new structure of requirements for construction business processes is going to be proposed in order to improve operational performance. The methodology of the study includes an exhaustive literature review, a case study and the application of a survey to a group of construction companies. It can be concluded preliminarily that there is a good operational improvement potential if construction central business processes are carried out in a systematic form and if the management of the construction operations at sites is also aligned with these processes in a more integrated approach.

Keywords: central business processes; construction companies; operations; performance.

1. Introduction

Various problems such as a slow pace of improvement of the construction industry as well as low productivity, profitability, and client satisfaction with the achieved value [1-3], are making the construction industry to lag behind other industries such as manufacturing and services industries [1]. To address this, it is proposed here that it is necessary to integrate business processes of a construction company with a focus on the client [4], on staff training, on promoting innovation, and on having a quality agenda, among other actions [1-3]. These conclusions are reported in various investigations around the world, and the Chilean construction industry reality is no different. There has to be a cultural change [5] and leaders' commitment in order to achieve permanent and effective solutions to these issues [1].

In the construction industry, the project culture has been established over the corporate one [6]. Most of the studies and actions to improve construction companies' performance have focused mainly on projects and operational processes. However, the central office is above the construction company's projects that direct them according to the strategies and visions set at the higher organizational level. There is an important potential to achieve significant improvements on construction projects and operations through the leaders and business processes at this level. However, this has not been studied in depth yet. It is necessary to understand how business processes at the central office are related to projects' operational processes and the impact they have or could have on their performance.

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This paper presents a research that is being carried out in order to identify the main business processes of construction companies and to understand how these processes are linked and affect the performance of construction operations and projects. Besides, it is going to be proposed a structure of conditions that these business processes should meet in order to achieve a positive impact on operational performance, aligning construction business processes and projects with company's strategies and clients.

In the next section a summarized background is presented. Then, the research problem is defined, with a brief description of the research methodology, methods and analysis tools. The main results obtained at the moment are shown. Finally, the conclusions of the actual research progress and a description of the following steps in the investigation are offered.

2. Background

This section presents a brief summary of the literature review related to the research problem. First, organizational and project change, and the different approaches relating them to operational performance are discussed. Then, business processes are explained, with some visions and tools used to manage them, and what has been studied and done at the construction industry at this area.

2.1. Project vs. organizational level focus

Changes in construction companies are inevitable and necessary, which must be managed to prevent negative consequences and maximize profits. These changes can be grouped into two major categories: 1) at the project level and 2) at the organizational level [7]. The first ones can be associated with projects' operational processes, which have been extensively studied. The latter, on the other hand, are related to subjects like human resource management, risk management, organizational learning, strategic management, information technology management, quality management and organizational development [7]. This level is associated to the business process at the superior level of construction companies.

In construction companies, the project culture dominates normally over the corporate one [6]. In practice, construction companies are highly dependent on their professionals and temporary collaborators' skills, as Kazi says [8]. In the same way, the chief executive officer of a local construction company, interviewed by the researcher stated that the lack of a clear supporting system from the top company' level makes each construction project behaving differently according to the characteristics of each project manager in charge.

Since the focus on construction companies' performance improvement has been put at operational process level, no real analysis has been performed on how to structure the business processed of the construction company so that they can contribute positively to the formalization and effective development of the way that the construction company carries out its projects. For example, improvements have been proposed at the project level on some subjects as processes modeling and simulation, management approaches like Lean and Just in Time, workers' motivation, tools and equipment ergonomics, information technologies like BIM, among others [9]. Some studies have been done at the local context too on topics like the identification of productive, contributive and no contributive work on construction projects [10], and the identification of operational factors affecting a building construction performance [11]. However, not enough attention has been paid to the impact that the top organizational level of a construction company and its business processes has on projects' performance, how can this impact, if constructive, be reinforced, and the way both, business and project processes are linked.

2.2. Business Processes

Business processes are all companies' activities that bring together people, technology and information in ways that create valuable outputs, in order to carry out their missions, set goals, measure performance, serve customers and address the challenges that arise while doing so [12].

In general, the literature defines business processes in a common way to all processes that create value, without differentiating between the different levels of the organization in where they are. For this research purposes, it is necessary to distinguish between non-operational high-level or business processes that belong to the central office, from the construction operational processes of projects.

2.3. Business Processes Management

Multiple perspectives have been proposed to manage the necessary changes in business processes and to control them. Some of these are: Six Sigma, Total Quality Management (TQM), ISO9000, Business Process Reengineering (BPR), and maturity models like the Capability Maturity Model (CMM), among others [7, 12].

These can be considered as different visions within Business Process Management (BPM), but other sources treat BPM as a separate perspective that emerges from BPR [13].

BPM is a body of principles, methods and tools to design, analyze, execute and monitor business processes [14]. This approach allows to design and manage in a systematic way the business processes, making them more agile, flexible, with more visualization and clear responsibilities, eliminating processes inefficiencies and making them simpler [15]. BPM looks for continuous improvement aligning the processes with the strategic objectives and with a focus on the client [13]. The lifecycle for doing so is shown on figure 1.

Actually, it is hard to find BPM research and applications in the construction industry and only a few companies are considering implementing this system [16]. Some first approaches have been completed with the study of cases, where they show how to identify some processes, adapt supporting IT and general factors to keep in mind in order to implement BPM [13, 15, 16, 17]. In most of the cases these studies have focused on projects' processes. This approach on business process management has not been applied yet at the top level of construction companies, and how changes can be achieved aligning the central office with the constructions operations, in order to have a positive impact on them.

3. Research problem

The link between central office business processes and the operational performance of the construction projects has not been studied yet. It is necessary to understand the central business processes structure of companies, identify the main ones and their current operating conditions, and find the relationships between them and construction operations. The main hypothesis proposed here is that to achieve greater improvement at the site level it is necessary first to have business processes that provide appropriate conditions and governance at the project management level to facilitate it. Together with this, it is considered that improvement efforts at the site level are of limited impact on projects' performance as many previous studies show.

Based on the above, a structure of conditions that central office business processes should comply to achieve a positive impact on constructions operations as well as an appropriate governance are going to be proposed. It is necessary to adapt approaches such as BPM (Business Process Management) to the construction reality in order to accomplish this.

4. Research methodology

To achieve these objectives, an extensive literature review has been carried out which will continue throughout the research. A case study is one of the main methods of study to be used, with the support of an extensive survey to be applied to construction companies. This is a work in progress, and the final results have not been obtained yet. However, the ones that are shown below are sourced from what has been observed at the company that is used as case of study until now. The research has the following stages:

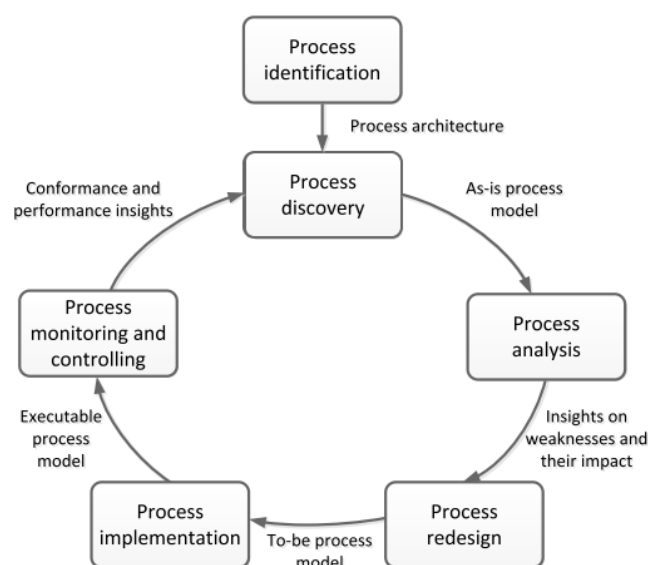


Figure 15: BPM lifecycle [14]

4.1. Phase I

It has been sought to define the current structure of the central office main business processes and their operating conditions. From the literature review it has been found out what is the reality of business processes at other industries and which of these processes are the most relevant to the construction industry. At the same time, a study of a case is being carried out to evaluate the main business processes of a specific construction company and to compare with the results from the literature.

The case of study consists in a construction company dedicated to massive housing construction. It has two projects in execution at the moment. Its organizational structure is simple and has less than 200 employees, characteristics that represent the majority of the Chilean construction companies. In this case, project managers and the central office personnel are going to be interviewed in order to see the structure of the main superior business processes, the perceptions they have on the influence of these processes over the construction operations, and the operational performance problems that could be linked to them.

Frequency analysis of the responses and cause-effect Ishikawa diagram are going to be used to model and associate the operational performance main problems with the construction company business processes that would be contributing to these problems. In this way, business processes that have the major influence on projects operational performance at the case of study are going to be identified.

4.2. Phase II

Given the above results, links between operational performance and the maturity or development level of these business processes are going to be determined in a qualitative way.

At this stage, a survey is going to be applied to some construction companies with similar characteristics to the case of study. It will be distributed in an electronic format so as to avoid unanswered questions and to have shorter response times. It will be directed to central office management and high-level project management staff. The questions will be closed-questions, with a Likert scale from 1 to 7. It is pretended to identify the perception that high level staff have about the impact that each earlier identified business process has on project operational processes performance.

A frequency analysis will be done, comparing the answers given by the personnel at the central office and at projects. Besides, an ANOVA analysis will detect the main business processes that impact on the operational performance. Finally, the results are going to be compared with the findings of the case of study.

4.3. Phase III

Based on the obtained results, it is intended to propose a structure of conditions and the governance that main business process of construction companies' central office should meet in order to achieve a positive impact on their projects operational performance. Other industries approaches for change management obtained from the literature will be selected and adapted to the studied reality of the construction industry. This structure of conditions and requirements will have to be aligned to the company's strategy both at the central office and at construction projects.

5. Main research results

This research is in progress, and the main results obtained until now are those related to the literature review and what has been observed on the surface of the case of study, at the phase 1 of the methodology.

In general, the classification of the business processes in the literature don't distinguishes between operational processes and those business processes at the central office. For example, [18] groups them in 3 sequential types: innovation processes related to the identification of client's necessities and new ways to satisfy them; operational processes; and after-sale processes. A broader classification is made by [4]. They mention a BCIOD+R vision, with processes related to: business, customers, integration, operations, delivery and regulation. Some of them are closer to the central office and others to the projects. Nevertheless, a larger literature review is going to be done in order to identify specific central business processes at the construction industry.

A first approximation has been done to the case of study. Field observations and informal conversations at all levels of the company have been conducted, including central office executives, project managers, crew foremen and workers. As explained by these personnel, central business processes at the following areas are considered as some of the most relevant in terms of their impact on projects' performance:

- Policies and procedures for worker's recruitment.
- Equipment management between different projects, including equipment maintenance plans control.
- Supply chain management and inventory policies.
- Contractors' payment management. Payment systems and incentive policies.
- Quality control and proceedings definition.
- Legal procedures and permissions.
- Knowledge management between the central office and the projects. Timely distribution of working documents and information.
- R&D and new technology incorporation.
- Risk management.
- Safety and accident prevention policies.

Some of them are provoking major project delay and overruns. The most relevant is the recruitment of labor workers. The lack of policies and clear contracting procedures are resulting in staff turnover, constructive errors and a low continuity and pace of work. Another business process carrying some troubles is the equipment management. Repetitive mechanical problems on the equipment that the company owns are delaying the construction operations and increasing the cost, since new equipment has to be rented to external companies.

6. Conclusions

A research effort is carried out currently to understand the link between central business processes of construction companies with the performance of constructions projects. A literature review and a case study have been done, and the next steps of the investigation have been described.

As a first approach to the research topic, the literature review as well as the case of study has shown that there is no much research on the impact of a construction company business processes on the operational performance of its construction projects.

At the case of study first approximation, it can be observed that the lack of clear and systematic central business processes is affecting the performance of the project operations. The most relevant of them are: labor contracting procedures and policies, and equipment management.

The main conclusion is that there is a performance improvement opportunity from the central office processes. The results obtained are important as inputs for the next research steps in order to understand the link between central office and operational processes. This is a work in progress; a deeper view and analysis of the case of study and surveys to other companies has to be done in order to be able to propose an improvement approach aligning the central business process to construction operations. It is expected that research results will be a contribution for those companies that are looking for greater and sustained improvement of the way they carried out their construction work.

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