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Guidelines for scope of work in corporate office building design

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ABSTRACT

Project process' hindrances over office architectural design production are common at civil construction sector, implying on schedule loss, reworks and higher costs. Many academic literature approaches to that hindrance resulted from failure in project process. Predominantly failures concern translating customer needs and expectations into design conditions. This research objectives to propose scope of work guidelines, securing customer satisfaction and avoiding unforeseen additional costs, reworks, schedule and project benefit loss. Additionally, for each guideline proposed, it is suggested an accountable for it (project manager, architect or client). The adopted methodology was the research and analysis of project methodologies from academic literatures, contenting responsibilities definitions and design criteria that should be considered on the approved scope of work. Furthermore, the creation and implementation of an interview plan with one Brazilian high concept corporative architecture firm and its three clients, in a way that it is possible to measure client's point of view over contracted project process. Results from the interviews identified scope definition and project process planning hindrances. Then, in comparison with academic literatures, main project and scope of work issues were identified and used as base to the scope of work development guidelines.

Key words: Office Design; Corporate; Project Management; Integrated Project Delivery System; Scope of Work.

RESUMO

A produção de projetos de arquitetura e engenharia no setor de construção civil apresenta entraves em seus processos de projeto, que implicam em perda de prazo, aumento de custos de projeto e retrabalhos. Diversos autores abordam falhas na gestão do processo de projeto, principalmente na interpretação das necessidades dos clientes e na definição dos critérios que o projeto deve seguir, alguns não previstos no escopo de contratação entre a empresa de arquitetura e o cliente. Esta pesquisa propõe diretrizes para que as empresas de arquitetura possam, junto ao gerente de projetos dos clientes, definir um escopo de serviços em que retrabalho, custos adicionais, atrasos e a insatisfação do cliente com o processo sejam reduzidos ou evitados. Para cada diretriz, há também a definição de quem é o responsável por executá-la (se o arquiteto ou o cliente). A metodologia utilizada para obtenção desse objetivo foi o levantamento e revisão de bibliografia sobre metodologias de projeto e de contratos de projetos, que auxiliem na definição de responsabilidades, atividades e critérios de projeto. Em acréscimo, foi formulado um roteiro de entrevista e eleita uma empresa de arquitetura corporativa com experiência de mercado no Brasil, assim como três clientes da mesma, de forma a mapear o ponto de vista do cliente sobre o processo empregado pela contratada. Com os resultados das entrevistas, fez-se uma análise comparativa entre os métodos de projeto empregados pela empresa de arquitetura e o encontrado em bibliografia, identificando os principais entraves no desenvolvimento e definição do escopo de serviços. Por fim, tais resultados foram utilizados como base para propor diretrizes para que o escopo de serviços entre arquitetos e clientes prevejam revisões de projeto, traduzam efetivamente as necessidades do cliente e atendam prazos e custos esperados.

Palavras-chave: Projeto Corporativo. Gestão de Projetos. Integrated Project Delivery System. Escopo de Serviços.

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LIST OF ABBREVIATIONS

ABNT	Associação Brasileira de Normas Técnicas
ANTAC	Associação Nacional de Tecnologia do Ambiente Construído
BIM	Building Information Modelling
BOMA	Building Owners and Managers Association
CAPEX	Capital Expenditure
CBIC	Câmara Brasileira da Indústria da Construção
ENTAC	Encontro Nacional de Tecnologia do Ambiente Construído
FEL	Front-End Loading
FM	Facilities Manager
IGLC	Internetional Group of Lean Construction
IPD	Integrated Project Delivery
LPDS	Lean Project Delivery System
NBR	Norma Brasileira
PM	Project Manager
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
WBC	World Building Council
VIP	Value Improving Practices

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1. INTRODUCTION

1.1. BACKGROUND

Economic crisis (2014), consequently civil construction industry slowdown, increased competitiveness over Brazilian Project and design firms. Higher competitiveness and lower profit margins provoked civil construction professionals to organize their internal processes, improving their business effectiveness (MELHADO, 2001).

Efficient and effective civil construction Project process management assists this sector industries to work more productively, reducing costs and deadlines, attending successfully to legislation and engineering standards and client's needs and expectations.

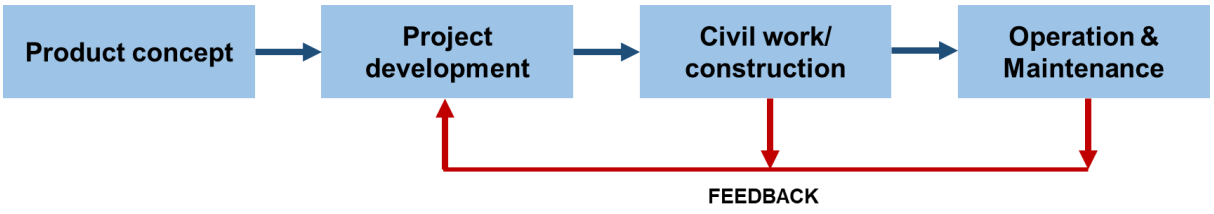
Project management theme has been discussed by many authors since the beginning of the 90's. Project management research theme was formally created in early 1995 (MELHADO, 2001). Construction and project management methodologies and guidelines were proposed and refined by related researches, contributing for architecture firms' process quality and competitiveness enhancement.

Among all Project process phases, this thesis focuses on the early phases of the process, when the architects and clients determine the project objectives based on the client's needs and expectations. Similarly, two authors discussed this theme:

Firstly, Liu's master's thesis (2010) discuss over information clarity and engaged professional's roles for each corporate office building project process phase. The author introduces Brazilian academic researches that had contributed for her thesis. They were organized by the themes their researches approached:

- Architecture design production: 06 referenced authors;
- Building history: 03 referenced authors;
- Technical building comfort: 02 referenced authors;
- Post-Occupancy Evaluation (POE): 02 referenced authors;
- Building infrastructure: 05 referenced authors.

Figure 01. Building design production phases. Source: LIU, 2010.



According to Figure 01, a corporate office building production process must consider four building production phases: product concept, project development, civil work/ construction and operation & maintenance. The process starts in the product concept phase, which is constituted firstly by a terrain prospected by the Commercial Department of the incorporation company. In case the terrain is approved, it becomes an output and important information to Project & Construction Team. Secondly, the project financial viability is studied together with an architect. The main purpose is to determine what are the project commercial characteristics: if there are any legal limitations, finishing standards, usable and constructed areas, private and common areas, building core, parking lots and commercial floors quantification. If the Project financial evaluation does not correspond to the stakeholder's target cost expectation, Commercial Department must review the project viability (reduce parking lot capacity and size of the private areas, etc.). (LIU,2010).

The author briefly discusses about the project process scope of work adopted by the cases studied in her research. Summarizing, it was analyzed that the most successful case' scope of work was the same who presented better integration between project manager and project & construction team since the early stages of the project process. Scope of work and program requirements must me clearly defined by all project engaged professionals in the product concept phase (LIU, 2010).

Finally, based on the case studies observation and analysis, the author proposes eight guidelines for the product concept phase: 1) legislation criteria; 2) BOMA[1] area calculation; 3) ceiling clearance & building floor quantification; 4) building core quantification and distribution on the floor; 5) building façade architectural concept; 6) finishing material standardization; 7) project criteria review; 8) project criteria approval.

[1] Building Owners and Managers Association International (BOMA International).

The second author whose research's theme is related to client-architect relationship in corporate office building project process is Pessarello's master thesis (2011). The research discusses about contract management through integrated Project system. It starts with integrated system conceptualization: it supports project costs, deadlines and quality control, and additionally that system must be used as a business competitive strategy. The author cites other related researches, dated from 2003 and 2009, that explore the integrated system applied for IT projects.

Pessarello's thesis discuss how a construction company contract management currently operate and manage their internal project processes. Using references like PMBOK (2008), the author examines a contract management process phases, including the concept phase, when all project resources must be defined and organized. As explained by the research, this phase is critical for project and construction continuity. Proceeding with the discussion, it is suggested that a planning software must be used in order to meet company's demands along the project process. The researcher exemplifies the practical consequence of using a software by examining three case studies. After implementing the use of the software on their project processes, the cases presented improvement on costs and deadlines control.

Despite both master theses are associated with this research's theme, they present different focus: Liu's research matter with a whole new building project process, starting from terrain prospection and concluding with the final process phase, operation & maintenance, and it extensively discusses about all project discipline criteria (electrical, civil, architecture, etc.) to define a scope of work. Meanwhile, Pessarello's research concentrates mostly on the construction company project process control and little on client needs and scope of work definition.

As observed, a detailed and clearly defined scope of work is a valuable project process tool to assure the architecture firm the needed competitiveness and to guide the quality of the expected work. Beyond setting price, payment conditions and other commercial information essential for client's decision making, technical quotations are important reference for project criteria guidelines development. For this reason, it must be carefully detailed and present a consistent project and process activities planning and design production costs (OLIVEIRA & MELHADO, 2006).

Corporate office building design theme is part of academic research and, since 2000, some scientific papers were published in Brazilian national conferences, such as ENTAC (Encontro Nacional de Tecnologia do Ambiente Construído – or, in English, Built Environment Technology National Conference), organized by ANTAC (Associação Nacional de Tecnologia do Ambiente Construído – Built Environment Technology National Association). The papers present in Table 01 are fully or partially concerned with corporate office project criteria definition and client's needs consideration for design development:

Table 01. ENTAC (2000-2016) published papers, which theme fully or partially concerns corporate office building design.

Title	Author(s)	Summary	Year
Proposta para sistematização de informações e decisões nas etapas iniciais do processo de projeto de edifícios (In Portuguese only).	FONTENELLE, Eduardo; MELHADO, Silvio.	Introduces Incorporation and Construction company's information flow and decision making, regarding housing Project development.	2000
O sistema de comunicação e a gestão dos fluxos logísticos na construção civil: estudo aplicado ao gerenciamento de processos empresariais (In Portuguese only).	NASCIMENTO, Verônica; CRUZ, André; ABREU, Aline.	Studies the relevance of construction company's process management, considering positive results on the company's resource control.	2000
Integração das relações empresa-cliente - aspectos conceituais e metodológicos (In Portuguese only).	OLIVEIRA, Maria Carolina.	Discusses client engagement importance to housing production Project process.	2000
Novas formas de contratação e organização dos empreendimentos no segmento de construção de edifícios para terceiros (In Portuguese only).	GRILO, Leonardo; MELHADO, Silvio.	Deliberate about contracting design and execution, evaluating costs reduction and Project delivery higher efficiency.	2002

(Continuance) Table 01. ENTAC (2000-2016) published papers, which theme fully or partially concerns corporate office building design.

Title	Author(s)	Summary	Year
Uma análise das técnicas e ferramentas utilizadas no processo de projeto de empreendimentos de capital (In Portuguese only).	ROMERO, Fernando; ANDERY, Paulo.	Based on FEL Project methodology, develops and presents a conceptual model for Project management of mega-enterprises.	2010
O processo de briefing em escritórios de projeto arquitetônico de pequeno porte (In Portuguese only).	CARVALHO, Karla; ANDERY, Paulo.	Through observation of three small architecture firms, this paper analyses their briefing process and how it affects project process.	2012
Caracterização e análise dos métodos de entrega de projeto (In Portuguese only).	LINS, Deborah; CAMPOS, Ivna; MORORÓ, Mayra; BARROS NETO, José de Paula; CARDOSO, Daniel	Studies and compares the most usual civil construction contract models (DBB, DB, CMR e IPD), proposing one model as a guide to future Project contracts.	2014
Diretrizes para a gestão de projetos industriais (In Portuguese only).	SILVA, Tássia; MELHADO, Silvio.	Analyzes the Project life cycle of two designing firms, discovering processes gaps and proposing improvements to their Project process.	2014
Gestão de riscos e riscos de gestão em projetos industriais: estudos de caso (In Portuguese only).	SILVA, Tássia; MELHADO, Silvio.	In continuity from 2014's paper, it identifies industrial project's uncertainties and risks and recommend improvements for the project risk management.	2016

Besides widely discussed, few researchers focus project management and project planning on corporate office building design and client's needs changed into scope of work criteria. Other national conference publicized papers which dealt with project management and client satisfaction. The first edition of SBQP Conference (Simpósio Brasileiro de Qualidade do Projeto no ambiente construído or, in English, Built

Environment Brazilian Project Quality Conference), in 2009, had four papers about these subjects. Their research considers housing design and building process, but not corporate office design.

Corporate office projects demand client and architect to be strongly aligned and integrated, then client's needs as quality, costs and deadlines can be achieved by the project process management. Internationally speaking, client commitment since early stages of project process has been discussed by scientific researches, some published as papers in conferences. The first ones are: the 4th Annual Conference, organized by International Group of Lean Construction (IGLC), 1996; the 4th Built Environment Congress, by Association of Schools of Construction of Southern Africa (ASOCSA), 2009; and the World Building Congress (WBC), by Conseil International du Bâtiment (CIB), 2016.

Chronologically, the first paper named "Adversaries or Partners? A Case Study of an Established Long-Term Relationship Between a Client and Major Contractor" (COOPER et al., 1996); examines a 20-year old partnership between a construction company and their client, in which both accomplished success in 15 projects concluded during that period of time. As stated by this research, that success is due to "the integration and collaboration of partner organisations so that communications are improved, with individual and mutual objectives known to all parties in a successful virtual organization".

In 2009, another paper analyzes the changes in scope of work and its consequences for risk management on GMP Projects (Guaranteed Maximum Price). Conclusion that "Scope changes and variations are inevitable inasmuch as designs are never completed before project pricing" and that, consequently, affect total project cost (ROTIMI, SMITH & OGUNSEMI (2009).

Recently, a whole section of the WBC (2016) was dedicated to meet the different stakeholder's interests. Eleven papers were published in this section as summarized in Table 02:

Table 02. WBC (2016) published papers, which theme fully or partially concerns corporate office building design.

	Title	Author(s)	Summary
1	Improving Early Stakeholder engagement process for Infrastructure projects	BAHARUDDIN, Har; WILKINSON, Suzanne; COSTELLO, Seosamh.	Through qualitative method, a survey was applied to two cases, one in New Zealand and one in Malaysia. The paper aims to inquire into infrastructure Project process when client engagement happens since the process beginning.
2	Development of a Collaborative Briefing Approach to Support Stakeholder Engagement in Construction Briefing	CHUNG, Jacky; WEI, Kua.	This paper analyzes a previous research results, about Collaborative Briefing Approach, (CBA), which proposes collaborative client relationship instructions. Chung & Wei introduce, then, an ongoing research about enhancing effectively and efficiently the CBA's presented results.
3	Contradictions of interests in early phase of real estate projects – What adds value for owners and users?	VALEN, Marit; BOGE, Knut; FOSS, Margrethe.	After interviewing 799 Norwegian civil construction companies, the authors ought to clarify what brings project value under client's point of view. Main project process constraints and stakeholder's different interests were identified by the applied survey.
4	Linking Activities During Construction to Inter-Organizational Value Co-Creation During Operations	PELTOKORPI, Antti; MATINHEIKKI, Juri; KYRO, Riikka; ARTTO, Karlos.	This paper identified operational and maintenance long term value activities for Project process. Results aim to assist including building life cycle value in project process by stakeholders.
5	An exploratory study of the practice of stakeholder participation in densification projects	AVILA, Carlos; NILSSON, Rikard; LANDIN, Anne; OLANDER, Stefan.	This research investigated stakeholder participation in urban densification projects (from private and public sectors). The results were the identification of obstacles, challenges, opportunities and best practices from client engagement in the Project process.

(Continuance) Table 02. WBC (2016) published papers, which theme fully or partially concerns corporate office building design.

	Title	Author(s)	Summary
6	Identifying client roles in mainstreaming innovation in Australian residential construction	MYERS, Georgia; HEYWOOD, Christopher.	The central and decision-making stakeholder's role is examined in this paper. It objectives how Australian housing mass construction can be more sustainable through stakeholder's role in Project process.
7	Customer roles in a business ecosystem – A case study in health and wellbeing campus	LAPPI, Tuomas; HAAPASALO, Harri.	This research evaluates how multiple client responsibilities by the beginning of project process can define a healthy and wellbeing environment for a campus.
8	Development of students' multidisciplinar collaboration skills by simulation of the design process	SALMISTO, Alpo; KEINANEN, Marko; KAHKONEN, Kalle;	Civil engineering student's education and capacitation is evaluated after a practical application of a 9-year multiple learning program in Tampere University, Finland.
9	An analysis of student performance measures in newly constructed schools	LAVY, Sarel; NIXON, Jerri; SAMANT, Sagar.	This paper examines whether new construction, building age, and building condition affect applications, enrollment, attendance, and student achievement measures in a large urban school district in Texas, USA.
10	Extending Professional Fields: Architectural Research and Regional Development	HYNYNEN, Ari.	This research focus on the innovation environment analysis, where researchers join as players among others, thus deviating from the more conventional role of architectural professionals.
11	A Framework for Designing Responsive Architecture: A Design Studio Approach	KU, Kihong.	The objective of this research is to understand the challenges and opportunities of responsive architecture and describe the author's research and teaching explorations for designing such responsive applications.

Only four (numbered from 01 to 04 in Table 02) of eleven published papers may directly contribute with this thesis, due to their focus on client commitment since the early stages of Project process. Their results over the comprehension of stakeholders' needs and values are key to this research, even though corporate office buildings design weren't considered.

In other sections of WBC Proceedings (2016), there are papers that broach over corporate office design but they focus on the building technical infrastructure (e.g. lighting) or on office building related to real estate market.

1.2. TERMS DEFINITION

Acknowledgement and alignment of terms used in this research are important for common and fully comprehension of the proposed discussion.

After building or refurbishing, it is considered a professional good practice that the construction company handle to the stakeholder/ client a document called the Owner's Manual. It is about maintaining the building characteristics until the end of its life cycle time. Building maintenance and conserving guiding is the manual most important content. How each building infrastructure is expected to be operated, clean and maintained must be easily identified in the manual. Furthermore, the manual must designate who is the responsible for the building maintenance (CBIC, 2016).

In Brazil, the Manual must comply with ABNT NBR 14.037:2011 Standard requirements, must be easy reading and have objective instructions. According to that standard, the manual is a document that appropriately gather building operational and maintenance needed guidance.

In dictionaries, manual (noun) has the meaning of a book or document with machinery operational instructions or information (Oxford Dictionary, 2018; LDOCE, 2018). Therefore, the term "manual" is a document that gives instructions for usage and operation of a machine or building.

When concerning about planning project process and gathering client needs information, manual is not the best option, but guidelines. The word guideline is and advice or rule about decision making or about the best way to do something (Oxford Dictionary, 2018; LDOCE, 2018).

Besides, the word “guidelines” summarize client’s expectations and can be used as a project measurement of success tool in the end of the process (LIU, 2010).

Guidelines may also be interpreted as an innovative method for developing a construction company real constraint on their daily routine (SOUZA, 2016).

Considering this research focus on the early phases of a corporate office building design Project process, more specifically on the scope of work and client`s needs, the term adopted is guideline. It is expected that an architecture firm can improve their scope of work through the results of this thesis, using it for design decision making.

1.3. THEORY DEFENCE

The 70’s were characterized by office building real estate market growth, impelled by many multinational companies’ arrival in Brazil that rapidly expanded the construction industry (ANDRADE, 2007).

In Brazil, civil construction industry is one of the most dynamic for country economy, mainly concentrated in Sao Paulo region. For corporate office buildings located in this city or region, the square meter cost is high, making vacant office space undesirable for stakeholders and incorporators. Vacancy is one of the consequences from the economic crisis in Brazil, which decidedly affected civil construction industry (BARBOSA FILHO, 2016).

Since office space has operational costs, it can be seeing as business and must be managed as so, specially when employee retrenchment policies are adopted. It causes office space surplus. Since space costs are maintained, it turns to be undesirable to have vacant space (THEN, 2012).

> “The founder needs to deal with the problems involved in making decisions within facilities management and property management (e.g. whether to rent, lease or own spaces, choice of location). The facilities management operation of the firm must thus match the conditions of the market and other external factors” (DETTWILER, 2012).

Office space occupation downturn caused office layout adequacy needs to enhance inside companies, aiming to optimize their square meter occupation and reduce space

operational costs. Multinational companies started an office layout refurbishment contract wave since then.

According to the Brazilian Standard, ABNT NBR 16280:2014 - *Reforma em Edificações – Sistema de gestão de reformas – Requisitos* (in English, Building Refurbishment – Refurbishment Management System – Requirements), any refurbishment or modification regarding the built environment and its infrastructure systems mandate the client hire a professional (architect or engineer). The refurbishment plan and design must be delineated by qualified professionals, specifying systems and subsystems impacts and building infrastructure equipment, formally forwarding that plan to the building legal representative before civil works begin.

When considering corporate office buildings, the design is usually third-part contracted by the client. All complexity of the design, then, must be dealt by an architecture firm. Due to small engineering and facilities teams, companies opt for outsourcing layout refurbishments and adequacies, though their internal teams keep the management of the project to themselves.

> "Pressed with organisational demands and the need to focus on core business, for many organisations, outsourcing presents an attractive proposition. Using the outsourcing approach, management expertise, technical expertise and labour are procured from the external market by means of a contract" (FINCH, 2012).

Outsourcing demands clear and consistent communication between client and the third-part, when project criteria, client needs and expectations, target cost and deadlines are defined. Therefore, communication is pointed as successful alignment key between client and architect, in order to obtain project's best results. Attending to local standards and legislations, constructability, easy operational and maintenance and client needs are some of the expected outputs from a successful project.

Without client and architect information exchange, project's criteria are poorly and unclearly defined, consequently and meaningfully enhancing execution and operational costs, causing client's dissatisfaction (SOUZA et al., 2001).

Communication flow for a corporate office project process must also happen internally in client's organization: project sponsors, company leadership, decision-makers, project manager, project team and facilities manager must all be aligned about project objective and the needs that pushed the outsourcing for a design project.

In case information is subjective and/or insufficient, hindrances, reworks, scope changes, missed deadlines and additional costs may occur during the project process, stressing both client and architect. Early in Project process, relevant information is needed for project development. However, even if all need information is provided, not all of them are trustworthy (SILVA E MELHADO, 2016).

Communication and information mismatch between client and third-part architect, right in the early stages of project process, incite gaps to later process stages, such as design stage:

> "It was observed that an equally serious discontinuity inhibits the attainment of the best solution and performance for a proposed project. A number of authors (Drage, 1970; DHSS, 1986; Hughes and Walker, 1988; Hughes, 1989; Walker, 2002) have indicated that there is a gap between the pre-design activities and the design stages" (SMITH & LOVE, 2012).

Due to complexity over client and architect relationships, hence project process management is necessary, making information flow effectively and avoiding process gaps. Thereby, the role of a Project manager is important for all project process, since its concept and planning until operation and occupation. Since project process conduction varies accordingly to the client's organizational culture, the project's scope of work turns to be a challenge to the architecture firm.

Lastly, this thesis proposes communication and client information into a formal document, specifying project criteria into a scope format, aiming for more efficient and quality project results and higher chances to achieve client satisfaction. In spite of any cultural and regional change that the project may be exposed to, the scope must consist of guidelines for architects who need well defined information and criteria to successfully develop project design and enhance the architecture firm competitiveness.

1.4. OBJECTIVE

This research main objective is to define and propose scope of work guidelines for architecture firms who are hired to develop a corporate office design. Those guidelines will be based on client's needs and expectations and project requirements, avoiding scope changes and reworks along project process.

In order to achieve main objective, it was necessary to:

- Identify and present project process management models and methodologies;
- Diagnose hindrances and gaps on project process, from client and architect point of view;
- Discuss gaps and hindrances found after interviewing qualified professionals;
- Based on literature and interview information, propose formal and standard scope of work guidelines for architecture firms develop project design consistently.

1.5. RESEARCH METHODS

The research methods used to achieve the proposed objectives are, in a sum, analyze academic literature fully or partially related to the subject and through a practical and qualitative analysis by interviewing professionals (architects and project managers) who have managed recently a corporate office layout project. By comparing the interview results with findings from academic literature, scope of work guidelines were developed.

For the practical and qualitative method, one architecture firm was chosen to be observed and one of their representatives was interviewed. The premises to choose an architectural firm were: it must be a corporate office design expert; with 10 years or more of experience in this area; must have multinational clients. In addition, three architecture firm's clients' project managers were interviewed in order to check their point of view over the management method adopted for each project. Summarizing, the research methods followed the steps below:

a. Data selection, organization and edition: useful information was selected and classified according to their contribution to this research. That information was gathered from websites, as well as academic literature (theses, papers, journals, etc.) since their subject is fully or partially alike this research's. For printed literature, a research was made at Architecture and Urbanism University and at Engineering

University Libraries; and at commercialized books. Digital material, such as papers and conference proceedings were also researched and analyzed, like the ones published at ENTAC (*Encontro Nacional de Tecnologia do Ambiente Construído* – or, in English, Built Environment Technology National Conference).

b. From researched academic literature, the better-known Project management methods or models were selected and analyzed, comparing their requirements and characteristics.

c. An architecture firm and three of its clients were selected and investigated, for a qualitative information sampling about how they manage their corporate office project process. The main premise to choose which clients would be considered for this research was that they must be a multinational company, since it was expected that they already had a project management culture implemented. It was personally applied a questionnaire to project managers from the three clients chosen.

d. For each client, one recently implemented project was evaluated through the interviews, from their planning and conception until the conclusion stage, to get an overview of how the process management was conducted.

e. If identified any Project management method adopted by the clients chosen, the management method/ model was analyzed and compared to those from academic literature.

f. Also, from the conducted poll, gaps and hindrances were investigated from client's project management method.

g. From the comparison between the Project process management from academic literature and from the three studied clients, considering the gaps and difficulties analysis made from their processes, scope of work guidelines were proposed to avoid the problems found.

2. CORPORATE ARCHITECTURE STUDY

2.1. CORPORATE OFFICE WORKSPACE BACKGROUND

In the 19th century, huge transformations on urban centers, urban population growth, mobility and transportation, technology and communication affected service and industry sector, intensifying customer demand and pressure for more quality and productivity. Urban and population growth attracted many multinational companies, which contended for the city's central locations, building their monumental head office expressing their economic strength (ANDRADE, 2007).

Along with production and technology changes, qualified labour workforce was increasingly demanded by industry, to operate and manufacture new developed equipment, such as computers and internet. These new kinds of work influenced architecture and office layout design as well as it influences nowadays.

> "Just as buildings must have built-in flexibility to accept upgraded mechanical, electrical, lighting, and communication systems, they must also be flexible to accommodate continually changing concepts of the way work is to be accomplished. The current trend toward warehouse-like space that is highly flexible, where workers can spend any hours they like, bring the dog or cat, and so on" (KOHN & KATZ, 2002).

Office building architecture, then, were planned and focused on accommodating infrastructure machines but not on employee and final user's wellbeing and engagement. Office furniture and workspace arrangement reflected the organization hierarchy and the mass production way of working from the 20th century – concept that lasts until the present in many companies. Layout used to reflect the company structure and organization, extremely inflexible, based on manufacturing way of working. Leadership was located at the higher floors, with a privileged view from workers from their big closed offices and decorated with luxurious furniture. Supervisors, not as privileged as the leadership, used to occupy a medium position for employee monitoring and controlling. Workers, however, used to occupy a big open office, with large shared work desks, arranged side-by-side (ANDRADE, 2007).

In the late 20th century, besides technology improvement, social changes occurred in consequence of work demand changes as well as the way of performing it. That

transformation reflected on the office workspace, which had to attend newer ways of communication (more efficient) between employee and optimizing workspace occupation, especially if the office space is rented – then, workspace starts to configure people's function needs instead of their hierarchy and status. Workstation characteristics evolved according to three main factors: organization increased flexibility, decreasing number of closed offices available and increasing collaborative and integrative workspaces; furniture production costs caused their size reduction; and information technology development, which changed requirements over furniture design (ANDRADE, 2007).

Then, when considering a corporate office building, technology and work performance affect directly the workspace once all multiple office activities, dealt and performed daily demand proper designed space, providing its occupants with comfort and functional and aesthetical requirements by properly dimensioned and furnished environments (ANDRADE, 2013).

Therefore, corporate office workspace elements must be considered by the company's stakeholders as much as by the architect. Stakeholders should intend to achieve corporate strategies through workspace layout, while the architect is responsible for comprehend stakeholder's needs for workspace and turn them into office layout design requirements.

STEELCASE (2016) interviewed 12.840 corporate employee professionals from 17 globally different regions, survey over office building elements, workspace, motivation and engagement, diagnosing if the office space those people worked at attended properly and efficiently their needs. Obtained results showed that 55% of respondents feel from disengaged and demotivated to highly disengaged and demotivated. Only 13% presented workspace high engagement and motivation levels. The survey presents the idea that noise (acoustics comfort) and temperature (thermal comfort) are the two office elements that negatively affect final users and, therefore, are two important elements corporate office architects must consider as design requirement. Effective client and final user insertion in the project process and in design decision making contribute to a better project transparency (KOWALTOLSKI, 2012).

Client and final user satisfaction are directly related to their engagement in the project process management.

> "If you can speak to the end users and explain what is needed to achieve the end goals, be it cost saving, closing a building, etc., and ask them to make suggestions on how this could be done, then they have not only engaged with the process, they have ownership of it" (BULL & BROWN, 2012).

The earlier the client engagement happens in the project process better to the architect to determine their needs and values and develop consistently the project design:

> "Initiate a stakeholder network in early phase of the building and to start a value management process early due to the stakeholder's different values and attitudes. This will require a change of the building and work process of particularly the early planning and design phase, but also challenge the traditional way of executing real estate project" (VALEN, BOGE & FOSS, 2016)

Project process early stages stakeholders engagement assists on better comprehension of their needs and, consequently, which project requirements must be considered in project architect's scope of work

2.2. CLIENT NEEDS AND SCOPE OF WORK DEFINITION

Through new office Technologies and strategic company's policies implementation, stakeholders view from workspace, building infrastructure and market turnovers directly reflect on the building facilities:

> "Globalisation, technological advances and shifting management priorities have altered both the provision and management of corporate facilities and associated support services. To this end organizations have pursued various strategies aimed at better matching between demand and supply, all efforts to better control and manage facilities occupancy costs. The need for alignment between business needs and the organisation's facilities infrastructure is at the heart of any strategy in supporting business success" (THEN & CHAU, 2012).

Since organization strategies affect the office-built environment and its facilities, their needs and values must be well interpreted in order to produce an efficient engineering solution for the company's demand. In order to successfully attend stakeholder's demands, architects and project managers must produce a formal, clear and objective document, easy-reading by all professional engaged in the process. The termination for the document, found in some literature, is Scope of Work (SOW), but is also called "Briefing", "Client's Needs Program" or "Architectural Program".

> "At the pre-design stage, briefing investigates the nature of design problem by helping clients to define, translate, communicate and present their needs and wants into a set of written project requirements in form of specific technical characteristics, functional performance criteria and quality standards" (CHUNG & WEI, 2016).

Client's need and expectation must be considered Project's main objective and must be translated in teh SOW document and Project criteria.

> "The central concern for the client is "what" is going to be achieved as a result of finishing the project. "How" becomes the vendor's responsibility (Rijt et al. 2016). The final step in the preparation phase is compiling a core document describing the project objective and scope, weighting the selection criteria, and establishing the project budget ceiling" (NARMO et al., 2018).

Successfully achieving client' satisfaction along all stages of project process depends on how much easy-reading and objective the project requirements are and the quality of their transcription into the project's scope of work. Developing a project's risk evaluation plan, a responsibility matrix, a schedule aligned with every project process stage and a communication plan are key-task to reach to a clear and objective interpretation of client's needs (RIBA, 2013).

When concerning about client's needs, it is important to understand the purpose behind the needs, that motivated the client to look after a corporate office design project. Through that intrinsic analysis, the architect add value to the project and has higher capability of achieving client's satisfaction.

> “But what’s needed is to work back to customer purpose—what are they trying to accomplish? What do they intend to do with the flat, bridge, factory? If purpose is understood, then it is possible to determine what features of the product are valuable; i.e., what features are means for realizing that purpose. But to incorporate those values into the product, it is necessary to translate from the voice of the customer into the voice of the engineer” (BALLARD, 2018).

Those values, when captured in the early stage on Project process, tend to last all building’s lifecycle time:

“By understanding the different operators’ and users’ value creation logics, developers and investors can orchestrate activities during the whole project lifecycle in order to maximize value in the inter-organizational network” (PELTOKORPI et al., 2016).

Table 03 is an example of information a project’s SOW must contain about client needs and structure and that must be considered as part of Project`s requirements to be accomplished in the end of its process.

Table 03 – Information requirements for assessing demand. Source: THEN, 2012.

People	Workspace	Services
• Types and numbers of people using the building and its facilities including other parties who are visitors for short or long duration. • Number of people to be engaged in each of the work processes of the business.	• Types and numbers of people using the building and its facilities including: types of workspace required and its attributes; and types of workspace settings required, e.g. individual and collaborative workplaces, meetings, social, open and enclosed. • Internal locations of workplaces – aggregated or dispersed.	• IT infrastructure: required to support the business, e.g. IT and communication systems, LANs and WANs, telephones, etc. • Support services: required for each work group and the business as a whole, such as security, reprographic, catering, cleaning, etc.

(Continuance) Table 03 – Information requirements for assessing demand. Source: THEN, 2012.

People	Workspace	Services
• Anticipated occupancy of the premises in terms of number of people, timing and duration.	• External locations of workplaces – CBD premises, satellite premises, customers and supplier premises, transit locations and staff homes. • Durations for which the various workplaces are required and by which workgroup. • Process operating environment and conditions, e.g. segregation, co-location.	• Operating hours: the hours of operation of the business and its constituent parts. • Equipment and machinery. • Information: types of information required to support business processes and its anticipated pattern of use. • Storage: e.g. document, records, raw materials, finished goods and consumables, in support of work processes and their anticipated pattern of use.

SOUZA (2016) suggested four categories and information requirements the SOW document should consider as project requirements:

i. Expected information: project requirements that do not demand much investigation, e.g. local legislation attendance.
ii. Explicit information: client personal information that is clearly communicated, e.g. square meters occupancy and/or expansion, space capacity, etc.
iii. Implicit information client personal information that is not clearly communicated, e.g. open office acoustics comfort.
iv. Unexpected information: space characteristics turned valuable after occupation, e.g. landscape elements, gardening and vegetation.

Another example of information a scope of work must provide to professionals engaged in the project process corresponds to “Stage 0” in RIBA Plan of Work (RIBA, 2013):

> “It may consist solely of a reasoned argument. It may contain supporting information, financial appraisals or other background information. It should also highlight initial considerations for the Project Outcomes. In summary, it is a combination of objective and subjective considerations”.

Those author’s project requirements mentioned (THEN, 2012; RIBA, 2013; SOUZA, 2016) are examples of general information an architect should consider in the scope of work as guidelines to develop design, while project managers may use them as parameters for project’s deliveries and to measure their quality. In a sum, client’s needs and values must configure the content of a scope of work and must be followed by project managers and architects as project’s requirements for design development in latter phases of the project process. Those are essential information for Project success achievement.

3. PROJECT MANAGEMENT AND PROJECT PROCESS

3.1. CORPORATE OFFICE BUILDING PROJECT MANAGEMENT

Different sectors apply Project management methods in their activities (bank, manufacturing, IT, etc.). In the civil construction industry, projects are not mass-produced. Their complexity and differences depend on local legislation, environment characteristics, costs and deadlines limitations, local labour availability, technology and client's needs.

Civil construction market is more competitive and clients are more demanding and aware of engineering and architectural solutions. In addition, projects become more complex due to new technologies, multidisciplinary issues that must be solved and have lower budget and tight deadlines.

Therefore, it is necessary that architects implement and follow project process management methods, aiming to accomplish projects objectives with product quality, complying with deadlines, target costs and with legislation, with lower environment impact and successfully satisfying client expectations over the whole process.

ISO 10.006:2006 norm defines Project management as "real estate enterprise management" consisting on "planning, organizing, monitoring, controlling and reporting real estate enterprise aspects through engaging all professional in project process". Real estate enterprise is defined by the norm as "organized and controlled task set, with predetermined start and end dates, and with deadline, costs and resources limitations". In this case, scope of work is key part of the enterprise project process, important for the final product development and client's expectations achievement. Client's products and processes needs and expectations, explicit and implicit, must be translated into documented requirements, including statutory aspects, which must be mutually agreed when demanded by the client (ISO 10.006:2006).

As contended by *Project Management Institute* (PMI, 2017), project management is "the knowledge, skills, tools and techniques application in project process, aiming to achieve its requirements". The Institute also characterize scope of work, quality, schedule, budget, resources and risks as determining factors for the project process management. Any impact on any of those factors influences project quality in the end.

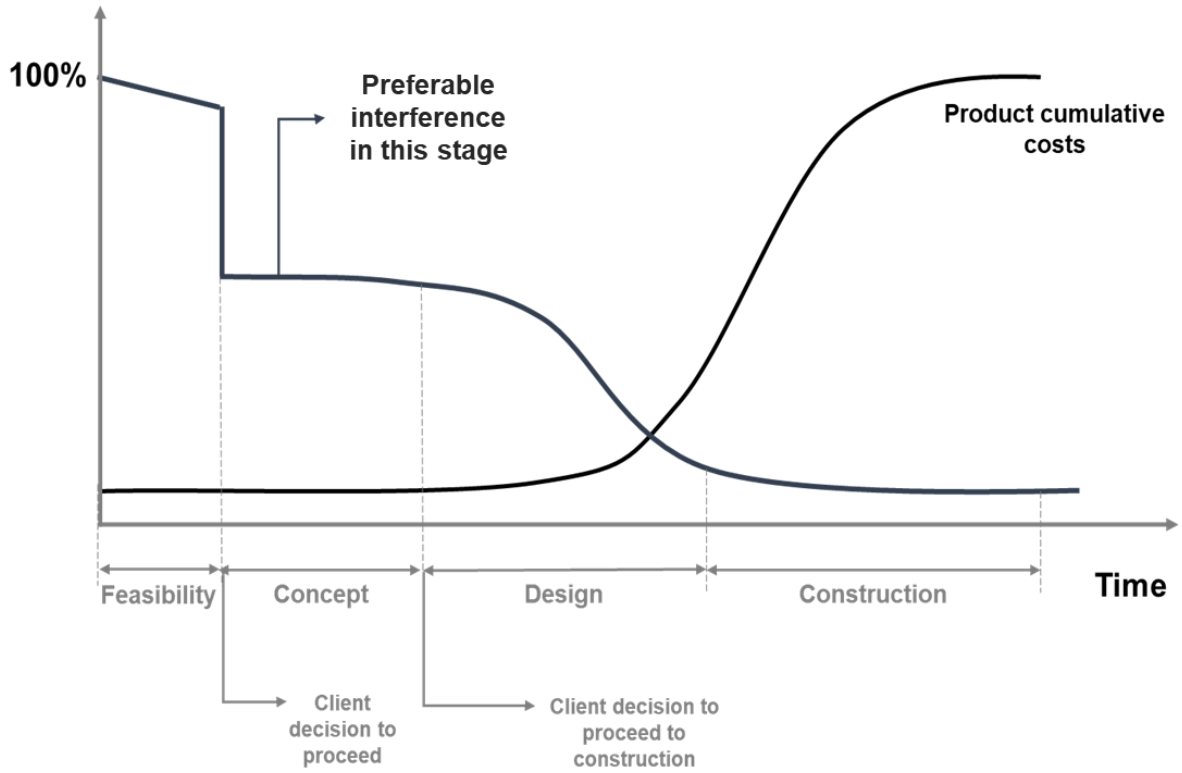
> “The building characteristics are the result of decisions made at the time of the design process and should be originated at the pre-design (PD) stage which aims at accurately identifying the performance criteria that will support the building quality, optimizing opportunities as well as correcting deficiencies that will better meet the expectations and needs of the users” (ORNSTEIN & ANDRADE, 2012).

PMI (2017) states that the more advanced the project process is the higher is cost and resources commitment. In the early stages of the process, costs are lower and increase proportionally to project process lifecycle. It is possible to infer that there is lower cost impact to the project if decisions are made and executed in the begging of the process, as illustrated by Figure 02. In feasibility and concept stages, decision making brings lower impacts to project process. The opposite is true: it can cause cost increasing, schedule delays, quality loss, lack of resources to perform a task, etc.

> “When detailed design has been done, the cost associated with change or variation to those plans will be so big that it will have a negative influence on the feasibility of the project (Visser, 2009:20). A feasibility study forms part of the project initiation stage within project scope management. A feasibility study will be conducted before the project starts” (KNOBEL, BREMER & ELS, 2017).

Figure 02 illustrates Project costs increase in construction stage while the best stage to decide or interfere over any scope change is the concept stage. “More efficient implementation strategies in infrastructure projects allow projects to be completed faster with lower project costs (Norwegian Ministry of Transport and Communications 2013)” (NARMO et al., 2018).

Figure 02 – Decision make cost and environmental influence over the building life cycle. Source: Hammarlund; Josephon, 1992. In. FABRICIO, 2002.

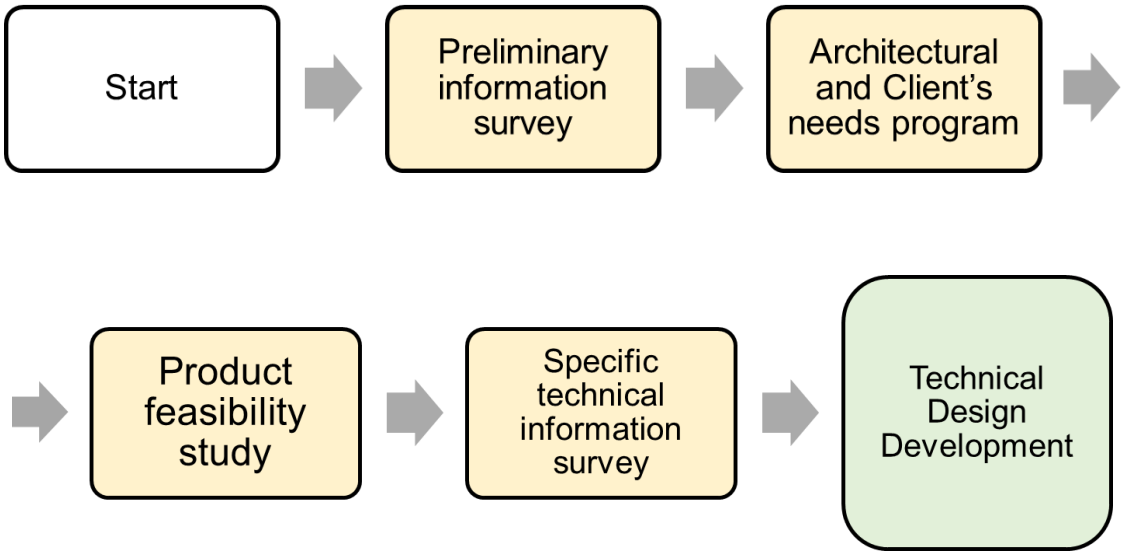


Project process management must “have a comprehensive view, explicating project related activities developed in each project process stage, for a product from civil construction industry. This project approach incorporates early stages, from feasibility, concept and planning, to post-occupancy evaluation” (TZORTZOPOULOS, 1999).

The ABNT NBR 16.636:2017 (which theme is the urban and architectural specialized project service development for new buildings) considers the steps of the first process stage, in a determined sequence:

i. Preliminary information survey;
ii. Architectural and Client’s needs program;
iii. Product feasibility study;
iv. Specific technical information survey.

Figure 03 – Architectonic project process phases. Source: Part II, NBR 16.636:2017.



After the *Specific technical information survey* step, comes the following project process stage: Technical Design Development. According to NBR 16.636:2017 norm, this stage consists on specifying all constructive elements (structure and infrastructure) in order to make the project's execution feasible.

This first stage, in a sum, aims to collect the biggest quantity of information to the project; thus, this stage and all steps that compound it are very important to keep project process flowing effectively. Physical feasibility, financial and economic studies are developed in this stage; furthermore, project design and specifications along with constructive activities development plans are being elaborated from this stage on (DEGANI & CARDOSO, 2002).

Considering the planning stage as an analytic one, it is important to have a specialized literature review. Norms, codes, legislations and recommendations must be gathered. It is important that a schedule, rules and Project team members responsibilities are clearly defined by the client in the early stage of the process. Since the process is structured, it is possible to comprehend the client's philosophy and organization (KOWALTOWSKI, 2012).

Client requirements have influence over engineering solution decision making, which may affect project's costs and deadlines, for example.

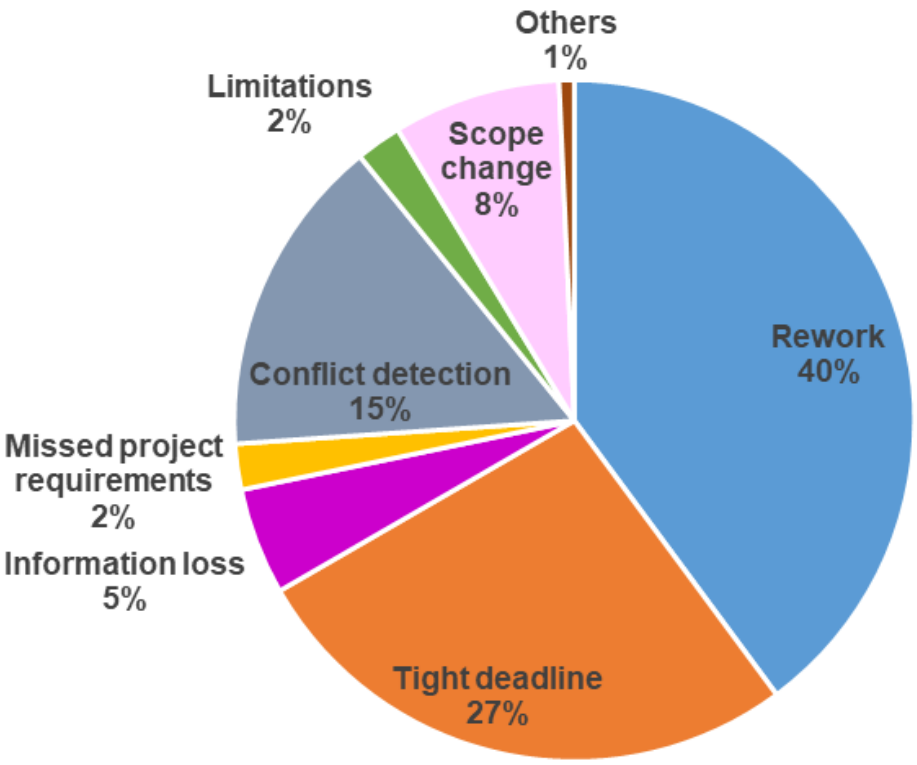
> "Projects that actively engaged with their stakeholders are more likely to succeed. The main purpose of engaging the stakeholder is to ensure their needs and preferences are reflected in the outcome. Early stakeholder engagement creates the ability to gain first-hand information to improve project and community outcomes. Engagement can address challenges and better manage" (BAHARUDDIN, WILKINSON & COSTELLO, 2016).

Albeit client engagement in the beginning of project process, the project objective may not be achieved without a process management. Therefore, client's needs and expectations would not be attended. In order to avoid it, Project management is fundamental. Project technical complexity increase and social and urban dynamics require systematization of Project team work; moreover, it is necessary that informatics is applied in the process to increase productivity with quality (KOWALTOWSKI, 2012).

Implementing and using project management methodologies help architecture firms avoid rework and human resource expenditure, since the professionals have limited capacity of number of projects to manage. A poll conducted with nine Brazilian architecture firms from the northeast region of the country (LEITE; BARROS NETO, 2014), indicates that rework corresponds to 40% of hindrances a project has along its process, as shown in Figure 04.

Project management is capable of identifying Project process potential challenges and difficulties, avoiding their occurrence during project's lifecycle. Besides, adopting a project management methodology assists the architecture firm to enhance project team integration and collaboration along the process, qualify and motivate professionals, increase productivity and competitiveness, etc.

Figure 04 – Corporate office building design process hindrances. Source: LEITE; BARROS NETO. 2014.



Summarizing, Project management consists on:

- Define Project team, their roles and responsibilities and needed qualification.
- Define and use of new technologies along the process, increasing productivity and multidisciplinary team integration, like modelling tools (2D, 3D).
- Complying with local norms and legislation, according to Project type and location.
- Attending to norms and policies imposed by the client, as well as attending to their needs and expectations.
- Developing a final product that presents high quality and expected performance.
- Compliance with costs and deadlines limitations.

3.2. PROJECT MANAGER AND PROJECT TEAM RESPONSIBILITIES

Multidisciplinary Project aspects, as well as its complexity, demands a specialized and multidisciplinary project team (architecture, civil engineer, air conditioning, etc.). Project team structuring multidisciplinary logic considers project disciplines

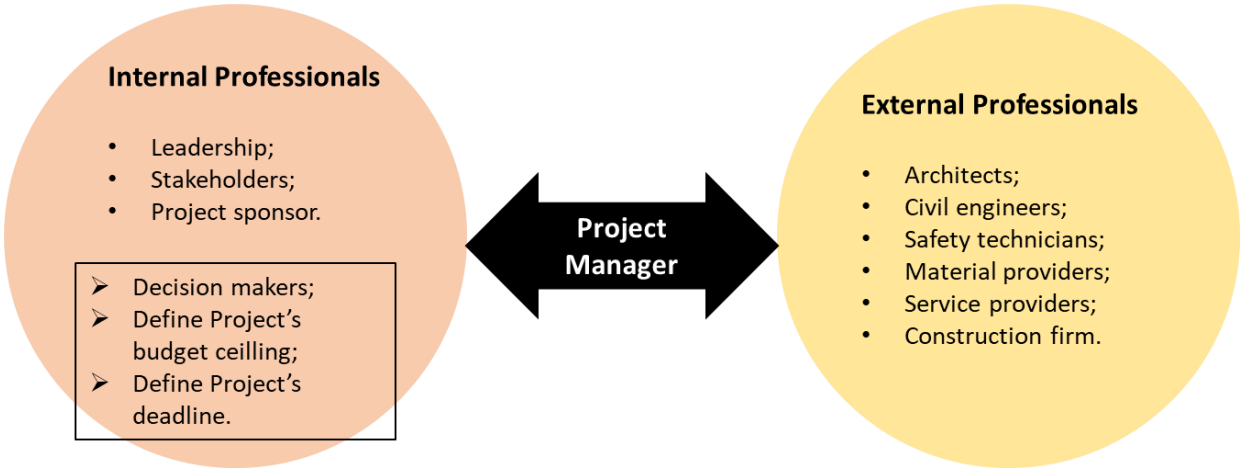
development in a harmonic and consistent product set generation, well suited to attendance of client's requirements and project process productivity (SOUZA, 2016).

For a corporate Project process, project team is compounded by internal professionals (client's project team, stakeholders, project sponsors) and external professionals (third-parties/ outsourcing). Project demand, expectations and requirements are originated by internal professionals.

> "In order to still achieve a project's goals for time, cost and quality, additional management effort is needed. Hence, the success of a project is highly dependent on effective management and therefore the construction manager holds a key position (Rösch 2014, 25). He is the main switchboard of the construction site and progress is highly dependent on his personal project management competencies" (BINNINGER et al. 2018).

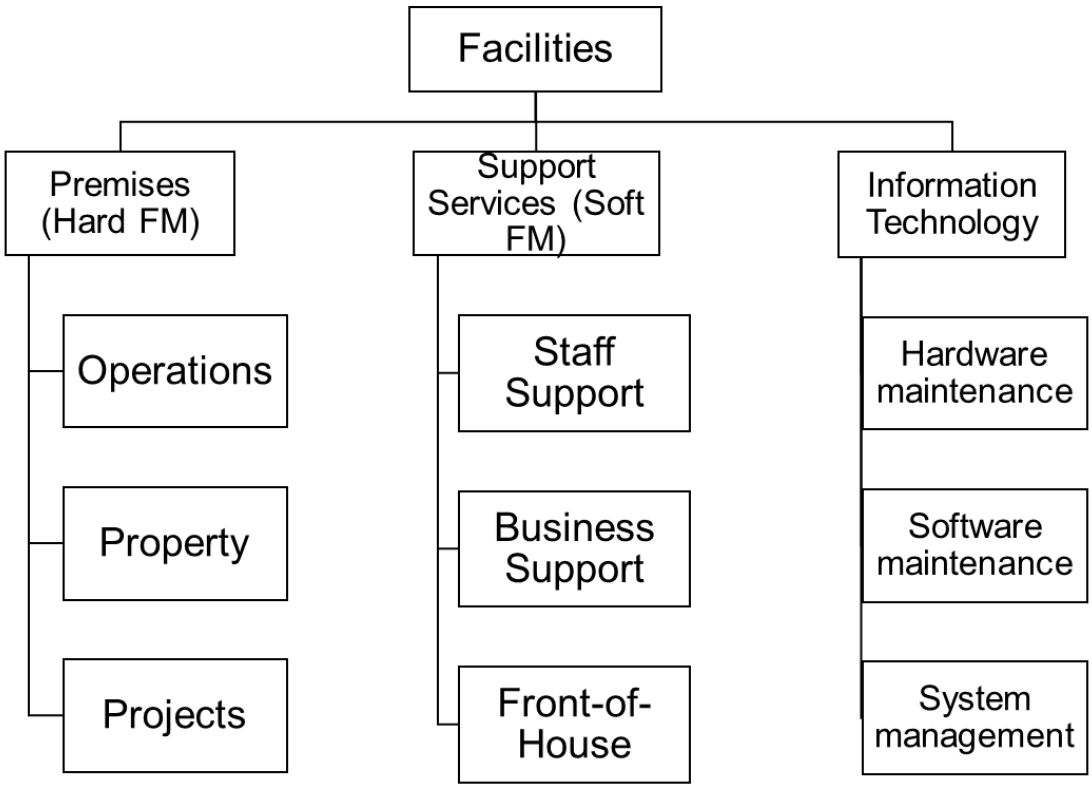
It is clear that the Project Manager (PM) has a great responsibility over Project process efficient results. On the other hand, PM needs a qualified and multidisciplinary project team, with different specialized professionals according to project complexity (architects, civil engineers, electricians, planners, safety engineers, furniture suppliers, etc.). Project managers, then, must have means to achieve project's objective (RAMOS, MOTA & CORREA, 2016). And it is PM's responsibility to assemble a proper qualified project team to work in a determined project, as well as defining each team member their role on the process.

Figure 05 – Corporate office building Project team example. Source: the author.



The PM, in a multinational company, is usually a company employee, qualified for managing project process. This professional is usually included in a Facilities structure, composed by Premises (Properties, Operations and Project), Services (Employee, business and operation support) and Information Technology. Most often, the PM professional is in *Premises* branch, Project subdivision (FINCH, 2012).

Figure 06 – Facilities management scope (modified from Williams, 1996). Source: FINCH (2012).



Inside a corporate company, the Facilities Manager's (FM) role is strategic when working together with the company's leadership. But it does not exclude this professional of operational activities, such as infrastructure maintenance and support services. When conducting an office or building infrastructure Project, FM acts like a civil construction PM: "we see increasing evidence that facilities managers are not operational managers but are indeed Project managers" (FINCH, 2012).

Investment Project types, also called Capex Projects (*Capital Expenditure Projects*) have different levels of complexity and their requirements and objectives vary according to the company leadership's strategy. "Projects may include simple churn

issues related to the movement of staff or departments. They may extend to the design and construction of new buildings or even masterplans" (FINCH, 2012).

The PM, then, must monitor and control the whole project process, since the first stage. This professional main responsibility is, by leading a multidisciplinary project team, to achieve project's objective (PMBOK, 2013).

OLIVEIRA & MELHADO (2006) research says that the PM professional, besides the leadership skills, must have a clear view of the entire project process as well as be able to manage costs and deadlines, sometimes very limited to the project. Managers who work with project activities must search for cost and deadline control skills. Little human and physical resource's deviance or tasks execution delays from planned project schedule might result in an unviable contract.

Therefore, Project process must count with a professional who manages and coordinates project's lifecycle stages, the other experts engaged in the process, project information and communication, norms and legislation compliance, stakeholder's expectations, deadlines and costs.

The fact that a multinational company usually have a PM in its structure does not exclude the possibility of having another PM from the architecture firm. There are some possible project team arrangements that indicate the relations a PM can find when managing a project (LIU, 2010).

Table 04 – Early project phase project manager responsibility matrix. Source: the author.

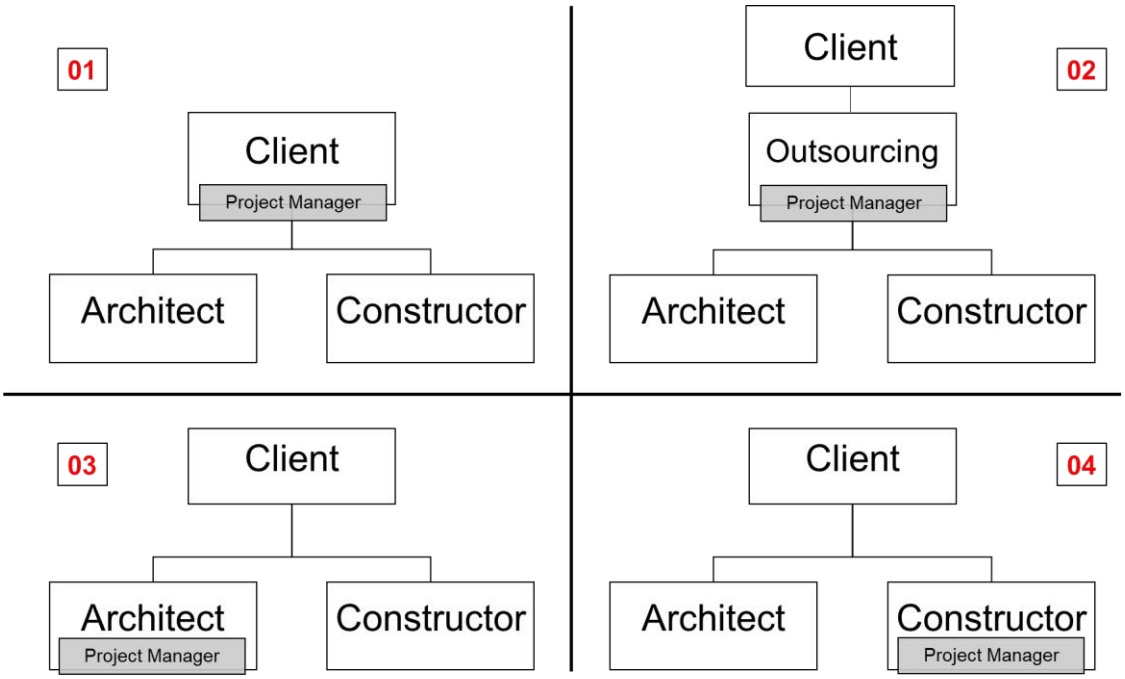
Activities	PM/ FM – Client	PM – Architecture Firm
Project process planning	X	
Project objective definition	X	
Project Scope of Work definition	X	
Documents, drawings and information control.	X	

(Continuance) Table 04 – Early project phase project manager responsibility matrix. Source: the author.

Activities	PM/ FM – Client	PM – Architecture Firm
Architectural program development and Project engineering solutions proposal.		X
Team alignment meetings		X
Feasibility studies		X
Decision making	X	
Target cost/ budget ceiling definition	X	
Project deadline definition	X	

Even if the client has a Project Manager acting in the project process, the architecture firm must also have a responsible for the same process, whose role is coordinating design development team and make sure the design service contracted by the client is successfully delivered. Still, one PM must not take responsibility and the authority from the other: both should work together to achieve the project's objective effectively.

Figure 07 – Multiple Project team arrangements. Source: LIU (2010).

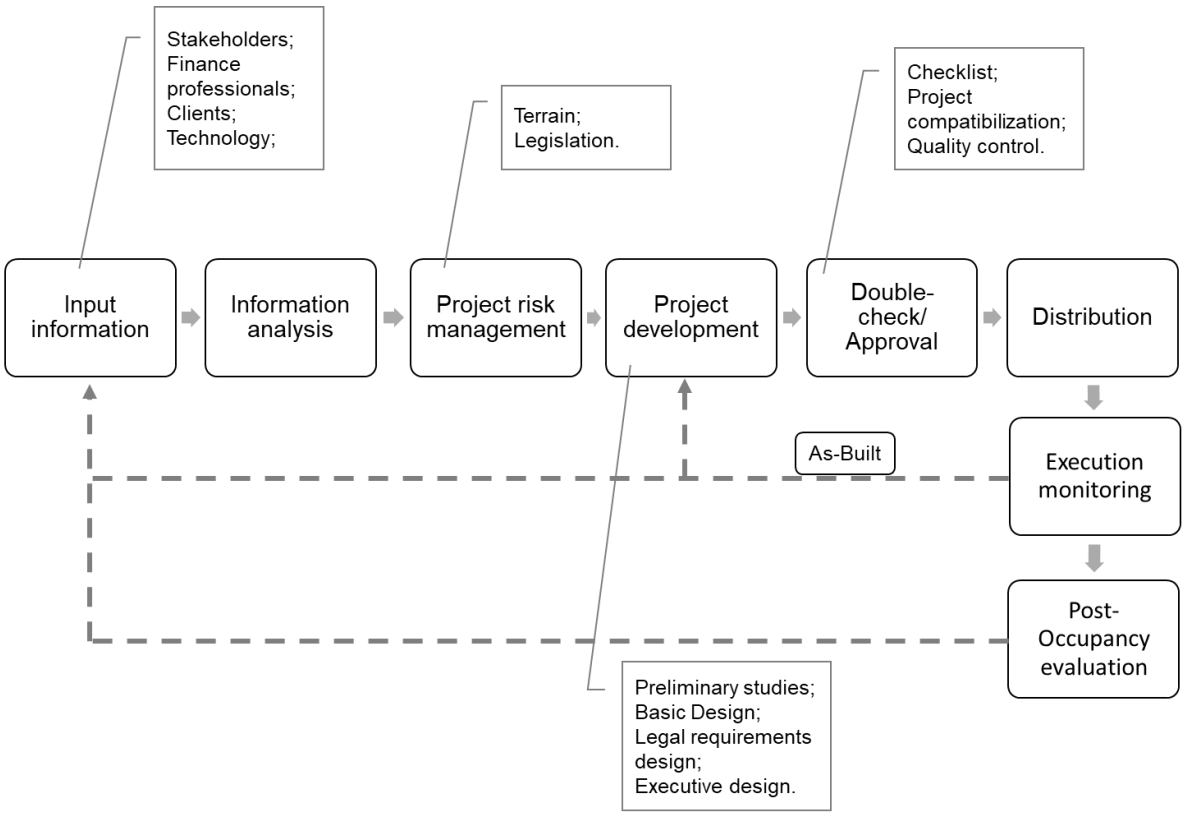


Each of the professionals engaged in the project process are component of the project team and their responsibilities and tasks must be coordinated by a project manager. They may or may not participate of all stages, yet they must be engaged and have a full view of the entire process. For this purpose, the PM can use some project management methodologies to guide all stages and actions needed and achieve project's objective.

3.3. PROJECT PROCESS METHODOLOGIES

One Project management methodology found in academic literature presents a process flow, which the main stages demand effective communication between the participants involved (OLIVEIRA & MELHADO, 2006).

Figure 08 - Project process versus Information flow. Source: OLIVEIRA & MELHADO (2006).



Consequently, an adequate and effective information and resources management must occur an integrative as possible. The proposed planning stage of this methodology consists of three phases, in the following sequence: Input information, Information analysis and Project risk management. This methodology also has the

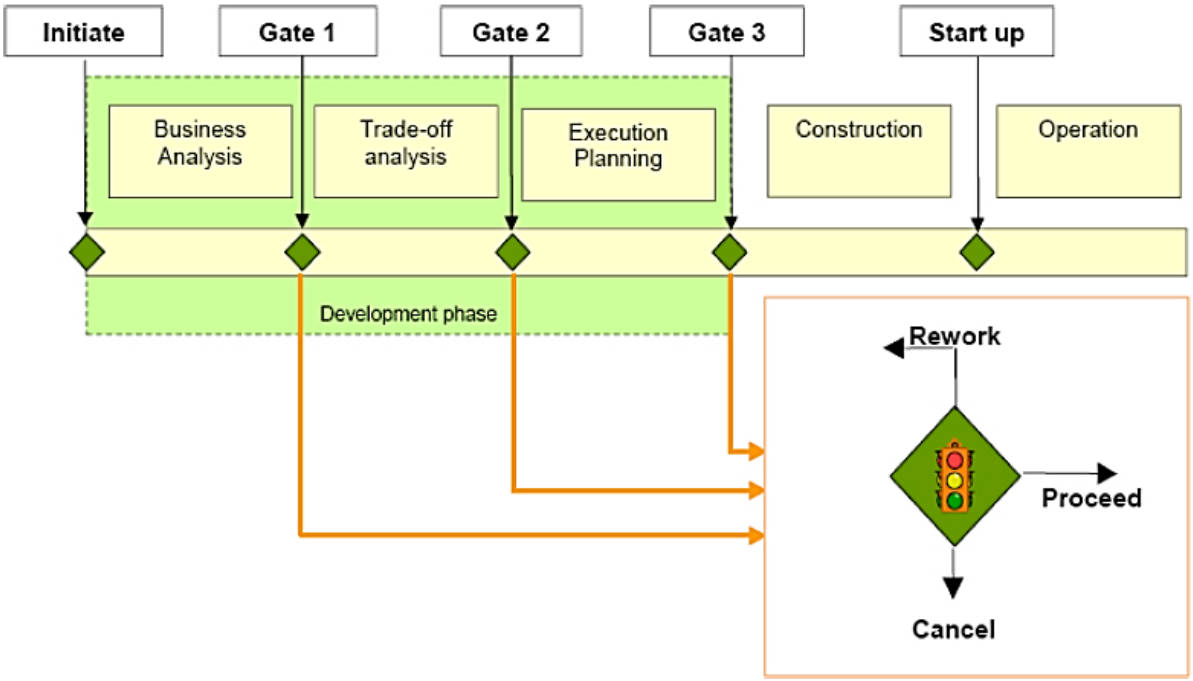
post-occupancy evaluation feedback of the process, which assists improving the process and increases chances of achieving client's expectations in next projects. Conversely, it does not cite the client's needs or requirements, neither the scope of work in its early stages, as shown in Figure 08.

Most multinational companies adopt a project management methodology for high investment projects, named Capital Expenditure Projects (Capex Projects). The commonly adopted methodology is the Front-End Loading (FEL). Based on PMBOK guide practices, the FEL methodology is characterized by leadership/ sponsors approval stages, called Gates, that happen in the end of each project process phase. The gates can happen as meetings, documents or any kind of formal presentation. Gates' objective is to present the Project's status, risks and outputs (the more detailed and accurate the information, the better) to the client and get their approval to continue with the Project development, avoiding rework during the process.

Additionally, the FEL methodology gives the Project Manager tools to coordinate the process stages as well as the project team involved. For example, one of these tools is called the Design Responsibility Matrix. According to RIBA (2013), this is "a matrix that sets out who is responsible for designing each aspect of the project and when. This document sets out the extent of any performance specified design". Its main objective is to define the work of each project team member early in the process, avoiding ambiguity.

Besides the gate structure, the FEL process is divided into three phases, named sequentially FEL 1, FEL 2 and FEL 3. Each phase's requirements result in Project outputs, varying conformably with project's complexity. Those requirements are named Value Improving Practices (VIPs) in FEL methodology. Their fulfillment aims for the project value maximization, acquiring project's objectives an optimized solution considering technical and operational limitations in the process (ROMERO & ANDERY, 2010).

Figure 09 – Capital Project Lifecycle according to FEL methodology. Source: VASCONCELOS & MORAES (2010).



There are twelve required VIPs in project process, according to FEL methodology. The quantity of VIPs fulfillment depends on the project's complexity - e.g. for simpler projects, there is no need to accomplish all VIPs (ROMERO & ANDERY, 2010; FRANÇA, 2015). The VIPs consist on:

1. Technology selection;
2. Process simplification;
3. Wastes and loss minimization;
4. Energy optimization;
5. Standards and specification adequacy;
6. Building and infrastructure quality classification;
7. Predictive maintenance;
8. Building capacity dimensioning and adjustment;
9. Process simulation and Reliability modelling;
10. Value engineering;
11. Building Information Modelling;
12. Constructability review.

The first phase, FEL 1, start the project process by the feasibility study, strategically aligning project's objectives with client's needs and demand. The PM is defined as well as the project team, establishing each one's role and responsibility during the project process. Moreover, the "Technology selection" VIP must also be defined and developed, assuring that "all viable technologic process and equipment alternatives are considered in this project" (ROMERO & ANDERY, 2010). The highlight is to the project's objective definition, based on client's needs and demands, that must be defined in this phase for scope of work development. The FEL 1 phase is concluded after the client's approval (named Gate 1).

Secondly, in FEL 2, some engineering solutions are proposed by the project team, such as use of scaffold or elevator stairs for façade refurbishment, for example. The engineering solution must be chosen according to the benefits it can provide to the project (cost reduction, safer and faster solution, etc.). Also, the chosen solution must be aligned with client's expectations and project's objective. During this methodology's phase, it is recommended the elaboration of the following VIPs: Process simplification, Wastes and loss minimization, Energy optimization, Standards and specification adequacy, Building and infrastructure quality classification, Predictive maintenance, building capacity dimensioning and adjustment, Process simulation and reliability modelling, Value engineering, Building Information Modelling and Constructability review (ROMERO & ANDERY, 2010). This phase is concluded after client approval in Gate 2.

Lastly, in the third phase, the FEL 3, the execution design, accurate execution schedule and cost estimate are the expected outputs, to start the execution bid. The VIPs from FEL 2 are refined, best detailed and accurate. The more accurate they are, smaller the chances of additional costs and delays in execution phase. Subsequently, they are presented in Gate 3 for approval and sent to contract a constructor for the next phase (ROMERO & ANDERY, 2010).

Project uncertainties and risks can also be mapped using the FEL methodology, from financial and environmental risks to business risks. These risks can comprehend negative impact over project's objective (VASCONCELOS & MORAES, 2010). It depends on project complexity, the qualification of the professional involved, specially

the PM, the environment where the product will be located and external factors (market economics, legislations, strike, etc.).

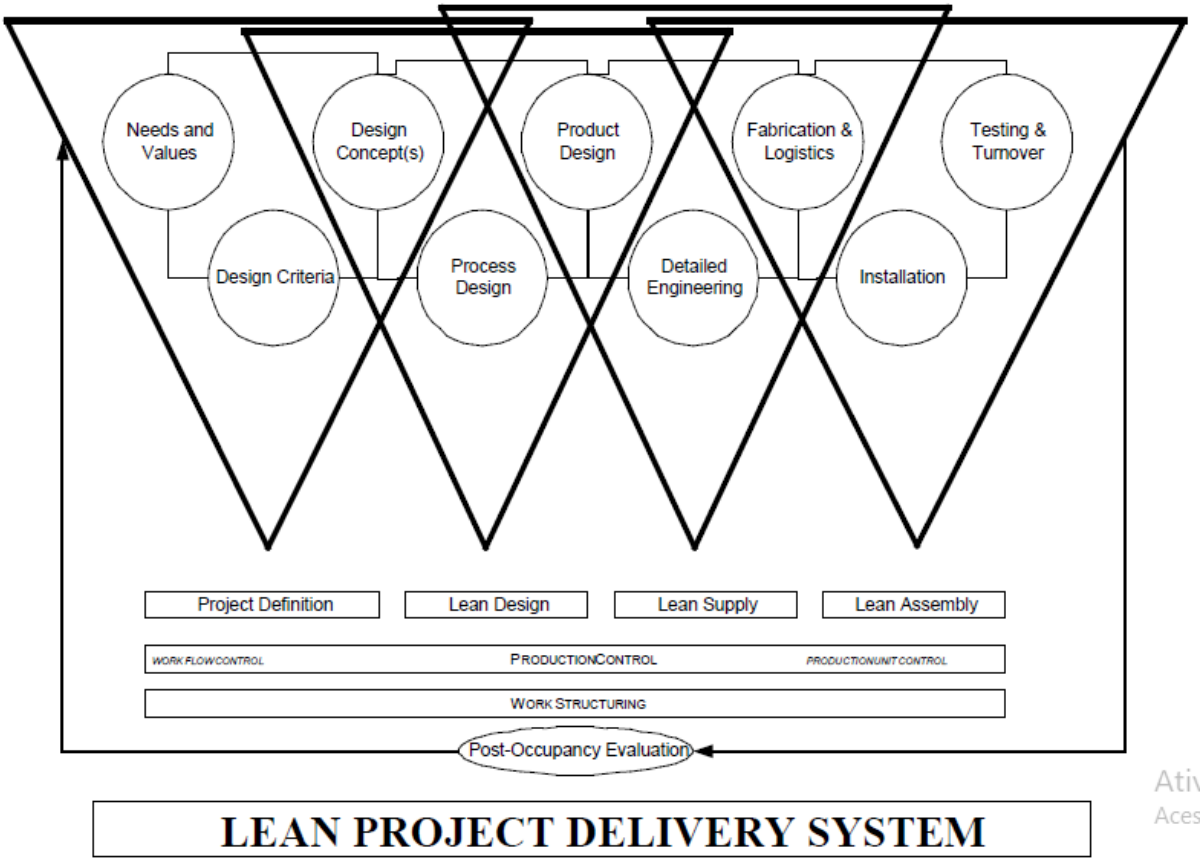
In a conclusion, the FEL methodology defines the project's scope of work in FEL 1, based on client's needs and expectations, in order to proceed to refinement of project's information in the next phases. Also, it is needed that a PM coordinate it since the begging of the process, assuring every project output is checked, validated and formally approved by the client in the end of each process' phase.

Another project management methodology that may be implemented in large business companies is the Lean Project Delivery System (LPDS). Similarly, to FEL, this methodology proposes a project process flow divided by stages approval meetings. LPDS aims to develop an improved planning, design and construction process (BALLARD, 2000).

> "Our current LPDS model consists of 13 modules, 9 organized in 4 interconnecting triads or phases extending from project definition to design to supply and assembly, plus 2 production control modules and the work structuring module, both conceived to extend through all project phases, and the post-occupancy evaluation module, which links the end of one project to the beginning of the next" (BALLARD, 2000).

Therefore, the modules compound the LPDS process, divided in 4 phases: 1) Project definition; 2) Lean design; 3) Lean supply; and 4) Lean assembly. It is in the first phase, project definition, that project's objective and scope of work is defined. This phase is compound by "values and needs", "design criteria" and "design concept", each surveying important information for scope of work based in client's needs and expectations. Also, it establishes design alternatives (same as engineering solutions in FEL), the target cost and the project deadline.

Figure 10 – Lean Project Delivery System (LPDS) model. Source: BALLARD, 2000.



The author gives a description of the features this methodology includes:

1. **Project definition:** under Project manager's coordination, in this phase, the outputs are estimate costs schedule development along with product development, aiming to achieve client's expectations. Besides, client's needs and expectations are analyzed and translated into Client's needs program and Design criteria. From this point, design concept is developed to the next phase.

2. **Lean design:** This phase consists on design concept development and refining, following project criteria from previous phase. Project process planning tools (schedule refining, responsibility matrix, design team definition and formal meetings establishment to approve project status) are defined; assisting successfully project development in the next LPDS phases:

> "The Lean Design phase transitions into Lean Supply when the product and process design have been developed from the design concept consistently with design criteria, which are themselves adequate

> expressions of customer needs and stakeholder demands. This alignment will be explicitly examined and agreed by the design/build team and the client before transition" (BALLARD, 2000).

3. Lean supply: "The Lean Supply phase consists of detailed engineering of the product design produced in Lean Design, then fabrication or purchasing of components and materials, and the logistics management of deliveries and inventories" (BALLARD, 2000). The engineering detailing can be modelled in 3D and the designed project is linked with supply chain, optimizing costs and lead time. In the author's opinion, "an objective of process design is to minimize inventories, right sizing them to the flow variability that cannot be eliminated. Where time is of the essence, capacity buffers will be substituted for inventory buffers". When first deliveries begin, the project goes to the next phase.

The LPDS phases from 01 to 03 are generic and can be applied from civil construction industry to manufacturing industry. In the case of civil construction and architecture, the connection made between the project design and the supply chain may be understood as the involvement of the constructors in the late architectural design stage, as a mean of transition.

4. Lean assembly: the last phase starts with tools, equipment, components and materials delivery to the construction site, following to execution of the designed product and end with its occupation. In addition, this phase's output process inspection in suppliers manufacturing sites and shops, avoiding wastes and loss in the process. Commissioning and feedback are also part of this phase, finishing the LPDS process. Although LPDS methodology is more appropriate to mass production industry, it can be reinterpreted to civil construction in order to include improvements and feedback in architectural and engineering project process. It assists the Project manager measure the Project success by collecting feedback from the client and from the project team and applying the knowledge in future projects. The improvement caused by client's feedback make easy to survey and define client's needs to the projects.

> "In the Lean Project Delivery System, it is assumed that the job of the project delivery team is not only to provide what the customer wants, but to first help the customer decide what they want. Consequently, 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" (BALLARD, 2018).

Both large businesses presented methodologies have similarities. Their main characteristics are compared in Table 05, in order to identify which of them have more resources for an architectural or engineering project process. The Table is divided in Pre-design (feasibility and project planning) and Design (design production).

Table 05 - Block methodology, Front End Loading (FEL) and Lean Project Delivery System (LPDS) phases comparison. Source: the author.

Project process elements		**FEL**	**LPDS**
Pre-design	Project manager, project team, roles and responsibilities, formal meetings frequency and adopted technologies definition.	X	X
	Client's needs and scope of work definition.	X	X
	Project deadlines and target costs definition.	X	X
	Project criteria information survey and analysis for design concept (legislation, norms, etc.).	X	X
	Architecture firm benchmarking	X	
	Identify, analyze and mitigate engaged business risks and Project risks.	X	

(Continuance) Table 05 - Block methodology, Front End Loading (FEL) and Lean Project Delivery System (LPDS) phases comparison. Source: the author.

Project process elements		FEL	LPDS
Design	Client engagement along Project process, for decision making and status approval.	X	X
	Engineering solutions proposal and analysis; one alternative is chosen by the client.	X	X
	Project design and documents production.	X	X
	Predicted run & maintain elements in Project design.	X	
	Materials and equipment supply and lead time (delivery) alignment with design production.		X
	Drawing compatibilization and start of construction bid.	X	X
	Project feedback analysis for future project's process improvement.		X

In a sum, as compared in Table 05, Project process methodologies presented concerns over the Pre-design and design stages, both engaging the client since the beginning of the process. Both methodologies are applicable for corporate office capital projects, since they have relevant tools to work with complex projects and their risks. Albeit LPDS considers materials, equipment and components production and supply, it does not regard benchmarking with project process potential vendors. This Project activity can greatly contribute with the process, since the client can check on the vendor past performance and results and analyze if the firm can attend to their interest and expectations, as a first project team filter.

Therefore, the FEL methodology is the most complete one for corporate office capital projects, since it comprehends more technical and administrative process details and calculate the risks in order to mitigate or avoid them. Briefly, the main FEL characteristics for the project process are:

- Project process flow and stages mapping;
- Project manager definition in the first stage of the process, to coordinate the whole process;
- Multidisciplinary Project team definition in the early stage of the process, along with their roles and responsibilities;
- Client engagement since the beginning of Project process, capturing and detailing their needs and values and turning them into Project requirements;
- Project schedule and target cost definition by the client. This information must be content of Project scope of work and be used as Project requirement as well;
- Architectural and client's need program definition, that would be important information of project' scope of work. The programs and the scope must be checked and formally approved by the client before it is sent to the architecture firm;
- Project risks identification and evaluation; Risks mitigation plan and constructability plan development; Financial risks and safety and environmental evaluation (compliance with local legislation);
- Project engineering solutions proposal, with pros and cons. Must be presented and validate by the client, for decision making on which solution will be chosen for that specific Project.

In order to avoid Project process gaps and hindrances, such as reworks and additional costs due to scope change or scope and requirements misunderstanding, the FEL methodology implementation to the project process is a viable alternative. The methodology's main characteristics can be used as a guide by the Project manager, since the client is engaged in the process.

4. CORPORATE OFFICE BUILDING DESIGN SCOPE OF WORK

4.1. CLIENT NEEDS INFORMATION AND PROJECT CRITERIA

The researched literature expresses the view that the pre-design phase in the Project process is the critical one, since it is when the Project manager and Project team are defined and the Project planning, feasibility study, architectural and client's needs programs and scope of work are established and developed.

Project' scope of work information can be used as a guide to project requirements as well as a basis to bid contract, assuring rights and duties to both client and architect. This project output must be as detailed as possible in order to secure architecture's firm competitiveness and to assist the PM to measure project's process quality. Technical-commercial contracts must present pricing, payment condition and delivery lead time for client decision; furthermore, they are important project's activities control methods for product development. For that reason, the contracts must be carefully detailed and consider project's activities planning and service's production cost prediction (OLIVEIRA & MELHADO, 2006).

Hence, a client approval stage along the project process must be foreseen and consist in project' scope of work. That secures alignment and transparency for client's expectations and architectural production. Achieving client' satisfaction by the end of the Project means to accomplish all their needs, values and expectations by the architectural solution given to the project. Not only project's risks are important to consider and solve, budget and deadline are also important to comply with. Despite its importance, large multinational companies resist to divulge their budget for the project.

> "Applicable constraints typically include cost and time, so the client must specify what money and time they are prepared to spend in order to achieve their ends. This is quite different from normal practice. Clients usually resist revealing their bank account lest it be emptied and spent without regard to the value they receive" (BALLARD, 2018).

Omitting project's scope of work information may cause rework on the project's engineering solutions presented. Therefore, the architect must have a contract with their client, in the attempt of avoiding rework and other process obstacles that may occur. There are several contract models. According to LINS et al. (2014), there are

four methods viable for civil construction architecture and engineering services: Design-Bid-Build (DBB); Design-Build (DB); Construction Management at Risk (CMR); and Integrated Project Delivery (IPD). Besides expected results, costs and deadlines, the contract must consider local legislation and norms as well as client's values.

> "Vertical building construction currently uses three primary project delivery systems: design–bid–build (DBB), construction management at risk (CMR), and design–build (DB). Owners choose these delivery systems, in part, to meet their goals for time, cost, and quality performance. Despite this range of options, many building projects do not meet the owner's performance expectations (Lichtig, 2006)" (MESA et al., 2016).

In a sum, each of the four contract models are characterized by:

- Design-Bid-Build (DBB):
  - Different contracts for Design and Construction, requiring two bids;
  - Constructor bid is based only in pricing;
  - All design products are fully completed before constructor bid starts;
  - Constructability and coordination issues due to the contractor was not involved in the project's design stage.
- Design-Build (DB):
  - There is one professional responsible for the process;
  - Project's design and construction overlapping: design products are not ready when constructor is contracted;
  - Preliminary services are offered by the constructor, such as material and equipment quotation, costs estimate, value engineering, solutions, etc.;
  - Constructor's fixed and accurate pricing is expected by the client, as well as constructor's commitment with project's deadline.
- Construction Management at Risk (CMR):
  - Different contracts for design and construction;
  - Besides pricing, other criteria are used to choose the constructor in the bid, such as professional's qualification and benchmarking;
  - Design and construction overlapping is permitted by project' schedule;
  - Refined process' transparency due to revealed project's budget and taxes, avoiding conflicting team Project relationships;

- Project's risks management includes "a list of identified risks, a plan for mitigating risk and an action plan if a listed risk occurs. The client owns the risk and is financially responsible for it, while the expert has no risk (Kashiwagi 2016)" (NARMO et al., 2018).

- Integrated Project/ Procurement Delivery (IPD):
  - Highly collaborative process, comprehending process' stages from feasibility to post-occupancy;
  - Project team basis on confidence and transparency principles;
  - Past experience and contribution from professionals engaged in Project process are used as a way to motivate them and explore their potential;
  - Information sharing between engaged professionals;
  - Project's risks and rewards are shared between all professionals involved in the project's process;
  - Collective decision making.

LINS et al. (2014) remark that IPD contract method is the most complete and efficient for civil construction services. Although DBB, DB and CMR methods are the more commonly adopted in civil construction industry, they present unsatisfactory results once they usually can not comply with project's budget and deadlines.

"The Integrated Procurement Delivery (IPD) System seeks to align the objectives of various parties while providing a system which is more comprehensive. Since a single contract binds the IPD team to the client the risk of claims is mitigated" (MOODLEY & HAUPT, 2017).

The IPD method has a structure which allows it to work as "a system model to achieve the high level of integration required to deliver a valuable, high performing building" (RISCHMOLLER et al., 2018). In addition, this method "seeks to improve project performance through a high level of collaboration between key participants" (ASLESEN et al., 2018). Furthermore, IPD is a solution to avoid issues with constructability, safety and health, costs increase and schedule delays. Opportunely, schedule delays were indicated as 27% of project's process hindrances architects face, as observed at Figure 04 (LEITE; BARROS NETO, 2014).

Hence, IPD's characteristics are the ones that most contribute for successful civil construction services contracts, according to LINS et al. (2014). In their research, they compare IPD method with the traditional usually applied in civil construction industry in Brazil, as shown in Table 06.

Table 06 - Comparison between the traditional Project process and IPD process. Source: LINS et. al., 2014.

	TRADITIONAL	IPD
Project team	Split, controlled and hierarchized Project team, who work individually, producing the basic and necessary only.	Openly collaborative, multidisciplinary and integrated Project team.
Project process	Segregated, linear and sequential process. Expertise and qualification acquired when necessary.	Competitive, collaborative and multidisciplinary process. Use of previous expertise and knowledge.
Project risks	Risks are individually managed and transferred to other professional whenever possible.	Collectively managed, as well as shared among all Project team.
Responsibilities and rewards	Minimum effort to achieve maximum results.	Project team success is Project's success: based on aggregated value.
Technology and communication	Analogical, bidimensional. Duplicated reports and documents, information loss and require design compatibilization.	Digital base and data base shared with Project team members. Use of 3D, 4D and 5D modelling. Automatic design interferences detection.
Agreements	Bilateral contract. Incites unilateral efforts, with lack of shared information and risks transference to another project member.	Multilateral contract. Incites Project team horizontal support. Project's risks shared among all engaged professionals. Information sharing.

Analyzing Table 06, it is possible to conclude that IPD method allows a collaborative, transparent and close relationship between client and architecture firm, by risks and

rewards sharing among them. This enhance the Project value cognizance between Project team members and move them towards the same objective.

> "A collaborative project delivery has facilitated effective solutions that are best for the project, based on a high degree of common understanding while there are still substantial opportunities for influence, which makes it likely to assume that the cost of changes has reduced drastically compared to traditional delivery approaches" (ASLESEN et al., 2018).

Therefore, IPD characteristics can assist the development of corporate office project's scope of work. The main IPD topics that should be considered in SOW are:

- Client's standpoint:
  - Identify what motivated the company's demand for that Project (needs, values and expectations;
  - Expected product quality level, considering building performance and materials and furniture specifications;
  - Project's schedule establishment, indicating Project and construction deadline;
  - Project's target cost definition;
  - Project manager definition (from client structure or outsourced).
- Architecture firm's standpoint:
  - In person meetings frequency establishment: present Project status, get client's approval and decision making over proposed project's engineering solutions;
  - Project team definition;
  - Definition of all products and outputs that must be delivered along the project's process;
  - Expected Project detail level;
  - Project's maximum design review, in case client opts for scope changes during the process.

4.2. CASE STUDY – DATA SURVEY

The research method adopted for this thesis was electing three multinational clients from a corporate office design architecture firm expert in São Paulo region, Brazil. The chosen architecture firm portfolio contains feasibility and concept studies services,

besides design production and construction. It has around 100 employee, 24-year experience in Brazil and 17 in international market (acts in Chile and Argentina, for example).

It is organized in the following structure:

- Company leadership;
- Administrative team;
- Commercial team;
- Design and Planning team;
- Construction team.

Leadership is compound by two business partners. Their role is to prospect new potential clients, maintain a good commercial relationship with the older clients and make the firm' strategic decisions.

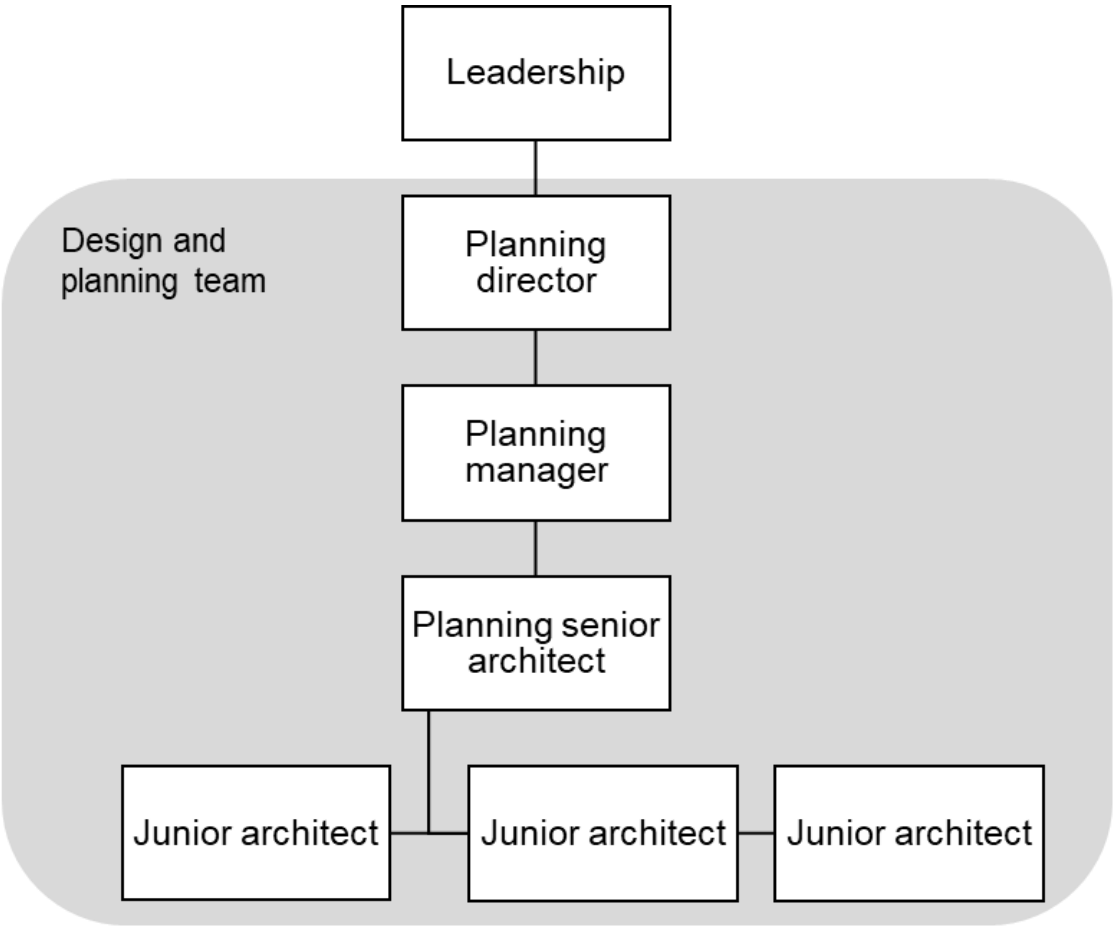
The administrative team is responsible for the firm' services and operations, such as coffee and cleaning supplies, stationery material as well as invoice payments. The other teams (Commercial, Design and Planning and Construction) have direct relationship with the firm's clients by contract, design and execution. The Commercial team's role is to receive a new demand from a client and, after an in-person meeting, establish which services would be provided, according to the client's need.

The Design and planning team is responsible for developing the feasibility study, concept and design for the project, acting in the Pre-design and Design phases. They refine the client's needs by diagnosing them along with the current building state, in case of refurbishments. Moreover, they propose architecture and engineering possible solutions to the project, submitting them to client's decision and election. In design phase, they produce basic and executive design drawings and documents, based on the concept and feasibility stages.

Lastly, the Construction team is responsible for receiving the design information and execute it, outsourcing the labour and necessary equipment and managing them to execution conclusion.

For this thesis, a member from the design and planning team, a planning senior architect, was interviewed.

Figure 11 – Architecture firm Project team arrangement. Source: the author.



In the opinion of the architecture firm interviewee, in case the client agrees with developing a feasibility and concept studies for the project, the design and planning team must generate as output:

- Square meters calculus;
- Current client's occupation observation and analysis;
- Current building facilities analysis (in case of refurbishments);
- Client's needs program development, applying questionnaires with the client's senior employee;
- Architectural and engineering solutions analysis and proposal;
- Proposed solutions' payback analysis.

According to the interviewee, when contacted by the client for a project, the architecture firm do not receive any document, report, proceeding or formal information about their demand. All information from the client is obtained from the internet or survey in later in-person meetings. Yet, the information received does not formalize the client's expectations, needs and values related to the project.

Regarding client's information provision, design review average is 05 per project, while it is usually considered 03 design reviews in the contract. This is caused by the lack of formal information from the client's needs and values, resulting in rework and productivity loss to the architecture firm.

Among the architecture firm's 175 clients, three were elected to be studied for this thesis, due to available time and easiness of access to the client's information. There were three requirements the elected case studies must present:

- Be a multinational company located in São Paulo city or region. It is expected that multinational companies have a management culture implemented in their daily activities, including engineering and facilities projects;
- Have contracted a corporate office building design Project from the Architecture Firm in the last 5 years (since 2013). In a short period of time, it is easier to have the same people still working in the company;
- The contracted corporate office project must contain a workspace layout intervention, which evolves more people and their expectations than a technical project like a façade retrofit.

Based on these requirements, three clients were elected and named as Client 01, Client 02 and Client 03 for this thesis. The sample of interviewees was limited due to companies' restrictions for information sharing. The respondents of this research were last of a few available to collaborate if this thesis. Client 01 is a North-American multinational Chemical company, with more than 200-year market experience and 80-year in Brazilian market. Client 01's headquarter is located at Barueri city, region of Sao Paulo. Client 02 is a technology multinational company, originated in Argentina in the late 1990's. Its headquarter is located at Osasco city, region of Sao Paulo. Finally, Client 03 is a Chemical multinational company, from United States, with 120-year global market expertise and 60 years in Brazil. Client 03's headquarter is located at Sao Paulo city. The three clients had different proportional and finality projects, varying their complexity. Anyway, the process applied to conduct and manage each project was expected to have similarities, making a general comparison possible.

4.2.1. Case study 01

Client 01: Client 01's Project contracted the architecture firm for executive design development and construction. Project's objective consisted on:

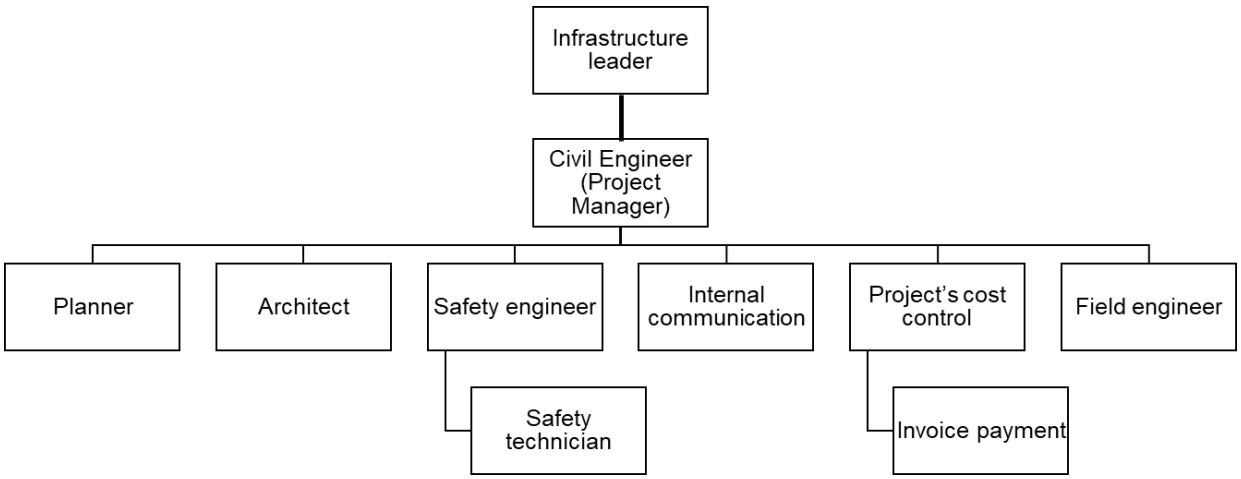
- Existing corporate cafeteria refurbishment;

- Intervention on approximately 300 square meters;
- New cafeteria capacity must consider 304 seating;
- Conceptual and basic design had already been developed by another architect;
- There was Project target cost and a Project deadline, both limited by Client 01.

The target cost was not publicized.

In this Project, Client 01 had a Project manager – a civil engineer – and a defined multidisciplinary Project team, compounded by engineers and an architect. The interviewee was the Client 01's engaged architect.

Figure 12 – Client 01 project team arrangement. Source: the author.



As illustrated by Figure 12, Client 01's project sponsor, and decision maker, was the Infrastructure leader. This leader's decision influenced project budget and deadlines, as well as material and architectonic quality. This professional was responsible for the cafeteria refurbishment demand, in order to modernize and refresh the appearance of that area. The expected strategic result was providing more competitive environment for the food provider to work and stimulating employee to use the space.

The civil engineer assumed the Project manager role for this project. Therefore, this professional was responsible for coordinating the project team tasks, assuring deadline and costs accomplishment as well as the leader expectations.

This Project' scope of work, in order to efficiently achieve the cafeteria refurbishment, were: replace food counters, changing their technology (they were using boiling water for heating. The new ones would use electricity); substitute visual communication and improve employee flow in the space; all project process, especially construction phase, must follow internal policies of Safety, Health and Environment; and the project design must consider easy and accessible cleaning and maintaining materials and solutions

for the new proposed space. Deadline was also highlighted, since the new cafeteria must be fully and efficiently operating in 77 days from the architecture firm contraction. The respondent says that the Project process methodology applied for this Project was the FEL and leadership approval was made in gates, after each process phase. The process started after concluding the scope of work, developed by the Project manager together with the Infrastructure leader, detailing the project's objective and requirements, such as easy cleaning and maintaining materials, etc. Once the SOW was concluded and approved, Client 01 first contracted a small-sized architecture firm, to develop to design drawings – architecture, layout, finishing, electric and sound system. After developing the basic design, the small architecture firm was replaced by the larger one, interviewed for this thesis. They were responsible for developing the basic design into executive design and, later, executing it. DBB method was adopted: first, they contracted the Architecture firm for executive design development and, secondly, Client 01 started a bid for construction. Except for the cabinetry and air conditioning design, all other disciplines were developed by the Architecture firm.

Since executive design is concluded, along with project memorials and material quantitative lists, they are sent for the construction bid. The construction bid was won by the Architecture firm so that it was expected from Client 01 that they would have better understanding of design in construction site.

During this Project process, Client 01 interviewee point out some hindrances they faced:

- There was not enough time for Project planning and executive design, considering the 77-days deadline. As a consequence, the Project delayed 30 days more to conclude;
- Scope of work changes caused design and construction rework, besides unexpected drawing reviews;
- Different discipline design, such as ceiling lining and air conditioning, was not compatibilized, causing unexpected problems, schedule delays and additional construction costs;
- Client 01's Project team members' responsibilities were superposed, so that some tasks were duplicated while other were not done;
- There was fluctuation in the Architecture firm's Project team – they replaced the contract manager, the construction manager, the field architect and the safety

technician during the 107-day Project. Consequently, alignment and integration between Project team members was impacted, as well as administrative reworks and unawareness of Client 01's cultural policies.

- Moreover, these Project process hindrances increased Project costs in 7% over the target cost designated by Client 01's leadership for this project, despite de schedule delay already mentioned.

The main impacts on Client 01's project process were schedule delay and additional costs. Besides de 7% increase over the Project budget, there were operational costs caused by the delay: without the cafeteria operating in the stipulated deadline, the company's leadership had to provide food services alternatives to their 900-employee in that site, what generated extra operational costs.

4.2.2. Case study 02

Client 02: Client 02 contracted the Architecture firm aiming to have a new location for their headquarters, making their office more accessible by public transportation, positively impacting all their employee, clients and commercial partners. Client 02 chose to move from Barueri to Osasco, both cities in São Paulo region, but the last one is closer and with easier access. In addition, the Architecture firm was contacted to develop the pre-design, design and construction of their new site, according to the following requirements:

- The new location demanded an industrial shed refurbishment, with approximately 17 thousand square meter area;
- The building must be sustainable, by using natural resources such as potable water, rain water reuse and prioritize the use of natural lighting;
- Additionally, the new office must have capacity for 2.000 employee, a 200-seating auditorium, 140 meeting rooms, 11 workshop rooms, cafeteria, gym, games room and a bus stop for easy access to the new site.

Client 02's project team is composed by a Facilities manager, a Facilities supervisor, who assumed the PM role for this project and was the interviewee for this case, a safety technician and an architecture intern. Despite the intern, the other project team members do not have an architecture or engineer qualification – the PM has a bachelor in business administration.

Figure 13 – Client 02 project team arrangement. Source: the author.

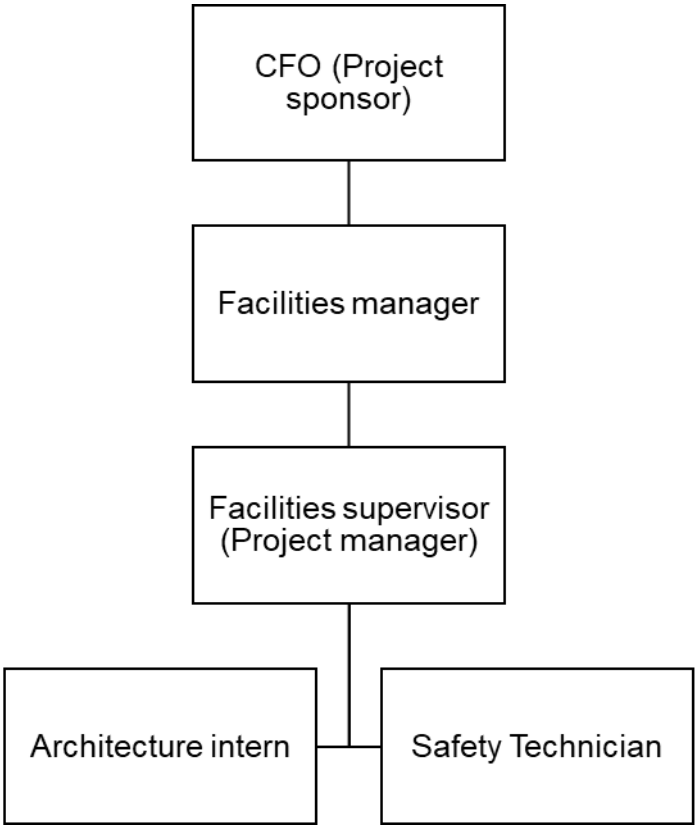


Figure 13 illustrates Client 02's Project team structure. The Facilities manager, along with the CFO, are the project sponsors and, therefore, the ones responsible for project's decision making and to input the company' strategy into project scope of work. The Facilities supervisor, project PM and interviewee for this research, did not perform the PM role properly, once the CFO used to intervene in the project and in the construction, administrating and changing details without previous alignment with the project manager or the project team.

This project's objective was a 17.000 square-meter area shed refurbishment to accommodate Client 02's new office, conforming it to public transportation accessibility; to sustainability by taking advantage of natural resources; and to transparency, promoting integration between employee, clients, vendors and partners. The project target cost was defined in R$105 million (around USD 33 million), as stated by the interviewee, and the deadline was set in 12 months. The Facilities supervisor indicated the following project process hindrances:

- Project' scope of work changed frequently, mostly during the construction phase. In order to avoid impacts on Project's deadline, additional costs were approved by Client 02 and some project's objectives were postponed;

- The Architecture firm received directions and information directly from the CFO, without previous alignment with the PM or the Project team; contributing for reworks and additional costs;

Postponing items from the Project' scope of work impacted project's costs on pricing readjustments, construction mobilization and administrative taxes; on project' schedule; and on quality, since employee had to operate without some office resources until they were concluded lately. One of the postponed items, for example, was the bus stop inside Client 02's site. Employee had to walk from the main office building to the main gatehouse in order to take public transportation, representing security and safety risks to them.

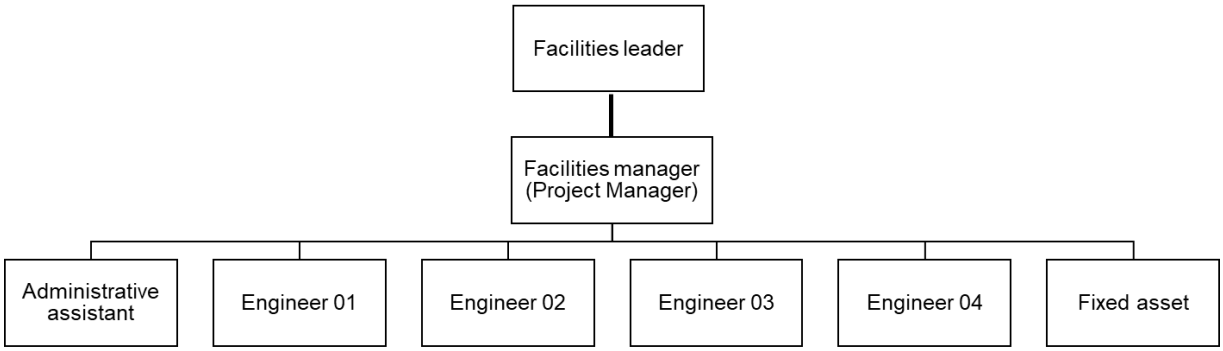
4.2.3. Case study 03

Client 03: Client 03's objective was to refurbish and modernize their occupied office layout. They contracted the Architecture firm to develop a Project plan, design and construction. Initially, it was a requirement that the new office layout must accommodate 500 employee and make the company more visible and attractive to the market. The refurbished office was located in a rented 5.000 square-meter corporate office building in Sao Paulo city (differently from Clients 01 and 02, whose buildings were owned).

- New office layout was based on Market strategy and visibility;
- The Project must obtain LEED certification (certification level was not informed);
- The new office must accommodate all 500 Sao Paulo employees;
- Besides, the new layout must provide to all occupants a cafeteria, a 230-seating auditorium, a 1.500 square-meter laboratory and an exclusive gym.

Client 03's Project team was multidisciplinary due to Project complexity, composed by engineers and administrators, as illustrated by Figure 14.

Figure 14 – Client 03 project team arrangement. Source: the author.



The PM role was assumed by the Facilities manager, the interviewee for this thesis, while the Facilities leader was the one responsible for the decision making and project sponsoring. The PM remarks that all Project team participated in decision making meetings, including the Architecture firm's team. That contributed for improved communication and integration among all professionals engaged. The contract method adopted was the DBB. Firstly, the project planning and design was contracted. After approval, Client 02 started the construction bid. As it happened in Client 01's process, the Architecture firm that developed the planning and design won the bid for construction.

Furthermore, the interviewee stated that the only significant scope change on this Project process was an amendment, increasing from 500 to 800 office total capacity. Before Client 03's leadership decided to proceed with that scope change, a formal and in-person meeting with the Project team and the Architecture firm's team was settled and Project' schedule and costs were analyzed together. They come to an open office solution, proposing a new way to perform daily work in the office. Instead of having 1:1 dedicated workstation, employee would have to share with one another, otherwise the acquisition of 300 more furniture and infrastructure for their operation would cause delays and high unforeseen costs to the Project. The responsibility was divided among all engaged professionals, including the Client 03's leadership (in Figure 14, represented by the Facilities leader).

4.3. CASE STUDY COMPARATIVE DATA ANALYSIS

Analyzing the interview information from the three companies, Clients 01 and 03 have architecture and engineering qualified professionals in their Project teams and a clearly defined Project manager. Despite the Client 02's facilities supervisor has assumed the role of Project manager, this professional could not manage and coordinate the members engaged, neither from Client 02's own team nor from the Architecture firm. Moreover, Client 02 was the only interviewee who demonstrated to unknow any project management methodology and, therefore, they could not apply it to their project process. Finally, Client 02 was the case in which the project process mostly presented issues and negative impacts, when compared to Client 01 and 03.

Although both Client 01 and 03 had multidisciplinary and qualified team members, Client 03's Project process was the one which presented more satisfactory results; yet,

their project was more complex than Client 01's. The great difference is the integration level of their project team with the Architecture firm's. In Client 01's process, the Architecture firm's team fluctuation impacted alignment, integration and communication between them and project team, provoking engagement loss and decreased focus on the project's objective accomplishment.

Table 07 – Comparison between Client Project process and FEL methodology. Source: the author.

FEL phase's outputs	Client 01	Client 02	Client 03
Project manager definition.	x		x
Project team compound by qualified architect or engineer.	x		x
Client's needs program and project's objectives definition.	x		x
Project schedule definition.	x	x	x
Project target cost definition.	x	x	x
Project team member's roles and responsibilities definition.			x
Project design products compatibilization.		x	x
Design considers run & maintain elements and requirements.	x	x	x

Analyzing Table 07, it is noticeable that Client 03 was the only company who applied all FEL methodology phases in their project process. Reinforcing that this methodology is commonly known and applied by multinational companies and allows the PM identify, analyze and mitigate project's risks before they impact project's deadlines, costs and quality. Hence, Client 03 was the one who presented more satisfactory

results when comparing to Client 01 and 02 and considering schedule and target cost compliance besides leadership and final users' satisfaction with the final product.

Despite applying FEL methodology, undefined and superposed responsibilities among Client 01's project team members caused control loss over design information and disciplines were not compatibilized and checked before construction bid. The result was schedule delay and additional costs.

Client 02 did not apply any Project management methodology – as stated by Client 02's interviewee, the FEL methodology was unknown to them. Comparing to the other two cases, Client 02's process presented higher impacts on their schedule and costs, besides client dissatisfaction since some items from scope of work were not delivered.

In spite of using FEL – or any other Project methodology – Client 03 emphasized the high integration, alignment and collaboration between their project team and the Architecture firm's team as an element of success. That relationship with the architecture firm is characteristic from the IPD method, in which all professionals engaged work as they were from the same team in favor of the same objective.

Table 08 – Client's Project delivery method analysis. Source: the author.

IPD	Client 01	Client 02	Client 03
Multidisciplinary and integrated client's Project team.	x		x
Information database and previous project's feedback sharing with current project manager and team.			x
Information database sharing with contracted architecture firm.			
Project risks analysis and management.	x		x
Responsibilities and rewards equally divided between client, architecture firm and project team.			x

It is important to observe in Table 08 that none of three cases had a database information sharing with the Architecture firm, which could have assisted them in providing faster and cohesive solutions according to the Client's values. Anyway, that was not an issue to Client 03 project process management and relationship with the Architecture firm. Conversely, the respondent architect explained that it would have spared research time, which could be used to develop planning and design instead of surveying client's information.

Despite the three Client's project presented different complexities and scope, by comparing their project processes, it was possible to verify that not adopting a project management methodology nor a project delivery method caused negative impacts on the project coordination, schedule and budget, besides not attending client's expectations.

For Client 02, unknowing and not applying any management or delivery methodology during their project process, summed with PM's lack of authority and qualification, caused disorganization of project's inputs; design and construction reworks; team members integration loss; additional costs and schedule delays; and not achievement of scope of work.

In spite of applying FEL methodology in their Project process, Client 01's relationship with the Architecture firm did not present actions to increase and value their integration and alignment during the process. Therefore, there was not an ownership feeling from the architecture's design and construction team and lack of Client 01's values understanding.

Finally, Client 03, when compared to 01 and 02, had the better results in their Project process, due to a close and collaborative relationship with the architecture firm, as strongly emphasized by the interviewee. Summarizing the survey results, only applying a Project management methodology do not bring all expected results to the Project process. The combination between a management methodology and its coordination with a Project delivery system, establishing a strong and collaborative relationship among all engaged professional is key to corporate office building Project process and move in favor of the same project objective. Lastly, defining clearly and objectively what is the achievement expected from the project, based on Client's values, is also important and must be defined in project's scope of work in the begging of the process.

4.4. CORPORATE OFFICE SCOPE OF WORK GUIDELINES

From FEL and IPD analysis and based on case studies results from interviews, it is important to stablish scope of work development guidelines, assisting the architecture firm being more accurate and efficient on their planning and design development; as well as assisting project manager measure the project status, increasing quality results by the end of project process. Following, there are Thirteen proposed guidelines to input information and develop a clear and objective scope of work for corporate office projects.

a) **Project Objective Definition:** Define "what" the project product is expected to achieve, in order to comply with client's needs; Define what motivated the project demand and what is valuable to the client; Define project's objective. The objective must be clear, concise and unambiguous.
    - **Example:** The project aims to provide employee an ergonomic and accessible office workspace.
    - **Responsible to perform this guideline:** Client.
    - **Guideline output receiver:** Architecture firm.

b) **Project Schedule:** Define and publicize project's deadline, considering all project process lifecycle time.
    - **Example:** Establish start-up and operation deadline to inaugurate the new space.
    - **Responsible to perform this guideline:** Client.
    - **Guideline output receiver:** Project manager and Architecture firm.

c) **Project Budget:** Define and publicize project's target cost, considering all needed investment for human resources and planning, design and construction phases. This guideline aims to limit the diversity of architecture and engineering solutions.
    - **Example:** If the project's objective is to refurbish and modernize the office workspace, there are numerous furniture available for this specific use. They go from the imported and most expensive ones to the national and lower cost.
    - **Responsible to perform this guideline:** Client.

- **Guideline output receiver:** Project manager and Architecture firm.

d) **Client's Culture Information:** Publicize client's organisational norms and internal policies, which may influence project process and its execution. Preferably, that information must be reviewed in-person with the architecture firm team, with the intention to avoid doubts and subjective understanding of them. Later, they must be formally sent together with project' scope of work.

- **Example:** Client's safety policies impact on project's logistics, human resources, time and costs. For example, if attending the accessibility Brazilian norm is a requirement, the design must consider a ramp or elevator for disabled people access.
- **Responsible to perform this guideline:** Client and Project Manager.
- **Guideline output receiver:** Architecture firm.

e) **Project Technology:** Define which technology will be used to develop project's process outputs and information exchange/ project database.

- **Example:** Use of cloud technology to deliver design outputs and other project information; Design development in 3D, 4D, etc.
- **Responsible to perform this guideline:** Client.
- **Guideline output receiver:** Project manager and Architecture firm.

f) **Project Manager Definition:** Define a project manager to coordinate the entire process, from the pre-design to its post-occupancy phases.

- **Example:** Election of a qualified and experienced professional, preferably graduated in architecture or engineering and with expertise in project management. The PM must be able to coordinate a multidisciplinary project team, their activities and outputs, as well as have an extensive view of the whole project process.
- **Responsible to perform this guideline:** Client.
- **Guideline output receiver:** Usually, when the client is a multinational or a large business company, the PM if a

professional from their facilities or engineering clerk. In case the client do not have a qualified professional to assume a PM role, they can opt to outsource him/her.

g) **Project Team Definition:** Define a project team which engaged members have enough qualification to act and develop activities necessary to that specific project, depending on its complexity. Better qualified and capable professionals, with project management expertise, are more likely to analyze inputs and develop outputs efficiently.
    - **Example:** For a complex corporate office layout project, which demands air conditioning, electric, IT design, it is necessary that the project team has correspondent professionals to check and review each design discipline.
    - **Responsible to perform this guideline:** Project manager.
    - **Guideline output receiver:** It is important that both client and architecture firm know the defined project team, in order to establish a better integration and alignment between them.

h) **Project Team Responsibility Definition:** Define each project team member their responsibility and which tasks they must perform during the project process.
    - **Example:** Define who is responsible for architectural design review, to elaborate and provide project communication, etc. A Design Responsibility Matrix (RIBA, 2013) is an appropriate tool for this guideline.
    - **Responsible to perform this guideline:** Project manager.
    - **Guideline output receiver:** Project team, Client and Architecture firm.

i) **Project Stages Approval:** Define which project process stages must be approved by the client before proceeding, depending on the amount and quality of information developed.
    - **Example:** Establish a minimum design review per discipline and the in-person formal meetings frequency, to obtain client's approval to proceed with project process after each stage. The

FEL methodology' structure, for example, presents these formal approval meetings as gates between each project stage.

- **Responsible to perform this guideline:** Architecture firm.
- **Guideline output receiver:** Client and Project Manager.

j) **Project Outputs:** For each project process stage, define what are the expected outputs and their detail level.

- **Example:** In the project's feasibility study, architecture and engineering solutions must be developed and presented. Each solution must present their pros and cons, estimated execution deadlines and costs, giving client enough information to decide which solution will proceed.
- **Responsible to perform this guideline:** Project manager.
- **Guideline output receiver:** Architecture firm.

k) **Project Database:** Organize a project's database, accessible to all professional engaged in the process, including client and outsourced; or accessible to key professionals, that control and coordinate the information stored. The objective of having a project database is to easily exchange project information and outputs and, also, feedback project process, improving it and future projects.

- **Example:** Sharing a virtual folder, using cloud technology, contenting design outputs, project information memorial, reports, schedules, etc.
- **Responsible to perform this guideline:** Project Manager.
- **Guideline output receiver:** Architecture firm and Client.

l) **Project Team Engagement:** Integration, alignment and ownership culture must be implemented in the project process, among all involved professionals. For example, the IPD method has a responsibility and reward characteristic that could be used in the process, specially engaging client and the outsourced architecture firm to successfully achieve the project goal.

- **Example:** For each efficiently executed action or task, the professional responsible for it must receive a recognition. In order to evaluate the quality of what is developed, time and costs saving

requirements must be checked and analyzed, as well as soft savings as environment protection, human safety, etc.

- **Responsible to perform this guideline:** Project Manager.
- **Guideline output receiver:** Architecture firm and Client.

m) **Project Process Methodology:** Consolidating all previously proposed guidelines for this research, a project management methodology must be implemented and coordinated by a qualified project manager. A project management methodology assists the project manager to achieve project's objective with quality and complying with proposed deadlines and within budget. It highly increases project's process to attend to client's values and needs satisfactorily.

- **Example:** The FEL methodology is one of the most complete and effective project management methodologies available. Also, due to the approving gates stages, it increases client engagement in the process.
- **Responsible to perform this guideline:** Client and Project Manager.
- **Guideline output receiver:** Architecture firm and Project team.

Guidelines from a) to e) are intended to assist the architecture firm on understanding client's needs, values and expectations. The most detail from what had generated the demand for a project, the best to work on the right direction and develop the design to attend it, achieving client' satisfaction.

From f) to h) the focus is determining the best qualified professionals to work on the project process. One of them must assume the project manager role and its responsibilities, coordinating the project team members and outputs as well as the project process. The PM mission must be on assuring that guidelines from a) to e) are effectively implemented and that the project team is integrated and aligned to them.

Finally, from i) to m) are the guidelines for consolidating a project process methodology and contract method. This thesis recommends the implementation of IPD method for contracts, and FEL methodology for project management; since, according to referenced literature, these are the most efficient and complete methods applicable to corporate office projects. Besides, both have tools to engage the client in the project

process and increase project team, architect and client integration and alignment about project objective and viable solutions.

In a sum, if all the mentioned guidelines are applied to a corporate office project and coordinated by a qualified project manager, they must avoid project hindrances observed in Clients 01 and 02 cases: unalignment between professionals involved, rework, deadline and scope of work requirements loss and increased additional costs.

5. RESEARCH RESULTS AND CONCLUSION

5.1. RESEARCH RESULTS

This thesis verified that lack of engagement of client in the project process may induce architects and project managers to not fully comprehend their needs, expectations and their values. As observed in literature, not involving the client in project process results in overstressed rework in design and construction phases, architect's productivity and competitiveness loss, final product quality and performance loss, schedule delays and increased unforeseen costs. Besides, the architect will not feel fully integrated with the client' strategy and needs. Likewise, this professional will not develop ownership for the project process and its objective, culminating in disengagement and stressful working environment. To avoid – or mitigate - project's hindrances and team disengagement, this thesis aimed to define and propose scope of work guidelines for architecture firms who are hired to develop a corporate office design.

Those guidelines will be based on client's needs and expectations and project requirements, avoiding scope changes and reworks along project process. They are based in project management and project delivery methodologies tools. Project management methodologies and Project delivery methods have elements that can guide and be used as measurement of project status. Academic literature results demonstrate that the FEL methodology and the IPD method are the ones that presented more satisfying results.

To check on literature results, a qualitative research methodology was adopted and consisted on interviewing project managers who recently conducted corporate office design projects for the multinational companies they work for. Three managers were chosen due to limited access to project information. When comparing and analyzing the case studies' project processes, Client 03, who applied FEL methodology and IPD method was the one who presented better results in accomplishing project's deadlines, target cost and client' satisfaction. It is possible to conclude that: a) It is not enough applying only a project management methodology. An integrated and collaborative relationship between client, Project team and architect is necessary in order to assure their engagement with the project's objective; b) There must be client engagement in the beginning of project process, assuring complete comprehension of their need, expectations, strategies and values. All information gathered from the client must be

translated into project' scope of work, serving as a guide for project manager measure project' status and success; c) By combining the client's engagement, a project management methodology and a project delivery method, all involved professionals have ownership over the project process and share responsibilities and rewards, according to its results.

Albeit having applied the FEL methodology and clearly defined scope of work in the beginning of the process, Client 01 could have had better results if there was better coordination and alignment of project delivery system and a more collaborative relationship with the architecture firm.

As Client 02 did not know about any project management methodology, neither about a project delivery system, their project resulted in many gaps and additional costs during the process. The fact that their project team did not have a qualified architect or engineer professional, experienced in project management, had also contributed for their project process disarrangement and lack of project manager authority.

Project management methodology and project delivery method were already developed, tested and previously publicized in respective literature. But the scope of work development had not being developed in such degree. By developing guidelines to assist architects impose receiving all client's necessary information to develop a detailed and accurate scope of work, this thesis proposed guidelines provide them more competitiveness and productivity.

As stated, the implementation of scope of work guidelines do not require resources investment, but a management culture change when starting a contract and relationship with the client. Structuring the pre-design phase would make scope of work guidelines application usable, avoiding project process hindrances and meeting this thesis objective.

5.2. FUTURE WORK PROPOSAL

Besides Project management is widely studied in academic literature, there are few researches about corporate office building project management. This thesis aimed to analyze corporate office project methodology management and how their results are impacted by lack of client engagement and information in scope of work. The results were the proposal of scope of work guidelines, to assist corporate office architects and

designers to fully interpret and understand client's need and values; therefore, they would be more competitive and productive. Yet, there are some points on this research that can be elaborated in future works:

- How can BIM be applied in the early stages of corporative project process and analyze its contribution to Project requirements fulfillment improvement.
- Corporate office Project risks analysis with short deadlines for planning and execution.
- Project cost control methodologies proposal, aiming to assist Project manager comply the determined target cost. This would be an elaboration from this thesis, focusing on achieving client's expectation related to costs and budget; and from the parameters proposed for building project process (GONÇALVES, 2011).
- Corporate office project post-occupancy analysis and verification if the project achieved client and final user' satisfaction. In addition, analyze how it can feedback project process, aiming for future improvement and productivity, concerning use, occupation and building operation (Facilities theme).

REFERENCES

ASSOCIAÇÃO BRAILEIRA DE NORMAS TÉCNICAS (ABNT) NBR ISO 10.006:2006. **Gestão da Qualidade – Diretrizes para a qualidade em empreendimentos**. (In Portuguese only). 39 pp. 2006.

_____NBR 16.636-2:2017. **Elaboração e desenvolvimento de serviços técnicos especializados de projetos arquitetônicos e urbanísticos - Parte 2: Projeto Arquitetônico**. (In Portuguese only). 22pp. 2017.

_____NBR 16.280:2014. **Reforma em Edificações – Sistema de gestão de reformas – Requisitos**. (In Portuguese only). 11pp. 2015.

ANDRADE, Claudia. **A História do ambiente de trabalho em edifícios de escritório – um século de transformações.** (In Portuguese only). Editora C4, São Paulo, 2007.

_____. **O Escritório no Século XXI – The XXI Century Office**. (In Portuguese only). Edição Bilíngue. Editora C4, São Paulo, 2013.

ASLESEN, A. R.; NORDHEIM, R.; VAREGG, B.; LAEDRE, O. (2018). **IPD in Norway**. In: Proc. 26th Annual Conference of the International. Group for Lean Construction (IGLC), González, V.A. (ed.), Chennai, India, pp. 326-336. DOI: doi.org/10.24928/2018/0284. Available at: www.iglc.net

BAHARUDDIN, H.; WILKINSON, S. & COSTELLO, S. **Improving Early Stakeholder engagement process for Infrastructure projects.** Proceedings the CIB World Building Congress (WBC16). Finland, 262-273, May, 2016.

BALLARD, G. **Lean Project Delivery System.** Paper 8. Lean Construction Institute. R/0 published 5/1/00. September, 2000.

_____. **The Lean Project Delivery System: An Update.** Paper. Lean Construction Journal 2008. 1-19 pp. Lean Construction Institute. 2008. Available at: https://www.leanconstruction.org/about-us/publications/lean-construction-journal/lcj-back-issues/2008-issue/. Acessed on 21, January, 2018.

BARBOSA FILHO, Fernando de Holanda. **Construção Civil: informalidade alta e recuperação ainda distante.** (In Portuguese only). Revista Conjuntura da Construção, Ano XIV, n.4, Sinduscon-SP, IBRE e FGV, Decembre, 2016. p. 13.

BINNINGER, M.; DLOUHY, J.; SCHNEIDER, J.; HAGHSHENO, S. (2018). **Analysis of the activities of site and project managers - implications from the perspective of creating value.** In: Proc. 26thAnnual Conference of the International. Group for Lean Construction (IGLC), González, V.A. (ed.), Chennai, India, pp. 337–347. DOI: doi.org/10.24928/2018/0315. Available at: www.iglc.net

BULL, Melanie. BROWN, Tim. Implementing Change. In. Finch, Edward. **Facilities Change Management (edited by Edward Finch)**. Blackwell Publishing Ltd. Oxford, 2012.

CBIC. **Boas práticas para entrega do empreendimento desde a sua concepção**. (In Portuguese only). CBIC - Câmara Brasileira da Indústria da Construção, Sindicato da Indústria da Construção Civil do Estado de São Paulo, Secovi-SP. Brasília, 2016. 71 p.

CHUNG, J.; WEI, K. **Development of a Collaborative Briefing Approach to Support Stakeholder Engagement in Construction Briefing.** Proceedings the CIB World Building Congress (WBC16). Finland, 274-284, May, 2016.

COOPER, R.; HINKS, J.; ALLEN, S. & CARMICHAEL, S. **Adversaries or Partners? A Case Study of an Established Long-Term Relationship Between a Client and Major Contractor**. In: 4th Annual Conference of the International Group for Lean Construction (IGLC). Birmingham, UK. 1996. Available at: www.iglc.net

DETTWILER, P. The Change Management Challenge in Growth Firms. In. Finch, Edward. **Facilities Change Management (edited by Edward Finch)**. Blackwell Publishing Ltd. Oxford, 2012. 42-56 p.

FABRICIO, Márcio M. **Projeto Simultâneo na Construção de Edifícios**. (In Portuguese only). Tese de Doutorado pela Escola Politécnica da Universidade de São Paulo. São Paulo, 2002. 350p.

FRANÇA, Thauany C. **Front-End Loading (FEL): Processo FEL e o Gerenciamento de Projetos na Construção Civil.** (In Portuguese only). Trabalho de Conclusão de Curso pela Escola de Engenharia Civil da Universidade Estadual de Goiás. Anápolis, 2015. 72p.

FINCH, EDWARD. **Facilities Change Management.** Blackwell Publishing Ltd. Oxford, 2012.

GONÇALVES, C. M. M. **Método para gestão do custo da construção no processo de projeto de edificações**. (In Portuguese only). Dissertação de Mestrado em Engenharia de Construção Civil e Urbana. Escola Politécnica, Universidade de São

Paulo, São Paulo, 2011. doi:10.11606/D.3.2011.tde-06052011-134259. Accessed in: 2018-09-28.

KNOBEL, L.; BREMER, T.; and ELS, M. **Feasability of active design.** Proceedings of Association of Schools of Construction of Southern Africa, ASOCSA, The Eleventh Built Environment Conference, Durban, 380-387, August, 2017.

KOWALTOWSKI, D. C. C. K.; MOREIRA, D. C.; DELIBERADOR, M. S. O programa arquitetônico no processo de projeto: discutindo a arquitetura escolar, respeitando o olhar do usuário. In: SALGADO, Mônica Santos; RHEINGANTZ, Paulo Afonso (Org.). **Projetos Complexos e os Impactos na Cidade e na Paisagem.** (In Portuguese only). Rio de Janeiro: Editora da UFRJ, 2012. p. 160–185.

KOHN, A. Eugene; KATZ, Paul. **Building Type Basics for Office Buildings**. Ed. John Wiley & Sons, INC. New York, 2002. 312 p. Available at: https://books.google.com.br/books?id=b3cPTXec89kC&pg=PA9&lpg=PA9&dq=evolution+of+office+buildings&source=bl&ots=QSUHEJHif-&sig=6THg_cSEm5L_ftU45ckRV6eNEww&hl=pt-PT&sa=X&ved=0ahUKEwjXyPuxibnVAhUGhpAKHX8HA5U4ChDoAQhbMAc#v=onepage&q=evolution%20of%20office%20buildings&f=false

LDOCE. Longman Dictionary of Contemporary English. Available at: https://www.ldoceonline.com/. Accessed in: October, 2018.

LEITE, K. P. BARROS NETO, J. P. **Avaliação do Processo de Projetos em Empreendimentos Imobiliários.** (In Portuguese only). XV Encontro Nacional de Tecnologia do Ambiente Construído. ENTAC. Maceió, 2014. p. 2071 – 2080.

LINS, D.; CAMPOS, I.; MORORO, M.; BARROS NETO, J.; CARDOSO, D. **Caracterização e análise dos métodos de entrega de projeto.** (In Portuguese only). XV Encontro Nacional de Tecnologia do Ambiente Construído. ENTAC. Maceió, 2014. p. 1428 –1437.

LIU, Ana W. **Diretrizes para projetos de edifícios de escritórios.** (In Portuguese only). Dissertação de mestrado. Escola Politécnica, Universidade de São Paulo. São Paulo, 2010.

MESA, H. A.; MOLENAAR, Keith R.; ALARCÓN, Luis F. **Exploring performance of the integrated project delivery process on complex building project**. Int. J. Proj. Manag. 34 (2016), 1089-1101.

MOODLEY, T.; HAUPT, T. C. **Integrated Project Delivery System Implementation on the public sector in South Africa: a Pilot Study.** Proceedings of Association of

Schools of Construction of Southern Africa, ASOCSA, The Eleventh Built Environment Conference, Durban, 507-514, August, 2017.

NARMO, M.; WONDIMU, P.A.; LAEDRE, O. (2018). **Best Value Procurement (BVP) in a Mega Infrastructure Project**. In: Proc. 26th Annual Conference of the International. Group for Lean Construction (IGLC), González, V.A. (ed.), Chennai, India, pp. 23–33. DOI: doi.org/10.24928/2018/0285. Available at: www.iglc.net

OLIVEIRA, Otávio J.; MELHADO, Silvio. **Como Administrar Empresas de Projeto de Arquitetura e Engenharia Civil.** (In Portuguese only). Ed. PINI, São Paulo, 2006.

ORNSTEIN, Sheila W., ANDRADE, Claudia. Pre-design Evaluation as a Strategic Tool for Facility Managers. In. Finch, Edward. **Facilities Change Management (edited by Edward Finch)**. Blackwell Publishing Ltd. Oxford, 2012.

OXFORD. University Press. English Oxford Living Dictionaries. Available at: https://en.oxforddictionaries.com/. Accessed in: October, 2018.

PELTOKORPI, A.; MATINHEIKKI, J.; KYRO, R. & ARTTO, K. **Linking Activities During Construction to Inter-Organizational Value Co-Creation During Operations.** Proceedings the CIB World Building Congress (WBC16). Finland, 297-309, May, 2016.

PMI (Project Management Institute). **Um Guia do Conhecimento em Gerenciamento de Projetos (Guia PMBOK®)** – Sexta Edição. (In Portuguese only). 2017. 756p.

RAMOS, Pamela; MOTA, Caroline; CORREA, Luciana. Exploring the management style of Brazilians Project managers. Int. J. **Proj. Manag. 34** (2016), 902-913.

RIBA. **RIBA Plan of Work 2013 – overview**. London, 2013. Available at: https://www.ribaplanofwork.com/

RISCHMOLLER, Leonardo; REED, Dean; KHANZODE, Atul; and FISCHER, Martin (2018). **Integration enabled by virtual design & construction as a lean implementation strategy**. In: Proc. 26th Annual Conference of the International. Group for Lean Construction (IGLC), González, V.A. (ed.), Chennai, India, pp. 240–249. DOI: https://doi.org/10.24928/2018/0521. Available at: www.iglc.net

ROMERO, F.; ANDERY, P. **Uma Análise das Técnicas e Ferramentas Utilizadas no Processo de Projeto de Empreendimentos de Capital**. (In Portuguese only). In: XIII Encontro Nacional de Tecnologia do Ambiente Construído. Canela, RS: ENTAC, 2010.

ROTIMI, J.; SMITH, L. & OGUNSEMI, D. **Managing the risks associated with scope changes in guaranteed maximum price (GMP) contracts.** Proceedings of Association of Schools of Construction of Southern Africa, ASOCSA, The Fourth Built Environment Conference, Zambia, 57-65, May, 2009.

SMITH, Jim. LOVE, Peter. Project Inception: Facilities Change Management in Practice. In. Finch, Edward. **Facilities Change Management (edited by Edward Finch)**. Blackwell Publishing Ltd. Oxford, 2012.

SILVA, Tassia. MELHADO, Silvio. **Gestão de Riscos e Riscos de Gestão em Projetos Industriais: Estudos de Caso.** (In Portuguese only). In: XVI Encontro Nacional de Tecnologia do Ambiente Construído. Anais... São Paulo: ENTAC, 2016. P. 3348-3359.

SOUZA, A. SABBATINI, F. Henry, E. MELHADO, S. **Recomendações práticas para implementação da preparação e coordenação da execução de obras.** (In Portuguese only). Boletim técnico da Escola Politécnica. Universidade de São Paulo. BT/PCC/304. São Paulo, 2001.

SOUZA, F. R. **A Gestão do Processo de Projetos em Empresas Incorporadoras e Construtoras. (In Portuguese only).** Tese de Doutorado. Escola Politécnica da Universidade de São Paulo. São Paulo, 2016. 331 p.

STEELCASE Inc. 360° Steelcase Global Report. **Engagement and the Global Workplace.** 2016. 249 p.

THEN, D. The Business of Space. In. Finch, Edward. **Facilities Change Management (edited by Edward Finch)**. Blackwell Publishing Ltd. Oxford, 2012.

_____; CHAU, C. K. **Facilities Management Alignment to Business Needs – An International Survey.** Proceedings of Joint CIB W070, W092 & TG72 International Conference on Facilities Management, Procurement Systems and Public Private Partnership. Cape Town, 23-25 January 2012.

TZORTZOPOULOS, Patricia. **Contribuições para o desenvolvimento de um modelo do processo de projeto de edificações em empresas construtoras incorporadoras de pequeno porte.** (In Portuguese only). Dissertação de mestrado. Escola de Engenharia Civil da Universidade Federal do Rio Grande do Sul. Porto Alegre, 1999. 150 p.

Universidade de São Paulo. **Diretrizes para apresentação de dissertações e teses**. (In Portuguese only). Divisão de Biblioteca da Epusp. - 4.ed. - São Paulo, 2013. 91 p.

VALEN, M.; BOGE, K. & FOSS, M. **Contradictions of interests in early phase of real estate projects – What adds value for owners and users?** Proceedings the CIB World Building Congress (WBC16). Finland, 285-296, May, 2016.

VASCONCELOS, I. M. M.; MORAES, P. P. **Structuring a PMO with the help of front-end loading and the PMBOK® guide**. Paper presented at PMI® Global Congress 2010 – EMEA, Milan, Italy. Project Management Institute (PMI), 2010.