

Systematization of pre-design activities in the management of the building design process

Fabiane Vieira Romano

*Federal University of Santa Maria
faromano@terra.com.br*

Nelson Back

*Federal University of Santa Catarina
back@emc.ufsc.br*

Roberto de Oliveira

*Federal University of Santa Catarina
ecv1rdo@ecv.ufsc.br*

Abstract: One of the most urgent practices to be reviewed in construction is building design process planning. Despite efforts in recent years, when it does exist, this planning is still insufficient and/or inadequate, above all because of market pressures and the scant time usually reserved for this phase. As a result, building projects often fail to achieve the expected results in terms of time, costs, quality and scope. This article discusses a model for developing integrated design process management, presenting a systematization of pre-design activities that involve the planning of a new project based on company business strategies, as well as organization of the work to be developed during and after the design phase.

Keywords: management, designing, planning, building

1. Introduction

Many problems related to building quality have the lack of quality in the design process as their main cause. In general, the building design process is developed in an unplanned, fragmented, and sequential way, without a comprehensive and integrated vision of the design/construction relationships, and with evident absence of interaction and communication among the actors involved. Although in an incipient way, Brazilian construction firms – following global trends –, started to search for design management methodologies to change the conventional model trying to assure the quality of their products and processes, and, consequently, the satisfaction of their customers.

Among the most urgent practices to be reviewed in civil construction, is the planning of the building design process. The planning, despite efforts in recent years, continues to be developed in insufficient and/or inadequate way, above all, by result of market pressures and of the short time usually devoted for this phase.

In a general way, in many times the projects do not reach the expected results (in relation to time, costs, quality, and scope), in consequence of managerial failures, above all linked to planning subjects: short time for the estimates and the planning process; little understanding of the degree of project complexity; poor and incomplete financial estimates; ignorance of customer needs, equipment and materials; absence of work patterns or lack of their standardization (VARGAS, 2000).

This article is underpinned by a reference model for the management of the integrated building design (ROMANO, 2003), presents a systematization for the pre-designing activities – involved in the first phase of this process – the project planning. In other words, how can be organized the related activities to the elaboration of the building design plan, whose objective is to guide the accomplishment of the designing and the after-designing macrophases.

2. The building desing process

Understood as “the activity or service of the construction process, responsible for the development, organization, registration and transmission of the physical and technological characteristics specified for a work, to be considered in the execution phase”

(MELHADO, 1994), the design process permeates the whole constructive process of a building, beginning by the planning, going through the elaboration of the product designs and of the production designs, the preparation for execution, the execution, and extending until the use (Figure 1).

According to ROMANO (2003), the building design process may be understood as a composition of three macrophases:

- Pre-designing – that corresponds to the phase of "project planning" and involves the elaboration of the building design plan;
- Designing – that involves the elaboration of the designs of the product-building (architectural, foundations and structures, property facilities) and the production designs (molds, flagstones, masonry, vertical revetment, building site, etc.). This macrophase is composed by five phases: "informational design", "conceptual design", "preliminary design", "legal design" and "detailed design & production designs". The option for the term designing – described by FERREIRA (1999) "as synonym to the act of design, of elaborating designs" – happens because of the current trend to the use of that term, instead of "projection" (SILVA, 1998). According to OLIVEIRA (2001, p.150), designing "refers to the design in action or being developed, being considered its interfaces and interrelations, in other words, the design inside of a dynamic context"; and
- After-designing – it involves the phases of supervision of the building construction and assessment of its use, whose principal results include, respectively, the feedback of the design, starting from the construction site and of the evaluation of after-occupation satisfaction.

Being subject of this article, only the pre-designing follows its description.

3. Pre-designing

This macrophase has the purpose of planning of a new project conforming to the company business strategies, as well as to the organization of the work to be developed along the design process.

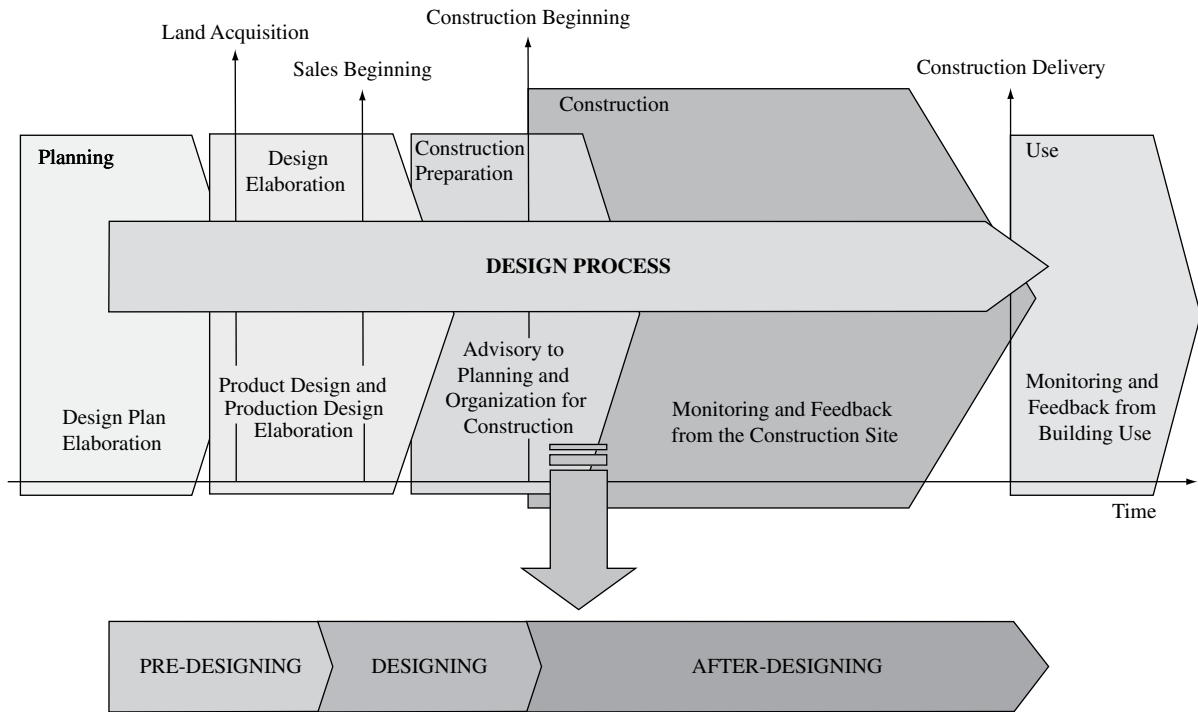


Figure 1. The design process in the context of development of a project/building.

In the management context, according to VARGAS (2000), the planning is the responsible phase for to identify and to select the best strategies of design approach, detailing all that will be accomplished.

DINSMORE (1992) also emphasizes the importance of the planning process saying that of all the measurements of project process, the planning possesses the potentially stronger impact, since it includes, among others, establishment of project goals, the forecasting of resources, the difficulties prevention and the execution of solution sketches. In other words, the panorama or the project scenery can be sighted and, thus, the plans can be traced to give the adequate direction in the execution moment of the tasks inherent to their implementation. Because of that, the same author points out two planning types: 1) technical – related to the execution of a detailed methodology to have a project well planned and controlled; and 2) managerial – related to the planning of the project coordination. The technical planning includes, typically, the definition of the project goals and objectives, identification and sequencing of the tasks, identification of the resources, estimate of the duration time for each task, budget, schedule, etc. The managerial planning involves the political articulation of the project, the team formation, the development of training programs, the accomplishment of audits in the project, among other actions.

Thus, the pre-designing in the building design process involves predominantly activities of managerial character: planning and specification of the scope (product – aspects and functions that should be included in the construction; and, project – the work that should be done with the purpose of building a construction in accordance with the specified aspects and functions); definition, sequencing and estimate of activities duration; resource planning; cost estimation; project schedule development and budget; etc.

Brazilian quality programs in civil construction mention this planning phase, previously accomplished to the designing. According

to “Items and Requirements of the Qualification System of Services and Works Companies” of the Brazilian Program of the Quality and Productivity of the Habitat (PBQP-H), that takes into account the point of view from the year 2000 version of the NBR ISO 9000 series of quality standards, the engaged companies that execute their projects internally or that subcontract the same ones, must, among other, to assist to the following requirement: “The construction company shall plan and control the construction design project destined to its customer. During this planning process, the construction company shall establish: the design elaboration phases, with regard to the different technical specialties; the appropriate critical analysis and assessment for each phase of the design elaboration process, for its different technical specialties; and the involved authorities and responsibilities for the project. The construction company shall manage the interfaces among the different involved technical specialties (internal or external) in the project, to assure the effective communication and the clear assignment of responsibilities. The results from the planning of the project elaboration shall be updated as appropriate, according to the project progress.” (BRAZIL, 2002, p. 22).

The first activities of the project planning phase are the definition (or recovery of related information) of the strategic plan of the business and of products.

According to NGI (2002), the business strategic planning consists of the analysis of company needs with relationship to the revenue and volume of necessary projects to give sustentation and growth/development to the existent business structure. And, the product strategy planning consists of the “establishment of the market segment(s) in which the company intends to work from of the analysis of the market sceneries; identification of customer needs from the products’ and services’ point of view that the company intends to produce, included the geographical locations that present potential for development; general strategies of products and

services for each market to be reached by the company; analysis of the competition (products and services/strategies); definition of the means for implementation of these strategies, being defined which will be demanded from the design company for this strategy is implemented indeed”.

Established the product strategic plan, the project marketing planning is elaborated (Table 1).

The linked tasks to this activity belong to the knowledge domain of commercial management (CM) and, some of them involve the business and financial management domains (BM and FM). It is, respectively, the case, of the project type definition to be developed and, of the preliminary definition and advertising costs – which can be based on internal previous company records.

During this activity, the first comparative evaluation of the available buildings at the market is accomplished, starting from the evaluation of characteristics of the real estate market for definition of the product to be developed, from the desired characteristics of the building, as for instance, it is to be residential building, destined to the middle class, for families with children in school age, etc.

After being elaborated, the marketing plan is submitted to the approval by the administration (business management), what allows the creation of the project summary plan (also known as opening term or project letter), that formalizes the existence of the project inside of the organization (Table 2).

Usually, business management personnel is responsible for creation and issue the project summary plan. In this activity the

Table 1. Elaboration of the project marketing planning.

Inputs	Activities	Tasks	Domain	Mechanisms	Controls	Outputs
Product Strategic Plan	To elaborate the project marketing planning	To describe the project type to be developed; geographical locations (neighborhoods, cities, etc. and theirs urban potentials); typology (commercial, residential, etc); general characteristics of the consumer needs program; dimensions (number of units intended, total areas, etc.)	BM, CM	Market analysis Form for initial definition of the project characteristics	Product strategic plan Procedure for general definition of the project characteristics	Preliminary project description
		To describe the type of necessary land for project accomplishment (minimum front, use coefficient, minimum area, main infrastructure services, price of the land, payment form)	CM, PM	Form for characterization of the intended land	Procedure for characterization of the intended land	Preliminary description of the land
		To evaluate the available buildings in the market	CM	Analysis of the competition Benchmarking	Specialist's analysis	1st evaluation of the available buildings in the market
		To identify the differentiation opportunities	CM	Market analysis Identification of the success factor-keys		Differentiation opportunities
		To define the preliminary price of sale	CM, FM	Analysis of sale price	Price of the available buildings in the market	Preliminary price os sale
		To estimate the commercialization speed (spreed of sales)	CM	Market analysis	Product strategic plan	Estimated speed of sales
		To verify the release and publicity costs	CM, FM	Preliminary budget of release and publicity		Preliminary budget of release and publicity
		To evaluate the marketing planning	CM	Analysis of the marketing planning		Marketing planning

Source: ROMANO (2003).

Table 2 . Elaboration of the project summary plan.

Inputs	Activities	Tasks	Domain	Mechanisms	Controls	Outputs
Marketing planning Readiness of lands	To elaborate project summary plan	To describe the project to be developed (preliminary schedule of the enterprise, initial needs of resources, initial estimate of cost, etc.)	BM, CM	Analysis of the real estate market	Strategic business plan	Project summary plan
		To identify and to designate the project manager	BM	Readiness of qualified people		
		To define attributions and responsibilities of the project manager	BM			
		To issue the project summary plan	BM	Printed or digital document		

Source: ROMANO (2003).

project manager is assigned, and main attribution is the elaboration and the implementation of the building design plan.

After issuing the project summary plan, the project documentation system (PDS) is created, in which all the generated documents along the building design process are registered and enclosed, as of managerial nature as of technical nature. The responsibility for the registration and the control of PDS is assigned to the project management team who is in charge of monitoring the development of the activities.

Soon after, the identification of the involved parts in the design is done: contracting businesses, construction users, construction agent, project partners, involved design specialties, financial institutions, etc.

The goal of this activity is to make possible the determination of relationships among the involved parts in the project and the identification of their information needs, in addition to their attributions and responsibilities during the product development process.

According to NBR ISO 10006 (ABNT, 2000), it “agrees that the customer needs and of the other stakeholders are clearly understood, to assure that all the processes are guided for them and get to assist them”. In order to accomplish such thing, it is necessary to establish the interfaces with all of them to obtain an appropriate communication during throughout the design process.

Because of the information demands during the building design process, and of the need of controlling the generated documents, the next activity consists of the elaboration of the communications management plan (Table 3).

In this plan, the whole structure of the information system is defined, in order to allow the efficient and controlled change of communications during the design process. In order to make complete the communications management plan and allow it for issue, it is usually needed an amount of information that will only be available as the other phase activities are accomplished. For instance, to define who will receive and who will issue certain document it is first necessary to define the design team, the organizational planning, etc. Therefore, it is an activity that begins after the identification of the involved parts in the project, but that is only ended when all the necessary information is defined.

In the sequence the declaration of project scope is elaborated, which describes the justification of the project, its restrictions, the

developed product (building characteristics), the wanted outputs of each process phase, as well as, the project goals.

An important task to be considered in the scope declaration is the scope reevaluation and the controlling of its changes. It is common, with the progress of the building design, recognition of needs of changing the project scope, assessing new elements which start to be part of the project. Any alteration that is done in this sense should be firstly evaluated, documented and updated with relationship to the project plan.

After approval, the project scope declaration is detailed through the elaboration of the Work Breakdown Structure (WBS) that defines all of the work of design process. The design decomposition refers to the subdivision of the main results in smaller components, until an enough level for the activity definition.

With the project scope declaration and WBS, the definition of the design activities list is started.

Depending on the building type to be developed, there is a wide variation in the number of activities to be accomplished, in the designing macrophase, as in the after-designing. Like this, for each new project, with respect to its typology, it is necessary to analyze if the general flow of the activities identified by the company is valid or if it is necessary to elaborate a specific flow.

Starting from the project activities list, the determination of the necessary physical resources is possible: necessary equipment (computers, instruments, etc.); supplies; technical bibliography, technical standards, procedures; etc.

Among the physical resources there are people that will be part of the building design team, which bring the need of defining an organizational structure for the project. Once identified the necessary functions to the design process, responsibilities shall be assigned to each of them, as well as the form of evaluating the team actions shall also be defined. It is also important to plan when and how the people will be allocated and removed from the design team.

In the sequence, on seeking the elaboration of the building design budget, the sequencing of design activities is accomplished, as also the duration estimate and the elaboration of the design preliminary schedule, start and finish dates, as well as the form of periods control (reevaluation and control of changes).

The correct activity sequencing is important for accomplishing of reduction of the time spent for the elaboration of the product design

Table 3. Elaboration of the communications management plan.

Inputs	Activities	Tasks	Domain	Mechanisms	Controls	Outputs
People involved in the project development Relationships among the involved parts Information need Atributions of the involved parts	To elaborate the project communications planning	To define the information that will be formally communicated, the frequency and the transmission means to be used	PM	Knowledge of communications management (especially of documentation management) Knowledge about of the information and communication technologies readiness Printed or digital document	Business strategic plan	Project communications plan
		To define the format, language and the structure of the documents	PM			
		To define the project information system (who will send and who will receive the information, the control and safety procedures of the documents)	PM			
		To establish the rules and guidelines for the meetings (schedule, involved people, elaboration and distribution of the record, important subjects, accorded actions, responsible)	PM			
		To issue the project communications planning	PM			

Source: ROMANO (2003).

and of the production designs, recommended whenever possible, the execution of the tasks in a simultaneous way.

Parallel to the elaboration of the design schedule, the estimated cost of necessary physical resources to the design (mainly of the services) is allocated.

With the estimated cost of the physical resources and with the schedule, the budget can be elaborated, that will serve as a baseline to measure and to monitor the design cost performance along the time (design cash flow). The building design budget should also include, the form of cash flow control and its reevaluation according to the changes happened along the process.

The activities presented until this moment seek the elaboration of the building design plan. In parallel, the procurement management plan can be elaborated, which defines the procedures to be followed for the team with the purpose of purchasing the necessary of goods and services to the design process. In this plan are included the documents, the contract types to be signed and the criteria for the suppliers selection.

With the resulting information of the previous activities, the elaboration of the building design plan is done, which consists of a formal document used to manage and to control the execution of the designing and after-designing macrophases. Once revised and appraised, the building design plan is submitted to the approval by the management board of the project executive organization and issued according to the communications management plan.

During the accomplishment of the building design process activities, different events are accomplished with more or less success. The registration of those variations, usually called lessons learned, results in knowledge for the team in the development of new projects. Like this, it is recommended that during the accomplishment of the

phase and, before the approval of the building design plan, the lessons learned are discussed and registered.

4. Final comments

In spite of the growing number of builders engaged in quality programs – above all in PBQP-H, and also of the number of works proposed by the academy, normally, time and efforts are not usually oriented to the building design planning, commonly developed in insufficient or inadequate way.

It is also verified, that the companies, on their great majority, are not prepared to manage the building design process, and they continue to lead their activities without an appropriate organizational structure, maintaining practices that are causative of many problems in the building construction process as a whole.

Thus, the contribution of this article is pointed out, as well as of the reference model as a whole (ROMANO, 2003), in the sense of settling down a systematic of management and integration of the building design process, above all in what it plays to the designing, that orientates all the following efforts in the constructive process.

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Adress for mailling

Fabiane Vieira Romano – Rua Doutor Zamenoff, 1160/902, Medianeira, 97015-180, Santa Maria/RS.

Nelson Back – Nucleus of Integrated Product Development, Mechanical Engineering Department, Federal University of Santa Catarina, Campus Trindade, Florianópolis/SC.

Roberto de Oliveira – Civil Engineering Department, Federal University of Santa Catarina, Campus Trindade, Florianópolis/SC.