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The Building Design Process in the Context of Different Countries

Similarities and differences of professional practices

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Abstract: Despite the historical, economical and socio-cultural disparities between the realities of different countries, it is also possible to see several similarities all over their design processes and practices. Building design is a unique process that has the same remarkable basic characteristics in any Western Nation, such as the need for design to be split up into stages, the multidisciplinary character of the design decisions despite the low collaboration level between design specialties and the inherent conflict between the viewpoint from market-based inception and further construction-driven requirements. These common points taken into consideration, each particular national context can lead to a singular environment in which the building design practices are embedded. Some of the most relevant context issues involve the construction regulatory and standardisation systems, availability of handbooks and guides, corporative patterns of professional activities, costs of manpower and education concerns. The aim of this paper is to present a contribution to the analysis of the building design process that emphasises the similarities and differences of the main practices actually conducted in Europe and Brazil. Research methods included a comprehensive literature review, records from case studies and interviews carried out by the authors. As a result, a set of influencing factors is presented in the final section of the text.

Key words: Architectural management, design process, Brazil, Europe

1. INTRODUCTION

The design process of building projects has deserved relevant research work, which generally has been done within the particular context of given countries. Additionally, several publications have dealt with the perspective of globalising design activities, highlighting the critical issues concerning a comparison of different realities.

Nevertheless, very few works focused on the understanding of a structural group of factors influencing the design process, and capable of explaining how to analyse and justify those different national practices in the building sector.

In this paper, due to their personal backgrounds, the authors make the choice for a comparison of the similarities and differences of the main design practices actually conducted in Europe and Brazil. The choice, even if it can be regarded somehow as a preference, can be of interest because of the emerging importance of the developing countries in the world economy and consequent opportunities for building projects, which are already in progress.

1.1 Research method, statements and definitions

The first author of this paper is responsible for a research group on Building Design Management since 1994. Currently, the research group involves 15 people, from undergraduate students to PhD candidates that are carrying out three major research projects.

In Brazil, several case studies and interviews carried out between 2004 and 2009, involving designers and design managers were facilitated by means of a research-action program involving design and consultancy firms.

In Europe, and most specifically in France and united Kingdom, the first author was involved as guest researcher in specific periods of time in the past years. His impressions issued from the intensive contact with design professionals and consultants were taken into consideration to write the present work.

In this paper, statements and definitions were assumed as a basis for the description and analysis as follows. Notwithstanding the multinational perspective of the analysis, those assumptions run the risk of being somehow specific, as they seem to be useful to a clear comprehension of the text. Thus, the considered main statements and definitions are presented below:

Briefing – process of identifying and analysing the needs, aims and constraints (the resources and the context) of the client and the relevant parties, and of formulating any resulting problems that the designer is required to solve (BSI, 1995).

Client – the individual or organisations commissioning the building project and directly employing the designers, the design managers and the contractors (Gray and Hughes, 2001).

Designers – architects, consultants and all the professionals or offices of any specialty that are involved in the design process of a building project.

Design process – a series of iterative events undertaken by the design team to identify the nature of the problem, develop appropriate solutions and transfer the solution from the collective mind of design team to those able to realise the design in a physical form (Emmitt, 2007).

Design team – the group of designers who will work together to provide the concept, scheme and detailed design information (adapted from Gray and Hughes, 2001).

Design management – a single function that starts with the understanding of design as a process, identifying the needs of at least the three main interested players (the client, the contractor and the user) and goes through models and tools to improve the design quality, thus having a comprehensive view of design with the aim of ensuring that appropriate design information is delivered within the project schedule to meet those needs.

Design manager – the individual or organisation responsible for performing design management in a given building project.

Design for production – expression used to designate the specialties of design that integrate the design phase to the construction works; design for production is used in the building construction with a twofold objective of improving buildability since the early stages of design but also to give a detailed view of the tasks to be completed by work contractors of the main parts of the building – formwork, masonry and facade coverings being the most common specialties (Aquino and Melhado, 2002).

Standard agreements and contracts – recommended conditions and terms for hiring or contracting design and consultancy services; general guidance on British typical contracts can be found in JCT (2009).

2. THE ROLE AND CONTRIBUTION OF DESIGN MANAGERS

Conventionally, the development of a building project is clearly divided into stages. In this divided and sequential process, the possibility for collaboration between the various participants is rarely ideal and often fragmented. Changes to the design could easily result in significant rework and errors due to the complexity of co-ordinating and checking multi-authored information (Fabricio and Melhado, 2009).

Certainly the source of many of these troubles is related to management, which can have two complementary approaches: (1) the client aims and practices that are mandatory to design activities; (2) and the internal processes carried on in design firms.

Winch (2011) analyses several case studies and concludes that organisationally, architectural practices stand at a three-way intersection between the creative industries, professional services, and the construction industry.

The construction industry is increasingly competitive and this is a strong source of pressure on the design process. Otter and Emmitt (2008) explain that "as a result of the multidisciplinary aspects of architectural design, the growing number of participants and increasing legislation and governmental rules, the task complexity of the individual team members is increasing".

The general context would certainly lead to an increased search for design management knowledge and tools. But these needs are not really clearly perceived by every professional.

Rose (1987) establishes a clear understanding of their typical behaviour saying that "design professionals think of their work situations as unique" and, nevertheless, "design professionals are not unique in that they do have organisational systems".

Emmitt (1999) noted that "management is often perceived by architects as time-consuming... something that detracts from creativity and hinders rather than helps".

In their "unique world", designers often behave as very reactive to management; to some extent, but not clearly, these professionals are questioning the real need of management, even though that need is perceived in their own daily practice. Another kind of typical designer behaviour can be illustrated by the "self learned" management, represented by the adoption of inefficient rules and very bureaucratic controls.

The trouble probably comes from the characteristic conflict between specialist and managerial activity; generally design professionals have had years of specialist education (in architecture or engineering) but only days of management training. As stated by Rees and Porter (2001) "the specialist culture that exists in so many organisations is perhaps the biggest single obstacle to effective management".

From a somehow more positive view, Best (2006) affirms: the objective of design management is to familiarise managers with design and designers with management.

And if the design management may be influenced by the organization of the design team or the roles and responsibilities assigned to each designer, some of the difficulties faced by the design team are a result of deficiencies in the design management (Grilo, Melhado, Silva, Edwards and Hardcastle, 2007).

Clients are expected to choose either to have their own design managers or request that as a proved architects' competence. Some of them will also assign part of that responsibility to contractors, when the latter have an engineering contract. Yet only few clients have the appropriate criteria to make the right choice in each case; most of them are thinking of having more control and others of risk transfer.

On the whole, design management is a field that naturally evolves from an experience-based activity to a more structured and systematic approach. Most design professionals will need complementary continuous education to improve their management skills, even if some of them still resist doing it. The main trend now is that undergraduates are revealing a growing interest in

management and are fond of it, thus starting their careers more prepared; therefore, the scenario tends to change in a near future.

Concluding, design management has emerged as result of a real demand and intends to help either the general aims of the project or the internal processes of a designer. Design management comprises a series of tasks to be performed along the project stages, and design managers should (Melhado, 2005):

- assist the client to establish the project objectives and parameters to be addressed in the design development;
- advise the client to constitute a design team and define the scope of each design and consultancy specialties to be considered at each design stage;
- analyse the needs of information flow and define deadlines for various designers along the design stages in accordance with the main project schedule;
- foster communication among design team-mates, coordinate the interfaces between designers and ensure compatibility between the specialties concerning these interfaces;
- perform or co-ordinate the design review to ensure the quality of the design solutions adopted and their compliance with project needs;
- validate or request validation by the client of the end results of each design stage;
- integrate the project with the following phases such as procurement, pre-construction and construction.

3. DIFFERENT COUNTRIES, DIFFERENT PRACTICES

3.1 Context in Brazil – São Paulo

As Brazil is a continental country and still underdeveloped in social and economic aspects, there is a very wide range of practices adopted in the construction sector. With regard to the Brazilian building construction, São Paulo is the most important site with about 5.7 million square meters of new buildings built annually (Grilo, Melhado, Silva, Edwards and Hardcastle, 2007). Thus, due to the impossibility of having a single pattern of analysis, the authors took São Paulo as a reference to all the considerations made in this paper.

In São Paulo, since the 1990s, the entry of foreign organizations has exposed the technical and commercial weaknesses of local firms. In addition, the lack of mutual agreements to regulate the trade of building design services between countries has enhanced these limitations. Musa (1996) listed some relative weaknesses of local architectural offices as compared foreign firms, such as lack of responsiveness and flexibility, difficult relationships with technical designers and reduced involvement of clients in the decision-making process.

The construction industry experienced outstanding progress in the period between 2005 and 2008, and in spite of the slow-down effect from the recent global crisis, it is still growing and now attained the level of full employment. The fierce competition among construction companies in the Brazilian market due to the demand for housing and the opening of capital in the private sector provides an increase in the search for rationalized constructions methods.

The Brazilian construction sector has an insufficient background in terms of standards and recommended practices. The lack of reference for a technical scope of design services, as well as the lack of definition of the design contents delivered by the professionals, generates a distortion in hiring, stimulating competition by pricing without a clear relationship between the design price and its quality. This scenario leads to conflicts between design clients and designers during the process, in addition to allowing losses to the construction process and to the quality of the final product (Maneschi and Melhado, 2010).

Education and assessment of professional practices have some particularities in Brazil. As compared to the United Kingdom, for example, one of the most remarkable differences concerns the entry in the job market. Undergraduation, in Brazil, is the only real requirement to become a design professional, architect or engineer. Institutionally speaking, a National Council with local offices will be charged of surveying the practices. However, there is no systematic assessment for architects, engineers and other construction professionals; thus, clients' requirements for hiring and the strong market competition are the main barriers to the career.

In the field of building design, it is noticeable that designers' attributions and obligations are very poorly developed in the documents of reference. Every person with a higher degree is considered equally a "chartered" architect or engineer, according to the certification issued by the school or university. In Brazil, no specific exams and no previous practice are requested to be a designer; moreover, continuous education is not an obligation and professionals can spend their entire career without any renewal of knowledge.

In the last years, a joint effort by unions and professional associations established a reference for the building design process through the publication of several best practices design handbooks, which are available on-line at http://www.manuaisdeescopo.com.br. Very innovative in their format and presentation, these handbooks cover almost all the design specialties, including design management, and they are all based on the same basis of statements and definitions. In those handbooks, the ideal of professional recommended practices has its rebirth. All the published issues have considered designers' activities at the pre-construction and post-occupancy stages of the buildings. Those handbooks are intended to be an integral part of design agreements as a reference for client-designer relationship.

As recommended, but not obligatory practices, the design and design management practices described are distributed into the six design stages considered in the mentioned handbooks:

Stage A: Product Conception
Stage B: Product Definition
Stage C: Identification and Solution of Design Interfaces
Stage D: Design Detailing
Stage E: Post Design
Stage F: Post Occupancy

As the regulatory system has little control over professional exercise, designers' Brazilian associations have an essential role in the best practices diffusion. Architects, landscape designers, structural engineers, systems designers and other specialised categories of professionals have their own associations. In the field of Design Management, an initiative by some professionals and academics created the "Brazilian Association of Design Managers and Co-ordinators" (AGESC) in 2006.

In recent years, Brazilian designers have revealed a growing interest in management, despite typically acting in small-sized and low-organised firms, which have few resources to apply in management systems. The governmental pressures of federal quality programs and some big clients' requirements are forcing several design firms to seek management systems and methods. For this, in 2006, the University of São Paulo established a cooperation program with design firms to improve management through action-research methods (Souza, Oliveira and Melhado, 2007).

A relevant fact concerns the relationship between designers and the site construction. Maybe except for the structural engineer, almost all design specialties do not systematically visit the construction site but only under a very specific demand (e.g. design inconsistency that requires specification change).

For a large part of Brazilian architects, the commitment to visit worksites is not an obligation. Only aesthetical features really demand the architect's involvement. In the public sector, due to legal

restrictions concerning the involvement of designers with contractors, small and medium-sized projects can also be executed without the presence of the architect in the site.

Additionally, low manpower cost in Brazil still allows low-industrialised construction methods, thus leading to an intensive use of masonry and plastering that brings as a counterpart the need of extensive detailing in construction documents. This situation allowed the emergence of a new design professional that is specialised in the so-called design for production. The most requested specialty of design for production concerns the detailing of masonry walls for facade and partitions.

Therefore, amongst some private clients, as a response to the weaknesses of "traditional practices", there has been an increased demand for design for production, which is used as a tool for optimizing and rationalizing construction, due to the inherent design interface between partition walls and coverings, structure, services and all the other building systems (Maneschi and Melhado, 2010; Oliveira, Melhado and Maizia, 2008).

As stated by Melhado (1994), "to achieve success in a building project, design cannot be restricted to the geometric characterization in the role of the construction being built. The design must conceive, in addition to the product, its production process; (...) must assume the fundamental task of adding efficiency and quality to the product".

The design for production of facade and partition walls is not another detailed design. It is a constructive design, which aims to integrate the information about construction methods as from the building conception. Nowadays, in Brazil, due to its proximity to the construction experience and its interfaces with several other systems, such as the structure, plumbing, water supply, waste and electrical systems, finishing etc., design for production performs an important role in the current design process.

However, the majority of the practices above described are connected to private construction. Public building projects, e.g. housing construction, have not experimented significant evolution in their processes for decades. Thus, the best practices concerning a building construction design remain unclear for a considerable part of the professional community and often the performance of the overall project management is somehow below the expectation.

In a brief approach, the most relevant of the structural weaknesses in the Brazilian building design process in present practices are: insufficient and ambiguous briefing; lack of clear design agreements; poor planning and scheduling of the design process; very superficial work in the early stages leading to a huge effort in detailed design; lack of effective integration of design to construction; few site meetings involving designers; reduced feedback from post-occupancy.

3.2 Context in Europe

3.2.1 United Kingdom

The Royal Institute of British Architects (RIBA) was founded in 1834 and was granted its royal charter in 1837. No practitioner of architecture is obliged to join, although the substantial majority of architects practising in the United Kingdom are members. The title "architect" is protected by law. The Architects Act 1997 following earlier legislation dating back to the 1930s requires any person who practices architecture in the UK using the title "architect" to be registered at the Architects Registration Board (ARB).

Registered Architects have completed at least seven years of academic and practical training and only practitioners who have prescribed qualifications and experience can be registered by the ARB. While all architects in the UK must be registered at the ARB, not all of them are members of the RIBA. A fully-qualified RIBA member is considered a "Chartered Architect" (RIBA, 2008). The RIBA Code of Professional Conduct comprises three guiding principles relating to: integrity; competence; and relationships.

The RIBA Plan of Work (RIBA, 2007) comprises five "super" stages and the traditional "A to L" architect's design services that are commented below:

Preparation

- A – Appraisal – identification of client's needs and objectives, advice on feasibility, assessment of options and cost implications;
- B – Design Brief – prepared by or on behalf of the client, definition of procurement method, organisational structure and range of consultants and others to be engaged;

Design

- C – Concept – concept design including outline proposals for structural and building services systems and preliminary cost plan;
- D – Design Development – development of detailed design from approved concept, submit application for detailed planning permission;
- E – Technical Design – development of technical design(s) and specifications;

Pre-Construction

- F – Production Information – prepare information for tender purposes and further production information for construction purposes;
- G – Tender documentation – preparation of documentation in sufficient detail to enable a tender or tenders to be obtained;
- H – Tender Action – identification and evaluation of potential contractors;

Construction

- J – Mobilisation – issuing of information to the contractor;
- K – Construction to Practical Completion – provision to the contractor of further required information and review of information provided by contractors and specialists;

Use

- L – Post Practical Completion – final inspections, assisting user during initial occupation and review of project performance in use.

RIBA also published a series of handbooks such as the RIBA Architect's Handbook of Practice Management (Cox and Hamilton, 1998), being very helpful to architects in the practice of management tasks, such as information management, quality management, staff motivation and training, risk management and other important issues.

The title "Chartered Engineer" is also protected by civil law in the United Kingdom. The Engineering Council is the UK regulatory body for the engineering profession.

Under the action of British institutions, codes of ethics and rules of professional conduct associated with recommended practices constitute a controlled environment that provides construction projects with a minimum frame of standardised procedures and contents. Thus, given this regulation scenario, a more predictable design process can be expected, which can facilitate the design management work.

Every design activity is affected by several standards, from those concerning construction itself to the specific standards related to each design specialty. British Standards Institution (BSI) is the world first national standards body and provides complete guidance on a wide range of building and construction matters including materials, testing, health and safety and access. They are an essential reference for architects, developers, building owners, site managers, building contractors, structural engineers and quantity surveyors.

Yet control of costs deviation deserves a special consideration, since economic aspects are mandatory in all design decisions. In the United Kingdom, the quantity surveyors' role is of paramount importance to ensure good quality decisions of design management all over the design stages. Quantity surveyors are able to help clients in cost planning, value management, feasibility studies, cost benefit analysis, amongst other consultant activities. By using a published standard

method of measurement (SMM) as agreed to by the QS profession and representatives of the construction industry, these cost consulting professionals reduce the construction risk in such a competitive environment.

Although in other countries there are other professionals responsible for costs estimation and control, the institution of the QS profession is a typically British practice that deserves a special place in the construction scenario. While The Royal Institution of Chartered Surveyors (RICS) is related to the building sector, the Chartered Institution of Civil Engineering Surveyors (ICES) is the qualifying body in civil engineering; both institutions are concerned with the regulation, education and training of surveyors in the UK.

Another point concerns design to construction integration. While it is clear that the integration of design and construction is vital to project success, it is also a fundamental weakness in the British construction industry (Egan, 1998).

Construction documents present a relative low level of information, since conventionally work contractors and trade contractors are intended to play an essential role in detailing design.

Pre-contract meetings to ensure that the contractor and other members of the project team understand the requirements and check the information completeness of design details, as well as Site progress meetings, usually attended by the client's representative, the architect, structural engineers and other consultants, project manager, contractors and the clerk of works, shall be scheduled to be weekly, bi-weekly or monthly in order to control progress and resolve any problems on site (Emmitt and Gorse, 2003).

Despite all those references to guide the professional activities, the building sector continues to evolve and change. Gray; Hughes (2001) recognized changes in architects and engineers roles in the United Kingdom, such as: emergence of new professions; redefinition in the traditional roles; loss of architect authority to project managers and specialized consultants; designers became generalists with less control over details; multiple control of the whole design and construction process; complex and restrictive fee agreements; and a wide variety of sophisticated procurement techniques to integrate design and construction.

The interviews carried out in England with professionals and researchers confirm some criticism about actual practices. As stated by of the interviewees "RIBA Plan of Work is not used that often, although the principles tend to be upheld most of the time. Again a personal view, but I would suggest that it should be updated to more properly reflect the latest procurement practices, with an ever-increasing proportion of contractor designed elements".

According to Bibby (2003), "there is a need to educate an increasing number of people in design management techniques to equip them to manage today's fast moving and demanding projects". That author affirms that the improvement of design management in the UK building industry demands modification of current techniques to align them with the needs of the modern design manager.

3.2.2 France

In the French building sector, "maître d'ouvrage" and "maître d'œuvre" are traditional, strongly defined functions and have very important roles. There are several institutions in France that must be mentioned for their influence over this matter and among them the following: The "Ordre des Architectes", the "Syndicat National des Architectes" and the "Union de Syndicats Français d'Architectes" (UNSFA).

A "maître d'œuvre" is defined as "a person or entity which the client ("maître d'ouvrage") hires to coordinate the design team ("maîtrise d'œuvre") and to take control of project development, as well as monitoring and control of execution until the delivery of the works" (Melhado and Souza, 2000).

The project phases considered in France are:

- “Etudes d’esquisse” (Concept design);
- “Etudes d’avant-projet sommaire” (Provisional scheme design);
- “Etudes d’avant-projet définitif ” (Scheme design);
- “Etudes de projet” (Detailed design);
- “Dossier de consultation des enterprises” (Tender documentation);
- “Etudes d'exécution” (Pre-construction design);
- “Direction de l'exécution des contrats de travaux” (Technical direction of works);
- “Assistance aux opérations de reception” (Assistance to delivery);
- “Dossier des ouvrages executés” (Report of practical completion).

In France, case studies performed between 2000 and 2007 involving design firms and projects in Paris revealed the force of traditions and the limits of their adoption in current practices, as well as the efforts to improve results by means of management techniques.

Normally attributed to an architect, the role of “maître d'œuvre” includes not only the relation with the client but also the co-ordination of the design team and the interaction with contractors trough the direction de travaux (works technical direction). The “maître d'œuvre” has an important leadership function in public projects.

Although the role of a “maître d'œuvre” is related to all the stages of a building project, the so called “mission complete” (complete assignment) is not always chosen by clients (maîtres d’ouvrage).

The 1984 law about public projects (called the “MOP” law) emphasises and consolidates the cultural and aesthetic character of architects’ role. This law established the modalities of professional assignments and responsibilities in public projects, then making hiring architects for “complete assignment” compulsory, i.e., from the stage of preliminary design to site works direction. As a result, architects became the privileged project co-ordinators of public project teams. On the other hand, however, for French architects committed to private projects, typical contracts have been shortened and they provide that architects are entitled to intervene only until scheme design and project approval in 32% of cases (Melhado and Henry, 2000).

In recent years, French architects have been losing their economic weight and the size of architectural offices has been dramatically reduced. The typical number of professionals being 1-2 persons in each office, design and managerial tasks must be executed by the same individual and processes tend to be very informal. An exception are the cases of few large French architectural offices that established a network of specialised collaborators, and also of a few medium-sized architectural offices, which are involved in all project phases, managing the technical, financial and production aspects of construction.

As one of the most remarkable points of French construction, knowledge and assessment methods for construction standardisation are assured by institutions such as the “Centre Scientifique et Technique du Bâtiment” (CSTB).

High manpower cost and a strong system of construction standardisation allows for less detailed design plans but requires on site management. Typical building procurement leads to a big number of specialised contractors besides the main contractor, thus generating a lot of interface problems. In this scenario the pre-construction period and the involvement of designers during the whole construction phase are of paramount importance.

The improvement of the pre-construction stage is assured by methods of site preparation, consisting of a plan that comprises organised site meetings and collective decisions about design detailing and adjustment, changes to construction documents, prototyping and on site testing of critical assemblies and products (Souza, Melhado, Henry and Sabbatini, 2003).

Finally, in France, it is verified that in such an intensive and extensive manner, public projects have much more sophisticated management practices than private ones. Comparing housing projects

to private residential construction, for example, residential has simplified design practices and involves less management techniques.

4. THE INFLUENCING FACTORS

4.1 Discussion

According to Winch (2006), one of the required skills to the design activity is the ability to understand local regulations. The reasoning of Winch can be interpreted as an acknowledgement of the high degree of influence of building regulations over the design process.

Bibby, Austin and Bouchlaghem (2003) show the results of semi-structured interviews carried out within a UK construction company and conclude that the interviewees do not have a common perception of the activities undertaken during each project stage, thus stating that "if the activities that constitute design are not understood, it is not possible to manage design successfully". This can lead to another important influencing factor i.e. the importance of a reference in terms of design process patterns to perform the management.

Behind the clear establishment of how a designer or a design manager should carry out their specialised work processes lies the system of protection for the professions involved.

In Europe, clearly the attributions and obligations of designers (and all protected professions) can serve as a reference of how they are intended to do their jobs. Even if some are probably more skilled and can take some profit from their networking to have better contracts, for all professionals in the of building design field; the institutional guidance is somehow a warranty of a more predictable and reliable environment. That will also be considered an important factor for the aim of this paper.

The overall scenario is quite similar but can have some particularities in other European countries. Based on a survey among 110 Dutch architectural design firms, Klein and Volker (2010) state that, as compared to contractors, architectural design firms are relatively small (seven employees on average), generally have private clients and most of them seek for more control over construction processes and product quality. Several other papers stress the integration of design and construction as an important quality issue (Aquino and Melhado, 2002; Oliveira, Melhado and Maizia, 2008; Emmitt, 2007; Bibby, 2003) and that is surely another factor worth being analysed.

Along with it all, in these aforementioned developed countries, a remarkable characteristic concerns the manpower level of education, which is strongly associated to the cost of labour. The condition of better education for construction workers encourages dialogue among designers and workers, thereby positively impacting the quality and the rationalization of the building processes. Training must be provided to construction workers by continuous education.

It is not only the manpower that needs this continuous education. For all professionals, and particularly for designers and design managers, if their institutions provide a specific education program to ensure good opportunities so that they can be recognised as more prepared professionals, this all contributes for better performance in the design process.

In the discussion of how to achieve the effective collaboration in construction projects Shelbourn, Bouchlaghem, Anumba and Carrillo (2007) say that "it is recognised that good collaboration does not result from information technology solutions alone" and address "people" and "processes" as important issues to plan and implement collaborative working. From the conclusions of those authors and taking into account the high level of IT solutions dissemination all around the world, the technological factor is not included among the influencing factors considered in this paper.

Another important comment is related to environmental requirements and certification. Nowadays, all of the influences on sustainability issues are globalised and European models have been

applied to Brazilian building projects. Therefore, those concerns are similarly affecting the design process in all the countries analysed.

4.2 Outline of a proposal for comparing design practices

The choice of what should be considered in the analysis or not was arbitrary but it is still something intended to contribute to its main objective. It was based on the literature review, the advice of professionals interviewed and also on the experience of the authors hereof.

Case studies data and the impressions of interviewees were considered. Most design management professionals have some criticism against the traditional practices adopted in the building construction sector. Thus, their views of how limited the actual performance can be, have helped to establish a more realistic approach to the analysis.

In brief, the selected influencing factors can be listed as follows:

- Building regulations and standards;
- Design handbooks and guides as a reference for design management;
- Attributions and obligations of designers (and all protected professions);
- Integration of design and construction;
- Costs of labour and workers' education;
- Continuous education and training for designers and managers.

Yet, even though there are noticeable differences between Brazil and Europe concerning building standards, Brazil has recently adopted a national performance standard. It is hence important to highlight the fact that the new Brazilian standard on Building Performance for Housing, NBR 15575 - Parts 1-6 (ABNT, 2008), establishes the minimum performance required for the most relevant building elements throughout their life cycle and this standard is expected to change the design and construction of buildings in Brazil. Applicable since May 2010, this standard has potential to increase the responsibilities but also the importance of designers.

Concerning continuous education and training for designers and managers, a separate general comment takes place here. All over the studied countries, the concept of continuous education and training for building professionals as a whole is becoming a key factor to the career. Nevertheless, as education is a consequence of several factors and among them the other five factors aforementioned, each national context reflects the particular context of its regulatory system and the actual relevance of professional bodies. Thus, it is quite reasonable to justify that more developed countries that have also a long history of their building regulations and standards are the countries where professionals clearly recognize the value of technical knowledge, which must be continuously updated. Moreover, one remarkable effect of strong professional bodies is also the increase in value of skills improvement.

See Table 1 for a more comprehensive view of comments.

Table 1 – Analysis of factors influencing design process and its management: Brazil vs. Europe
Note: grey cells indicate non-applicable (n.a.) or insufficient analysis (i.a.)

Influencing factors	Phase: Briefing	Phase: Concept / Scheme design	Phase: Detailed design	Phase: Pre-construction design	Phase: Construction until completion
Building regulations and standards	**Brazil** –recent performance standards would revalue technical briefing **EU** – such as BS 7832:1995 (ISO 9699:1994) are very helpful	**Brazil** – building regulation submission and approval at the end of this stage **EU** – Application for detailed planning permission in UK	**Brazil** – there is no approval at this stage **EU** – design detailing must have submission and approval in the UK	n.a.	**Brazil** – mostly fire safety inspection for completion **EU** – practical completion involve the inspection of the architect according to JCT contracts
Design handbooks and guides as a reference for design management	**Brazil** – poorly developed; quite new design and management handbooks as a reference **EU** – comprehensive and in-depth literature from professional bodies	**Brazil** – influenced by clients' aims, practice does not meet recommended activities **EU** – good guidance for professionals and clearly stated practices	**Brazil** – insufficient background; lack of standard solutions; handbooks of *design for production* **EU** – standard solutions; simplified drawings	**Brazil** – few used but seeming to become a trend **EU** – traditional in certain types of contracts and increasing interest of architects	**Brazil** – recommendation of designers involvement but still out of practice **EU** – well defined role and responsibilities of designers
Attributions and obligations for designers and other professionals	**Brazil** – mostly informal and performed without a common fee reference **EU** – developed and formal; recognised as a specialised service; cost consultancy	**Brazil** – product driven outputs and low committed to cost estimate **EU** – clear commitment to cost is an obligation	**Brazil** – mostly, design management starts here and does not advise on procurement **EU** – involvement of architects and DM in the construction procurement	**Brazil** – weak but recommended and leading practices would change it **EU** – important role of trade contractors; shop drawings	**Brazil** – no contractual obligation of designers regarding completion **EU** – designers' involvement with construction completion
Integration of design and construction	i.a.	**Brazil** – adoption of the cheapest system capable of assuring construction delays **EU** – concerns on productivity	**Brazil** – in private projects, the anticipated integration adds value; the contrary in public projects **EU** – public projects have leading practices	**Brazil** – in the private sector, increasing role of contractors in design decisions **EU** – involvement since procurement to design improvement	**Brazil** – frequent design changes; most of designers do not visit sites **EU** – more co-operative work and clearer responsibility of designers
Costs of labour and workers' education	i.a.	**Brazil** – prevalence of traditional construction systems and non-industrialised methods **EU** – technical choices based on productivity	**Brazil** – adoption of a large number of different solutions and mostly craft-made techniques **EU** – an sufficient number of standardised solutions	**Brazil** – education level of workers limits interaction on site **EU** – more usual to have interaction and decision sharing on site	**Brazil** – cheaper human work, less equipment; exception to some fast-track and prefabricated construction **EU** – influenced by weather and manpower cost: intense equipment use

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