

## Chapter 6

# COLLABORATIVE ARCHITECTURAL DESIGN MANAGEMENT

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### Introduction

A building project goes through a long process from project conception to realisation, handover, and operation, and involves a large number of people and organisations. As a project becomes more complex, more teams of specialists are required to combine their effort with considerable enthusiasm and commitment to work collaboratively towards achieving the project goals. Each team or individual participating in the project has its own agenda, goals and aspirations, which may not be congruent with the project goals (Walter, 2002). Design, too, has increasingly become a complex collaborative process that needs to be carefully managed, since many people from different organisations and with different roles and multidisciplinary expertise are involved. Collaborative design process is comprehensive, as it comprises many interdependent issues and factors which cannot be isolated to be understood separately. The intervention of design management is expected since the early phase of design because the conceptual design phase has become more and more complex and collaborative design in this phase has become a real necessity.

Architectural design management, both in theory and practice, has made attempts to respond to these needs, but the knowledge field still needs to develop further. As stated by Allinson (1997), many people in the building industry still perceive that design and management are two poles apart. Designing is an iterative and creative process, which is often thought to be a black box containing problem-finding and problem-solving processes. Architects are typically thought to enjoy a tolerance for ambiguity that is an antipathy to what people often perceived as management: a rigid project planning and its anxious pursuit of certainties and predefined outcomes. In order to progress with design management, a common between design and management is needed, on which the complementarities of the architects' and managers' competencies can be optimally deployed for achieving excellent project results and innovations. This has to start with a thorough understanding of architectural values and the dynamics of value creation, and follows by a rethinking of management as well as design processes.

This chapter focuses on collaborative design and aims to contribute to the attempt to better understand architectural design management in this context. Architectural design management will be addressed in short as design management further in this chapter. This chapter presents an overview of the pertinent approaches of architectural design management in this context and the trends in the building industry as a part of defining the strategies for design management research and education that can respond to present and future needs.

## Overview of pertinent approaches of design management

The growing complexity of architectural design and the growing number of design partners involved with special needs lead to the emergence of design management. Recently a series of authors addressed this subject, amongst which: Nicholson (1992), Gray et.al. (2001), Allinson (1997), Emmitt (1999), Boyle (2003), and Tzortzopoulos & Cooper (2007). Some other reasons of the emergence of design management as a field of study are the growing awareness of design as a prime mover behind value creation (see for instance Egan (2002), Gray & Prins (2002), and Macmillan (2004)), and the growing emergence of collaborative designing (see for instance Spence et.al. (2001), Otter (2005), and Sebastian (2007)).

Design management can be formalised as a function in the project team or as a participative role in the design process. According to the project setting, scale, complexity and organisation, design management can operate informally or more formally. Prins et al (2001) give the example how design management can operate more formally. At a higher scale in the project, design management can be understood to encompass management activities in the design phase of a building project. This means that design management is a part of project management. At a lower scale, design management can be defined as the management function of design processes, which corresponds to the traditional coordination responsibilities of the architect.

Otter & Prins (2002), Doorn (2004), and Sebastian (2007) categorised design management approaches by focusing on the design actors (people), design processes, and design products. In practice, these distinctions can be clearly seen in the context of design organisations and design projects. Design management in design organisations (mainly focussing on people and processes) can be recognised through the approaches for managing business strategies and working processes within an architectural firm, and the inter-organisational relationships between the architectural firm, the client and other stakeholders. Design management in design projects (mainly focussing on processes and products) can be recognised through the approaches for managing the architectural quality, design tasks and information, and creative teamwork in design.

### *Design management in design organisations*

Managing the business strategies of an architectural firm usually begins by deciding on the types of services and project (see for instance Gutman (1988), Guff (1991), Littlefield (2005)). There are architectural firms which provide broad multidisciplinary services, ranging from conducting feasibility study until elaborating detailed design and supervising the building process. There are also firms which choose to concentrate on conceptual and preliminary design. The business strategies also indicate the involvement of an architectural firm in certain types of project. Some firms are specialised in one or more sectors, such as residential, commercial, or utility building sectors. Within each sector, there are different preferences for the types of building and the types of collaboration with clients and partnering with other architectural firms. In this context, design management carries an important role concerning corporate identity and marketing.

Within the context of design organisations, design management might be recognised through its role as the design office manager. Managing collaborative working processes in an architectural firm deals with the 'production line' through which the client order is acquired, the work is assigned to the project teams, the budget and task division is organised, and the results are delivered to the client. Prins et.al. (2001) and Doorn (2004) demonstrated how the internal management of an architectural firm should accommodate the architects' necessity of freedom and autonomy. For this reason, a horizontal and relatively flexible organisational structure is often chosen, referring to the concept of operational adhocracy by Mintzberg (1979).

The responsibilities of a design office manager extend to establishing the contractual relationships with the other parties. This applies to design briefing and design contract management, which includes the discussions of the professional codes of practice governed by the (local) architect

association, the contractual and procurement types, and the legal terms related to the assignment of an architectural firm. In one of the recent studies on these issues, London (2002) studied the application of stakeholder analysis to the development of a design management model for performance-based briefing.

### *Design management in design projects*

Managing architectural value (quality) generally has a main focus on the design products. In this context, design management aims to assure that design products (the buildings) are able to meet the cultural, aesthetic, functional, economical, and technical requirements. In relation to aesthetic quality, design management evaluates the spatial and architectural harmony of a building and its urban environment before a building permit can be issued. In the Netherlands this is an example of the role of an architectural supervisor in case of large-scale building and urban projects (Talstra, 2003). Design management also contributes in defining the quality criteria and translating these into the design brief and programme (see for instance Austin (2005), Macmillan (2006)).

Managing design tasks and information is perhaps the most widely studied and practised design management approach. This can be further distinguished in design-methodological and engineering-instrumental approaches.

The design-methodological approach attempts to manage the design process by rules and methods to transparently structure and optimise the designers' working processes. There are different views on the methodology of the design process. Amongst the most popular is the view of Lawson (1994), which states that the design process is generally held to consist of a problem being stated, then analysed; a solution being synthesised and evaluated; and followed by a process of communication. This view of design as a sequence of assimilation, analysis, synthesis, evaluation, and communication is also supported by the Royal Institute of British Architects (RIBA) in its stage-model of design practice (*The Architect's Plan of Work*).

The engineering instrumental approach considers a design process mainly as a rational problem-solving mechanism within a technical complex system that includes inter-dependent subsystems. The engineering instrumental approach employs the systems thinking introduced by Simon (1960) to take out the parts, which can be well defined, and solve them separately. This approach has three dimensions: programming facilities, constructional issues, and inter-agency coordination (Gray et al, 2001). Various planning techniques and ICT tools have been developed, among others ADePT (Austin et al, 2000), to map different design activities by different people, analyse the interdependencies between these activities, and generate proactive scheduling. Some of these tools have been applied in practice (mostly still at experimental stage) to coordinate workflow and information flow.

### **Managing collaborative design in multi-architect projects**

Managing multi-architect teamwork is needed in a building project where multiple designers from different organisations work together to design a building complex. In some recent projects, many high-profile design teams have emerged to take on large and complex public projects. Architecture firms are collaborating to create new design models, in project and in practice (Yang, 2004). Such projects can be called multi-architect projects. Sebastian (2007) looked into collaborative design during the conceptual design phase of multi-architect projects, and then proposed a concept for managing creative teamwork in design. This after analysing several case studies in the Netherlands, namely: De Resident in The Hague, New City Centre in Almere, Eastern Dock Island and Mahler 4 in Amsterdam; and in USA, namely the design competition for Ground Zero / New World Trade Centre in New York.

Collaborative design is a process in which actors from different disciplines share their knowledge about both the design process and the design content (Kleinsmann, 2006). Designing is a social process that requires trust, sharing of ideas, trade-offs and consensus (Bucciarelli, 2003). In his research, Sebastian (2007) found that design management needed to become the catalyst and facilitator of social processes in teamwork. In creative teamwork, one's cognitive process is influenced and enhanced by other members of the team. With reference to theories in social-psychology, Sebastian (2007) presented a conceptual model of creative teamwork in design. From the perspective of human-centred design, Badke-Schaub (2004) and Frankenberger et al. (1998) defined three interrelated groups of factors which influenced the design process and its results, namely: the individual factors (e.g. style of problem solving, open-mindedness, knowledge, and experience), the group factors (e.g. style of communication, cohesiveness, hierarchy, and group climate), and the external conditions (e.g. management style, company situation, and restrictions). Similarly, Buchanan (2001) presented 'interaction design' that focuses on how human beings relate to other human beings through the mediating influence of products. Here, products are not only physical objects, but also experiences, activities or services. In line with this, Bucciarelli (2003) wrote that design comprised a balance of the analysis of situation and the creation of design artefacts, and the purposes and roles in social circumstances.

Sebastian's (2007) conceptual model (Figure 1) represents the collaborative process in which designers, working in real project circumstances, are engaged in the creation of design through dynamic cognitive processes, and at the same time, in social interaction in which group behaviour and social environment play an important role to achieve the desired synergy effect. The cognitive-frame comprises problem framing and problem solving processes using methods of enlarging and limiting the search area. It involves the analysis of the situation and the creation of a solution. It implies the analytical and synthesising ability of the design actors, including human perception and insight. The social-frame comprises cooperative behaviour, which might take account of the relationship between conscious and unconscious aspects of behaviour in the design team. It involves the purposes and roles in social circumstances. It implies group leadership integrity and the ability of the design actors to interact with each other. The project-frame comprises actual project goals, constraints, operations, and targeted results. It involves the awareness of project resources, challenges, and circumstances. It implies multidisciplinary and multilevel linkages in the project process.

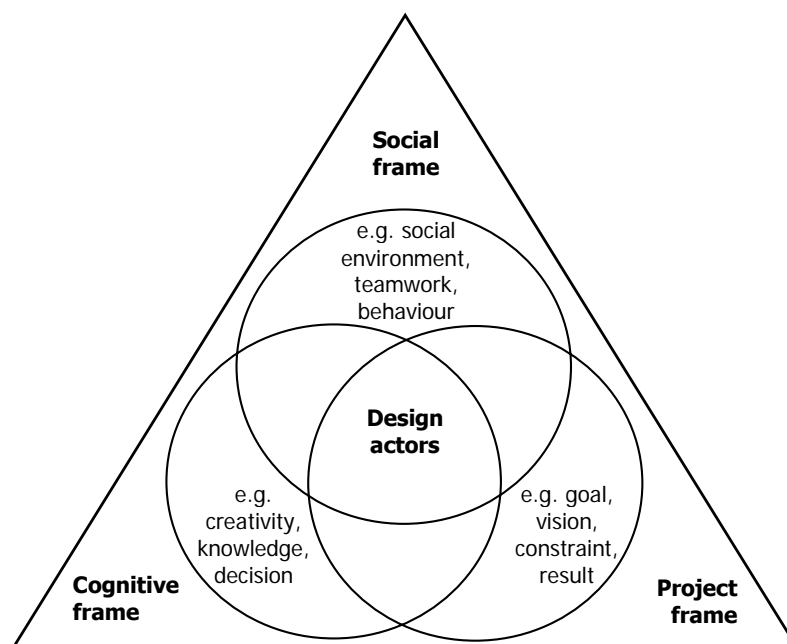


Figure 1. A conceptual model of creative teamwork in design (Sebastian, 2007)

The cognitive, social, and project frames as shown in the conceptual model do not pre-exist and cannot be standardised. Hence, managing creative teamwork means creating, shaping and customising these frames to apply in different projects and to different design actors and organisations. In other words, design management is to be carried out by designing these frames. This concept is introduced as ‘managing by designing’ (Sebastian et al, 2003). Here, designing is not merely understood as an artistic activity associated with drawings and models. Design is seen much wider than creating forms and spaces. Design can be about anything: organisations, processes, communications, policies, etc. (Peters, 2005). This model still needs to be further validated in practice.

### **Trends in the building industry and future challenges for design management**

If the building industry wants to innovate, now seems to be the right moment. Major clients around the globe are looking to implement new procurement methods; construction companies are seeking opportunities to increase their market competitiveness by providing new services through new business models and supply-chain; end-users have more and more significant roles and influence in the building process; new manufacturing technologies are developed for wide-scale implementation; and sustainability is on the top agenda of every sector, including building. As a consequence the roles of different parties in the building supply-chain are changing and new collaborative processes are emerging. The role of the architect and the design process are also changing. Based on observation of actual trends in practice, several developments with regards to the building process that will affect the design process in the future are described in this chapter, namely: steering on value in integrated procurement, open building manufacturing, and the dynamics of life-cycle management. A brief analysis over these developments will give an indication how design management can anticipate the future challenges and contribute to the process innovation in the building industry.

#### *Managing value in integrated procurement*

In many countries, there has been a shift from traditional procurement, in which the client establishes a contract with each of the parties in the supply chain, towards integrated procurement, in which the client establishes a contract with a contractor that is responsible for the whole or most of the work. Integrated procurement is assumed to encourage the transition to a more competitive, innovative and creative construction industry.

One of the innovative aspects of integrated procurement is the opportunity to benefit from the innovative and creative power of the contractor as the client assigns the work based on an open-solution program of requirements as for instance in case of performance based briefing (Ang & Prins, 2002). The client is supposed only to describe his/her problem and develop a functional program of requirements for the project; leaving sufficient room to the contractor for finding an innovative solution. During tendering, a contractor is to be selected based on the value created for the project instead of solely on the lowest price offered. During the execution of the work, which is usually based on a longer-term contractual relationship extending from design to construction and maintenance, the contractor will be evaluated and rewarded according to the value delivered from the project instead of following detailed specifications of work items written by the client. This is known as management on value in integrated procurement (Sebastian et al, 2007).

The transition from traditional to integrated procurement, establishing open-solution programme of requirements and the value-oriented measures and criteria, and management on value require a shift of mindset of the parties on both the demand and supply sides. It is essential for the client and contractor to have a fair and open collaboration in which both can optimally use their competencies. The success of the collaboration is also determined by the client’s capacity and strategy to organize innovative procurement procedures.

Furthermore, integrated procurement also pictures a new contractual relationship between the parties involved in a building project. Instead of a relationship between the client and architect (for design) and client and contractor (for construction), in an integrated procurement the client only holds a contractual relationship with a main contractor which is responsible for both design and construction (Joint Contracts Tribunal, 2007). The traditional borders between tasks and occupational groups become blurred since architects, consulting firms, contractors, subcontractors, and suppliers are all standing on the supply side in the building process while the client on the demand side.

Such configuration of the design team puts the architect in a very different position that influences not only his role but also his responsibilities and tasks and communication with the client, the users, the team and other stakeholders. A new challenge for design management emerges in case of positioning an architect in partnering with the contractor or with the client. In case of the partnering between the architect and the contractor, design management can be of help in ensuring that architectural values as well as innovative engineering and construction processes are realised. Design management at the client's side can become a strategic advisory function for translating client's requirements and wishes into architectural values in the design specification, and evaluating the contractor's proposal against this. According to Saxon (2005), this design management task might be fulfilled by architects with the responsibilities as stakeholder interest facilitator, custodian of customer value and custodian of design models.

### *Open building manufacturing*

Industrialisation has been considered as an important way forward in building and construction. One of the major research projects being undertaken in Europe is the open building manufacturing (ManuBuild). Open building manufacturing relies on lean design and construction processes. Buildings are to be designed, produced, and delivered according to systematic, repeatable, well-structured and well-registered procedures which allow effective control and value optimisation (Eichert et al, 2007). The project has the ambition to re-engineer the construction process towards a manufacturing process, integrating the entire supply and value chain.

As has been stated earlier in this chapter, architectural design often involves incremental refinements, as problem-framing and problem-finding in a continuing process along with problem-solving. Many design methods cannot be made fully explicit and structured. In addition to this, a certain amount of waiting is indeed often necessary in the design process. Alvar Aalto once described how he regularly tried to forget an ongoing project for a while in order to let it mature. Is Aalto's maturing process to be considered wasteful or conversely as adding value? (Engstrom, 2007). Design management can investigate how to solve what seems to be a dichotomy of artistic-creative and rational-efficient design strategies by learning from the experiences from, for instance, industrial design, the automotive industry and naval architecture. This will contribute to the answer the question of how the iterative and creative design process can be embedded in the efficient and lean design approach for open building manufacturing. Furthermore, perhaps new architectural typologies will result from the integration of the traditional creative process and lean design approach. Design management might help architects to take into account the compatibility of dimensions, components, and technology platforms in order to effectively, efficiently and economically engineer, manufacture and realise the design.

### *The dynamics of life-cycle management*

In most building projects, initial investments and construction costs are the most important considerations in design, tendering and contracting. A well-known problem if the whole life-cycle of the building is not taken into account in the beginning is that the client may be confronted with more effort and higher costs to maintain the quality and functional operation of the building. For long Life-Cycle Cost Analysis (LCCA) has emerged as a method to estimate the total cost of facility ownership (see for instance Stone (1975), Dell'Isola & Kirk (1981), Brandon et.al. (1987), and Flanagan (1989)). It takes into account all costs of acquiring, owning, and disposing of a building or building system. Its

purpose when used during the design phase is to estimate the overall costs of project alternatives and to select the design that ensures the facility which will provide the lowest overall cost of ownership consistent with its quality and function (Fuller, 2006).

However, LCCA also has shortcomings. By focusing only on minimizing costs over the life-cycle of a building, it does not automatically assure the optimal value for the users and owners during the building life-cycle, which might be difficult to measure. Moreover, life-cycle costs should not be considered static as there are possible changes in the building during its life-cycle which affects the costs (Tempelmans Plat, 1991; Prins, 1992).

In order to advance beyond this, people have begun to seriously consider the dynamics of life-cycle management as there is a shift from focusing only on minimizing the costs to focusing on maximizing the total benefit that can be gained from the project. One of the determining factors for a successful implementation of dynamic life-cycle management is that of the sustainable design of the building and building components, which means that the design has the required degree of flexibility to accommodate possible changes in the long term (Prins, 1992). Architects need to be well-informed about the usage scenarios and related financial arrangements, the changing social and physical environments, and new technologies. Design needs to integrate people activities and business strategies over time. In this context, design management may be needed to help architects to align the design strategies with the organisational, local and global policies on finance, business operations, health and safety, environment, etc.

#### *ICT developments*

One of the key disciplines to be considered influencing design management is ICT, knowing that the development of architectural practice in collaborative processes can no longer be separated from the developments in computer-aided design, planning, coordination and communication. Especially state-of-the-art ICT instruments, such as groupware facilities in form of project websites, Industry Foundation Classes (IFC) and Building Information Modelling (BIM). All of these developments are targeting at the sharing of coherent design, construction and building information, generated and maintained throughout the life cycle of a building, for time and place independent collaborative working that need to be managed properly. BIM in its ultimate form provides the potential for a virtual information model to be handed from design team (architects, surveyors, consulting engineers, and others) to contractor and subcontractors and then to the client. For example, the American Institute of Architects has foreseen the wide application of BIM in the future as a part of regional, national, and international standards for integrated project delivery (AIA, 2007).

#### **Concluding remarks and discussions**

The management of architectural design processes is traditionally an indefinite and vaguely formulated responsibility of the architect. Only recently design management is developing into a better-understood discipline both as a field of knowledge and as a practical managerial approach. The emergence of complex collaborative design processes, like in the so called multi-architect projects, requires further development of the domain.

This chapter has reviewed several approaches of design management, which can be recognised in design organisations and in projects. In design organisations, design management is engaged with corporate identity and marketing, design office management, and contractual management of assignments and alliances. In design projects, design management can take the role and responsibility as the supervisor of the architectural quality, coordinator of design working processes, and facilitator of design teamwork.

A conclusion can be drawn that the current approaches of design management are mainly formal-rational. Most approaches attempt to manage the processes in the design organisations and projects by

applying decision-making and operational protocols, systematic planning and communication techniques, and 'objective' measures on architectural quality. In case of collaborative designing, there is still lack of attention on managing creative teamwork of the design actors. In managing collaborative design, an informal-interpersonal approach is essential as design is a social process which somehow relies on trust, shared understanding, cross learning, commitment, enthusiasm, emotion, and fun during teamwork.

This chapter has also identified some challenges and opportunities for design management to fulfil different functions in response to the trends in the building industry in which collaborative processes are changing, design process is taking new forms, and designers are engaging new roles. Design management might be needed to help architects in taking new roles according to the new design strategies for integrated procurement and open building manufacturing. Design management might also assist the architects to collaborate with experts from different disciplines and stakeholders in the building process, for instance in an attempt to comprehend the present and future end-user needs, markets and technologies, which is necessary to design a building according to life-cycle management strategies.

It can be concluded that design management research is timely and important, especially in the context of collaborative processes. Since architectural design can be seen as a social process involving architects and designers from different disciplines, as well as the stakeholders and users which participate directly or indirectly, in design management research needs to combine knowledge from both technical and social sciences. Design management research may also need to establish a scientific underpinning for design management on the common ground between design and management before it defines a coherent strategy which can then be adapted in different situations in practice.

In education, design management should give adequate attention on the fact that architectural design requires specific adaptations of management methods, tools and techniques. The awareness not to bluntly adopt existing managerial thinking to architecture is a prerequisite for design management to be effective. Furthermore, design management education should give an opportunity for the students to develop their managerial and interpersonal skills, next to their formal knowledge. In case of managing collaborative design, both adequate knowledge of design and management and good interpersonal skills are important. Managing collaborative design can be exercised as a participative role in designing, which may be detached from a formal title or function in the project organisation. In this capacity, a design manager will act more as a peer rather than as a superior leader, and provide consultations to the design actors.

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