Go to contents 09

3 x 2 Approaches to Design Management

KOUTAMANIS, Alexander
Faculty of Architecture, Delft University of Technology, The Netherlands
http://www.bk.tudelft.nl/informatica/koutamanis http://caad.bk.tudelft.nl/koutamanis
a.koutamanis@bk.tudelft.nl

Following the arguably successful introduction of building, project and real estate management to traditional architectural areas, design management is emerging as the new hot issue. One of the main arguments for it is the alleged low performance of the architect in the face of the technical complexity and operational intricacy that characterizes current design problems. In this respect, management is seen as the missing link in the architect's methodical and operational framework. The paper suggests that this link derives more from the constraints of the domain and its subject matter rather than a management perspective. Design management refers to two main dimensions of architectural design, these of design method and of design subject. With respect to the first dimension we distinguish between three main categories: proscriptive, prescriptive and descriptive approaches. In the second dimension the distinction is between the coordination of the design process and that of the design product. The 3x2 matrix defined by these two dimensions stresses the significance of descriptive approaches for the informatization of the representation and communication of the design product. In this framework design information management emerges as an applied area of (computational) design theory that facilitates the amphidrome development of a design, i.e. not only from brief to post-occupancy but also from detail, case and precedent to design idea and solution, as well as the identification and management of critical moments, i.e. moments characterized by convergence of activities and hence extensive and intensive communication.
Keywords: *Method; management; descriptive; informatization*

Introduction

The term "information technology revolution" is a succinct but apt characterization of recent and ongoing processes that are altering most facets of human life and culture. Nevertheless, the emphasis on information and technology obscures the social and economic changes that relate to this revolution either as causes or as effects (Castells, 1996). The informatization of professional activities is not merely a matter of computerization. Its emphasis on coordination, rationalization and efficiency points out to a wider necessity or desire for drastic change. Architecture has been experiencing the effects of informatization mostly in terms of automation of design technologies and through the introduction of management practices. The latter have already been applied to areas where interaction between the architect and other parties has been identified as a factor of poor overall performance. Building, project and real estate management have already been infused with new ideas, approaches and techniques. These have arguably been instrumental for improving performance in the production and management of the built environment.

Following this successful introduction of management to architecture, it is logical that design management is emerging as the new application area, being the last traditional architectural domain to have so far escaped rationalization and modernization. One of the main arguments for design management is the alleged low design performance of the architect. This is attributed largely to the increasing complexity that characterizes the built environment and its design. Such complexity and its pace results into conceptual, technical and operational problems that cannot be resolved by conventional architectural practices (Colquhoun, 1981). CAAD has attempted to provide an answer by a rational, analytical introduction of not only technology but also methods that aimed at improving most facets of designing, from design generation to communication (Mitchell, 1990; Schmitt, 1993).

However, with the democratization of information and communication technologies external factors have become too powerful for CAAD to have a profound influence on architectural theory and practice. Arbitrary technology transfer and loose analogical justifications are proving more popular than reasoning on the basis of computational domain systems, despite the inherent dangers of comparisons between architecture and other areas (Collins, 1965). Consequently, management is considered by many to be the missing link in the architect's methodical and operational framework. It is proposed that the transfer of management concepts to architectural design and the remodeling of the design process in accordance with general principles that underlie the procedures of other disciplines can provide the much-needed improvement of design performance and, though this, of the quality of the built environment.

Design management and design method

The present paper presents a dissenting view in that it proposes that any approach to design management derives primarily from the constraints of the architectural domain and its subject matter rather than from a management perspective. While management concepts appear to be a necessary addition to areas where architectural performance has already been secondary, such as construction (Warszawski, 1990), we argue that the cognitive and social processes of designing should be augmented by (mostly computational) analytical means. These support the exploration and understanding of the nature and structure of the design process rather than aim at short-term efficiency increases. This view contrasts sharply with deterministic models that serve as background to simple, straightforward formalization and automation of designing. The fundamental difference is that the view proposed in this paper is rooted in education and research and assumes therefore that the first step in design management is a better understanding of what designing entails and how it could be coordinated. From this perspective, design management addresses the two main dimensions of architectural design, these of design method and of design subject.

Method

With respect to method we distinguish between three basic categories:

1. Proscriptive approaches: these characterize the core of architectural practice, from architectural styles to the bulk of building codes and regulations. In a sense, proscriptive approaches refer to the origins of current architecture and the (ultimately arbitrary) formal systems that determined the design of the built environment on the basis of orthodoxy. By accepting the commandments of a system, which are usually expressed not only as norms and rules but also through positive and negative examples, the designer can determine explicit or, more probably, implicit solution spaces and position his actions and results with respect to these. The acceptability of a design can be determined by the inclusion of recommended or required elements and the

exclusion of prohibited ones (Summerson, 1980). Proscriptive approaches are therefore appropriate for systems such as architectural styles (e.g. classicism, modernism), which are defined by prototype, precedent and canon. Similarly, building norms, rules and regulations that aim not at a design's form but its behaviour and performance, define acceptability by means of design features (characteristics and relationships) that can be easily detected, measured and evaluated.

2. Prescriptive approaches: these underlie most computational attempts and represent in effect a reversal of proscriptive systems. Rather than defining solution spaces, prescriptive approaches attempt to guide the design process in an algorithmic fashion. Designing is segmented into distinct stages and steps that form generally deterministic sequences of known states. By means of reductionism and determinism prescriptive systems purport to reduce complexity and uncertainty and thereby guarantee adequate design performance. Such systems advocate orthopraxy, i.e. a 'correct' way of handling situations by taking the prescribed 'correct' steps in established 'correct' frameworks. Prescriptive approaches can be viewed as a twentieth-century reaction to the limitations of proscriptive ones, especially following the relaxation effected by eclecticism. The results of this reaction are design approaches that are determined by a 'method', i.e. a formal interpretation, usually in a computational direction (Eastman, 1975). Prescriptive approaches have also transformed building rules and regulations, especially where procedural aspects are concerned. Such aspects are frequently formulated as stereotypes that provide predictability and hence design guidance.
3. Descriptive approaches: these focus on the representation of design problems and products with accuracy, precision and completeness that vary with the design stage, aspect or level of abstraction. While proscriptive and prescriptive approaches consider the complexity of real design problems and situations a problem and substitute it with simple rules, norms and local procedures, descriptive approaches acknowledge and attempt to register and process this complexity. In what might appear as an almost total negation of method, descriptive approaches make the designer central to the resolution of design problems and facilitate his activities by providing the necessary information in a relevant and responsive manner. This contrasts with the dominance of the system or method over the designer in proscriptive and prescriptive approaches. Descriptive approaches form therefore a reaction to the limitations of proscriptive and prescriptive ones, especially in the framework of the ongoing informatization of professional activities. For example, rather than implementing established, outdated rules of thumb (Maver, 1987), descriptive analysis employs advanced simulation technologies in order to produce projections of behaviour and performance for use by the designer and other decision-takers (Hartog and Koutamanis, 2000; Hartog, Koutamanis and Luscuere, 1998). Concepts like representation, analysis, information and abstraction are central to descriptive approaches. It is worth noting that precedents, originally a proscriptive device, are also heavily used in descriptive approaches. The difference lies in that descriptive precedents operate not as implementations of prototypes but as in the sense of case-based reasoning and as carriers of fuzzy typologic structures.

Subject

The second dimension distinguishes between the coordination of:

- The design process (syntagmatic aspects): this is approached either holistically or segmented in discrete procedures. One aspect common to most available models of the design process is the

emphasis on dynamic issues such as transformations, transactions and transitions largely irrespective of the declarative side (input and output).

- The design product (paradigmatic aspects): similarly to the design process, the products of designing (decisions, policies, specifications of form and of activities in the built environment) are considered either continuously or with respect to (preferably correlated) distinct aspects and abstraction levels. These correspond to different design stages and the parties involved in these stages.

The distinction between process and product may seem academic but one should not underestimate its analytical and explanatory power. The separation of input, output, transformation and transaction is instrumental for the identification of weaknesses, conflicts, incompleteness, inconsistency and other factors influencing operation and performance (Van Sommers, 1984). Moreover, the correlation of procedural and declarative factors provides a comprehensive and coherent map of distinct events and actions that goes beyond current interpretations of designing in terms of stages and aspects. This has beneficial effects on e.g. feedback, as it permits higher transparency and specificity in the propagation of constraints and hence better control by the designer by means of fuller understanding of different types of relations.

Towards a typology of approaches

Table 1 summarizes the relation between the two dimensions addressed by design management, i.e. the three categories of methodical approaches and the distinction between design product and process in a 3x2 matrix. It illustrates that, while proscriptive approaches place more emphasis on the product, the reverse is true for prescriptive ones. Descriptive approaches are also more concerned with the design product but in a different way: the representations used for the precise and accurate registration of a design also facilitate the actions and activities of designing by means of flexible information processing. The issues of abstraction, continuity and communication and the diptychs of background / foreground (focus of attention) are central to descriptive information processing, as they support recognition of scope and relevance feedback.

The 3x2 matrix also stresses the significance of the descriptive approach for the informatization of the representation and communication of the design product. Proscriptive and, to a lesser extent, prescriptive techniques are widely employed in practice and by virtue of their simplicity have become almost self-evident. For example, even though Blondel's formula for the calculation of step sizes has long been known to be severely limited if not plainly erroneous, it still remains the basis of practically every stair norm in the world (Templer, 1992). Simulation of human movement on stairs provides a wealth of

Table 1. The 3x2 matrix

	Product	*Process*
Proscriptive	*Suitability*	*Stereotypical*
	Finite collection	*Effectiveness*
	Prototypes	*Less attention*
Prescriptive	*Stereotypes*	*Algorithmic*
	Limited number of states	*Normative*
	Less attention	*Guidance*
Descriptive	*Analytical*	*Background / foreground*
	Explicit	*Abstraction / specificity*
	Transparent	*Continuity / communication*

information and helps identify critical conditions and relationships (Koutamanis and Mitossi, 1996; Mitossi and Koutamanis, 1996). These can be expressed in e.g. a features vector that facilitates evaluation of stair designs by matching subsequent designs simulations to the appropriate criteria. The vector can have a variable composition and significance, depending on the type of the stairs and the users. This allows for the expression of kinetic differences between children and adults, short and long persons, etc. in the analysis of a design. In this setting, an alternative formulaic expression that can generate stair designs such as Blondel's formula is ultimately not desired, as it would impede creativity and innovation without providing the accurate and precise performance measures required for design management, control and guidance.

The significance of informatization for the implementation and management of professional activities and its potential for the modernization of the largely outdated technologies of the building industry suggest that, while proscriptive and prescriptive techniques are well-suited to established practices, the improvement of architectural performance, design coordination and integration lies with descriptive approaches. These can question existing knowledge and augment it by means of selective, directed knowledge and technology transfer. Moreover, the emphasis on representation and continuity supports abstraction in design thinking, though in a bottom-up manner that may not agree with the arbitrariness and reductionism of certain current architectural and managerial attitudes.

The descriptive agenda

The development of descriptive instruments for design management is a continuous process that should reconsider its applications and principles with each application or the addition of a new aspect or abstraction level. To achieve this, emphasis should be on representation and analysis in a coordinated multilevel, multivariate system. Such emphasis focuses the immediate priorities of design management on design information management towards the virtual prototyping environments that will allow comprehensive treatment of the design product and process on the basis of performance-based guidance rather than administrative control. On the methodical level this implies intensive use of informatization and stresses the significance of cognitive aspects, both in designing and in human interaction with the built environment. Especially the latter can provide meaningful departure points and criteria for the improvement of design performance and accountability. On the process side, the emphasis on representation facilitates continuity in the design process and even beyond it, towards construction (e.g. through rapid prototyping), facilities management and post-occupancy evaluation. It also supports communication, by providing a responsive background of relevant information that helps focus problems and decisions and recognize their significance and consequences.

The correlation of these principles and priorities suggests two main areas of investigation and development that have the potential to transform architectural practices:

1. The amphidrome development of a design: the conventional linear development of a design from initiative and brief to construction and post-occupancy should be complemented by the reverse direction that draws from detail, case and precedent to formulate design ideas and solutions, even at the conceptual stages. Continuity of design information in the direction of virtual prototyping is the key concept for this development, as it allows for precise projections, accurate positioning of each contribution and targeted feedback.
2. The identification and management of critical moments: rather than prescriptively defining sequences of deterministic steps, we should concentrate selectively on moments characterized by convergence of activities and hence extensive and intensive communication. At these moments

decision-taking refers primarily to issues such as normalization and conflict resolution. This results into guidance that determines the further development of the design process, including feedback loops to earlier decisive moments.

References

Castells, M.: 1996, The rise of the network society, Blackwell, Malden, Massachusetts.

Collins, P.: 1965, Changing ideals in modern architecture, Faber & Faber, London.

Colquhoun, A.: 1981, Essays in architectural criticism. Modern architecture and historical change, MIT Press, Cambridge, Massachusetts.

Eastman, C. M. (ed): 1975, Spatial synthesis in computer-aided building design, Applied Science, London.

Hartog, J. P. d. and Koutamanis, A.: 2000, Teaching design simulation, in D. Donath (ed), Promise and reality. eCAADe & Bauhaus-Universität Weimar, Weimar.

Hartog, J. P. d., Koutamanis, A. and Luscuere, P. G.: 1998, Simulation and evaluation of environmental aspects throughout the design process, in 4th Design and Decision Support Systems in Architecture and Urban Planning Conference. Eindhoven.

Koutamanis, A. and Mitossi, V.: 1996, Simulation for analysis: Requirements from architectural design., in B. Martens (ed), Full-scale modeling in the age of virtual reality. OKK, Vienna.

Maver, T.: 1987, Software tools for the technical evaluation of design alternatives, in T. Maver and H. Wagter (eds), CAAD Futures ’87. Proceedings of the Second International Conference on Computer-aided Architectural Design Futures. Elsevier, Amsterdam.

Mitchell, W. J.: 1990, The logic of architecture: Design, computation and cognition, MIT Press, Cambridge, Massachusetts.

Mitossi, V. and Koutamanis, A.: 1996, Parametric design of stairs, in 3rd Design and Decision Support Systems in Architecture and Urban Planning Conference. Part One: Architecture Proceedings. Eindhoven.

Schmitt, G.: 1993, Architectura et machina, Vieweg, Wiesbaden.

Summerson, J.: 1980, The classical language of architecture, Thames and Hudson, London.

Templer, J.: 1992, The staircase: Studies of hazards, falls, and safer design, MIT Press, Cambridge, Massachusetts.

Van Sommers, P.: 1984, Drawing and cognition, Cambridge University Press, Cambridge.

Warszawski, A.: 1990, Industrialization and robotics in building, Harper & Row, New York.