CRITICAL REFLECTIONS ON MEASURING THE EFFECT OF STEERING ACTIVITIES IN ARCHITECTURAL DESIGN

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In the field of architectural design management it is hard to find empirical evidence that describes the actual effect of managing designers. This paper reflects critical considerations in developing a research design to establish an empirical connection between steering and value creation in architectural design. Based on a literature review two relevant types of design management are distinguished: instrumental steering and human steering. Instrumental steering implies the use of tools and techniques to coordinate and distribute design information, while human steering refers to leadership, vision and interpersonal skills. In this research project design value is seen in two ways: as the sum of the complementary parts or more holistically as wholeness. Hypothesis is that different kinds of steering will influence different kinds of values. After considering several difficulties in measuring the effects of steering during the design phase, a first step is made towards the development of an appropriate research method. This step involves studying the selection of architectural firms during European tenders.

Keywords: design management, measurement, research methods, value.

INTRODUCTION

In applying management in design the assumption is often made that a fluent, effective and efficient process will influence the value of the final outcome. The fields of construction management, concurrent engineering, lean thinking and new product development are based on these principles. Other people, mostly architects and designers, claim that chaos would lead to excellence. Making design subject to management is still assumed, at least by the designers involved, to result in the death of creativity. Justifiable they say that traditional management could be counterproductive, particularly in contemporary large and complex design projects; it creates self-created problems that seriously undermine productivity. And professional managers tend to shy away from architectural design, which is seen as a black box not to be opened (Prins 2004). In general not many stated effects can be retrieved within other fields of science about the impact of management on adding value. In design, object and process often overlap and it is difficult to draw a sharp line demarcating where the 'hard' object ends and the 'soft' social process begins. Fraats (2003) found three, mostly corresponding, levels of steering within the firm: steering by the management, internal project management and steering by the controller and quality administrator. She focused in her study on the use of the means of budget, planning,

information, communication, IT and employees. Although she suspected steering would mean controlling soft components (team building, communication) as well as hard components (time, money), she could only find steering activities on hard factors like budget and the number of faults in the drawings. The soft factors she was looking for couldn't be found by interviewing members of this organisation and tracing procedures as described in the ISO certification. They seem to be hidden within the designers and their design.

RESEARCH PROBLEM AND APPROACH

Although several books have been written on the management of design or comparable creative and uncertain processes (e.g. Allinson 1997, Bekkering *et al.* 2001, Gray and Hughes 2001, Prins, Heintz and Vercouteren 2001, Kestle and London 2002), almost none of these publications are based on just empirical and generalizable evidence. Most seem to be based on expertise, experience and tacit knowledge of the authors. Explanation for this phenomenon can be found in the high level of complexity, uniqueness, mysteriousness and changing characteristics of management as well as design. Therefore the department of Real Estate and Housing at Delft University of Technology started a research project to find empirical relationships between steering activities in the design process and value creation within architectural designing. Main research question is: 'To what extent does the use of management techniques add value in architectural building design?' To answer this question several sub questions about the steering methods, values in design and methodological questions have to be fulfilled. Hypotheses in this research project concern the function of management in design. In the most beneficial way design management would work as a catalyst – accelerating and intensifying the design process and optimizing the potential quality of the ingredients while keeping the natural environment and the catalyst intact. Otherwise design management could have a counterproductive effect on the design and the design process.

The research focuses on two parts of design management: 1) instrumental steering techniques and 2) human steering activities, and two ways of looking at value: A) value as complementary parts or B) value as a whole (Volker and Prins 2006). The empirical part of this research will consist of two steps: exploration and testing. Step 1 will concern the exploration of methods based on their properties to examine these variables and views. The second step of the research project will focus on establishing an empirical connection between steering activities and value creation by combining the best 'method-variable combinations' based on the findings of the first step.

MEASURING THE PROCESS

Within the wide range of design management approaches, a distinction can be made between managing the product, managing the process and managing the organization (Sebastian 2005). Managing of the organization currently is understood as the management of a design office and the coordination of inter-organizational decision-making. While managing the process believes that management effort must be mainly focused on the design processes, the view of managing the product focuses on the production of an object that meets the aesthetic and functional expectations in use, as well as the economical and technical requirements. Methods for managing the project like the tools PRINCE 2 and PMI all express the need for a structured overview of the management aspects of cost, time, quality, information and communication. The problem in architectural design is that a structured overview of these aspects is hard to

find. These managerial aspects seem to be inconsistent with the design cycle of analyzing, synthesis, evaluation. Still Sebastian (2005) acknowledges that design and management are both knowledge-intensive human activities, which works with and within uncertain situations, to deliberately initiate and devise a creative process for shaping a more desirable reality. Both activities require analytical, synthesis and evolutional thinking processes. And both activities are necessary to reach the project goals.

The study of project success and the critical success factors (CSF's) is considered to be a means to improve the effectiveness of a project. Chan *et al.* (2004) describe a framework of critical success factors in construction management based on a literature review in seven major management journals. Five main categories are found: human related factors (experience, client characteristics, project team), project factors (type, complexity, size), project procedures (procurement, tendering), project management actions (communication system, planning, control mechanism) and external environment (social, economical, political etc.). Some of these factors consider hard factors while the human and societal related factors concern soft factors. Oyedele and Tham (2005) discovered that pre-design meetings, identifying and prioritizing objectives and knowledge of materials are very important for architects' performances in Nigeria. Co-ordination between design phases, identifying and prioritizing objectives, quality management strategy, pre-design project meeting and project review meetings were best-performing criteria. Oyedele and Tham also discovered through a survey that private sector clients are likely to be more concerned with cost, while public sector clients are more concerned with buildability of design. So understanding and reflection between parties appears to be crucial in translating the relevant design information and means into valuable design ideas.

In new product development (NPD) projects a few studies have been done that both designed and tested a model in order to link management during the process to quality of the product. In product design quantitative data such as scrap and rework rates, defect rates and reliability are used to define internal quality, while market share, customer complaints, warranty and litigation are used to measure external quality. Ahire & Dreyfus (2000) distributed 418 surveys to find out if Design Management and Process management affect the external and internal quality of products. The use of the management methods is measured by statements on a Likert scale on the involvement of users and use of management tools. They found that both design and process management have an equal impact on internal and external product quality. There are many synergistic effects of DM, training and TQM. It shows that design efforts - such as concurrent engineering, cross-functional product development organization - have a significant direct impact on internal product design performance. The same applies to the involvement of suppliers and customers in product and process design for the long-term success of quality programs and process quality management efforts - such as monitoring of scrap rates, rework rates, defect rates, and corrective actions. Quality training and the use of quality tools are also useful in attaining high levels of product design performances and process quality management efforts. While results of the studies found on new product development and construction management cannot automatically be associated with the existence of a positive relationship between the management of design and value creation in architectural context, they do provide interesting ways to study these effects.

PERCEIVED BOTTLENECKS PROCESS

Unfortunately, in the building construction sector it is still not possible to claim that a high quality process does result in a high quality product and vice versa. When trying to understand (and control) what happens in the throughput - also stated by Allinson (1997) as the 'black box' - complex, situational and personal events within the process and its participants are difficult. Regarding the processes occurring in peoples mind, (fortunately) uncertainty still plays a big role. Most results on the studies mentioned in this paper focus on tangible aspects of the process by using quantitative surveying. This could be explained by the engineering roots of construction management. But in the traditional management sciences, relevant aspects are also based on more intangible psychological and sociological aspects to explain team bonding, leadership and decision making. These kinds of aspects cannot always best be measured by questionnaires and would benefit from a more qualitative approach.

This project is especially interested in steering activities within the broad context of management. Steering implies influencing people in a certain direction through information or social skills. Steering activities are hard to distinguish from normal interaction activities and design processes. In this research project we assume that the activities of the steering party during the design phase are all focussed on accomplishing their mission and reaching the goal. Some activities could seem productive in the first place but could finally turn out to be counterproductive. The project architect or manager doesn't have to be the only person who shows steering activities. Other parties or people like the client organisation, external advisors, investors, junior architects or firm partners could also contribute to the steering activities applied. In this complex scene it is hard to filter interaction effects. By using experimental research methods the amount of interacting variables can be reduced. This opens up the possibility to more labour intense data gathering methods like observation and open interviewing. Experiments carry a great risk of failing, often don't reflect real situations and can take a lot of time. But in search for one of the most essential parts of our complex field of knowledge it's worth trying.

MEASURING THE PRODUCT

This research project is about measuring added value. The term 'value' in an architectural context is also known as build quality. Most of the latest literature on build quality originates from the UK, partly related to the discussion about the DQI. Quality in building design embraces all the aspects by which a building is judged such as uniqueness, functionality or durability. Vitruvius' utilitas, venustas and firmitas have been a source of inspiration for several researchers (Duerk 1993, Gann, Salter and Whyte 2003, Voordt and Wegen 2005). Prasad (in Macmillan 2004) describes quality as the achievement of a totality that is more than the sum of the parts. She argues that design quality can only be achieved when the three quality fields of functionality, built quality and impact all work together as circles. Non-overlapping areas of the circles represent very basic things to get right, regions with some but not total overlap represent the added value, while in the middle all three quality fields overlap and one obtains true excellence. The basic things are just as important as the excellent - without the basics there can be no true excellence. Prins (2004) developed a framework of architectural value in which he supports Pirsig's view that value can be considered as the 'metaphysics of dynamic quality'. This value concept addresses the goals, needs, ambitions, wishes, dreams and beliefs of all the participants in the entire life-cycle of a building from initiation to demolition. So architectural value is

not confined to users and clients but extends to society as a whole and the other stakeholders involved in a project. From the background of Value Management, value depends on balancing the three factors of time, cost and quality against the client's requirements, while retaining the basic ideal, i.e. to complete the project at minimum cost, in the shortest possible time and to the highest possible standard (Best and Valence 1999). At the same time, there will also be a willingness to satisfy the client's needs, including those related to function, aesthetics, business goals and image. Value always involves a relative and balanced consideration of tangible and intangible costs and benefits and a willingness to give up in order to gain. According to Best & De Valence, the success or otherwise of a building will be decided according to a complex mix of judgements offered by a range of interested parties. In this definition the process and the product are intertwined, they cannot be valued separately. These value and quality models are all based on complementary parts of value, somehow summed up and balanced to be compared to other products. Added value can only be achieved if basic values are delivered. Does this mean that every valuable building is perfect in its construction, durability, functionality and beauty?

In line with Einstein one could say that 'facts are just facts, it's the perception that really matters'. Architectural professionals would say that quality of design can only be determined by peer experts, even at a glance. According to the Dutch architect Carel Weeber (in Voordt and Wegen 2005), a building's architectural quality is determined not by the professionalism with which it was built, but by the part it plays in architectural debate. A building only becomes architecture when it is discussed; the fact that a building is well thought out professionally is not enough to make it a piece of architecture. Rossum and Wildt (1996), Usmani & Winch (1993), Dijkstra (2001) and Bártolo (2001) studied architectural quality as perceived by a number of architecture critics and architects. Building function, materialization & context, internal consistency, unity and legibility, expressiveness, magnitude & meaning and fulfilment of users' requirements within a stimulative environment were defined as components of architectural quality. These aspects of architectural quality mentioned by architects themselves, show great correspondences with the results of environmental psychological experiments. Environmental psychologists like Kaplan & Kaplan (1989), Gifford *et al.* (2002), Berlyne (1974) and Prak (1979) found that mystery, complexity, coherence and legibility are important cognitive issues in the preferences of people for the environment. These factors can be explained by the fact that to understand and to explore their environment are basic needs of people. It seems that architects are trying to design such a clear, comfortable and explorative environment for people by using comparable components. Could we conclude that the level by which they are able to communicate their expertise by design might affect the architectural value?

Gann & White (2003) identify three approaches for looking at value and design quality. The judgement-based approach is adaptive, focusing on the experts' abilities to evaluate the design product. The 'manage and measure' approach is based on a belief that designers can make rational responses to social, economic and environmental needs, and research has been focused on achieving better design by measuring, management and integration of the process. In the middle lies the rational-adaptive approach, which accepts that quality is a difficult and uncertain aspect to measure but that the development of tools to think about the impact of the design could be beneficial. Two of these approached correspond with the distinction of a quantifiable quality and a subjective quality by Bártolo (2001). Quantifiable quality

refs to 'conformance to requirements' which can be managed and measured. Subjective quality concerns a personal response to built form, people's perception of space, scale, texture, colour and light, the meanings and associations attached by people to places and the way in which people assign aesthetic qualities to their surroundings. The subjective quality is very difficult to quantify and can only be judged as a whole experience; it is essentially a question of perception and consequently a question of characteristics. The same idea can be applied to value: the quantifiable value can be seen as complementary parts that can be managed, measured and summed up, while value as a whole can only be experienced or judged by experts. These experts could concern all stakeholders involved in the process. By all stakeholders intangible aspects of value also have to be taken into account. Although theoretically tangible and intangible costs and benefits have equal weight in decision-making, in practice tangible factors are seen more often as a valid basis for decision making than intangibles (Macmillan 2005).

PERCEIVED BOTTLENECKS PRODUCT

Quality is mostly defined as meeting agreed requirements or conformance to requirements. In this research project architectural value has been defined as a profile of tangible and intangibles meanings of stakeholders. This definition is about incorporating subjective quality. It implies that quality can only be seen in the eye of the beholder. As long as they are satisfied, the value is high. Theoretically one should be able to design a product that integrates all requirements as set in the beginning, but in practice it is impossible to fulfil all needs of the stakeholders in the same product. Often a fundamental difference appears between the interests of the stakeholders involved, let alone between the groups of stakeholders. The perception of the stakeholder is influenced by personal and situational factors and changes over time. The process and the way the stakeholder is involved in the process also influence the perception of quality. By using quantitative research methods these differences might be levelled. Attention should be given to equal weighting of the intangible aspects as well as the tangible aspects.

Because of the subjective character of value, it could be hard to rate the level of value in a solid number. One way of looking at quality would be by using Key Performance Indicators. For 'hard' physical building elements KPI's can be quite easily set (e.g. the amount of day light, the average temperature). But what about the atmosphere and architecture of the building? How can these intangible or soft indicators be set? Do we actually have to quantify these performances or can they be measured in a qualitative manner, for example by ranking? The work of Kaplan, Gifford, Prak and Stamps confirms the use of expert judgements. This approach also builds upon the traditional laws of aesthetics, meaning, order and harmony, expressed by the overall judgement of experts who implicitly balance quantitative and qualitative aspects.

Future value cannot be predicted. Time will tell if a building will develop as highly valuable. One could say that this kind of value presumably involves 'love' for the building. This love only seems to develop through a mixture of ambition, risk taking, passion, beauty, sense and commitment from all stakeholders - mostly independent of initial costs, time and circumstances. The participants in the study of Macmillan (2005) underline the fact that is a common experience in architecture that the desire to deliver value for money is often interpreted as cutting costs rather than raising values. Designers need to be more engaged in the delivery of outcome and the willingness to

increase short-term cost for long-term gain has to grow. As Macmillan describes: the 'black box' of valuation needs to open up.

FIRST STEP IN MEASURING THE EFFECTS OF DESIGN MANAGEMENT

During the discussion of the bottlenecks a few possible solutions to the measurement problems have come across. In measuring the process an experimental research design could be chosen which decreases the number of interrupting variables and increases the possibilities to apply more labour intense research methods. Within the research design focus should lie on instrumental as well as the more hidden social steering techniques. The value of the product could best be judged by the experts that are involved in the process or by professional views. The selection of an architect during a traditional European tender competition based on a sketch or concept design matches this situation. In design competitions the client expresses his needs by providing an assignment including the judgemental criteria. The architectural firm reacts to the assignment by sending in the best possible concept design. Both parties (client and architectural firm) are willing to empathize in each others positions to create the best match possible. These design situations can be seen as an experimental setting with a homogeneous group of highly ambitions parties wanting to achieve the same goal in a short period of time. The focus lies on the idea generation and concept design phase, based on the assignment given by the client and developed by the design team solely. The design processes and strategy conducted by the design team could be observed during the full design period, combined with interviews and a feedback session. In this design process there is no interaction with the client during the observation period and there are no external advisors involved in the design process. The steering party will be included in the design team. During the observations, comprehensibility is sought for which member(s) of the design team contributes most to the steering activities, how and when these steering activities appear and whether a distinction can be made between design activities, steering activities and management within the design team. During the observation process the role of the project architect and/or senior architect in relation to the other team members will be emphasized. There will also be looked at the design strategy and vision of the architectural firm and the translation of this view into the concept design.

During these tenders the focus will lie on the functioning of the design team. Design decision-making is often negotiated amongst groups and teams – it is an iterative process so that the design management should work in a cyclical form, alternating between setting-up the strategy, formulating the process layout and directing the process (Prins, Heintz and Vercouteren 2001, Kestle and London 2002, Doorn 2004, Sebastian 2005). The nature of complex group dynamics affects design and building performance criteria. In assembling a team, careful consideration should be given to the level of professional experience, the design experience and the personalities of the team members, and to whether the team is sufficiently multi-disciplined (Shen and Liu 2003). Having a clear objective that is understood is crucial for directing the process and concentrating participants' efforts. The results of a survey study of 131 completed NPD projects by Swink (2003) suggest that project acceleration interacts with project content, leadership and integration variables to affect on-time performance differently across NPD projects. These effects can be explained by the fact that due to the acceleration, the difficulty of the project also increases the value of leadership, integration techniques and careful decision-making. In European design tenders one

could also talk about a high pressure situation. Design competitions are usually done additional to the design normal activities of a firm. Most of the time no or little compensation is given for their design activities and the preparation needed to join the tender. On-time performance is essential and the vision and design strategy which the architectural firm is trying to sell probably depends greatly on the leadership capacity of the senior architect. Lots of internal decisions are made in a relatively short period of time without interactions with the outside world. The architectural firms combine their expertise with the assignment that was given to all parties at the same time.

PRELIMINAIRY RESULTS AND CONCLUSION

At the moment the research team is working on the first case studies on European design tenders. Preliminary results seem to show a tendency towards the development of a successful measuring method. The steering typology based on literature and explorative interviews seems tenable during the observations of the design team. The senior architect shows great leadership skills during the very first design meetings by starting to communicate design sketches immediately. These ideas seem to be based on a rough study of the assignment material which mostly consists of an estimated brief, a detailed description of the building area and the vision expressed by the client. The project architects usually arranges for a summary of the expectations, a short project plan and the organisational conditions like the available time and information. Hardly any attention is given to the available financial means and almost no planning techniques are used. The team composition seems to be based on the most suitable senior architect and availability of other designers. As the process progresses the role of the senior architect changes into guiding the design vision and advising the other designers on general and striking briefing requirements. The other designers seem to watch over the exact briefing requirements and available information. The amounts of time spend on the actual design by the senior architect decreases during the process while the other designers spend increasing time. During the process very much attention is given to special means to find a strategy that will suit the client and persuade it. The presentation to present their sketch design and vision to the client at the end of the process, most of the time is being prepared and given by the senior architect. Emphasis is given to the vision and collaboration between the architect and the client during the design process.

The client has expressed their expectations on possible design solutions in the assignment. In this assignment most of the time selection criteria are also mentioned. During the decision making process it appears to be hard to stick to these criteria. The composition of the client committee differs in level of professionalism and internal conflicting interest. It also seems hard to some members of the selection committee to look through the sketch design and see the vision of the architect. Relative many remarks are made on functional and detailed design solutions, while the status of design doesn't meet up to these expectations. Further results are being worked out at the moment. Wrapping up these results would provide us with research based ideas on the measurement of the effects of the design process at the value developed within the design.

Benefits of this research strategy seem to concern the relatively short and clear cut period of time, the lack of interaction with other parties, clients or stakeholders during the design phase, the high pressure environment which strengthens the strengths and weaknesses and the high involvement of the senior architect because of the importance of the tenders for the subsisting of the firm. The concept design is often

seen as the most important decision phase because of the fact that this vision will greatly influence the following design phases. The value of the design will be judged by 'the beholders', the paying clients and theoretically experts on their needs.

Disadvantages as seen for now are the fact that these design activities are additional to the common processes and the design processes traced in these periods of time only concern the first stages of the design. In these stages relatively less instrumental steering methods will be applied so the results could not be generalised to the whole design process. The winner of the tender competition will not always be selected on the quality of the architectural firm but also represents politics and/or personal preferences of the selecting committee. Although the judgement of the selection committee of the client does fit the definition of subjective quality, one could question the ability to judge 'true' architectural value. There is no interaction with the client so this situation does not reflect the real communication and collaboration processes. And don't architects and clients agree on the statement that real quality arises through a critical dialogue between these two parties? This dialogue benefits from personal preferences and mutual understanding but at the same time there must be room for a constructive conflict. In the next period further analysis will be done on the case findings and the research methods. Hopefully a part of the black box in managing the design will open up during this period.

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