

SUSTAINABILITY IN PROJECTS REQUIRES TRAINING IN MANAGING AS DESIGNING

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Problems that present project managers have to deal with are more and more concerning complexity, i.e. unexpected, uncertain, unstable or unique situations. This seems also the case with sustainable building projects. It is therefore necessary that project managers are trained to deal with these problems, especially by learning from their performance. In this article we motivate why and propose how.

Based on literature study we elaborate on the concepts of reflection-in-action, design-thinking and managing as designing. In sustainable building projects the problem occurs on a regular basis that the often big ambitions in the initiative phase are not realised in the realisation phase. These ambitions perish because of a lack of substantial knowledge regarding the quality-, time- and cost-aspects of sustainable building projects. More important than this sufficient substantial knowledge is an integral approach of the entire building process. Exactly this integral approach of the process with its characteristic of working from sketch to detail –and backwards- appears to be very suitable for sustainable building projects and requires a management approach that allow, support and stimulates this; an approach that can be characterised as designing project management.

Where the concepts of reflection-in-action, design-thinking and managing as designing are interrelated in the concept of learning we introduce the project management design cycle. Project managers do not only need to use this searching and experimenting approach with awareness in order to learn from their performance, but students in project management will also have to be trained in how they can learn from their performance as a project manager. We propose that training related to cases e.g. as in management games seems to be the most suitable.

Keywords: sustainability, training, reflection-in-action, design-thinking, project management

INTRODUCTION

Despite all good intentions, ambitions in sustainable building projects often fail or go under in the course of the process, usually as a result of budget cuts. Instead of integral designing from the first sketch on, the building is designed as a Mr. Potatohead in which all sustainable solutions are pinned, making them an easy target for budget cuts. The key to creating a sustainable building is in customizing the underlying design process (Van Doorn, 2012:6).

Adjusting underlying processes is a project management task, whether this is carried out by a project manager or an architect is not in question. In addition, the problems that a manager of a sustainable building project has to cope with, can be characterised as complex i.e. uncertain, instable and/or unique. Since about a decade coping with these kinds of problems has special attention in project management literature (e.g. Cicmil et al., 2006, Blomquist et al., 2010). However, it is but relatively little attention that has been paid to a line of thought that begins with Donald Schön's 'The Reflective Practitioner' from 1983. In this article we pick up this line and develop it further through Design Thinking, Innovation and Managing as Designing. We will discuss these concepts extensively. We then reflect from this theoretical framework on the problems faced by sustainable building projects and describe how solutions from a searching and experimenting approach can be achieved. Finally we propose how project managers and students in project management can be trained in this approach that seems to be

conditional for successful sustainable building projects.

REFLECTION-IN-ACTION

Schön starts with the determination of ‘a gap between professional knowledge and the demands of real-world practice’ (Schön, 1983: 45), a gap that, although ever smaller, still exists (cf. Koskola & Howell, 2002, Cicmil et al., 2006, Gustafsson & Lindahl, 2015). Where professional knowledge is ‘convergent’, practice is ‘divergent’ (Schön, 1983: 45). For project management, this means that where project managers are taught to converge in a project to result in terms of quality, time and money, practical experience shows that this guidance in particularly complex projects is not enough, and that here is a quest for means to mitigate the ‘chaos of practice’. Schön then introduces the concept of *Reflection-in-action*, defined as thinking about doing something while doing it (ibid. 54). He then describes a number of professional practices including those of architectural design, but is limited in that because it is only about the reframing of the (design) problem. In the next section on Design Thinking we will come back to that. More extensively Schön discusses the structure of reflection-in-action. At first framing and next reframing of the problem is discussed as in a conversation between a student and practitioner. The practitioner then takes the reframed problem and conducts an experiment to discover what consequences and implications can be made to follow from it (ibid. 131). ‘In this reflective conversation, the practitioner’s effort to solve the reframed problem yields new discoveries which call for new reflection-in-action. The process spirals through stages of appreciation, action, and re-appreciation. The unique and uncertain situation comes to be understood through the attempt to change it, and changed through the attempt to understand it. Such is the skeleton of the process’.(ibid. 132). Schön even writes about ‘reflection-in-action as an epistemology of practice’ (ibid. 133).

The chapter on management starts Schön with a two-tier management approach to professional knowledge that shows similarities with the dichotomy in project management approaches as still discussed in the literature (cf.. Blomquist et al., 2010, Gustafsson & Lindahl, 2014). In the first approach, the manager is a technician whose practice consists in applying to the everyday problems of his organization the principles and methods derived from management science (ibid. 236). Taylor was the first to coin ‘scientific management’ where ‘work was treated as a man/machine process which could be decomposed into measurable units or activity (ibid. 237). Further on Schön notices that ‘Taylor saw the industrial manager as a designer of work (-). Above all, he saw the manager as an on-line experimenter, a scientist in action, whose practice would consist in the trial and measurement of designs and methods aimed at the discovery and implementation of the one best way’.

The second approach differs in this with the first, because it contains ‘the manager is a craftsman, a practitioner of an art of managing that cannot be reduced to explicit rules and theories. Managers do reflect in action. (-) Whatever the triggering condition, a manager’s reflection-in-action is fundamentally similar to reflection-in-action in other professional fields. It consists in on-the-spot surfacing, criticizing, restructuring, and testing or intuitive understandings or experienced phenomena’. (ibid. 241). Then Schön describes a number of examples from practice from which this reflection-in-action should turn out.

DESIGN THINKING

Schön wrote referring to Herbert Simon’s ‘The Sciences of the Artificial’ (1969) ‘Simon believes that all professional practice is centrally concerned with what he calls ‘design’, that is, with the process of ‘changing existing situations into preferred ones’.’ (Schön, 1983:46). In line with this is the concept of design thinking. *Design thinking* can be

interpreted as 'thinking as a designer'. Many of the design models described in literature have the following activities in common: analyse (getting to know the problem), synthesize (to find a solution to the problem) and evaluate (testing the solution against the problem) (Van Doorn, 2004: 32, Van Doorn, 2012:130). Contrary to the usual induction and deduction for analysing problems, design thinking characterizes itself by abduction. In the three step cycle outlined, the first step remains 'conventional' induction and deduction analysis, it is the second step that is characterised by abduction. Here we touch something basic: design thinking is solution-oriented (Dorst, 2010:133). At abduction, we know where we want to go, what we want to have as an outcome merely than a result, what the desired situation is, but we don't yet know exactly what the problem is from the given situation and we don't know how we may come from the given situation to the desired situation. That is selected by searching and experimenting, where in a co-evolutionary process the problem is reframed (Dorst, 2010:133) and is experimented with a number of possible solutions to see if they meet.

Meanwhile, Design Thinking has many application areas for example in IT and Business (Dorst, 2010:131), but also in Innovation (cf.. Smulders, 2012). What these applications seem to have in common is that they are applying the searching and experimenting nature of design thinking in their field and know the benefit. It is precisely this searching and experimenting nature of design thinking which we assume that it can be the distinctive feature for managing in complex i.e. unexpected, uncertain, instable and/or unique situations.

MANAGING AS DESIGNING

Although, contrary to the work of Dorst and Smulders, examined in only one case, this seems to be confirmed in *Managing as Designing* (Boland et al., 2008). Based on the observation that 'A design attitude, with its expectation to shape a better world, is a neglected but centrally important cognitive mode that should be nurtured in management practice and education' (ibid. 12), a research into Frank Gehry's practice of design is discussed, including lessons to be learned for management practice. These lessons are about organizational design and are first 'The possibilities for transformation in organizational leadership beginning with the adoption of a design attitude', second 'The design attitude includes an expectation that an organization's familiar language will be subject to scrutiny, and that new vocabulary elements are expected as an emergent outcome or seeking to create a more desirable state of affairs', third 'Part of the design attitude for leaders is to make a conscious effort to resist closure of a design problem and to maintain an open and liquid flow of design ideas', fourth 'Our study also shows that, like the search for functionality, organizational designs are never complete' and finally 'The design of large software systems is representative of the design type or complex organization attempted by their leaders today. The software design literature clearly shows that the design time spent in a liquid state, exploring alternatives and requirements early on in the process, results in fewer "bugs" and software repairs later on.' (ibid. 22, 23). The lessons for the management practice concern apparently only organizational design, not the daily management.

This day-to-day management of complex projects can be seen as a form of problem solving (Ahern, et al., 2014), where problem is the determination of courses of action to change present states into more desirable states, then it follows that design and design thinking are necessary tools. Projects present managers with design problems at several scales. The overall organization of the project, selection of partners, forms of contracts and tendering, structures of reporting and meeting is a large scale design problem facing any project manager at the outset. One might call this the strategic level. Resolving a

scheduling conflict between two agents or a question of how to structure a BIM database would be examples of tactical problem solving.

Seen this way, it becomes easy to recognize that project management is a form of problem solving. These problems may be planning problems, or they may be problems requiring interventions in already ongoing events. We are used to thinking of the design and construction of buildings as requiring the solution to many kinds of problems: what forms will best accommodate the project brief, what materials will best realize these forms, what techniques are the best for assembling the chosen materials in the desired form. Problems in architectural and engineering design, and problems relating to the many crafts required for the assembly of buildings.

While one may consider these issues as matters of choice, the interrelation between the different choices to be made (each representing a different frame), the multiplicity and ambiguity of project goals and resources (typically seen differently by different stakeholders) raises the complexity of the network of choices to the level of a wicked problem (Coyne, 2005; Rittel & Webber, 1973) – i.e. a problem where there is no possibility of optimization or algorithmic approaches to decision making. This is a problem type for in which design thinking has been found to be very useful.

A variety of researchers have proposed that these sorts of problems are best addressed by design. Among them Boland and Collopy describe the advantages of design thinking in management contexts as follows:

“A decision attitude toward problem solving is used extensively in management education. It portrays the manager as facing a set of alternative courses of action from which a choice must be made. The decision attitude assumes it is easy to come up with alternatives to consider, but difficult to choose among them. The design attitude toward problem solving, in contrast, assumes that it is difficult to design a good alternative, but once you have developed a truly great one, the decision about which alternative to select becomes trivial. The design attitude appreciates that the cost of not conceiving of a better course of action than those that are already being considered is often much higher than making the ‘wrong’ choice among them.” (Boland & Collopy, 2004, p. 4)

It is our contention that design and design thinking are particularly useful in design and construction management, especially in managing sustainable projects.

SUSTAINABLE BUILDING PROJECTS

The two in the previous section described characteristics of managing as designing, namely looking in a different way at the organisational design and looking in a different way at daily management, can be made concrete in sustainable building projects, in particular in relation to the design process.

The 'classic'/'traditional' design process is in the Netherlands and similar in other countries is phased in a preparation/ definition phase (appraisal and design brief), design phase (concept, preliminary, final and technical design). 'The nature of the sustainable design brief asks for a recast. There must be time and space for the joint definition of the project meaning of sustainability, in order to create integrated architectural design proposals and for developing innovative solutions (Van Doorn, 2012:129). This calls for a redesign of the design process, on the basis that the overall design process doesn't longer than the traditional design process.

Two possibilities are conceivable in this light (ibid. 129, 130). The first is that the phase of the structure design is integrated with the definition phase. Defining the sustainable design ambition plays a key role in the success of the sustainable design project. There are two reasons for integrating the definition of the sustainable brief with the design phase and hence involve the members of the design team in it. First, it can better be used in this way by their creativity, insight and experience. 'It makes sense that the

sustainable ambition often arises only during the design process and not before that. The preparation of the sustainable project ambition in the form of a sketch design is therefore effective for a sustainable project. Secondly, a shared understanding of the meaning of sustainability in the project is important to the success of it. That is also why it is valuable to do this again in the design phase and to define it together. ' (ibid. 130).

The second possibility to redesign the sustainable design process is extending the preliminary design phase. 'The preliminary design phase is the moment where the main design decisions are made and the design concept takes shape. From the point of view of sustainability, this is the phase where design choices are made, such as the orientation and location of the functions, which have the greatest effect on the final building performance (while often being the cheapest to implement).

The need for looking differently at the daily management of a sustainable project, appears from the question for a higher degree of iteration, for repeating the design cycle of analysis, synthesis, and evaluation and for working from coarse to fine – and back again – then in a 'traditional' design process. This concerns specifically an early contribution of technical know-how and forward integration of architectural knowledge (ibid. 132).

However, besides the forward integration of architectural knowledge, it is also about giving space to research and experiment and to constantly, until with the preparation of the implementation, testing of (in between) results to sustainable criteria. In this way is 'the traditional management cycle of analysis, diagnosis, goal setting, planning and execution embedded as an iterative routine in each iteration instead of being executed only once throughout the project. The management cycle is repeatedly executed by the team of well-educated knowledge workers instead of an individual manager who predicts and controls the team. ' (Stettina, 2015:43)

LEARNING

If we compare the elaboration of the concepts of reflection-in-action, design thinking and managing as designing, they seem to show much similarity with the concept of *experiential learning* (Kolb, 1984), a concept that originates in the experiential works of Dewey, Lewin, and Piaget and is extensively studied in practice. The experiential learning cycle consists of respectively the phases of the Concrete experiencing of an experience, Reflective observation, the Abstract conceptualizing and the Active experimentation, hence so forth. This experiential learning matches with the cognitive structure by which people can achieve the highest stages of learning (cf. Moon, 1999:24, 110). Key concept in this is reflection (Moon, 1999), but then as *reflective habit* (Smith, 2001:31), a reflective habit that turns out to be inherent to design thinking.

To the in the section Design Thinking cited quote about the definition of design as 'changing existing situations into preferred ones' adds Schön: 'But design in this sense is precisely what the professional schools do not teach.' (Schön, 1983:46). Our proposal is to pick up this challenge (cf. Dun & Martin, 2006) and develop a cyclic model by which project managers or students in project management can learn how to cope with complex, i.e. unexpected, unstable, insecure and unique situations. We have named this cyclic model the Project Management Design Cycle and it consists of the stages Awareness/Recognition, Design, Performance and Reflection.

Project managers with their busy agenda's and often seemingly necessary daily fixation on end goals that must be met, seem to have little time for a reflective practice, while in

fact their behaviour is accordingly to it (cf. Kolb, 1984, Moon, 1999), only they are just not aware of it. The first step that we propose to train (prospective) project managers in reflective practice is that of Awareness/recognition. This awareness encompasses not only the formal project as captured in so called "project information", but also, and importantly, the social situation (situational awareness), including the status and state of the various actors and stakeholders in the project. Awareness of what is going on, who is doing what, etc. Also of intentions, goals, and plans. Awareness also encompasses the determination that 'something needs to be done' i.e. deviation from the intended course of the project in some way. Awareness has a very significant component of sense-making.

Out of this awareness flows an understanding of both the current state and a desired outcome. Having determined that action is required, design refers to the shaping of a course of action. Design thinking here is important in its open and free approach to generating alternatives and possibilities. But Design should include both generate and test. A designed course of action is also one that has been in some sense tested.

This course of action will naturally consist of a list of things for the actors in the project to do, but equally important it will include things which the project manager him or herself must do in order to initiate and guide the other actors in the actions they must carry out.

This second set of actions must then be performed by the project manager. And this performance constitutes the second main set of activities of the building project manager. The choice of the word performance refers to the performative aspect of management. It is not just a matter of carrying out the design. A Performance is required in that management, especially Design & Construction Management, requires that one changes people's minds and actions. This requires that one reach them in the same way an actor does.

Finally, there is a reflection upon the outcome, attempting to draw any lessons about the designed course of action or its performance that may be useful in the future.

Coping with complex managerial problems in a way as described above can be trained in a simulation of 'real life' situations as in management games. There are practical challenges, of which the least seems: "How do we know whether the simulation is 'real as life'?" In the literature enough material can be found to construct a reasonably similar simulation (cf. Duke & Geurts, 2004, Gaffney et al., 2007).

However, the most important practical challenge seems to be: "How do we know whether the trainees have gone through the cycle of Awareness/ Recognition, Design, Performance and Reflection in their daily management 'while doing it'?" We think that this can be solved by subsequently on the one hand discuss with the trainee whether he/ she recognizes the different steps, looking back on his/ her daily functioning as a project manager, but above all by assessing whether he/ she during the exercise of his/her function works 'designerly', i.e. focussed is on analysing the problem by developing various solutions. Because that determines the searching and experimenting nature nature of managing as designing contrary to the common view on managing as choosing between ready-made options presented. By observing and subsequently evaluating the behaviour of the trainee at his/her daily management, we expect it is possible to train project managers and students in project management in learning from themselves.

RESEARCH METHODOLOGY

Even though the paper is solely based on a literature review it is an important question to which extent the concepts covered in this paper are based on sound research. Scientifically speaking, Schön's operationalisations of the concept of Reflection-in-

action are not very convincing. They are examples such as a lecturer uses to illustrate a theory, but it is unclear whether they are systematic case studies on the basis of which a theory is proposed. Also Moon (1999) states that Schön's concept is established, without ever been tested to be substantial and that there has been a tendency to adopt Schön's model as a 'fact' and theorize on this basis rather than treat the model as speculative (Moon, 1999:14, 54). There have been attempts to operationalize the concept (ibid. 49). One example is the reflexive practice of design teams (Valkenburg & Dorst, 1998). In an explorative study Valkenburg and Dorst investigate whether by means of Schön's reflective practice the nature of team designing can be described. This seems to be the case; reflection-in-action can be operationalized as reflection that guides the development of one's knowing-in-action habits (ibid. 251).

The concept of Design Thinking has been extensively researched in different practices (cf. Dunne & Martin, 2006, Dorst, 2010, Smulders et al., 2014).

The concept of Managing as Designing however seem to be grounded in only one case study, but is very well received (cf. Sebastian, 2007, Winch, 2008,).

Although there is evidence on the basis of the literature about the uncertain, searching and experimenting nature of the integral development process of sustainable building projects (cf. Van Doorn, 2012), operationalisations of Reflection-in-action, Design Thinking and Managing as Designing in these projects are, also as far as we know, not tested.

However, because these concepts seem to be very near to the concept of experiential learning and motivated by the extensive research on this concept (cf. Kolb, 2000), we believe on the basis of our literature review in this paper that it is very worthwhile to test the operationalisation of these concepts in the management practice of sustainable building projects.

CONCLUSION

In the foregoing we argued on the basis of a literature review that it is appropriate specific to sustainable building projects that students and professionals are trained in managing as designing. We started at the concept of Reflection-in-action defined as thinking about doing something while doing it. This was then associated with Design thinking of which the searching and experimenting nature seemed suitable for managing complex i.e. unexpected, uncertain, instable and/or unique situations. Although concerning only one case this seemed to be confirmed in a study that introduced the concept of Managing as Designing. The two characteristics of managing as designing, namely looking in a different way at the organisational design and looking in a different way at daily management, were made concrete for sustainable building projects. Finally we specified based on the concept of experiential learning this daily management into personal awareness, design, performance and reflection to support the training of students and professionals in managing as designing.

The education of (future) managers of sustainable building projects should therefore, focus in particular on the actions of individuals. This focus on personal awareness, design, performance and reflection makes the approach ideal for the education of students and professionals. By focusing on the higher level actions of a project manager we avoid losing ourselves in chasing the ever changing body of management tools and techniques which will face anyone in the field, and concentrate on those cognitive and social skills that will be required for making sustainability in building projects possible.

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