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ELUCIDATING HERMENEUTIC AND REFLECTIVE DESIGN PRACTICES; IS IT POSSIBLE TO PRESENT A PRESCRIPTIVE PROCESS?

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ABSTRACT
Reference to six modes of design reasoning, this article aims to elucidate designers´ hermeneutic and reflective ways of thinking. It seeks to answer whether it is possible to present a prescribed hermeneutic and/or reflective process. Several real-life design projects were analysed retrospectively. Results have indicated that the problem-solving design process has broadly been applied and adapted in real-life design projects. Methods and tools to support "Analysis", "Synthesis" and "Evaluation" were varied, multiple, and not consistently applied in specific patterns or sequences. Therefore, it is difficult to elucidate a typical hermeneutic or reflective design process. However, being able to formalise some practice elements, and acknowledge the importance of context and bounded rationality, are key factors to consider, when aiming to understand what really happens in real-life design practice.

Keywords: Hermeneutic and Reflective Reasoning, Design Process, Practice and Situated Design

1 INTRODUCTION

In many Industrial Design (Engineering) programmes, problem solving processes provide a cognitive framework for analysis, synthesis, and evaluation. Students are taught specific methods and tools, which starts with defining the problem and moving through steps to create logical solutions.
However, such a prescribed step-by step design process is seldom completely implemented in actual design practice, as it is too time consuming and costly. Instead professional practice encourages a combination of intuition, logic reasoning, experience-based insight (vision), reflective practice in anticipating future needs and trends.
The aim of this article is to elucidate designers´ hermeneutic and reflective ways of thinking by answering the research question whether it is possible to present a prescribed and formalised design methodology, which encapsulates certain elements of hermeneutic and/or reflective modes of design reasoning.
The first part of the article shares a critical view on the "Structured Problem-solving" design process. This is followed up by an inventarisation of six models of design reasoning to highlight that there are other modes of designing, besides a strict process of problem solving. The second part introduces the relevancy of "Practice Theory" in design as a reference for appreciating the importance of hermeneutic, reflective and partly participative reasoning modes in *actual* practice. The third part illustrates how hermeneutic and reflective thinking has been applied using three product design case studies, as well as concludes with implication for design education.

2 THE STRUCTURED PROBLEM-SOLVING DESIGN PROCESS

The origins of design methods lay in 'scientific' methods, similar to decision theory and methods for Operational Research [1]. However, the application of scientific methods to design was initially not very successful. Fundamental issues were also raised by Rittel and Webber [2], who characterised design and planning problems as 'wicked' problems. These 'wicked' problems were not suited to be solved by science and engineering techniques, which dealt with 'tame' problems. However, controversial views, whether designing is itself a non-scientific or scientific activity, has led to the following debate.

According to Simon, designing is problem solving within an engineering educational context, whereby "design theory is aimed at broadening the capabilities of computers to aid design, drawing upon the tools of artificial intelligence and operations research." [3, p.114]. Its complementary design process design process operates within a closed, abstract system that is controlled and manipulated by a professional problem-solver and free from human judgment and experience [4, p.35]. However, it is difficult to acknowledge the existence of the "fully rational man" who knows the solutions of all mathematical problems and can immediately perform all computations, regardless of how difficult they are [5, p.3]. Human beings are very different, and their cognitive capabilities are rather limited. Therefore, the decision behaviour of human beings cannot conform to the ideal of full rationality.

This debate has enlarged the scope of "Design methodology" by including the study of how designers work and think, the establishment of appropriate structures for the design process, the development and application of new design methods, techniques and procedures, and reflection on the nature and extent of design knowledge and its application to design problems [6]. It has also led to the development of models and strategies for executing design projects. These are for example, systematic models of the design process, particularly in engineering design, and particularly from Germany [7] [8] [9]. Besides that, the emergence of 'concurrent' models of product planning and development has also been observed [10] [11].

To extend the debate concerning the above controversy, it is questionable how applicable these systematic models of the design process have proven to be in real-life design practice. The question here is: *Do designers adopt these prescriptive systematic models in their **actual** design practices?*

According to Cross [1, p.23] "Design methodology has become a much more mature academic field, but still suffers from a lack of confidence in it by design practitioners and it has had little (acknowledged) practical application". This has been somewhat confirmed by the phenomena that some aspects of the work concerning theory-building around the concept of 'designerly' ways of thinking and acting [6] [12] [13] has been challenged from a hermeneutic perspective by Coyne and Snodgrass [14].

3 MODES OF DESIGN REASONING

The adoption of Lie´s categorisation was based upon how the authors view the current discourse, which demarcates theoretical traditions with respect to models of design reasoning. Lie´s extensive literature review has led to a systematic framework [15, p.68], which illustrates the current dispute between positivistic/deliberate design approaches on one hand and the more reflected and embedded design approaches on the other hand. Explicitly, the six models of design reasoning are "Problem Solving", "Hermeneutic", "Reflective Practice", "Participatory", "Social", and "Normative".

Problem-solving. As discussed in the previous chapter, this model represents a systematic and deterministic approach to the design process inspired by engineering, the natural sciences, and the rise of the computer sciences in the mid-1900s [3]. Through a mechanistic world-view, the design process is partitioned into smaller sub-processes or sub-problems, which then can be solved through problem-solving methods [16]. For well-defined problems, this is still the most widely used model for dealing with the design process [17].

Hermeneutic. At the outset of the design process, the potential opportunities and the choices that designers face are practically infinite. In this approach, the designer must reduce this variety by aiming for a sustained and increasing understanding of the designed product, its contexts, values, and functions until the designer decides that saturation has been reached [14]. This means that he or she needs to capture the complexity of views, which are socially and historically influenced, instead of narrowing them to a few categories of ideas. Inevitably, the designer's personal experience and subjectivity in the design process play a key role. Designing focuses on these conjectural conversations in context and interactions among stakeholders.

Reflective Practice. The constructionist reflection-in-action theory, proposed by Schön [18], is perceived as a reaction to the rational problem-solving philosophy. As design problems are unique and difficult to generalise, it focuses on the designers' or developers' actions and efforts, with respect to reflective and conjectural conversations with the situation to reinterpret and improve the problem as a whole. Methods applied by the designer are to be based on acquired knowledge, experience and reasoning.

Participatory. Designers act as facilitators to mend the gap between their own perception and understanding of "Design" problems and those of stakeholders. In this co-operative or participatory

design activity of interpretation, information gathering and facilitation, users make critical decisions in the design process. This turned out to be an acceptable way of dealing with these "wicked" problems [19]. Sanders and Stappers provided an historical overview of participatory design and co-design, as they underlined a transition from a user-centred approach, towards a user that actively participate in the design process [20].

Social. As design activities are enabled by the social community in which they are situated, a growing conscience of the designer's role in the society marked the beginning of a social model of the design process [21] [22]. Hereby, professional reasoning is not a personal competency but based on the collective wisdom of a community of practitioners, where the scope was more than to promote social and economical sustainability. Buccarelli underlined the impact of design engineers' decisions in peoples' everyday life [23], as well as described the nature of the process as a sense of 'social construction', denying the validity of simple linear models of the design process.

Normative. In this prescriptive model, "Design" solutions are fitted to certain standards, values and conventions in accordance to their role and responsibility. The normative framework can be understood as guidelines that should be followed in order to satisfy certain criteria, for example ideals of user/product experience [24], manufacturability or sustainability [25]. This way of thinking is often referred to as Design for X [26], where the X denotes a certain aspect of the design.

4 PRACTICE THEORY AND SITUATED DESIGN

Practice theory is relevant in guiding designers, students and educators to be more conscious "anthropological" thinkers by bridging the gap between design thinking and design research. In other words, design and research goals intertwine with the goals of real-world practice. Inevitably to understand the deeper connections between research and design through design thinking, and to argue for their increasing similarity in terms of knowledge creation and innovation, the conceptual relationship between practice, praxis and practitioners will be discussed below.

First to make the distinction between practice and praxis, practice guides activity, while praxis is the activity itself. Hereby, 'practices' refer to shared routines of behaviour in the broadest sense, including traditions, norms and procedures for thinking, acting and using 'things' [27, p.619]. Praxis refers to what people actually do. Practitioners are the actors, who make, shape, investigate and execute. They include senior (strategic) design executives, designers, researchers, makers, prototypers, etc.

The concept of "Praxis", which encompasses "Practice", is complex and diffuse. It embraces routine and non-routine, as well as formal and the informal, activities at the corporate centre and at the organisational periphery [28]. These activities include meetings, conducting interviews, presenting concepts, entertaining potential and existing customers, talking with suppliers and distributors on the phone, organising and conducting usability studies, ad-hoc "firefighting", and many more.

The notion that particular activities cannot be detached from society, because the rules and resources it furnishes are essential to their action, leads us to the concept of "Situated Design". As such, design processes and methods should not be described as though they are universal and can be applied in the same way across contexts [29]. They take place in particular situations and are carried out from embedded positions [30] [31]. In other words, design is situated to highlight the interactions and interdependencies between designers, designs, design methods, and the use situation with its actors, activities, structures, particulars, and broader context. This means that design is in line with Gibbons views on scientific knowledge as being practice-oriented [32]. It stresses that analysis and design should be carried out in continuous dialogue with the field and in collaboration with participants. Complementary to "Situated Design", Haraway [30] introduced *situated knowledges* by arguing that knowledge is situated and partial. As knowledge production takes place under specific historical, political, and situational circumstances, it is embedded in context [33].

A situated design approach emphasising the complex relation between the context and the design situation at ground level, involve different actors and stakeholders, as well as societal structures dictated by institutions, regulation, market mechanisms, and so forth.

The connectivity between "Practice Theory" and "Situated Design" challenges designers to work with the routine and the non-routine, the formal and the informal. As such, a need for a more practice-oriented design process may arise. This process should fit typical contexts and be able to stretch them when aiming for innovative solutions.

5 CASE STUDIES

In this section, three cases will be presented to illustrate the hermeneutic and reflective practice movements in past product design projects.
These projects were:

- Interior Customisation of Singapore Fast-Response Police Car
- USB- Memory Stick for Customer Recruitment
- Land-side Airport Luggage Trolley for Changi International Airport

5.1 Interior Customisation of Singapore Fast-Response Police Car

In 2001, the Singapore Police Force (SPF) launched initiatives to improve and enhance the installation and use of equipment to optimise its fast response operations using police patrol vehicles with in-vehicle information and communication systems. These Fast Response Cars (FRCs) include mandatory elements, such as an on-board computer terminal and keyboard, radio and data transfer communication equipment in the front area of the vehicle, as well as efficient storage of other equipment and tools required for Fast-Response Operations, such as bolt cutter, roadblock signs, riot shields etc. in the rear area of the vehicle.
Through an iterative trail-and error process, a reflective practice-oriented approach was adopted in the conceptualisation and detail design of the interior customisation. Foam and cardboard models (see Fig.1) were used to obtain better knowledge on how the electronics, equipment and tools need to be arranged in a constrained space with respect to the user. Furthermore, fact that customisation has not been integrated and was referred to independent sub-contractors and designers, was a matter of *"Situatedness"*. The established car manufacturers, who provided the Fast-Response-Cars, were concerned about responsibility issues.

Figure 1. Foam models to explore the positioning of equipment in the front and rear interior of the vehicles

5.2 USB- Memory Stick for Customer Recruitment

In this "Lady´s Card" credit card campaign, the United Overseas Bank of Singapore (UOB) commissioned the design and development of a USB memory stick *(Fig.2)* to recruit female applicants. The contract manufacturer was able to purchase the electronics and mould the plastic parts against significantly affordable prices. This made it attractive for UOB bank to purchase large quantities to be distributed as an ancillary reward for successful female credit card applicants.
In *"praxis"*, a reflective approach was adopted in the conceptualisation of the USB stick. The sourcing of electronics was done at relatively low cost from a Taiwanese supplier. *(At that time, in 2003, the USB technology was expensive and newly patented, but as Taiwanese manufacturers were not subjected to intellectual property rules and regulations, they were able to copy unrestrictedly).*
The oval shape of the electronics, which was coincidental, suggested the presence of symmetry lines. From a reflective practice perspective, these lines led to the idea of developing symmetrical plastic parts, saving tooling costs.

Figure 2. Low-cost USB Memory Stick for Enticing Prospective Credit Card Customers

5.3 Land-side Airport Luggage Trolley for Changi International Airport

In 2003, a collaborative project was initiated among the National University of Singapore (NUS), Design Division, a German airport trolley manufacturer and Changi International Airport. The brief was to look beyond the trolley as merely a means to transport luggage. Several rounds of participatory design and user-testing were conducted. Complemented by a hermeneutic approach, where designers advocated their professional experiences, views and visions of future air-travel, many concepts *(Fig.3)* involving communication and information *(e.g. trolley as hotspot, trolley as an interactive entertainment and information hub, etc.)* and ancillary uses *(e.g. trolley to transport children, trolley as a resting place etc.)* were proposed. Hermeneutic design reasoning was facilitated by having a good grasp of the situated context. Location, demographics of travellers, airport regulations, traveling and interaction culture *(e.g. meeting and saying good bye, amount and type of luggage to transport, etc.)*, contributed to discussions, reflections and speculations, which led to a broad range of future concepts.

Figure 3. Different Concepts of a Land-side Airport Trolley

6 IMPLICATIONS FOR DESIGN EDUCATION

As a response to the research question the three projects supports the phenomenon that emergent design activities based hermeneutic and reflective reasoning are equally important as being deliberately guided by prescriptive and structured design processes. An essential factor, which puts hermeneutic and reflective thinking in the forefront, is context typicality and dependence. In other words, actual design practice is driven by context and interactions among stakeholders, and is most likely emergent. In terms of design education, a practice frame work should be introduced to facilitate the choice of prescribed, routine and non-routine design activities. Such a framework will not be able to prescribe a holistic stepwise procedure on how to start and end a design project. Instead, it focusses on helping students to choose typical design tools help to complement emergent and deliberate design activities.

In terms of mentorship, faculty should develop students´ sensitivities and interests to reflect on societal, technological, economic, environmental and political issues and trends. Besides, exposing them to using certain tools, they should be trained to think in causalities. This means that students should be subjected to (literature) sources, materials, experiences, cultures, etc. so that they are able to analyse and conjecture, think linear and non-linear; and think deductive, inductive and abductive. Once students are able to adopt the above modes of thinking and attitudes towards designing, they will be in a better state, not only to analyse information and develop concepts, but also to create new knowledge and futures.

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