
Editorial: Fostering creativity and innovation during early informal design phases. Part 1: sociotechnical and psychology studies

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Abstract: The first part of this special issue, entitled 'Fostering Creativity and Innovation during early informal design phases. Part 1: sociotechnical and psychology studies', contains a selection of research work focused on the analysis and the characterisation of the early innovation phases. It is focused on the early design phases of innovative projects that are one of the important challenges for industrial companies. Indeed, innovation contains complex socio-technical phenomena and processes, especially when new ideas of innovative concepts (such as products or services) are proposed. These questions are complex because the first moments of innovative developments are not well-defined phases of the design activity. Indeed, they are not well-known, and combine different aspects such as creativity with negotiation among different stakeholders (design, marketing, suppliers, R&D, etc.).

Keywords: early design phases; informal processes; innovation; sociotechnical approach.

Reference to this paper should be made as follows: Legardeur, J. and Merlo, C. (2007) 'Editorial: Fostering creativity and innovation during early informal design phases. Part 1: sociotechnical and psychology studies', *Journal of Design Research*, Vol. 6, Nos. 1-2, pp.1-4.

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It is now a well-established fact that the early design phases of an innovation are complex and take place within conflicting contexts that combine technical, economic, organisational and social aspects (Bucciarelli, 1996). Today, the generation of innovative products, services and processes is a key issue for companies' development and competitiveness.

But, how are new ideas of innovative concepts developed and progressively accepted in industrial companies? What happens at the beginning of this venture, between the moment of the new idea generation and the decision to start a project based on this new initiative? These questions are complex because the first moments of innovative developments are not well-defined phases of the design activity. Indeed, they are not well known, and combine different aspects such as creativity (Christiaans, 1992) with negotiation among different stakeholders (design, marketing, suppliers, R&D...). In this part of the Special Issue, we address this question in a pragmatic way based on empirical studies of industrial situations. Our aim is to go deeper into the understanding and the characterisation of these very early design phases of innovative design projects.

However, experience in practice highlights the difficulties and the weaknesses of the cooperative processes during the early design phases, especially when a new concept or idea is proposed for consideration. During these early phases, exploring new possibilities (new concepts, technologies, new markets...) can prove very difficult and off-putting as the actors find themselves devoid of knowledge in certain areas and tend to remain faithful to traditional solutions that are already proven to be stable and reliable.

Fieldwork in various industries suggests that, before launching an innovative project, characterised by various targets in terms of cost, quality and lead time, an important amount of work is required in order to convince the participants and the management that the new idea is worthy of consideration for the given application. At this time, the goal is to legitimise the proposed idea and also to organise (and to invent) the necessary management processes in order to prepare for the launch of the future project. Therefore, innovators sometimes have to work during informal pre-project periods to disseminate new ideas or concepts in order to introduce them as new innovations. Dorst and Cross (2001) report a protocol analysis study of industrial designers and highlight the co-evolution of problems and solutions.

In this context of early design phases, actors discuss the new ideas and drafts of solutions and exchange preliminary information that may be partially validated, incomplete, uncertain and ambiguous or even risky. Cooperative processes are quite unstructured, and the confrontation of the different actors' points of view leads to informal and unofficial information exchanges. These phases of investigation and negotiation are not formalised design phases; however, they sometimes lead to the construction of official project development plans. Indeed, the work carried out during

these phases widely determines the success of some innovative projects. If proper work is carried out, the arguments developed at this stage should lead to the definition of proper specifications (technical, organisational and economical), providing the input for an official development project.

This Special Issue is entitled *Fostering Creativity and Innovation during early informal design phases*. Part 1, 'Sociotechnical and psychology studies', contains a selection of research work focused on sociotechnical analysis (Boujut and Tiger, 2002) and the characterisation of the early innovation phases. Part 2, 'Methods and Tools', is more focused on the propositions of tools and methods designed to be used during early design phases.

Part 1 contains the following six articles.

The first paper is by Anja-Karina Pahl, Linda Newnes and Chris McMahon and is titled 'A generic model for creativity and innovation: an overview for early phases of engineering design'. Based on a state-of-the-art survey of design theory, methods and tools, this paper is focused on the proposition of a generic model to describe the 'process of creating'. It explores how 'creativity' and 'innovation' can be most usefully modelled for the modern design context.

The second paper 'Sketching the product strategy: team processes in early design innovation' is by Kristina Lauche. Based on fieldwork observations (analysis of video recordings, artefacts and interviews), the author proposes a characterisation of early design phases regarding distinctions with the later ones.

In the paper 'Staging sociotechnical spaces: translating across boundaries in design', Christian Clausen and Yutaka Yoshinaka address how insights from the Actor-Network Theory (ANT) proposed by Callon (1986) and political process theory may contribute to a reflexive understanding of design (according to Schön's theory, 1983) as the staging of sociotechnical relations and processes cutting across boundaries of diverse organisational, political and knowledge domains.

Various methods have been used to identify and analyse designers' frames and their evolution within the design process. In the paper 'Framing innovation: negotiating shared frames during early design phases', by Jonathan H.G. Hey, Caneel K. Joyce and Sara L. Beckman, an interesting approach dedicated to analyse collective design activity is proposed. An original model is developed to describe how design frames are socially negotiated and shared during early design phases.

When design decisions are made by a group of diverse stakeholders, the decision-making process is affected by both technical and social dynamic factors, and the design results are consequently a product of the joint influences. In the paper 'On social dynamics factors in multi-stakeholder decision making in the early stage of product development', Ping Ge and Ping-Hung Hsieh focus on a prioritising problem concerning understanding customer needs at the early stage, in particular the identification of quality requirements and their relative importance.

Among the large number of innovation opportunities, eco-innovation is one of the most promising ways for the next innovative and sustainable developments. In the paper 'New tools for the early stages of eco-innovation: an evaluation of simplified TRIZ tools', by Elies Dekoninck, David Harrison, and Neville A. Stanton, an analysis of the use of TRIZ method (Altshuller, 1984) for early design phases of eco-innovation is proposed.

As a conclusion of the complete Special Issue, we hope to show that important developments occur during early design phases. These first periods have a significant impact on the innovation process and on future projects. Therefore, we believe that the early design phase is an actual design phase that is particularly important in the development of innovative solutions.

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