What are the early informal phases of design projects?

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Abstract. This paper presents a research work concerning with the description of the early informal design phases. Our results are based on an empirical study carried out in different industrial companies. We propose a characterization of these early design phases based on the actor-network theory. Then we show how these first periods of new ideas development lead to complex informal negociations between design participants both on technical and social aspects. The aim of this paper is to illustrate the need to integrate these particular phases in any product development process in order to foster innovation.

Introduction

How new ideas of innovative concepts are 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 product developments are not well-defined phases of the design activity. Indeed, they are not well-known and combining different aspects such as creativity aspects but also negotiation between different partners (design, marketing, supplier, R&D…). In this paper we address this question in a pragmatic way based on the empirical studies of industrial situations. Our aim is to go deeper in the understanding and the characterization of these very early design phases of innovative design projects. We will adopt a constructivist point of view based on the actor-network theory (ANT) in line with the works of Callon and Latour [1-5]. Therefore we consider that innovation is a process that entails the development of alliances among groups of actors, the evolution of practices and knowledge, the creation of specific mediating artefacts and finally organizational shifts. Consequently, the term “innovation” does not characterize a “new product” but rather the adoption process of an artefact which is new to an organization and to the relevant environment” [6].

1. Research background

We realised an industrial fieldwork based on a socio-technical study [7] of the innovative process at Renault VI R&D departments. This study, based on intervention research and participant observation has been carried out by an interdisciplinary research team composed of social scientists and engineering design researchers. For over 18 months, we took part in the development of a new vehicle design project. This empirical study was the opportunity to closely observe the work practices of actors faced with a proposal for an innovative technical solution. The technical aspects and especially the social ones [8] of the design project was related to the development of a new application using a composite material which was not

very well known by designers. We were thus able to observe and analyse the collaboration processes between different kinds of actors.

A previous study [9] characterises the difficulties when new ideas, different from the ones traditionally used, is integrated in the very early design phase. At this time of the development, exploring these new alternatives (new technical concepts of product, process, technologies…) can prove very difficult and off-putting as the actors proposing the new idea find themselves devoid of knowledge in certain areas where traditional solutions, that rely on better understood technologies within the company, are already relatively stable and advanced. Indeed, we observed that presenting the pros and cons of the proposed idea are not always enough in themselves to get a new project accepted. In this situation, we found that the integration of a new concept, different from the ones traditionally used, is often only achievable with the hard work of a particular actor to help propagate the new concept, who we name the pilot. Additionally, the pilot is typically the actor who proposed the innovative concept.

We propose in this paper a characterization of these early design phases based on the actor-network theory (ANT) [1-5]. According to Lundberg and Sandahl [10], the ANT is one way to represent work that in reality is difficult, messy and complex. The theory simplifies this representation in a way that highlights how human actors and artifacts are intertwined in order to reach the initial goals. In the ANT both humans and artifacts are seen as part of the social world. The ANT may also have the potential to indicate how new artifacts may impact work practices. Therefore, while describing the different steps of the process we will meet new actors, witness the creation of a network and observe the evolution of the design problem. We use ANT in order to analyze and illustrate how the technical and the social things are interwoven, focusing on particular actors when they attempt to persuade others, to "align" various points of view. We believe it is through the description of this movement, made of alliances and shifts (cognitive or physical) of either things or persons that the observed process can be qualified as innovative or not.

2. The early informal phases of innovative design projects

During our fieldwork we included the material department of our industrial partner by following and questioning specific actors, referred to as "materials experts". The traditional role of a material expert is to provide information and data on materials and the related processes, but in our case we observed that certain material expert played also a key role in the informal pre-development of new innovative solutions by providing new design alternatives and ideas. At this stage these material experts try sometimes to select and propose potential applications, enabling the connections between the various actors in order to build credible propositions. In that case these material experts are mostly in the position of "interface actor" facilitating and managing competencies, and fostering the diffusion of a new idea that is yet only at the stage of a concept.

At different levels, we think that we should find a lot of "interface actors" in companies and others complex organisations. These "interface actors" are not only material expert, head manager or project manager. For example, design, marketing, production, and manufacturing actors can play this role during a temporary time of their activity. Therefore, we named the "pilot" these interface actors who are trying to put forward new ideas of alternatives during the early design stages. This particular work leads the pilot to be a strategist in order to align the interests of the various participants. According to ANT, we can describe this step as a process of *achieving agreement* which is dependent on the actors' ability to appropriate the

interest of others to one's own project. In these situations, the goal of the pilot consists above all in managing a certain amount of tension between a "qualification" (or acceptance) system set up by the promoters of a new solution, and a "de-qualification" (or rejection) system implemented by the promoters of a more routine-based solution.

New product/process ideas might thus developed during periods of negotiation and research, which are often informal and non contractual. At this level the official project has not been launched and the goal of these phases is first of all to be able to bring together a certain amount of data and information in order to justify and consolidate the idea put forward creating a configuration in which it is possible to launch a project. With ANT, these *enrollment processes* are characterized by the achievement of a certain degree of alignment of interests that depend on the translation done by the actors [1]. Within these processes the pilot has a very important and strategic role by managing informal exchanges between partners and *working at interfaces* according to [11]. The process of the idea adoption relies on informal networks managed by the pilot actor and involving partners from different departments and with different skills. According to ANT, agreement is achieved when a certain degree of alignment of interest is reached in a stabilized network. This ANT concept of a stable and aligned network can be interpreted as a "successful" network which is created through the enrolment of a sufficient body of allied interests. In fact, the advantages of the new idea introduced and promoted by the pilot acts as an instrument for innovation. In that case the innovation is pulled by the advantages of the new idea whereas innovation is mostly presented as pushed by the market.

This paper aims to put forward the importance and the difficulties of the early development phases, especially those that mostly remain informal. We highlight the fact that the work carried out during these phases widely determines the emergence and the success of an innovative project. Before launching a new project, characterised by the definition of various targets in terms of cost, quality and lead time, the pilot carries out an important work in order to convince the other participants (and also head managers) that the new idea is reliable for the given application. If a proper work is carried out, the argumentation developed at this stage should lead to the definition of proper specifications (technical and economical), providing the input for an official development phase.

During the early design phases we also observed the various strategies used by the pilots in order to consolidate the technical propositions and legitimise their proposition. The achievement of this goal is subordinated to the confidence the pilot must gain by providing pertinent and reliable information. But on the other hand, the argumentation developed by the pilots must be understood and integrated by the other participants. In this way, the choice of the "representative" (or "spokesperson" according to [4]) of the new idea, is one of key point during the selection process.

Conclusion

In this paper we presented a caracterization of the "early informal design phase". They sometimes leads to the development of an official project or product prototype ... However whereas traditionnal steps of product development are identified these first periods of negotiation and investigation are not seen as official design phases (see figure 1). We underline here the importance of these phases and the need to develop and propose new methods and tools dedicated to help the various actors at this stage.

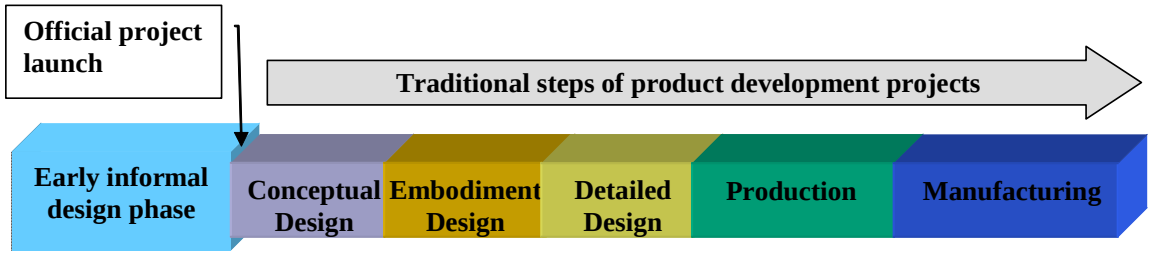

Figure 1. Early informal design phases

The observation of these informal early design phases lead us to formulate three hypothesis which characterise them:
- first innovation requires an evolution of the organisation and especially the structuration of a network of actors around the points of view confrontation between the promoters of innovative solutions and more routine solutions,
- second innovation implies the generation of new knowledge and its sharing between all actors involved in the proposal and the validation of a new solution. The aim is to facilitate and to organise the emergence of this knowledge,
- third innovation goes on with the development of new tools and criteria for the evaluation of product and process solutions.

By the way the confrontation between the different points of view implies large processes of informal exchanges. From this analysis specifications for a collaborative tool could be defined. In order to foster innovation in these early design phases, we define key elements that should be satisfied and that are summarised as follows:
- support the creation of a network of actors around the pilot,
- provide a project guide for the pilot,
- enable the synthesis of different points of view in order to evaluate/validate the proposed solutions,
- capitalise and re-use the information to assist future projects.

As all the developments carried out during the early design phases remain mostly informal and not framed by a project structure, it is very difficult to allocate specific resources to these phases. However we showed that important developments occurred during these phases and moreover they had a significant impact on the innovation process and on the future projects. Therefore we claim that the early design phase is an actual design phase particularly important in the development of innovative solutions.

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