A SOCIO-INTERACTIVE FRAMEWORK FOR THE FUZZY FRONT END

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ABSTRACT
This paper aims to illustrate that the dominating rational-analytic perspective on the Fuzzy Front End (FFE) of innovation could benefit by a complementary socio-interactive perspective that addresses the social processes during the FFE. We have developed a still fledgling socio-interactive framework blending existing knowledge of the FFE with theories from design methodology and the psycho-social sciences.
For the framework constructs like the interplay of design problem and design solution, mental models and social processes are used and applied to the results of an empirical study for illustration. The paper ends by discussing the results and presenting a future research agenda including implications for management.

INTRODUCTION
Consider the following quote from a salesman of a globally operating supplier of mechanical parts for among others the automotive industry who was interviewed for the current research:

> "…we have an idea [from a customer], but we are desperate … It is like a wall, you run with your nose to the wall and you don't come further [with the new idea]…"

This quote clearly illustrates this paper's core issues: the problems that actors in the front end of innovation encounter in their efforts to bring new ideas further into the organization. From this research project we have learned that interactional and communicational problems behind this quote and similar quotes are quite often causing frictions and barriers in respect to the progress of the early or upfront stages of New Product Development (NPD).

In our technology driven, rapidly changing society, the need for fast and innovative product design becomes more and more eminent. But, the design process officially only starts at the moment a clear picture is obtained of the market opportunity and an idea for the new product including a strategy of how to combine these two into a high quality design. In the last decade, this front end of NPD is denoted as a very important and also challenging phase because of its non-transparent character. Due to the required and difficult translation from vague ideas about market needs and likewise vague ideas about possible new products to a new and innovative business concept the front end of innovation is often referred to as the Fuzzy Front End (FFE) (Smith & Reinertsen, 1991).
In this paper the focus will be on the early stages of the FFE when there is no clearly defined market need, nor a detailed idea for the new product. For a design process to

get started a clear match between those two elements is necessary. Typical activities in this phase are: need identification, need assessment, idea generation & selection, and concept generation (Koen et al., 2001). These activities are believed to result in writing a business case and/or a project proposal to convince top-management to provide the funding and the resources needed for the NPD-project.

This seems quiet straightforward and is illustrative for the dominant rational-analytic perspective on the FFE in literature that is suggested to be of help in cases of incremental innovation (Kim & Wilemon, 2001). However, because of its contingent character (Khurana & Rosenthal, 1998; Reinertsen, 1999; Nobelius & Trygg, 2002) framework-building in the area of the FFE is still considered to be very limited (Kim & Wilemon, 2002) and this is even more true for discontinuous innovation. Reid and De Brentani (2004, p. 182) point out that, researchers who discuss discontinuous innovation "have tended to invoke NPD processes, which are relevant to incremental innovation" and not to discontinuous innovation. Researchers miss therefore in their descriptions essential differences related to the creative process, because discontinuous innovations require a process of "identifying, understanding and acting on emerging patterns in the environment" (2004, p. 182) and do not start with a more or less defined and structured problem situation as is the case with incremental innovation. From this it becomes clear that there is an urgent need to investigate the idea-forming stages related to discontinuous innovation from a different perspective in order to be able to create a deeper understanding. What perspective could this be?

Recent literature on discontinuous innovation shows that it is seldom the case that only one individual is involved in making the creative connection that leads to opportunity recognition and further on to start the NPD project (Colarelli O'Connor & Veryzer, 2001; Reid & De Brentani, 2004; Veryzer, 2005). The people that have the most articulated (still not very clear) image of possible market needs are in most cases not the same people that have sufficient knowledge of (technological) possibilities that could result in the match sought for. The result is that people need to interact with each other and that iterations are needed before a promising opportunity gets defined; sometimes even successive cycles of opportunity recognition are necessary (Colarelli O'Connor & Rice, 2001). The role of individuals in this process is believed to be important, but we should not forget that these individuals are not acting on their own but are engaged in social processes in order to share and acquire information and knowledge that form the base of their recognition activities. Although recent literature seems to make some first steps away from the rational-analytic paradigm by lowering the level of analysis to the level of individuals they do not provide enough footholds to build on because they refrain from mentioning the social system these individuals are engaged in. Therefore this so-called socio-interactive perspective is still largely missing in the FFE literature.

This paper aims to make a first step in filling this gap by presenting the results of a study that focused on improving the processes of the fuzzy front end. The main theme of this paper is to illustrate that a fundamental approach that aims to investigate the socio-interactive side of the FFE in addition to the existing rational-analytic paradigm could be a promising direction to advance our knowledge on discontinuous FFE.

Next, we will describe the rational-analytic perspective on FFE which is followed by defining innovativeness. Subsequently, we will use theoretical constructs from the field of design methodology as an analogy for the creative phase of discontinuous FFE. Then we make clear that the FFE must be considered as a social process that leads to a new social reality. Introducing the psychological construct of mental models completes the socio-interactive framework of the FFE. The findings of the

empirical research will be used to illustrate this socio-interactive framework. The paper ends by discussing our findings and by presenting managerial implications.

RATIONAL-ANALYTIC PERSPECTIVE ON FFE

Over the last two decades, the research attention of academics on one side and professionals on the others side to better understand the FFE has certainly increased. Over the years, many theoretical phase models that somehow describe the FFE-process have been published. In this section we will briefly describe some models and perspectives as found in literature to create a better understanding of the FFE-process from the rational-analytic viewpoint. Cooper (1983) is one of the first researchers to explicitly focus on the FFE and starts with the generation of ideas and ends this phase with the definition of a concept. Later models include at the end also the project planning stage or even the actual product development (Roozenburg & Eekels, 1995; Buijs, 2003). However, Nobelius and Trygg (2002) found in their explorative case studies that in practice there is a large variation of front-end models containing a variety of activities, sequences, degree of overlap and perceived importance of specific tasks. These findings are in accordance with the suggestions by other researchers that the FFE has a contingent character, meaning that there is no one best way of managing the FFE-process. This seems to disqualify the prescriptive models that present a general step-by-step approach. However, some activities seem to be relevant to most of the FFE-situations be it that they do not occur in the same sequence for all projects. Koen et al. (2001) developed a circular model based on experiences from eight multinationals. They characterize the FFE process by saying it is chaotic, unpredictable and unstructured but that five elements are found in all eight FFE: idea generation, opportunity analysis, idea genesis, idea selection as well as concept and technical development. The center part of their circular model, which is called the engine and consists of leadership and culture, drives these five elements. Around the engine and its five elements are the influencing factors such as competitive environment and business strategy. The circular shape of the model expresses the flow and the circulation of ideas, iteration between the five elements, and the dependency among them. Although they step away from a strict rational-analytic and sequential model, they don't yet make the connection to the socio-interactive perspective that needs to connect these activities on the level of the actors involved. Schröder and Jetter (2003) also create a certain dependency between three phases they describe: opportunity recognition, product concept creation, and concept evaluation and testing. They emphasize that there should be a focus on the following aspects: support of uncertain, imprecise and dynamically changing information, processing of diverse information and enhancing information processing capabilities. Although they fail to show how this additional support must be realized during the FFE, the information perspective fits the socio-interactive view as we will show later. The models as found in literature seem to be more applicable to the situation of incremental innovation than to discontinuous innovation that we are focusing on. But what are the characteristics of discontinuous innovation? In the next section we will answer this question by reviewing the literature thereof.

DEFINING INNOVATIVENESS

In the last two decades academics have introduced a plethora of names and definitions to indicate levels of innovativeness. The result is an ambiguous situation regarding the interpretations and comparisons of the literature that addresses all these innovations (Garcia & Calantone, 2002). At the moment there are many other terms

ubiquitously in use like, incremental, routine, imitative, steady state, radical, disruptive, breakthrough, discontinuous, really new and disruptive to identify innovation. In general, one could identify a dichotomy that is made up by radical innovation on one side and incremental innovation on the other side. In the typology that is developed by Garcia & Calantone a third category is proposed in between these two extremes and labeled as 'really new' innovation. Their motivation is that only 10% of all innovations can be considered as radical which labels the remaining 90% as being incremental. This is not very realistic because it seems to skip a presumably large group of moderately innovative innovations in between radical and incremental.
For evaluating innovations they propose a distinction between a macro/micro perspective on one side and marketing/technological discontinuities on the other side. The macro/micro perspective is related to evaluating the innovativeness based on factors exogenous to the firm (macro) and on factors related to the firm and its present market (micro). The marketing discontinuities may require new marketing skills or new marketplaces, whereas the technological discontinuities refer to paradigm shifts related to technologies embedded in products, production and/or R&D. It should be made clear here that every evaluation of innovativeness should be relative to the innovating firm. What is discontinuous for one firm could be incremental for another, even if they are developing the same innovation.
According to Garcia and Calantone (2002) the term discontinuous innovation, as being used in this paper, cover the 'radical' and 'really new' innovations and as such fits perfectly the early idea stage of the FFE that is presented here. One should realize that during the early stage before the opportunity is fully recognized there is no firm combination of market need and product concept and therefore it is impossible to categorize the future innovation in classes like radical or really new, hence our focus on discontinuous innovation.
The next section aims to introduce an additional perspective on the specific form of reasoning belonging to discontinuous innovation. Theoretical constructs that stem from design methodology seem to be of help.

CREATIVE DESIGN AS ANALOGY TO DISCONTINUOUS INNOVATION

In this section we will draw a parallel between the discontinuous FFE and the creative design process in order to create a more fundamental view of the FFE phase. We will start with describing the design process as a process of matching the problem space and the solution space. Connecting this to the situation of discontinuous FFE is what follows.

Matching problem and solution spaces in Design

Although the actual design activities take place down stream from the main focus of this paper, we have reason to believe that some of the creative design processes show similarities to the creative processes that need to occur in the FFE. In both situations the actors involved aim to solve in a creative way the problematic situations that surface along the process. In the positivist perspective that was introduced by Simon (1973) designers seek solutions for ill-structured problematic situations. This perspective on design belongs to the paradigm of rational problem solving and presupposes that the process is running from problem to solution. Schön (1983), not satisfied with this positivist paradigm, introduced the notion of the 'reflective practitioner' that considers design as an individual reflective conversation with the design task and possible solutions. Dorst and Cross (2001) take the basic idea of Schön a step further by considering design as a co-evolution process of problem space

and solution space. Extensive protocol studies by Dorst and Cross (2001) confirm that creative design involves a period of exploration in which problem and solution spaces are both evolving in parallel, and that they are unstable until (temporarily) fixed by an emergent bridge which identifies a problem-solution pairing. This 'bridge' is called 'an idea'. Based on this perspective, ideas in design thus involve both an interpretation of the design problem and a proposal for a possible solution and make the process to arrive at such an idea-state to a co-evolution of problem and solution (Dorst & Cross, 2001). The co-evolution view implies that we cannot presuppose that there is something like a fixed design problem at any point early on in the creative design process nor can we describe the creative design process as running from problem to solution (Dorst, 2004). This clearly disqualifies the rational problem-solving paradigm as suitable for describing creative design and urges us to open the door for analyzing design activity using the phenomenological paradigm that includes the reflective practice with its co-evolution perspective (Dorst, 2006). But, how does this fit the situation of discontinuous FFE?

Discontinuous innovation: matching need space and competence space

The co-evolution perspective regarding creative design shows parallels with the early phases of discontinuous innovation. During the FFE the actors seek to make combinations between ill-defined market needs and conceptual ideas for new products that solve those needs. According to Colarelli O'Connor and Rice (2001) opportunity recognition in case of breakthrough innovation must be seen as a creative act linked to individuals. Reid and De Brentani (2004) call this creative act "marrying new information with previous knowledge", and indicate that it is a process that is not very well understood in the case of breakthrough innovation. The cognitive leap that is made by these individuals and result in identified opportunities can be seen as the creative idea that bridges the 'need-space' in the market and the 'competence-space' belonging to the company. In the case of discontinuous innovation a need-space contains the final need that is sought for be it in an unarticulated form, often referred to as latent needs. The competence space contains the firm's specific competences, similarly not yet articulated, that will make it possible for the firm to develop and bring to the market a satisfactory answer to the identified need. Both spaces can be considered as unarticulated mentally held knowledge fields. Therefore it is argued here that the process that result in these breakthrough ideas can not be a rational problem solving process that runs from a clearly defined market need to a new product idea. Reid and De Brentani (2004) hypothised that only in the case of incremental innovation the process runs from problem to solution. We suggest here that breakthrough innovations are, like in the case of creative designs, being preceded by a period of co-evolving need and competence spaces until a promising match between the two is recognized.

Although this cognitive leap is considered to be an individual act, Colarelli O'Connor and Rice (2001) have seen that in most cases multiple waves of opportunity recognition are required to keep the process going. This seems to suggest that an initial breakthrough idea from one individual needs to be recognized as opportunity by other individuals as well which implies that different individuals (in different functions) create different perceptions of the same opportunity. If that is the case then these successive need-competence matches build onto each other and result in a new body of knowledge. Why would otherwise additional individuals need to make a cognitive leap to?

The different waves of opportunity recognition are according to Reid and De Brentani (2004) related to different types of decision-making interfaces. An interface according to these authors denotes a point at which independent processes, individuals and/or groups interact with each other. They suggest that there are three successive interfaces that often involve different individuals (boundary spanners, gatekeepers, decision makers) and are necessary to bring the initiative further into the organization and into the sphere of corporate consciousness, that is, onto the level of corporate decision-making. They, like only a few other scholars (e.g. Van de Ven, 1986), label innovation in it's essence as a social process, however without being able to clearly describe what is happening during these social interactions.

SOCIAL PROCESSES TO CREATE A NEW SOCIAL REALITY

Until now we have been talking about individuals that need to make creative leaps at some point in time. Preceding such a leap these individuals are not locked up in solitary confinement with the task to 'identify something new'. They are involved in all kind of interactions with people that might possess parts of the jigsaw puzzle. Colarelli O'Connor and Veryzer (2001) mention two types of individual drivers, one that has the ability to play a technology-visioning role (≈ competence-space) and one that plays the market-visioning role (≈ need-space): inventors and ruminators respectively. An opportunity recognition event then requires a match between the two knowledge fields as represented by the inventors and ruminators. If we want to take the co-evolution perspective as described above seriously, then the individual cognitive leap is somehow embedded in a social process that has served the transfer of knowledge from inventors to ruminators and vice versa. One way or the other the need-space in the market must match with the competence-space belonging to the firm. And this is obviously not where the buck should stop. Therefore the successive waves of opportunity recognition are to be seen as series of socio-interactive processes that eventually lead to the start of a formal NPD-project. We feel strengthened by Veryzer (2005) who found that in the case of discontinuous innovation actors from marketing, R&D and industrial design should be involved as early as possible in order to prevent time consuming and costly iterations further downstream. The involvement of all these parties makes the social interactions complicated and the FFE-process vulnerable in terms of its progress. Veryzer even found that discontinuous innovation require unconventional processes which implies different forms of attention and reasoning (Danneels, 2004). An uncommon way of reasoning not only relates to the cognitive activities of individual actors but obviously also to the social processes during the FFE, that is, it influences the reasoning of collaborating individuals during the FFE that aim to identify an opportunity by matching need and competence spaces. The aim of the actors during the FFE is to decrease the uncertainty level until a 'required' level is reached and the fuzziness is under control (Kim & Wilemon, 2002). The level so reached shows similarities with the idea of cooperate consciousness as mentioned by Reid and De Bretanni (2004) that provides the management enough reality to base their decisions on.

These levels and successive waves of opportunity recognition by the different actors involved in the FFE point to some kind of critical mass, maybe we should say 'critical momentum', that needs to be accumulated around the discontinuous innovation. Although it is not clear what exactly leads to such a critical state, it is surely an accumulation of individual knowledge particles that together form a new or additional body of knowledge. In the case of discontinuous innovation this even might be considered to be new social reality that will be far different from the present one and

is made up by complementary mental representations of the involved actors regarding the future new business. The next section deepens the mental dimension by introducing the construct of mental models.

THE THEORETICAL CONSTRUCT OF MENTAL MODELS

In addition to the co-evolution and social perspective this section introduces the construct of individually held mental models that forms a deeper layer to the former two. The actors that are contributing to the FFE have different backgrounds and work in different functional departments, like R&D, Sales & Marketing, NPD, etc. and on different hierarchical levels. As a result of that each actor is in his/her work involved in a specific discourse related to his/her object world (Bucciarelli 1988) or thought world (Dougherty, 1992). With a discourse here we refer to the social life within the respective functional environments that is governed by reciprocally depending roles played by the actors in that specific environment. The mental representations of these worlds are called mental models (Mohammed & Dumville, 2001) that are believed to contain explicit as well as implicit and tacit knowledge structures (Kim, 1993). These mental models have been built up over the years by education, training and experience and have led to "deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action" (Senge, 1990). Mental models therefore provide a very deep understanding of the specialized line of work that belongs to each of these individuals and in coherence with other actors also provide a specific function related socially constructed reality (Berger & Lukeman, 1966) that includes function bounded discourses. This raises questions in the case of a new form of discourse that is needed to bring a discontinuous idea further into the organization as mentioned by Reid and De Bretanni (2004). How are the actors able to share and match their tacit understandings that are either related to the need space or to the competence space? Nonaka (1994) mentions socialization as means for doing that, however not clear is what happens during socialization. A recent publication suggests that for effective and efficient exchange of implicit knowledge among actors with incongruous mental models, like those belonging to NPD and Sales, both actors should possess rudimentary mental models representing the world of the other (Smulders, 2007). These rudimentary mental models seem to facilitate the bridging process that aims to connect the different cognitive worlds by sharing implicit and tacit knowledge.

The next sections will report on the setup of the empirical research and explain the findings by means of the here presented theoretical discussions.

RESEARCH PROCESS

The company under study in this project is a multinational manufacturing company of mechanical parts and supplier to for example the automotive, railway and medical industry. The research process had an exploratory character that consisted of interviews, literature search and desk research.

In this study we are interested in finding out how the FFE-process can be improved. During this explorative phase general company information was analyzed and semi-structured interviews were performed. All interviews (n=13) had an open and semi-structured character; people were not only asked for facts, but also for their experiences in the product innovation process. The interviews were taped and full transcripts were made and analyzed afterwards. The interviewees came from different functional departments and from different managerial levels in order to record the different perspectives regarding the same subject of FFE and were located in three

countries: Sweden, The Netherlands and Germany. This exploratory phase put us on the track of interface interactions within the FFE-process and the subsequent theoretical analysis as described earlier in this paper. In the following sections we will report on the findings and make clear that they provide enough support for lowering the level of analysis to the level of the participants by investigating the social interactions they are engaged in.

RESEARCH FINDINGS

During the interviews the participants were asked to speak about their collaborative experiences related to concrete projects. We found that apart from problematic interface interactions the interviewees also mentioned interactions that didn't occur but according to them should have occurred for taking the initiative further into the organization. The largest group of interface interactions is on horizontal level among the actors from different departments. In the following some interview quotes will be further explained using the theoretical framework as introduced earlier in this paper.

About Sales

New ideas in the company come from different parties, from customers, the market and from employees. Sales is one of the crucial departments, since they have the most contacts with the customer. The quote that we started this paper with (see again below) already illustrated quiet clearly the interface problems a salesman could experience.

> "…we have an idea [from a customer], but we are desperate … It is like a wall, you run with your nose to the wall and you don't come further. It is also said; 'you have to bring more ideas', but they [the management] should be quiet, because we don't have a process to handle these ideas…" (Sales)

Apparently the customer information doesn't arrive in the product development organization because Sales doesn't know where or how to bring the information. The salesman simply doesn't know how to 'break down' the imaginary wall, he doesn't know how and to whom he should spread the new ideas. What he really seems to mean is that the ideas that come from the customer and represent the need-space doesn't fit the competence-space at NPD and therefore is not matched into an opportunity. The social process that needs to create such a match is missing. In other words, the actors are not able to synchronize or to connect their respective and different mental models in order to bring the idea to more maturity.

Within this firm Sales is the department which should form a bridge between the customer and product development. However, NPD would like to join the sales force more often when they go to the customer. According to NPD,

> "…the sales people should more often ask people from the development to go with them to the customer, not only in cases where they have to give presentations, but also to speak with other people of the same level…" (NPD)

NPD wants to be partner in the discussions on potential new products or on problematic issues with present products. What they really seem to want is to develop

some kind of rudimentary mental model that is representing the customer situation and by that be able to arrive at a better match of the need and competence-space. Without that they can only lean on the explicit knowledge that is brought to them through Sales people and that misses the implicit knowledge to have a more complete picture.
The critical aspect in the interaction between Sales and the factory is mainly the Sales Engineers that don't know what the factory can contribute.

> "…I think Sales and Application Engineering must know what we can contribute to that field. That they recognize it in all fields is not necessary but they have to find out [about our capabilities]…" (Manufacturing)

This is about the transfer of the competence-space to the Sales people which could be done by providing them with rudimentary mental models that represent this competence-space. However, it is questionable that only Sales is responsible for bridging these interfaces, since they experience to hit a wall when they want to exchange ideas with other departments. It is the responsibility of all participants of social processes to make the process as effective and efficient as possible.

About NPD
A product development engineer mentions the problems that occur with discontinuous products:

> "…sometimes there are [ideas for new] products, that are not really traditional products, it can be a couple of mechanical parts involved, plus a housing, plus mechatronics and so on. And then, where should it go? There is no home for such products in division B at the moment. The factories are still very much focused on the traditional mechanical parts…" (NPD)

Here is quiet clearly referred to the situation that there are no social processes in the FFE for product ideas that represent the need-space in the market but do not fit the present competence-space belonging to the firm. Part of the social reality that is necessary for the actors to create a valuable opportunity seems to be missing.
Another product development manager says that in general the process of looking for new opportunities lacks structure and resources.

> "…opportunity investigation could be more a task, which is clearly not just every now and then! … there is for example a big meeting in Lisbon, and everybody runs around for a short while [after that meeting] and does some investigation and …… then falls back in the old trot. We should do this more structured, but you need to put more resources…" (NPD)

But what is behind the remark of lacking structure and resources might be something different. For innovation to become part of their daily activities they need to be able to switch to a innovative way of working or reasoning as a social process in addition to the 'old trot'. If they are not able to make innovative collaboration part of their

socially constructed reality then they seem to return to their existing social reality that is represents to the present business.
In another occasion NPD believes that it is necessary for them to team up with the customer which is not perceived as normal behavior in this company.

> "…sometimes if we [NPD] have very specific questions and they [Sales] are not so deep into the matter, maybe they bring you the wrong answer. Because neither he nor the customer has understood what you really wanted to get. In that case it is better to contact the customer yourself to get information…" (NPD)

Here NPD wants to skip one interface in order to arrive at better information and contact the customer directly and thus to get engaged in a social process that makes it possible for them to have a deeper understanding of the customer needs. In other words, a social process that facilitates the exchange of implicit knowledge from the need-space to the competence-space.

DISCUSSION

In this explorative step we have discovered that the FFE consists of a complex process of interacting people with different backgrounds and different mental models, that has to add up to a new social reality that contains the 'critical momentum' sought for. The empirical study illustrates quiet clearly that in our case company the FFE can be improved by focusing on the quality of social processes that occur by interacting representatives from different departments. Communication in the FFE often seems to be more a matter of talking at cross-purposes than a matter of synchronizing the different mental models. The events that are related to matching need and competence spaces seem to occur not only at the very start of the FFE but also later in the process. Maybe, discontinuous product innovation is to be considered as a continuous process that aims to build the perfect match of the need and competence space and finally result in the product that the customer never looked for explicitly but at it's availability can't do without anymore (e.g. 3M's Post-its).
On the other hand, these findings add to the process interfaces as found by Reid and Brentani (2004) and make the front end to an even more socially complex activity. It is interesting to notice that the literature is not really addressing these interactions and sort of hovers over this area on just one level of aggregation higher as is needed to get grip on this matter. Also the work on sense-making seems to skirt these kind of processes. Weick et al. (2005, p. 409) recently define sense-making as the "ongoing retrospective development of plausible images that rationalize what people are doing" and therefore seem to address what perfectly individuals are doing but misses the point of social interaction. If we want to improve the FFE in the case of discontinuous innovation we need to better understand the social processes around the co-evolution of need and competence spaces that seem to encapsulate the various cognitive leaps that lead to successive waves of opportunity recognition and build up into the 'critical momentum' sought for.

CONCLUDING

Van de Ven (1986, p. 598) suggested twenty years ago regarding the overall process of innovation to investigate the social and political processes. According to him an innovation "proliferates over time into a web of complex and interdependent transactions among the parties involved" in order to "push them into good currency".

This paper makes clear that apart from the overall process of innovation the social processes in the early stages of discontinuous FFE also need to be uncovered. It is surprising that the findings of 20 years ago still not have resulted in research that aims to disclose the nature of the social processes in innovation. It is like the FFE itself: it takes a long time for new ideas to get into the sphere of academic consciousness. Researchers are only able to investigate the social side of the FFE if they are willing to change from a positivist way of investigating the FFE to a more phenomenological, ethnographic and grounded approach. Recent literature seems to mark a turning point in that respect because appears to be a change of the lens through which the FFE-process is examined and described (e.g. Colarelli O'Connor & Rice, 2001; Reid & De Brentani, 2004; Veryzer, 2005).
We intent to follow up on this new track and will apply a multidisciplinary research approach that combines design methodology, communication & cognitive science, (organizational) psychology and management sciences as core disciplines and aim at starting three research projects. One will be set up as an ethnographic study to uncover the social processes. Another will aim at detecting the mental state, emotion and feeling during the FFE. The last one will focus on developing specific tools that could enable and facilitate the social interactions.

MANAGEMENT IMPLICATIONS

Based on these early findings just a few remarks can be made and are not necessarily restricted to actors on management levels. First, actors involved in FFE should be aware of the fact that ideas in the FFE need to build up to a certain critical state, here referred to as 'critical momentum', and that every actor seems to be a contributor in the social processes that in the case of discontinuous innovation finally must result in a new social reality. The FFE can therefore be considered as a collective learning process. Second, although cognitive leaps that lead to new ideas are limited to individuals, the opportunity recognition process is to be regarded as a social activity embedded in various social processes. Each actor engaged should feel responsibility for the recognition process of the other actor. Therefore actors then need to develop their empathic abilities more profoundly.

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