CREATIVITY IN NEW PRODUCT DEVELOPMENT WITH COMMUNITIES : THE ROLE OF COGNITION AND EMOTIONS*

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W.P. n° 937   **April 2014**

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Creativity in new product development with communities: the role of cognition and emotions

Abstract

Companies increasingly tap into their customers' knowledge to stay innovative. This activity is fostered by the influence of social networks and technologies. To fully understand the factors at stake in a company's creative process, an interpretative, qualitative study is performed with innovation experts. Results show that there are two underlying dimensions at stake in a co-creation process: a cognitive dimension and an emotional dimension. The cognitive aspects identified by experts include the design of a web platform to facilitate creative engagement, an incentive policy and the skills of contributors. On the affective side, aspects such as the role of imagery, the role and expression of emotions, empathy and creativity tools are mentioned.

Key words: NPD, community, co-creation, creativity, idea generation, emotion, cognition

1. Introduction

The co-creation phenomenon is widely implemented in companies' new product development process (NPD). Research has proven that the first stage of NPD, the "fuzzy front-end", is one of the most critical stages (Hauser, Tellis and Griffin, 2006). Managers have to contend with two main issues. The first issue relates on the firm's capacity to attract the most creative customers into their virtual community and incite them to participate in idea generation contests. The second issue relates to inspiring novel and useful ideas. Specifically, how do you motivate, interact with and train people in the community to become more creative? Practitioners have established many different scenarios. Some companies choose to have very little interaction with the community, whereas others solicit and encourage comments by community members. Managers give more or less informational and technological support to participants in an idea competition to achieve better results. Other companies prefer to organize idea challenges among their own employees to guarantee confidentiality. In summary, there are many factors at stake with regard to generating creative ideas.

Co-creation has been studied by many researchers from fields such as marketing (Bendapudi and Leone, 2004), innovation (Füller, 2010), strategy (Chesbrough, 2003) and even information systems (Kohler et al. 2011). The term co-creation is used to qualify participation by the consumer in the NPD (Prahalad and Ramaswamy, 2004). Practitioners have integrated the consumer in their NPD for many years and have identified those consumers who possess special skills as "lead users". Lead users are defined by two main characteristics: (1) they have needs that foreshadow general demand in the market place, that is, their needs today are the market's needs for tomorrow; and (2) they expect to obtain a high benefit from a solution to their extreme needs (von Hippel, 1986).

Consequently, consumers are invited to actively participate in idea generation for new products by developing new ideas and evaluating those of their peers. These tasks are facilitated by web tools that allow the user to transfer explicit and implicit knowledge (Füller, 2010). For Bendapudi and Leone (2003), every consumer is a value co-creator. He cannot benefit from a service without co-producing it. Another research stream focuses on mass-

customization as a co-creation process. Mass customization refers to consumers choosing a product's features from a set of predefined features made by the company (Merle, Chandon and Roux, 2008). Research has identified a sub-category of mass customization: "co-design". This term refers to a consumer's interaction with the product in the co-design pre-buying stage facilitated by a toolkit or CAD[1] software (von Hippel and Katz, 2002). Co-design is arguably a more elaborate mass customization form, as the consumer uses his skills to perform the tasks.

Very little research focuses specifically on co-creation in an innovation context, with the exceptions of von Hippel and Chesbrough. Research by von Hippel focuses on identifying the personality traits of lead users (von Hippel, 1986), whereas the work of Chesbrough builds an "open innovation" framework based on a systemic approach, where the innovation process extends beyond the company boundaries (Chesbrough, 2006). These findings are relevant in terms of organizing innovation, but they contribute very little insight to the topics of fostering creativity and interaction with communities. Co-creation and creativity are sometimes incorrectly used interchangeably; however, these issues are slightly different constructs. It is important to define both constructs.

In our opinion, the most convincing definition of co-creation is the one delivered by Piller and Ihl (2009): "The co-creation process with consumers stems from an active, creative and social collaboration between producers (retailers) and consumers (users) facilitated by the company."

Creativity has been conceptualized in many different ways in different fields: (1) as individual personality traits that facilitate the production of new ideas (Guilford 1950, Hirshman, 1980); (2) as the process of generating new ideas (Woodman, Sawyer and Griffin, 1993); (3) as the outcomes (products) of the creative process (Burroughs and Mick, 2004); and (4) as environments that are conducive to engaging new ideas and behavior (Csikszentmihalyi, 1977, Amabile, 1996).

The purpose of this study is to assess how practitioners understand the role of these different factors in the creative process and to determine which of these factors are dominant and which ones are subordinate for making managerial recommendations.

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[1] Computer Aided Design

We begin with a review of the literature. We will then describe our methodology and present our major findings and discussion.

2. Literature review

In looking at marketing and consumer research fields, we find two main streams that involve creativity. The first stream regards consumer creativity as an isolated, individual process, and the second stream places consumer creativity in the context of consumer communities. Finally, we present our *fuzzy front-end* framework, which combines the best of both worlds (individual and collective creativity).

2.1 Creativity as an individual process

From the stream that analyzes consumer creativity as an individual process, we can distinguish three main views: the personality trait view, the psycho-social view, and the political-cultural view. The personality trait view assumes that consumers have stable, measurable personality traits and that creativity depends on those traits. One example of this view is Hoffman Kopalle and Novak's (2010) study on the scale of *Emergent Nature,* which posits that the best consumers to include in the NPD process are those who can visualize how concepts might be further developed to match consumer needs. (This scale outperforms the *Lead User* and the *Innovativeness* approach, according to the authors). The *Emergent Nature* consumer has unique personality traits and information processing abilities that include openness to new experiences and ideas; the ability to synergistically apply both an experiential and rational processing style; the ability to process information both verbally and visually; a high level of creativity; and optimism. Personality traits are not the only possible factors that influence consumer creativity.

According to the psycho-social view, researchers postulate that individual consumers are information processors who are influenced by their psychological, social, and other contextual factors. The creative capacity of consumers is strongly related to these factors. Cognitive complexity (Hirschman, 1983), positive affects (Moreau and Dahl, 2005), and intrinsic motivation (Amabile, 1996) are examples of such factors.

Finally, consumer creativity does not exist in a vacuum. The political-cultural view of consumer creativity acknowledges that creative ideas and solutions to problems reflect existing values and norms that are embedded in a community or in society. For Firat and

Venkatesh (1995), the consumer is a free, active cultural producer. Through creative and rebellious consumption practices, consumers invent a new world where they can engage in free *self-development*, *self-actualization*, and *self-expression*. Berthon et al. (2007) define *creative consumers* as those who adapt, modify or transform a proprietary offering. The *creative consumer* does not refer to *creative resistance* (Thompson and Troester, 2002) where the innovation is oriented to struggle against perceived oppressive constraining social forces but has much more to do with modifying products to find a solution to a particular consumption problem.

2.2 Creativity as a collective process

Creativity as a collective process is a key point to study because co-creation strongly depends on communities. Kozinets, Hemetsberger and Schau (2008) claim that online communities enable the creation of more original ideas, allow for more efficient selection of the best ideas and solutions, and, in some cases, permit these ideas to be implemented more easily.

Many studies have analyzed the process of how individual consumers develop their knowledge and skills and how they contribute to a collective project. The creative task remains an individual work, but it is transformed by the interaction between the community and the contributor. This approach also examines how individual consumers express themselves individually and collectively, their problem-solving processes, their motivation to share creative ideas, and the cultural meanings that consumers experience during such activities.

Nevertheless, due to the community dialogue, integrating the consumer into the NPD process is a complex task and is a process that should be clarified. (Sawhney, Verona and Prandelli, 2005; Füller, Matzler and Hoppe, 2008).

One way that companies can collaborate with consumer is to organize an innovation challenge or contest (Boudreau, Lacetera, and Lakhani, 2011). This form of collaboration has gained notable acceptance among consumers. An explanation advocated by scholars is *customer empowerment*; the customer is involved in NPD in two basic dimensions: customer empowerment to create ideas for new product designs and customer empowerment to select the product designs to be produced (Fushs and Shreier, 2006).

Many scholars have studied the motivations that drive consumers to engage in creative activities (Füller, 2010) and have discovered to two main motivation types: intrinsic and

extrinsic. Extrinsic motivations refer to partaking in an activity for its instrumental value (e.g., monetary rewards), whereas intrinsic motivations refer to pursuing an activity for its own sake (e.g., task enjoyment). The theory upon which this distinction is based has been conceptualized by Deci and Ryan (1985) and posits that consumers have multiple, contradictory motivations. One argument for this view is that a combination of both intrinsic and extrinsic motivations drives individuals to engage in collective creative activities. A paradox noted by many researchers in creativity literature states that extrinsic motivations have a detrimental effect on intrinsic motivations, and thus creativity (Amabile, 1996). Therefore, why is it that companies that are hoping to foster creativity offer monetary rewards for most of their innovation challenges?
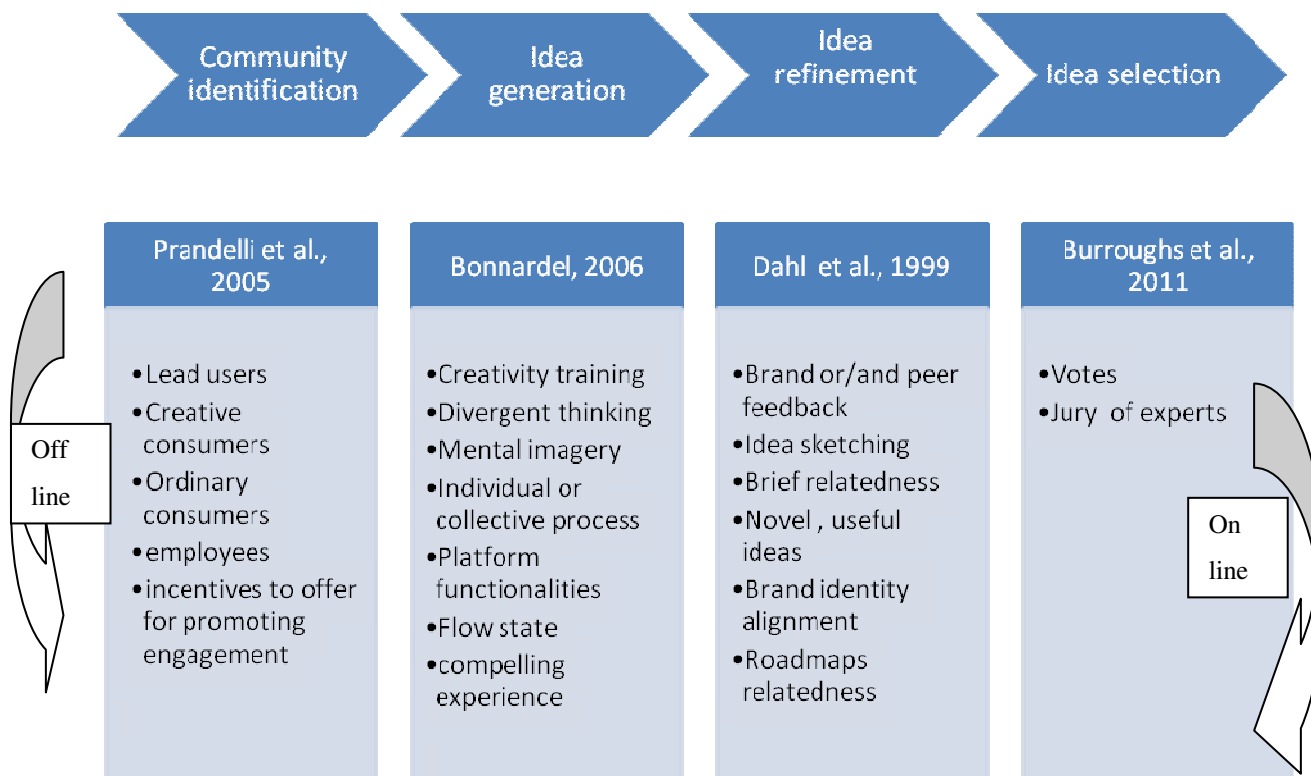
Many authors have discussed this deep mismatch between practitioners and academics. For example, Ariely et al. (2009) have shown experimentally that the higher the reward, the greater the damage on intrinsic motivation and, thus, on task performance. The most likely explanation for the use of monetary rewards is twofold: (1) that this is the most effective way to attract skilled participants in online innovation contexts; and (2) that when the task is demanding, receiving a reward is justified by community members, otherwise it would be perceived as working for free.

However, the creativity process is still an area where scholars generally have limited insights with regard to the "ideal" process (Poetz and Schreier, 2011).

2.3 Fuzzy Front-End (FFE) framework

Creativity is commonly associated with idea generation, and the basic rationale is that the greater the number of ideas at the start of the new product development process, the greater the probability of ending up with successful products. Consequently, in the innovation process (FFE, NPD, commercialization), the FFE is critical. Thus, we consider the following framework:

Figure 1. Fuzzy front-end with community process

Community identification	Idea generation	Idea refinement	Idea selection
Prandelli et al., 2005	**Bonnardel, 2006**	**Dahl et al., 1999**	**Burroughs et al., 2011**
• Lead users • Creative consumers • Ordinary consumers • employees • incentives to offer for promoting engagement	• Creativity training • Divergent thinking • Mental imagery • Individual or collective process • Platform functionalities • Flow state • compelling experience	• Brand or/and peer feedback • Idea sketching • Brief relatedness • Novel, useful ideas • Brand identity alignment • Roadmaps relatedness	• Votes • Jury of experts

Off line

On line

First, the question of which consumer or community to interact with in an innovation context is not sufficently examined by the literature. A large consensus exists that the lead user profile is the right one to connect with in order to innovate. However, this assumption has recently been challenged by Hoffman and Novak (2010), who posit that lead user status is specific to domain of use instead of a trait-based approach. They developed the emergent nature scale, which corresponds to the best profile to work with for creative outputs.

Second, feedback given by peers or brands has a notable impact on the number of high quality ideas. (Chen, Marsden and Zhongju, 2012). These authors argue that idea quality is significantly and positively affected by prior sponsored company feedback and with how

quickly the company gave that previous feedback to the participant. Peer feedback also has an effect on motivation, which can be explained by the fact that the comments of 100 community members on your idea shows that the idea has a global impact. In the *Open Source Software* field, being of service to others appeals to volunteers' self-esteem (Mesch et al., 1998). The concept of feedback valence Bandura (1978) assumes that people who receive more positive feedback tend to produce more, higher-quality contributions, while those who receive negative feedback will either modify their behavior or drop out.

In the same vein, Frey and Lüthje (2011) argue that *community innovativeness* is positively related to *interaction quality*. In that study, *interaction quality* has two antecedents: the level of interpersonal trust in benevolent behavior and the nature of the competitive climate in communities.

Finally, little is known about the effects of rewards on contributions in online communities for innovation related activities. Many psychologists and economists have investigated the effect of rewards on motivation and voluntary behavior in offline contexts. Economics literature suggests a positive effect of rewards on motivation and behavior (Benabou and Tirole, 2003). Awards, rewards and incentives have also been studied in crowdsourcing contexts and in idea generation competitions. The main issue to address is consumer engagement in creative activities; that is, how do we facilitate cooperation between the participants given that cooperation has been shown to generate the best ideas (Toubia, 2006), and how do we motivate consumers to reveal their ideas? Monetary rewards seem to be adequate for most innovative solutions, and in offering a monetary reward, a company avoids the impression that it is ripping-off consumers' creativity for free.

However, designing a reward system is complex. Many authors highlight the negative aspects of monetary rewards as they lower intrinsic motivation, become the main driver to creative outcome (e.g. Ryan and Deci, 2000), lead to a crowding-out (e.g. Frey and Oberholzer-Gee 1997), and lower task performance (Ariely et al., 2009). Surprisingly, empirical evidence exists for the opposite effect. Burroughs et al. (2011) demonstrated that a monetary reward with a creative training session does not undermine intrinsic motivation. Moreover, incentives can increase the quality of the ideas submitted in an ideation game (Toubia, 2006).

When monetary rewards are not sufficient to foster creativity, engagement and cooperation, another type of incentive can play a beneficial role in an ideation challenge. Intangibles such

as feedback, reputation reward (recognition), or the interaction experience can also be thoroughly rewarding (Füller, 2010).

The **affective** aspect of the co-creation process and creativity is not directly addressed in the literature. Enjoyment, pleasure, playfulness, and surprise are all representative of the emotions that appear frequently in the literature. According to Dahl and Moreau (2007), enjoyment is a goal for those who are looking for a compelling creative experience. To experience *task enjoyment*, consumers must have good time, have fun and avoid boredom during the creative process, The distinction between goal-directed and experience behavior is justified in our case to assess the role of emotion in the creative process. Experience behavior is found in consumers who are intrinsically oriented, who obtain value from hedonism, who are more affective than cognitive and who prefer fun rather than work (Novak, Hoffman and Duhachek, 2003). In a recent study by Salerno (2009) on the topic of consumer creativity, consumers working with handcrafted jewelry felt two motivation orientations: telic (goal) and paratelic (task) orientation. The consumers who were more paratelic orientated expressed more pleasure during the task, whereas those who were more telic oriented produced more original and aesthetically pleasing jewelry.

In general, pleasure is experienced when practicing a hobby and leads to exploration attitudes (Spreitzer et al., 2005), encourages creativity (Friedrikson, 1998) and provides better result evaluation (Hirschman and Holbrook, 1982). The emotion of pleasure is the main driver for the satisfaction obtained from a consumption experience. A new theory is posited by *experience marketing* authors, who argue that the dominant model of consumer decision-making based on information processing is not sufficient to assess all types of behaviors. A new framework is built in which an experiential and information processing system are interacting and where enjoyment, fun and pleasure are output consequences (Hirschman and Holbrook, 1982).

Finally, the *flow state* construct may help elucidate the experiential aspect of consumer behavior, especially when mediated by a computer. Flow state or optimal experience was originally conceptualized by Csikszentmihalyi (1977) and states that playfulness, challenge, and enjoyment are antecedents of this construct (Agarwal and Karahanna, 2000)

3. Methodology: semi-structured expert interviews

The objective of this research is to discover emerging themes that are related to co-creation in an innovation context to assess how practitioners understand the role of the different factors affecting the creativity process. Because of its exploratory aspect, we chose a qualitative approach to probe more in-depth information and to gain a better understanding of companies' creativity generation. This methodology was chosen because it enables us to discover latent behaviors, opinions and attitudes, which are not spontaneously revealed by respondents.

Thirteen innovation experts were selected and interviewed. The interviews took place in two main phases: first, participants were informed about the main rules of the interview, and second, participants were questioned about how they decide upon and prepare co-creation projects. The interviews were conducted in the firm's office to make respondents feel more comfortable. The interviews were conducted between March and July 2012 and lasted from 40 minutes to one hour and 10 minutes. Due to the high responsibility levels of the participants, we choose the informants based on the researchers' personal acquaintances or by snowball sampling (Cooper and Schindler, 2008). It was critical for the participants to have participated in a co-creation project and/or to have launched such projects. Therefore, 13 innovation management experts were interviewed (see Table 1 for sample specification).

To analyze these data, we used two analytical software programs, Sphinx Lexica and Nvivo, because of their complementary features. The methodology chosen consists of two stages: the first stage is designed to gain an overview from interview data and provide statistical metrics such as numbers of words used by experts, the most used words, and factorial analysis; the second stage enables us to analyze the data in greater depth and allows themes to emerge from the interviews.

Table 1: Expert profile

| Company	Industry	Co-creation activity	Respondent
Til Technologies (#1)	High technologies	Contacts with stakeholders (universities, retailers, providers), but no real co-creation activities with customers	CEO
ST Micoelectronics (#2)	Semiconductors	Integration of employees in NPD, creativity is a key issue	Innovation Program Manager
E-Yeka (#3)	Co-creation web site	Leading co-creation vendor who works with a community of more than 200.000 members	Key account manager
Méditerranée Technologie (#4)	Public organization	Cluster network innovation organization	Project Director
Qualiris (#5)	Consultant	Innovation Management Consultant	CEO
Local Motors (#6)	co-creation web site	Mechanical and design engineering	Community Manager
Peugeot (#7)	Automotive	Internal and external co-creation	Idea Management Project Manager
Renault (#8)	Automotive	Internal co-creation	Open Innovation Manager
Renault (#9)	Automotive	Internal co-creation	Director of "Vision and creativity" department
SFR (#10)	Telecommunication	Mainly external co-creation	Project Manager "Innovation Ecosystem"
Cabinet Gérard Mangin (#11)	Innovation Consultant	Creativity consultant	Director
B Twin Lab (#12)	Cycling manufacturer	Deep co-creation strategy	Brand Innovation Manager
Eurocopter (#13)	Helicopter manufacturer	Co-creation on services only for the moment	Innovation Service Manager

4. Findings

4.1 General overview

We began by grouping the words according to their root in order to perform a lexical approximation and reducing data to word families. The most frequent occurrences used for root word grouping were: *innovative* (258), *interactive* (150), *ideas* (144), *community* (123), *power* (116), *creative* (93). Two interesting groupings may be emphasized: *interactive* and *power*. This finding clearly shows the need for consumers to collaborate in the NPD. This willingness to collaborate is known as "customer empowerment" and is linked to two main activities: (1) creativity and (2) ideas/product selection (Fushs and Shreier, 2011). We also conducted a semantic grouping of word approach, implementing a Principal Component Analysis (PCA). We made three groupings according to Piller and Ihl's definition of co-creation, which focuses on the dimensions of creativity, activity, and community (Piller and Ihl, 2009), and were able to extract the words that were most cited by experts.

Results confirm the three dimensions of the co-creation process: a first group of experts is associated with the community exchange (Local Motors, E-Yeka, and Btwin Lab), a second group is associated with creativity and empowerment (SFR, E-Yeka, Peugeot, Til Technologie, Méditerranée Technologies, Btwin Lab, Qualiris and Eurocopter), and a third group is associated with interactivity with single users (Cabinet G.Mangin, STMicro and Renault). The PCA extracted 94% of the variance, which demonstrates that we do not need a third axis.

Figure 2. PCA of co-creation with three dimensions[2]
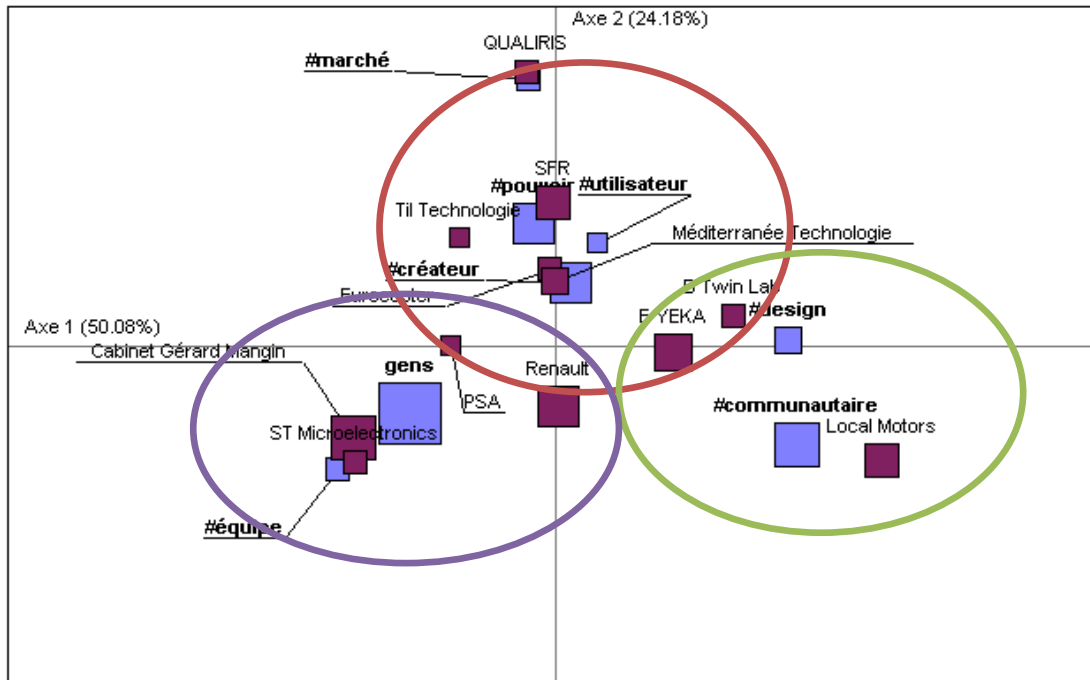
The horizontal axis (50% of variance explained) represents an individual/collective continuum; at one extremity (purple circle), we find a group composed by St Microelectronics, Cabinet G. Mangin and Renault, which focused on *people* (*gens* in French). As mentioned in the verbatim transcripts, those companies are building strong ties with individual consumers or employees, which is essential to mastering the interactivity process (on line or off line) in order to innovate. At the other extremity of the horizontal axis (green circle) lies a group of companies that are community oriented. Their purpose, through ongoing dialogue, is to generate new ideas and to find solutions to problems that are identified by the community. Key issues to tackle by community managers include offering new challenges on a regular basis, designing incentives and developing tools that are adapted to task complexity

The vertical axis (24% of the variance explained) is built around a two-word grouping *#créateur* (creative consumers in French) and *#pouvoir* (power in French). This group is composed of eight companies (three companies of this group belong to the two other groups)

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[2] Translation of French words: marché=market, gens=people, communautaire=community, PSA=Peugeot, utilisateurs= users, équipe=team, créateur=creative, pouvoir=power

and is located in the upper part of the matrix. This finding is logical according to the purpose of our study, that is, most of the experts seek to identify creative consumers. Eurocopter and M.Technologies are the companies that are most related to the grouping *creativity*. It is surprising to note that experts highlight the increasing power of consumers who want to participate in NPD, to create, to comment, and to vote for the best idea. SFR is the company that is most related to the grouping *empowerment*.

However, the semantic grouping approach did not allow us to extract all the meaning from the data or all of the correlations between the words. Therefore, we conducted a thematic analysis with Nvivo 7 based on a manual coding of word grouping.

4.2. Emergent themes

Two main themes have been identified: the design of the co-creation process and creativity.

4.2.1. Design of the co-creation process

Regarding the **design of the co-creation process**, four different themes emerged: creative engagement, the incentive policy, the design of the web platform and contributors' skills.

Regarding **creative engagement**, interviewers mentioned the difficulty in attracting users to their web platform.

> *We supposed that creativity wouldn't only come from passionate users but also from designers and engineers, and we had to overcome the lack of interest in bicycles in order to attract these people.* (Btwin Lab)

They mentioned that one way to solve this problem was through providing an enjoyable component to the co-creation tasks.

> *We think that web surfers join the platform because the Rally Fighter design is seen quite sexy and the co-creative tasks are enjoyable, playful and fun. We definitely need to propose new projects to maintain a high level of community engagement.* (Local Motors)

The **incentive policy** is a major issue for companies. Monetary rewards are largely used by firms, but with the risk of affecting the spontaneity of the community's behavior.

Next week we are going to launch an internal competition in a collaborative mode. We are not giving a prize to the best idea at the end. We hope that at the end we will obtain innovative ideas based on the collaboration of the community members. (Peugeot)

Many other rewards are mentioned, such as "*social rewards (peer recognition)*" or "*knowledge improvement*".

In our workshops we hardly try to include the first and most active contributors on our platform. They meet the designers and the engineers, which raises their self-esteem and corresponds to a nice reward for them. (BTwin Lab)

The combination of extrinsic and intrinsic rewards seems to be at stake. Research shows that monetary rewards undermine intrinsic motivation and thus reduce creativity (Amabile, 1996).

We would have loved web users to devise new ideas based on one another's contributions but the platform ergonomics prevented it. The comments were practically invisible. (SFR)

However, the interaction of both types of motivation is rather complex, and results are not convergent (Crino and White, 1982; Gagné and Deci, 2005). **The design of the web platform** is also critical, especially with regard to fostering collaboration. Many experts mentioned the difficulty in designing solution spaces or toolkits for finding novel ideas. Finally, **the skill of contributors is** a recurring theme. For some experts, the user needed design and drawing skills; for others, these skills were not a priority.

4.2.2. Creativity

Concerning **creativity**, four themes emerged: the role of imagery, emotions, empathy and creativity tools.

Regarding the role of **imagery**, some experts use images to boost creativity.

We organize visual creativity workshops, where we invite participants to draw their ideas on a paperboard. (Cabinet G. Mangin)

Other experts invited participants to visit *inspirational spaces* on web sites where images and ideas were posted by the community manager. The role and expression of **emotions** is also an

emerging theme, as experts find it difficult to assess the emotions felt by web users who rarely have the opportunity to express them.

> *What we are trying to do is to summarize our ideas or the issues we wanted to solve (in a visual and emotional way).* (ST Microelectronics)

Empathy is another important factor regarding how consumers could apply ideas. Consumers often express their need to visualize the end user using the idea.

> *What we really seek in a community is firstly creative insights and secondly empathy, which is the ability to imagine the end user with your new contribution.* (E-Yeka)

Finally, **creativity tools** are mentioned as an important theme. Many tools belong to the engineering, world such as "TRIZ" or "Concept/Knowledge" methods. These tools are used to find solutions to technical issues in product design. Some additional classic tools such as "mind mapping" or "brainstorming" sessions are also cited.

These results are summarized in Table 2

Table 2: Main Results

Main themes	Main sub-themes	Key quotes	Main questions raised
Co-creation process design	Creative engagement	*These participants have intrinsic interest for those types of tasks, and we realized that those people really appreciate to think about new subjects, new solutions (#3)[3]* *When the challenge deals with ideas, we don't care about intellectual property. What matters is the quality and the quantity of interactions (#8)*	How to attract creative users?
	Incentive policy	*For instance, the reward in Asia is very important. It is not necessarily monetary; recognition or a simple award ceremony is sufficient(#10)*	What effects and bias do the different types of incentive have on creativity?
	Web platform design	*We would like to offer a lot of functionalities on our platform, I've already mentioned a 3D viewer, you can do so much for the community!(#6)*	Which design foster more collaboration?
	Contributors' skills	*We gathered 9% of enthusiasts, they are brand fans or lead users. They react to content, they vote, they comment on Facebook for instance, and finally they upgrade the collective solution because they possess a high technical background (#3)*	Need of specific skills or not? (design or drawing skills)
Creativity	Imagery	*This is what we call "scrabbing". What we try to achieve is to draw a picture of what issues we would like to handle in an visual and emotional manner (#10)*	Does the use of imagery boost creativity and how?
	Emotions	*Community members have pleasure to do the task, they improve their knowledge in engineer design, and have feedbacks on their contributions (#6)*	How to assess emotions felt by users?
	Empathy	*In our creativity center we use two methods: the dynamic brainstorming and the sensitive approach. We connect ourselves to our emotions, we are in slower rhythm, in empathy, we take care about the quality of mutual listening and thus new ideas can emerge (#6)*	How to visualize end-users using the idea?
	Creativity tools	*To improve this idea, we utilize a C/K tool, which is a Triz method (#8)*	Which tools to use: engineering or more classic ones?

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[3] Numbers correspond to experts' companies see table1

5. Discussion and implications

The **cognitive** aspects of co-creation have been largely studied by authors such as Füller (2010), who have shown that consumer motivation determines the expectation of the virtual co-creation design and that differently motivated consumers differ with regard to personality. In line with Füller's findings, we found in our study that if the task is oriented to problem-solving, companies should interact with reward-driven consumers; however, if the task is more creative, intrinsically oriented consumers are highly qualified due to their knowledgeable and creative personalities.

The question of competence and skill remains partially unresolved since Kristensson, Gustavsson and Archer (2004) demonstrated in an experiment that ordinary consumers create the most valuable ideas compared to those produced by experts or advanced users. Divergent thinking is facilitated by the combination of different information elements. This finding strongly supports the creativity training approach (Bonnardel, 2006; Burroughs et al., 2011), which assumes that showing far inter-domain images or using mental imagery training enables the consumer to be creative independent of his prior skill level. We do not find a clear answer to the skill issue; it depends on the complexity of the task. However, what is mentioned regularly by experts is the complementary role of community members (technical skill for CAD design, no skill for voting or idea generation). Therefore, our managerial implication at this point is to design an innovation challenge according to the competence of the community. Consequently, if the tasks are too complex, anxiety may arise. The co-creation experience should be tailored toward the consumers that the company is targeting, such as through offering ideas for new products, commenting on contributions, participating in word-of-mouth on social networks or by simply voting for the most creative idea.

Another interesting cognitive aspect underlined in our study is the key role of interactions. We argue that feedback valence (positive or negative) and origin (brand or peers) do not have the same impact on consumer motivation. Managers and Community Managers should pay attention to avoid negative feedback and should delete deleterious comment threads because encouraging comments enhance creative engagement.

To conclude regarding the cognitive aspect of our findings, we must consider the paradoxical role of rewards. Most experts acknowledge the importance of monetary rewards as being the best driver for participation and creativity, but such rewards are not sufficient to motivate all community members, especially those who are intrinsically motivated. Managers must pay

particular attention to other rewards such as non-monetary rewards (reputation, feedback, and tokens) if they want to motivate all types of consumers.

The **affective** part of the creativity process remains rather mysterious for the interviewees; even when they emphasized the enjoyable and playful aspects of the experience, they expressed some difficulties in assessing their emotions. The ideation process or FFE is basically an online activity in which the interaction between brand and consumer is a factor of success; thus, communicating emotions in this environment is complex. Our findings are in line with the *flow state* theory, which has been studied in many fields such as web surfing, sports and creativity. This theory posits that a person "feels more active, alert, concentrated, happy, satisfied and creative, regardless of the task being performed" (Csikszentmihalyi and LeFevre, 1989). Pleasure, enjoyment, and fun are emotions that were mentioned regularly in our interviews, which is congruent with the literature and with flow state theory. Designing compelling co-creation experiences is an important challenge for community managers to motivate community engagement. One way to achieve this goal and to avoid boredom is to propose renewed challenges to the community each time. Inducing surprise is an original way to enhance engagement, pleasure and, ultimately, creativity. Website ergonomics plays a key role in facilitating flow state and interactivity, and managers should pay particular attention to this topic.

6. Conclusion and limitations

Due to its exploratory nature, this research has a number of limitations, which provides a platform for the undertaking of further empirical and theoretical research in this emerging area. The first limitation concerns the lack of time on the part of many experts, which resulted in reduced insights in some cases. Another limitation is the impossibility of organizing focus groups with experts from different fields due to the confidentiality obligations of most of the managers interviewed. Moreover, most of the companies work with consumers to generate new ideas, but many others also interact with employees, which impacts the design of the co-creation platform in terms of incentives and functionalities. One way to address this drawback and to raise external validity is to interview experts with the same concerns (crowdsourcing[4], or co-creating with internal communities).

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[4] Crowdsourcing is a process that involves outsourcing tasks to a distributed group of people. This process can occur both online and offline (Howe, 2006)

This study creates several avenues for future research. The first avenue relates to the ideal reward combination that innovation contests should propose. Reputation rewards represent an unaddressed topic in management literature. To our knowledge, very few studies deal with reputation. Wasko and Faraj (2005) determined the helpfulness of answers to legal questions based on an interpretation of response messages and found that the only motive, desire for reputation, has a positive effect on quality. Jeppesen and Frederiksen (2006) measured the self-reported innovativeness of contributions and concluded that striving for firm recognition increases the innovativeness of contributions.

Second, more theoretical findings are needed, especially to assess the issue of which consumer to integrate in the NPD (lead users, emergent nature, innovative). Further theoretical research should integrate other relevant theoretical perspectives, such as consumer behavior theories that address individual and/or social identity (Kozinets et al., 2008). Consumer engagement in virtual communities provides an important avenue for research as it leads to empowerment, emotional bonding, trust and commitment (Brodie, Biljana and Hollebeek, 2011).

Third, the flow theory requires further empirical research, especially in the field of community creativity. To the best of our knowledge, most of the studies on this topic involve the immersive experiences of consumers surfing web sites (Mollen and Wilson, 2010). Other applications of flow state are equally important. Causal chain enjoyment, engagement, flow state and creativity merit further attention.

Finally, we clarified the constructs of co-creation and creativity in an online context by reviewing creativity and innovation literature. We built a framework based on the fuzzy front-end process, which aims to integrate the isolated consumer's creativity and the community's creative ideas. The creative process is never completely individual nor is it completely collective; rather, it is a back-and-forth process where the initial idea is continuously upgraded through dialogue between the brand and the consumers. This creativity process needs more empirical study.

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