Exploring the Ideation Patterns of Ordinary Users

The Case of Mobile Telecommunication Services

Article published in International Journal of Product Development. To cite see below:

Magnusson, P. R., P. Kristensson, and C. Hipp. 2010. Exploring the ideation patterns of ordinary users: The case of mobile telecommunications services. *International Journal of Product Development*, 11 (3/4): 289-309.

ABSTRACT

On a micro level, user involvement is an under-investigated area, in general, and with regard to service development in particular. This article aims to fill this knowledge gap by enhancing understanding of how users contribute to the ideation process concerning technology-based services, as well as how they may satisfactorily be managed within it. We identify and investigate different ideation patterns, as well as their effects on the created ideas' characteristics in the context of mobile telephony services. The article is based on a quasi-experimental study lasting twelve days and involving 56 ordinary users and 12 professionals as idea creators. We inductively identify four different ideation patterns, which lead to different types of ideas, with regard to their innovativeness. The paper concludes with managerial implications concerning how to manage user involvement for ideation by using different strategies in order to obtain service ideas that are either more incremental or more radical. We further discuss and advocate the use of in situ methods for understanding the value in use.

INTRODUCTION

Technology-based services like mobile communication services represent an area of rapid growth with a large impact on the general economic growth in society (Rust and Kannan 2002; Rust and Miu 2006; Woodall, Colby and Parasuraman 2007). According to Barras (1986), the ideation process is first based on existing technologies, and the development of a new underlying technology is thus not in focus. However, in a second step, some ideas might imply the development of existing technologies, especially for more radical service innovations. For new technology, the challenge for companies is, thus, to innovate services creating the most value, or in another sense, finding good use for a given technology.

However, it can be quite difficult for potential users to imagine the need for a new technology when asked. An alternative is to invite the users to create innovations themselves, with the lead user method probably being the most well-known (Lüthje and Herstatt 2004; von Hippel, Thomke and Sonnack 1999). However, this also has problems, mainly regarding the identification of lead users. For business-to-consumer (B2C) markets, there is also the problem of knowing whether or not lead users are representative of the bulk of the future market (Mahajan, Muller and Srivastava 1990; Martinez, Polo and Flavián 1998; Moore 1991; Rogers 1962). Furthermore, there is very little documentation of lead users in services. Yet another alternative for mass markets to find useful applications for given technology platforms is to involve *'ordinary users'*, i.e. users who do not have any in-depth knowledge of the underlying technical systems but are still familiar with the use context. Documentation of the merits of ordinary users as potential idea creators is rather sparse, probably due to the little interest that past research has paid to this category of users in relation to leading edge users.

Although user involvement has been saluted as a promising method for understanding user needs and improving products and services, understanding the ideation process – the creation of novel ideas – on a micro level is essential and an under-investigated area, in general (Dahl and Moreau 2002; Moreau et al. 2005), and for service development in particular (Alam 2002; Magnusson, Matthing and Kristensson 2003). Managers aiming to utilize the potential of user involvement for the ideation of technology-based services currently receive very little guidance regarding how to do this in a satisfactory way.

The current paper aims to fill this knowledge gap by contributing to a better understanding of how ordinary users contribute to the ideation process of technology-based services. This is accomplished in an explorative manner by identifying different approaches – here called 'ideation patterns' – adopted by users to create ideas and analyze their effects on the created ideas' characteristics, in a specific context of technology-based services: mobile telephony services. We further investigate whether the chosen ideation pattern is affected by how the user (strategy for) is involved in the ideation process. More explicitly, the research questions can be formulated as follows:

i) Which different 'ideation patterns' can be identified among the ordinary users involved in an ideation process?
ii) How does the ideation pattern affect the characteristics (innovativeness) of the created ideas?
iii) Is there a dependency between the strategy for involving the ordinary users in the ideation process and the ideation pattern adopted?

The remainder of this paper is arranged as follows. In the next section, the theoretical background is described. This section includes a discussion of the role of innovation and technology in service industries. A theoretical model for understanding the contribution of users in the innovation of technology-based services is deducted. Also, the role of users as

idea creators is reviewed. The third section of the article describes the quasi-experimental methodology of the empirical study, while the fourth section presents the results and analyses, including the findings in connection with examining the research questions. The fifth section discusses the findings of the study, including a discussion structured around the research questions. The article ends with managerial implications and conclusions.

THEORETICAL BACKGROUND

Technology-based services

Most literature on technology-based services has focused on the diffusion problems of these services generally due to the resistance to embrace technology (Zhu et al. 2007), or the impacts on perceived quality and satisfaction when migrating from human interaction to self-services (Bitner, Brown and Meuter 2000; Dabholkar 1996; Meuter et al. 2000). The fuzzy front-end of developing technology-based services is, however, much less understood. Technology-based services are produced without direct human interaction, which renders it difficult to detect and adjust imperfections at delivery time; therefore, involving customers in the design process of these services has been advocated for (Bitner, Brown and Meuter 2000).

To understand user involvement and innovation of technology-based services theoretically, we develop a model from a knowledge resource perspective. Following Reid and de Brentani (2004), an innovation can be divided into two layers: 'generic technology' and 'application technology'. This division is obvious for technology-based services, as these services are based on a technology platform that is often standardized; technology is only a medium for services (Sundbo 1997), and it can have a wider scope than just being a piece of hardware. Following Perrow (1967), technology can also include all of the organizational resources necessary to produce the services. However, what distinguishes the competition is those applications or services developed.

From a knowledge perspective, the company will need to combine two types of knowledge to accomplish successful innovation: *technological knowledge* and *use knowledge*. Technological knowledge is the knowledge needed to design the technology and implement the services. It is, for example, constituted by the ability to analyze technical feasibility, including the opportunities as well as limitations of a given technology. To design valuable services from a user perspective, one needs 'use knowledge', i.e., knowledge of what brings value to the end-users and can be expressed in the form of functional descriptions, or the service characteristics, of the wanted service.

'Use knowledge' and 'technological knowledge' need to be combined in order to achieve successful innovations. The dilemma is that these two knowledge domains do not normally have the same locus. Technology knowledge is generally a core competence of the professional developers (experts) at the developing company, while ordinary users can be expected to have a rather limited knowledge of the underlying technology (Hamel and Prahalad 1994). On the other hand, 'use knowledge' has its main locus among the potential end-users of the services, while professional developers have proven to have rather limited use knowledge (Magnusson, Matthing and Kristensson 2003).

Thus, an objective for the company is to obtain the necessary use knowledge from users. However, in order to activate the use knowledge, the users must also have some knowledge regarding the opportunities of the technology. As previously mentioned, one way to achieve mutual learning is to involve potential end-users in the innovation process.

Users as contributors of service ideas

The extant literature is rich regarding user innovation among leading edge users, who are often referred to as lead users. They are defined as users who face needs that will be common in the marketplace, but face them months or years before the bulk of the marketplace encounters them; as they will benefit from a solution to those needs, they are also very motivated (von Hippel 1988). The phenomenon was first found in business-to-business markets, but has subsequently been described in different business-to-consumer areas as well, but with a concentration of innovation in extreme outdoor sports (e.g. Franke and Shah 2003; Hienerth 2006; Lüthje, Herstatt and von Hippel 2005). Thus, it is mainly extreme users who are innovating solutions for other extreme users. This reflects a problem with engaging leading edge users: the problem of knowing whether they really are representative of the bulk of the market (Mahajan, Muller and Srivastava 1990; Martinez, Polo and Flavián 1998; Moore 1991; Rogers 1962).

There are two main explanations brought forward when analyzing the success of user innovation. One explanation is the number of users (potential inventors), which is normally much greater than the number of persons at the R&D department engaged in ideation. Users also come from heterogeneous contexts, the above put together will render it more likely that users' ideas will be more innovative (e.g. Franke and Von Hippel 2003). Furthermore, success is attributed to the fact that innovating users have more use experience (use knowledge) from being close to the use context, thereby unveiling new needs (Lüthje 2004; von Hippel 1994). Lead users also have the necessary technological knowledge to actually come up with solutions to newly discovered needs.

Ordinary users cannot, however, be expected to have such extreme needs and much less technological knowledge compared to lead users. There has also been skepticism that the lack of technology knowledge undermines the ability to contribute valuable ideas (Bennett and Cooper 1981; Christensen and Bower 1996; Martin and Faircloth 1995). However, the findings of Magnusson, Kristensson and Matthing (2003) contradict this and indicate that ordinary users can also make valuable contributions to the ideation process. These researchers further indicated that the characteristics of user ideas are dependent on the involvement process, and call for more research to develop a better understanding of how to better involve users in the ideation process.

Past research has generally paid little attention to the actual ideation process (Dahl and Moreau 2002; Goldenberg, Lehmann and Mazursky 2001; Moreau et al. 2005). The creation of ideas is often perceived as something that cannot be managed; instead, the most common approach is to encourage the generation of a large number of ideas in order to increase the selection base (Goldenberg, Mazursky, and Solomon, 1999). To increase the number of ideas, there are also a vast number of practitioner-oriented writings focusing on different creativity techniques (e.g. de Bono 2000; Miller 2005). Studies conducted to understand ideation processes are mainly experimental psychological studies with a vague link to product or service development (e.g. Marsh, Landau and Hicks 1996; Marsh, Ward and Landau 1999). Due to the complexity of product or service development, a laboratory setting is, in our opinion, not sufficiently representative for investigating the true merits of user involvement. Most importantly, such research will miss the *in situ* influence of the context, thus not capturing the real use knowledge which is obviously very important for user innovation.

One of the few studies found that has investigated ideation in product or service development settings is that of Goldenberg, Lehmann, and Mazursky (2001), who suggested that ideas are composed of 'functions' and 'forms'. Functions are related to consumer needs (use knowledge), whereas forms are related to the technical solutions (technological knowledge) to user needs. Depending on the genesis of the idea, the authors define different patterns for developing new products: (1) *need spotting,* (2) *solution spotting,* (3) *mental*

invention, (4) *market research for new products,* and (5) *following a trend.* The pioneering research by Goldenberg et al. (ibid), showed that ideation patterns affect the likelihood of product success; successful products tend to involve a solution to a customer problem, thus further motivating the involvement of potential users. Goldenberg et al. do not, however, give any detailed account of the actual ideation process on a micro level.

As previously mentioned, the current study aims to: 1) identify different 'ideation patterns' among ordinary users involved in an ideation process; 2) analyze the ideation pattern's effect on the idea's characteristics, especially regarding their innovativeness; and 3) investigate dependencies between adopted ideation patterns and how the users are involved in the ideation process. Our review has further motivated the relevance for our study, and that it will contribute both to theory and management practice.

METHODOLOGY

Research design

In order to investigate the research questions, a comparative quasi-experimental design which involved users during the ideation phase was used. Four different ideation groups were used: three different experimental groups consisting of users and one control group including professional developers. The task given to all groups was to derive service ideas for an existing service platform for mobile telephony services. The experiment lasted for twelve days and the participants were equipped with mobile phones prepared with eleven sample services illustrating the potential of the available service platform. In total, 354 ideas were collected and assessed with regard to three dependent variables, see below.

Participants

The control group, '*professionals*', consisted of 12 professional service developers all recruited from Telia Mobile (the largest mobile telephony operator in northern Scandinavia). All came from an R&D unit responsible for developing new non-voice mobile services, i.e. services based on SMS, WAP, GPRS, and so on. Their professional experience in the field varied between 1 and 10 years.

'Ordinary users' are defined as users who do not have any in-depth knowledge of the underlying technical systems. Put into a knowledge perspective, the ordinary users do possess use knowledge, but have limited technology knowledge.

All ordinary users were volunteer students from a Swedish university enrolled in non-technical study programs, e.g. social science, teacher training, business administration, and so on. The main reason for choosing students was that they represent one of the most frequent SMS user segments, thus representing users in general and a target customer segment of great interest to mobile service providers. The students were randomly divided into the three experimental groups.

The first experimental group, *'ordinary users'* (n=19), managed idea creation by themselves, while the second experimental group, *'consulting users'* (n=20), consulted a professional service developer in groups of 4-5 during two controlled 1-2 hour meetings. The feedback given by the professionals was restricted to whether an idea was feasible; they could also tell the participants when they knew that the proposed idea already existed. This approach provided the participating users with the opportunity to learn more regarding the technical possibilities and limitations of the underlying technical systems.

The last experimental group, '*creative ordinary users'* (n=17), participated in a university course prior to the study in which they practiced different creativity techniques, e.g. brainstorming, slipwriting, random input, and six thinking hats (de Bono 2000).

All three user groups' use knowledge are expected to be affected by using the sample services presented at the introduction meeting, i.e. their use knowledge was stimulated. In addition, for the consulting users group, the technology knowledge was stimulated; during the meetings with experts they received information about the technical opportunities and limitations of the underlying system.

A number of background variables were measured for the participants, see Table 1. This included three personality tests: (i) the FS test, which correlates to a person's creativity (Holmquist and Ekvall 1986); (ii) the LOT (Life Orientation Test), which indicates whether a person has a positive or negative disposition (Scheier and Carver 1985), and (iii) TR (Technology Readiness), which indicates a person's willingness to adopt new technology (Parasuraman 2000). The professional group was significantly different from the other three groups in regards to mobile telephony experience. This should be expected and accounts for their technology knowledge. Among the three user groups a two-way ANOVA yielded significant differences between the groups for the variables FS ($F_{2,53}$=6.32, p<.003), as well as for the age ($F_{2,53}$=5.00, p<.010). Scheffé's (Scheffé 1959) post hoc multiple comparison test showed that the Ordinary Users scored significantly (p<.003) better that the Consulting Users in the FS test, and that the Creative Ordinary users were significantly older (p<.012) than the Consulting Users. A subsequent analysis using ANCOVA with FS as the covariate, the groups as the independent variables, revealed that FS did not account for any of the differences on the dependent variables (p>.05).

Table 1
Personal characteristics of the participants

		Pro-fessionals (N=12)	Ordinary Users (N=19)	Consulting Users (N=20)	Creative Ordinary Users (N=17)
FS-test	M	5.92	6.37	4.55	5.76
	SD	1.56	1.77	1.23	1.86
LOT	M	23.08	24.53	23.50	23.47
	SD	3.70	4.34	3.75	5.04
TR	M	8.00	5.79	4.65	1.88
	SD	4.11	5.92	4.97	6.06
Age	M	36.50	23.79	22.10	27.53
	SD	8.13	2.18	2.02	9.07
Gender	Females	2 (17%)	4 (21%)	8 (40%)	9 (53%)
	Males	10 (83%)	15 (79%)	12 (60%)	8 (47%)
Mob. tele. experience (years)	M	10.42	3.60	3.88	4.32
	SD	6.04	2.33	2.50	3.28

Dependent variables

The dependent variables should reflect the merits of the submitted ideas. Therefore, we first look into the criteria that should be used to assess new service ideas, after which we discuss the concept of innovativeness.

Assessment criteria. First it must be noted that idea assessment is different from concept evaluation. Ideas, at least those from users, are merely functional descriptions of a use

situation. When conducting concept evaluations, companies often use different techniques to visualize, simulate the concepts, or even create prototypes. For the evaluation of ideas, the criteria used should, accordingly, be blunter than those used in later phases of the development process (Koen et al. 2002; Rochford 1991). As services are immaterial, they can be expected to be harder to assess than ideas regarding physical products. The literature mentions numerous criteria to evaluate the 'merit' of an idea; however, there are no uniformly-accepted general criteria (Balachandra and Friar 1997; Cooper 1993), and it would seem that different criteria should be chosen depending on the context (Hart et al. 2003; Hauser and Zettelmeyer 1997). In a survey of different evaluation criteria used in practice, Tzokas et al. (2004) investigated the most popular criteria used throughout the new product development (NDP) process among 234 industrial companies. For idea screening, four criteria were used by more than 50% of the companies: technical feasibility (70%), market potential (59%), product uniqueness (58%), and intuition (56%). The rationale for using "intuition" was the difficulty getting precise information at the idea stage, thus allowing for this "soft" criterion.

Unfortunately, no similar analysis of criteria for services seems to exist. This might be due to the rather unstructured and ad hoc approach that has been common in new service development (NSD; (Menor, Tatikonda and Sampson 2002). However, the three first criteria identified by Tzokas et al. (ibid.) are on such a general level that they can be used as a base for evaluating both products and services, and further reflect the necessity to perceive the ideas from both the producer's and user's perspective.

The technical feasibility is related to the ease with which the product or service idea can be implemented. We name this dimension *producibility*, thus taking the producer's perspective. The market potential can be related to the users' or customers' expected reception of the product or service, i.e. the estimated perceived *user value*. Product uniqueness, or novelty, is linked to innovation; we name this dimension *originality*.

The dependent variables used to measure the merits of the ideas were, thus: originality, user value, and producibility. The variables were furthermore validated in a focus group of five experts from Telia Mobile experienced in assessing mobile telephony services

Innovativeness. The traditional innovation literature often classifies innovations according to their degree of innovativeness. Two dichotomous categories are often used, e.g. incremental vs. radical, continuous vs. discontinuous, and so on (e.g. Crawford and Di Benedetto 2000; Tidd, Bessant and Pavitt 2005). Both types are regarded as necessary, but the incremental innovations have a lower risk and better short-term profitability, whereas the radical innovations are more risky but aimed at the future (Tushman and O´Reilly III 1996).

No unanimous operationalization exists in regards to the radical and incremental concepts. There are further scholars who find these two categories binary and have introduced a third state in between to break the dichotomy, e.g. 'really new' (Garcia and Calantone 2002) or 'very new' (Callahan and Lasry 2004). Even after adding a third category, this grouping of innovations is still discrete.

In line with Green et al. (1995), we argue that innovativeness should be regarded as continuous rather than discrete; they further state that innovativeness should be conceptualized by multiple dimensions which vary with the project's characteristics. The literature is lacking suggestions on how to conceptualize innovativeness for the type of ideas we have at hand. However, drawing on Green et al. (ibid.), we develop an index to decide the innovativeness of an idea based on the three assessment criteria previously identified: originality, producibility, and user value. This index can be expressed as follows:

Type of innovation (Innovativeness) $\leftarrow\rightarrow$ (α∗Originality, β∗Producibility, γ∗User value).

Two different types of innovativeness can be operationalized: 'degree of radicalness' and 'degree of incrementalness'. We thus acknowledge that innovations can be either more radical or more incremental, and further define two indexes to establish the degree of radicalness and degree of incrementalness: Radicalness Index and Incrementalness Index.

When seeking more *radical* ideas, 'originality' is deemed the most important factor, at the expense of 'producibility'; 'user value' is not unimportant, but can be given a lower weighting (compared to an incremental innovation) because the actual user value can be rather difficult to establish during the idea stage of a new, original idea (Koen et al. 2002). On the basis of this rationale, the following values were assigned to the coefficients for the Radicalness Index:

Radicalness Index ←→ 0.55**originality* + 0.35**user value* + 0.10**producibility*

For more *incremental* innovations, 'producibility' (γ) and 'user value' (β) are most important, i.e. the service should be both easy to implement and valuable, whereas 'originality' (α) is, by definition, low. Based on this reasoning, we assign the Incrementalness Index as follows:

Incrementalness Index ←→ 0.05**originality* + 0.475**user value* + 0.475**producibility*.

It should be noted that the two indexes are not mathematically complementary, i.e. scoring low in one index does not necessarily mean that there will be a score high in the other.

Procedure

The experimental procedure consisted of four stages: (i) initiation; (ii) idea creation; (iii) delivery; and (iv) evaluation. Each group participated for twelve days.

Initiation stage. During the *initiation* stage, participants were given the assignment to create one or more ideas for SMS-based services. The users were asked for proposals for new services that would be of value to them, whereas the professionals were asked for proposals that would be of use to the participating users; all groups thus had the same target group for their ideas (students at the university).

The participants were not organized into teams; however, they were free to collaborate if they wished. If this was the case, the names of their co-creators were noted. The ideas were expected to include at least one new service idea that utilized the existing application platform, which was essentially a converter between SMS messages and http calls on the Internet; i.e. enabling access to information on the Internet by sending and receiving SMSs.

To give the participants a sense of how these services work and to provide inspiration, users were equipped with a mobile phone with a pre-paid card allowing approximately 150 SMSs, and were also given access to a sample of about ten implemented sample services.

Idea-creation stage. The *idea-creation* stage of the study lasted for 12 days. The only group that had any interaction with the researchers was the 'consulting users', as previously described. In the other groups, the users managed the creation process without assistance. Each participant was given a diary (notebook) in which he or she was instructed to document the ideas arising from their thoughts, as well as the activities triggering idea creation. The diary data were used to gain a deeper understanding of the individual idea creation process, thus making the factors influencing the creation of ideas and solutions explicit.

Delivery stage. After 12 days of idea creation, each group was gathered and the ideas were delivered to the researchers, in a predefined format, together with the diaries. Additionally, all participants were interviewed within the next two weeks, with the interviews being semi-structured in nature. The interviews were tape-recorded and transcribed. The purpose of the interviews was to trace the relevant process data, e.g. important events that made the participants come up with especially good ideas. Accordingly, much of the interview was spent discussing how the submitted service ideas had been triggered.

Evaluation stage. The evaluation was based on a modification of the Consensual Assessment Technique (CAT) (Amabile 1996). Six experts, all of whom were experienced in evaluating service ideas for mobile communications, independently assessed the service ideas. Three of the judges were engineers working in the R&D department of Telia Mobile. All three had more than five years' experience with assessing mobile services, and were engineers working in the R&D department. The other three judges had a blend of technical and marketing experience outside of Telia Mobile. The ideas were ranked on a scale of one to ten on all three dimensions—originality, user value, and producibility (see previous paragraph 'Dependent variables')—with a score of one representing the least original, least valuable, and hardest to produce idea, and a score of ten indicating the most original, most valuable, and easiest to produce idea.

A test round was conducted to calibrate the judges' assessments; the calibration was an extension of the original CAT methodology described by Amabile (1996). During this test, five ideas were chosen for individual assessment by the judges, followed by a discussion of the results between the judges. If any individual assessment was found to differ markedly from the others, it was discussed and judgment anomalies were addressed. After completion of this test round, the service ideas of the participants were formally evaluated. Each assessment was made individually, and no discussion was allowed between the judges.

ANALYSIS AND RESULTS

Identification of the different 'ideation patterns'

All 354 ideas were first analyzed in order to identify possible ideation patterns, using an inductive approach. The basis of the analysis was to investigate the extent to which participants utilized the available sample services during their ideation process, i.e. the priming effect from the sample. The input for the analysis consisted of the written service descriptions, the notebooks (administered by the participants) wherein the origins of the ideas were documented, and, finally, the transcripts from the concluding interviews with the idea creators. These three sources together provided the basis for analyzing the ideation patterns used. We then analyzed and categorized these and were able to identify four different typical ideation patterns: (i) '*Improvement',* which is an improvement of one of the available sample services. The intention is to make a slight improvement in efficiency or to add some minor function. For instance, one of the sample services was an electronic bus timetable; several of the created ideas proposed minor improvements of this timetable. (ii) '*Context translation'*, ideas where it is traceable that one of the sample services was the trigger for proposing the same type of application in a new context, i.e. extending the application context. An example of this is the previously-mentioned bus timetable that someone proposed should be translated into a train timetable. Both previously-described ideation patterns thus originated from one of the sample service's functions, i.e. a type of sample priming. Another type of priming was also found among the ideas: (iii) *'application adoption'*. These were cases where the participants adopted an existing application outside the sample services (often web-based), and proposed that it should be implemented on the application platform. The fourth and final ideation pattern we call (iv) '*unprimed application',* a novel idea which cannot be traced to any of the sample services or to any other pre-existing service. These ideas seem to have "popped up" at some creative point during the idea creation phase period, constituting either the solution to an encountered problem or a spotted opportunity. The distribution of ideation patterns is presented in Table 2.

Table 1
Distribution of Ideation Patterns

	Ideation pattern				Total
	Improvement.	Context translation	Application adoption	Unprimed application	
Professionals	7 (13%)	4 (7%)	32 (58%)	12 (22%)	55
Users	46 (15%)	35 (12%)	125 (42%)	93 (31%)	299
Total	*53*	*39*	*157*	*105*	*354*

The ideation patterns' effects on the characteristics of the created ideas

To investigate the characteristics of the ideas and whether they can be classified as more radical or incremental, the two previously derived indexes - 'degree of radicalness' and 'degree of incrementalness' (see paragraph "dependent variables") - were used.

Incrementalness Index ←→ 0.05**originality* + 0.475**user value* + 0.475**producibility*

Radicalness Index ←→ 0.55**originality* + 0.35**user value* + 0.10**producibility*

A one-way ANOVA conducted for the four ideation patterns yields significant differences with regard to both the *Incrementalness Index* ($F_{3,350}$=13.805, p<.001) and the *Radicalness Index* ($F_{3,350}$=23.150, p<.001). Scheffé's (Scheffé 1959) post hoc multiple comparison test was used to investigate significant differences between the groups, with the results shown in Table 4.

Table 1
Comparison of innovation indexes between ideation patterns

		N	Mean	Std. Deviation
Radical_index	Improvement	53	4.02	.837
	Context translation	39	4.34	1.079
	Application adoption	157	3.67	.738
	Unprimed application	105	4.57	1.024
Total		*354*	*4.06*	*.966*
Incremental_index	Improvement	53	5.92	1.190
	Context translation	39	4.55	1.54
	Application adoption	157	5.23	.889
	Unprimed application	105	5.03	1.025
Total		*354*	*5.20*	*1.121*

Table 1
Post Hoc test using Scheffé's test

	Ideation pattern (I)	*Ideation pattern (J)*	*Mean difference (I-J)*	*Sign.*
Radical_index	Unprimed application	Application adoption	.901*	.000
	Context translation	Application adoption	.676*	.001
	Unprimed application	Improvement	.552*	.004
	Improvement	Application adoption	.348	.108
	Context translation	Improvement	.327	.384
	Unprimed application	Context translation	.225	.607
Incremental_ index	Improvement	Context translation	1.369*	.000
	Improvement	Unprimed application	.887*	.000
	Improvement	Application adoption	.693*	.001
	Application adoption	Context translation	.676*	.006
	Unprimed application	Context translation	.482	.123
	Application adoption	Unprimed application	.194	.555

The 'unprimed application' pattern scored highest on the Radicalness Index, and was significantly higher than both 'application adoption' and 'improvement'. Although better than 'context translation', the difference between the two was not significant. A third significant difference was found: 'context translation' scored better than 'application adoption'.

For the Incrementalness Index, the ideation pattern 'improvement' was significantly higher than all three of the other ideation patterns. Furthermore, 'application adoption' was significantly higher than 'context translation'. Of practical relevance, of course, is *how* managers can guide participants toward adopting the desired ideation pattern. This issue was addressed in our third research question.

Dependency between user involvement strategy and ideation patterns

It should be noted that the participants in the different groups (involvement strategies) were not explicitly instructed to adopt any specific type of innovation pattern, as these patterns were inductively constructed after the experiments. Nevertheless, the groups showed different propensities to adopt different patterns, depending on the involvement strategy used. Table 5 shows the distribution of the involvement strategies among the four ideation patterns. The table also includes the adjusted residuals in order to analyze whether a cell contains significantly more (or fewer) ideas when no differences are expected between the involvement strategies.

Table 1
The Proclivity of Different Developer Types for Certain Ideation Patterns

		Ideation pattern				Total
Involvement strategy		Improve-ment.	Context translation	Unprimed application	Application adoption	
Professionals	Observed	7	4	12	32	55
	Expected	8.2	6.1	16.3	24.4	55
	Adj. Residual	-.5	-1.0	-1.4	2.2*	
Ordinary Users	Observed	27	13	37	46	123
	Expected	18.4	13.6	36.5	54.6	123
	Adj. Residual	2.7*	-.2	.1	-1.9	
Consulting ordinary	Observed	12	9	29	61	111
	Expected	16.6	12.2	32.9	49.2	111
	Adj. Residual	-1.5	-1.2	-1.0	2.7*	
Creative Ordinary	Observed	7	13	27	18	65
	Expected	9.7	7.2	19.3	28.8	65
	Adj. Residual	-1.1	2.6*	2.3*	-3.0*	
	Total	*53*	*39*	*105*	*157*	*354*

Items with an absolute value greater than 2 for the adjusted residual are regarded as significant (Hinkle, Wiersma and Jurs 1998, p 581). A plus sign in the residual indicates a significantly higher number of ideas than expected, whereas a minus indicates a significantly lower number than expected.

As Table 5 shows, several significant differences could be identified in regards to cross tabulation. The professional and 'consulting users' groups showed a significant preference for the 'application adoption' ideation pattern. The ordinary users, on the other hand, seemed to be primed by the available sample services and their ideation pattern, relative to the other groups, was dominated by the 'improvement' pattern.

The 'creativity trained users' had two dominant ideation patterns: 'unprimed application' and 'context translation'. The first pattern is the only pattern that is totally free from any priming of existing applications.

DISCUSSION

Different ideation patterns

The four identified ideation patterns largely conform to those proposed in the literature (Finke, Ward and Smith 1992; Goldenberg, Lehmann and Mazursky 2001). An important contribution made by this study is that the ideation process was performed in a natural yet controlled setting, rather than in a laboratory, as is the case for most other studies. Two of the patterns were directly primed (i.e. automatically influenced without intention) by providing one sample service (an existing solution), triggering either an improvement or context translation process. This is an extension of 'solution spotting' discussed by Goldenberg et al. (2001). From an innovation perspective, this extension is relevant, as it can be regarded as a type of proposal for customization, whereas context translation is a type of analogical thinking process whereby the "inventor" is stimulated by a sample service into imagining new use contexts. For the 'application adoption' pattern, the participants were instead primed by

an idea outside the sample services which they thought would be useful for them, accordingly proposing an adoption of the service into the technical platform at hand; this pattern can be regarded as a type of 'need spotting' (Goldenberg, Lehmann and Mazursky 2001). In the fourth ideation pattern, no direct priming was found to be present in the sense that it is neither a need spotting nor a solution spotting process. It can, however, be presumed that the participants were indirectly affected by the sample services' opportunities in a way that stimulated their creativity, allowing them to come up with ideas that were not directly primed to the samples.

Different patterns lead to different types of innovation

More radical ideas were obtained when the users adopted an ideation pattern of the type 'unprimed application' or 'context translation'. Common to both of these patterns is the fact that they are aimed for a new use context compared to the sample services; thus, the inventor needs to create, or activate, new use knowledge.

To obtain more incremental ideas, the 'improvement' or 'application adoption' patterns seem to be the most suitable. Common to both of these is the fact that the ideation is based on an already-known application which is either improved or transformed into a new technical platform.

It should be noted that both incremental and radical innovations, as previously discussed, are beneficial to the innovating firm. This implies that a firm should try to stimulate the involved users in regards to a variety of ideation patterns. The problem for managers, however, lies in guiding the involved users into a specific ideation pattern. The present study indeed contributes to a better understanding of how to actually lead the involved users to produce either more radical or more incremental ideas. Investigating the three user involvement strategies as well as the control condition (professionals) showed a dependency between the involvement strategy and the adopted ideation pattern. The reasons for this are intriguing and will be discussed in the next paragraph.

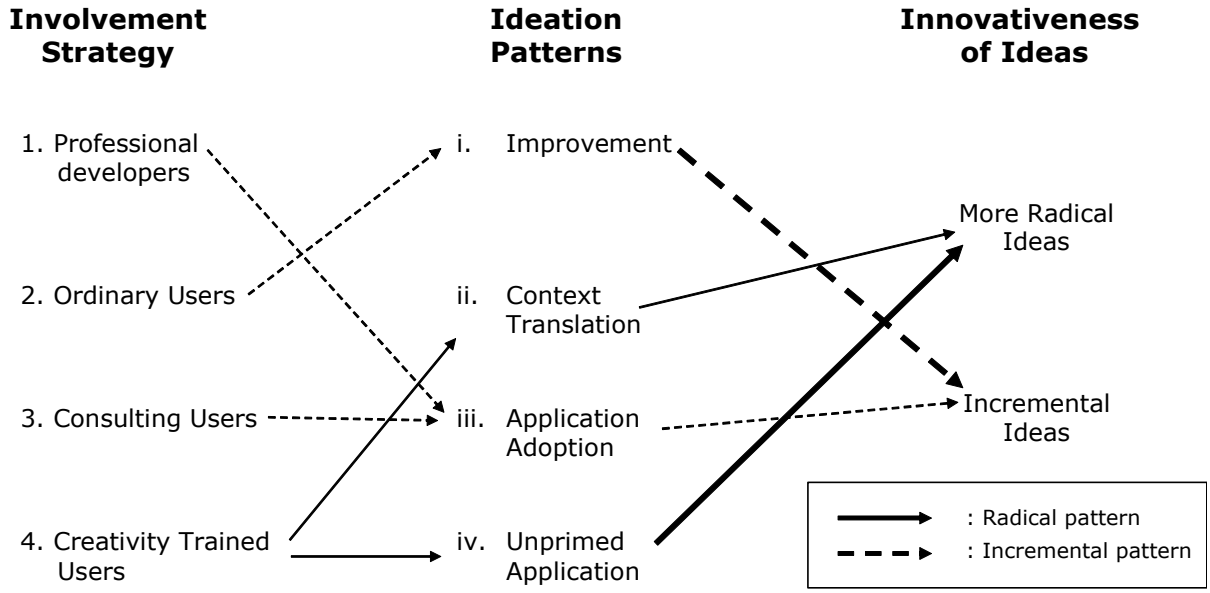
A propensity to adopt a certain ideation pattern

What could explain the differences in ideation between participants? Inferring from the notes in the diaries, it seems that prior knowledge, especially in terms of previous experiences from either similar technological solutions (i.e. professionals') or usage situations (i.e. the user groups'), inspired the participants in generating ideas. For example, professional developers may have retrieved previous solutions when they attempted to come up with new service ideas, and users' solutions may have been stimulated by various need situations during their ideation. Thus, one tentative explanation for the results is that the adopted ideation pattern is due to various triggers perceived at the start of the experiment or gained earlier in life.

Psychological theories support the notion that prior knowledge may account for the propensity of adopting a certain ideation pattern. According to Marsh, Ward, and Landau (1999), prior knowledge plays an important role in structuring novel ideas when these are generated. Interestingly, the more prior knowledge one has, the less novel the created solutions. Of interest here is the notion that prior knowledge is activated automatically and requires no intention, i.e. typically referred to as priming (Bargh and Chen 1996). Thus, interpreted in terms of our study, when a participant identified that a certain type of prior knowledge was useable in a certain situation, then his or her prior knowledge acted as a stimulus activating a set of predetermined response tendencies (i.e. ideas for new services) of which the participant was unaware. Although none of the participants were explicitly instructed in regards to how to perform the ideation procedure, they did adopt different ideation patterns, and the propensity to do so may have been conditioned by their previous knowledge and experiences. Figure 1 summarizes the relationships between the chosen

strategy for involving users in the ideation process and the ideation patterns and innovativeness of the resulting ideas.

Figure 1
Relations between involvement strategy, ideation patterns, and the innovativeness of the ideas



We infer that prior knowledge on the system platforms and experience with limitations of software programming primed the professional participants while situations of use primed ordinary users. A study by Marsh, Landau, and Hicks (1996) has shed light on why this cognitive course of events may occur. In their study, ideas generated by individuals conformed to examples that subjects had been shown before becoming engaged in creative problem-solving. From a theoretical point-of-view, people seem to take the *path of least resistance* by retrieving existing solutions or information which seem likely to immediately contribute to a future solution, and the reason for mental shortcuts like this may be that creative problem-solving is considered to be a very demanding mental task (Ward 1994).

MANAGERIAL IMPLICATIONS AND CONCLUSIONS

Capturing the value in use

An important factor in the experiments was that the users could use and test different sample services in their daily life; during the experiment they encountered different problems, or opportunities, which they could imagine to be solved or realized by some technology-based service. The user's ideas were, accordingly, reflecting solutions that would bring value to the users. In each submitted idea was *embedded the actual need* of the submitting user at the instant when the idea was created. By giving the participants diaries to capture their ideas, a window was opened which made it possible to "observe" and "record" the users' needs. The diary enabled the recording of user data *in situ,* in contrast to most marketing methods which normally obtain the data *in retrospect*. This gives the data a higher validity; psychological

research in studies using ecological momentary assessment has revealed that it is difficult for individuals to recall past experiences correctly. In order to minimize biases, people should be asked to report their state of mind (e.g. behaviors, emotions, cognitions, and so on) immediately (Riis et al. 2005). The diary method does, in fact, present a cost efficient way of assimilating new service ideas from a "value in use" perspective.

Idea Management from Push versus Pull to Interplay

The vast majority of previous research on user innovation has focused on leading edge users, or so-called lead-users (e.g. Hienerth 2006; Lüthje, Herstatt and von Hippel 2005; von Hippel 1988). The current study has justified *ordinary users* as a worthy resource for creating valuable technology-based services. However, due to the ordinary users' limited or absent understanding of the underlying technology, they need other management in order to be effective in a company's innovation process.

To utilize the integration of ordinary users, it is essential to notice that ideas considered as unfeasible – i.e. those being outside the solution space of the technical platform at hand – should not be rejected for further processing. As previously discussed, the ideas do reflect the users' aim to provide a solution that will bring them value. Ordinary users will, however, have a very limited understanding of how to actually implement such a solution.

A first interpretation is that user involvement would bring little value to the company, at least when it comes to services dependent on an advanced underlying technology that is rather non-transparent for the user. However, we claim that this is an incorrect interpretation; irrespective of whether an idea can be realized or not, the company can learn about the users' actual needs and what would bring them value in a real use situation. These (yet) unfeasible ideas can also stretch the technical requirements to trigger new innovative technical developments.

Thus, involving ordinary users for ideation is an interplay between technology push and market pull, beginning with the company developing a technical platform (push) for which it seeks valuable services by involving users for ideation (pull). Some of the users' ideas can challenge the existing technology, as previously mentioned, triggering an extended technology development. One implication for management is, thus, to handle users' proposals for new services not primarily as ready for use concepts, but rather as probes to understand the true needs and what brings value to the users; this in turn can work as a trigger for new technology development.

Generalizabilty

From a theoretical standpoint, the participating users are primarily in possession of use related knowledge, i.e. knowledge related to what they want the technology to do for them. However, their technology knowledge – knowledge regarding how to realize the services – is much more limited. This can be assumed to be generally true for most technology-based services. However, a situation where the implementation of the service is not transparent to its users is not limited to technology-based services; this is also the case for other services having, for example, back office processes invisible to the customer. Technology has a wider meaning than merely being technical hardware, as it also includes organizational resources necessary to produce the services, e.g. organizational structure, processes, personnel, and so on.

Instead of being a drawback, the lack of technology knowledge can indeed be an asset that induces the participants to think outside of the box of limitations – the users are, in fact, not aware of the limitations. In addition, the methodology presented could improve existing services by inducing current users to think freely about what services they would like to have. The important issue in any case (as discussed in the previous paragraph) is to enable the users

to provide instant feedback when the ideas occur. Of great importance in our study is the opportunity to use prototype services in the natural use environment.

Concluding Remarks and Future Research

The present study provides managers with useful insights and practical guidance with respect to involving ordinary users in idea generation related to technology-based services. The study finds that different ideation patterns have a propensity to produce ideas that are either more incremental or more radical. If the objective is to obtain more incremental ideas, then managers should influence the users to adopt an ideation pattern of the 'improvement' or 'context translation' type. A direct way to obtain this could be to present sample services, or prototypes, and explicitly ask the users to come up with improvements to these or to find analogous uses or other contexts where they could be applied.

On the other hand, if a company aims to achieve more radical innovation, then the 'unprimed application' pattern would seem the most preferable. In this case, the firm in question could instruct the participants to actually think more freely in order to not get stuck, primed by the sample services and even omit any discussion of the underlying technical platform. It seems that, in order to obtain this, it might be preferable to actually have some kind of creativity training for the participants. Under all circumstances, an ideation pattern based on application adoption should be avoided when involving ordinary users in ideation. This will minimize the creative outcome and can, moreover, be carried out by the professionals without involving any users in the process.

REFERENCES

Alam, Ian (2002), "An Exploratory Investigation of User Involvement in New Service Development," *Journal of the Academy of Marketing Science*, 30 (3), 250-61.

Amabile, Teresa M. (1996), *Creativity in Context*. Boulder, Colorado: Westview Press.

Balachandra, R. and John H. Friar (1997), "Factors for Success in R&D Projects and New Product Innovation: A Contextual Framework," *IEEE Transactions on Engineering Management*, 44 (3), 276-87.

Bargh, J.A. and M. & Burrows Chen, L. (1996), "Automaticity of Social Behaviour: Direct Effects of Trait Construct and Stereotype Activation of Actions," *Journal of Personality and Social Psychology*, 7 (1), 230-44.

Bennett, Roger C. and Robert G. Cooper (1981), "The Misuse of Marketing: An American Tragedy," *Business Horizons*, 24 (6), 51-61.

Bitner, Mary Jo, Stephen W. Brown and Matthew L. Meuter (2000), "Technology Infusion in Service Encounters," *Journal of the Academy of Marketing Science*, 28 (1), 138-49.

Callahan, John and Eytan Lasry (2004), "The Importance of Customer Input in the Development of Very New Products.," *R & D Management*, 34 (2), 107-20.

Christensen, Clayton M. and J. Bower (1996), "Customer Power, Strategic Investment and the Failure of Leading Firms," *Strategic Management Journal*, 17, 197-218.

Cooper, Robert G. (1993), Winning at New Products : Accelerating the Process from Idea to Launch, 2nd ed. Reading, Mass.: Perseus Books.

Crawford, C. Merle and Anthony Di Benedetto (2000), *New Products Management*, 6th ed. Boston: Irwin/McGraw-Hill.

Dabholkar, Pratibha A. (1996), "Consumer Evaluations of New Technology-Based Self-Service Options: An Investigation of Alternative Models of Service Quality," *International Journal of Research in Marketing*, 13 (1), 29-51.

Dahl, Darren W. and Page Moreau (2002), "The Influence and Value of Analogical Thinking During New Product Ideation," *Journal of Marketing Research*, 39 (1), 47-60.

de Bono, Edward (2000), *Six Thinking Hats*. London, UK: Penguin.

Finke, Ronald A., Thomas B. Ward and Steven M. Smith (1992), *Creative Cognition : Theory, Research, and Applications*. Cambridge, Mass.: MIT Press.

Franke, Niclaus and Sonali Shah (2003), "How Communities Support Innovative Activities: An Exploration of Assistance and Sharing among End-Users," *Research Policy*, 32 (1), 157-78.

Franke, Niclaus and Eric Von Hippel (2003), "Satisfying Heterogeneous User Needs Via Innovation Toolkits: The Case of Apache Security Software," *Research Policy*, 32 (7), 1199-215.

Garcia, Rosanna and Roger Calantone (2002), "A Critical Look at Technological Innovation Typology and Innovativeness Terminology: A Literature Review," *Journal of Product Innovation Management*, 19 (2), 110-32.

Goldenberg, Jacob, Donald R. Lehmann and David Mazursky (2001), "The Idea Itself and the Circumstances of Its Emergence as Predictors of New Product Success," *Management Science*, 47 (1), 69.

Green, S. G., M. B. Gavin and L. Aimansmith (1995), "Assessing a Multidimensional Measure of Radical Technological Innovation," *IEEE Transactions on Engineering Management*, 42 (3), 203-14.

Hamel, G. and C. K. Prahalad (1994), "Competing for the Future," *Harvard Business Review*, 72 (4), 122-8.

Hart, Susan, Erik Jan Hultink, Nikolaos Tzokas and Harry R. Commandeur (2003), "Industrial Companies' Evaluation Criteria in New Product Development Gates," *Journal of Product Innovation Management*, 20 (1), 22-36.

Hauser, J.R. and F. Zettelmeyer (1997), "Metrics to Evaluate Rd&E," *Research-Technology Management*, 40, 32-8.

Hienerth, Christoph (2006), "The Commercialization of User Innovations: The Development of the Rodeo Kayak Industry," *R and D Management*, 36 (3), 273-94.

Hinkle, Dennis E., William Wiersma and Stephen G. Jurs (1998), *Applied Statistics for the Behavioral Sciences*. Boston: Houghton Mifflin.

Holmquist, Rune and Göran Ekvall (1986), *Bpe: Bedömning Av Personliga Egenskaper*. Stockholm: Psykologiförlaget.

Koen, Peter A., Greg Ajamian, Scott Boyce, Allen Clamen, Eden Fisher, Stavros Fountoulakis, Albert Johnson, Pushbinder Puri and Rebecca Seibert (2002), "Fuzzy Front End: Effective Methods, Tools and Techniques," in *The Pdma Toolbook for New Product Development*, Paul Belliveau, Abbie Griffin and Stephen Somermeyer, eds. New York: John Wiley & Sons, 5-35.

Lüthje, C. (2004), "Characteristics of Innovating Users in a Consumer Goods Field: An Empirical Study of Sport-Related Product Consumers," *Technovation*, 24 (9), 683-95.

Lüthje, Christian and Cornelius Herstatt (2004), "The Lead User Method: An Outline of Empirical Findings and Issues for Future Research," *R and D Management*, 34 (5), 553-68.

Lüthje, Christian, Cornelius Herstatt and Eric von Hippel (2005), "User-Innovators And "Local" Information: The Case of Mountain Biking," *Research Policy*, 34 (6), 951-65.

Magnusson, Peter R, Jonas Matthing and Per Kristensson (2003), "Managing User Involvement in Service Innovation: Experiments with Innovating End-Users," *Journal of Service Research*, 6 (2), 111-24.

Mahajan, Vijay, Eitan Muller and Rajendra K. Srivastava (1990), "Determination of Adopter Categories by Using Innovation Diffusion Models," *Journal of Marketing Research*, 27 (1), 37-50.

Marsh, Richard L., Joshua D. Landau and J. L. Hicks (1996), "How Examples May (and May Not) Constrain Creativity.," *Memory and Cognition*, 24 (5), 669-80.

Marsh, Richard, Thomas Ward and Joshua Landau (1999), "The Inadvertent Use of Prior Knowledge in a Generative Cognitive Task," *Memory and Cognition*, 27 (1), 94-105.

Martin, Justin and Anne Faircloth (1995), "Ignore Your Customer.," *Fortune*, 131 (8), 121.

Martinez, Eva, Yolanda Polo and Carlos Flavián (1998), "The Acceptance and Diffusion of New Consumer Durables: Differences between First and Last Adopters," *Journal of Consumer Marketing*, 15 (4), 323-42.

Menor, Larry J., Mohan V. Tatikonda and Scott E. Sampson (2002), "New Service Development: Areas for Exploitation and Exploration," *Journal of Operations Management*, 20 (2), 135-57.

Meuter, Matthew L., Amy L. Ostrom, Robert I. Roundtree and Mary Jo Bitner (2000), "Self-Service Technologies: Understanding Customer Satisfaction with Technology-Based Service Encounters," *Journal of Marketing*, 64 (July), 50-64.

Miller, Christopher W. (2005), "Getting Lightning to Strike: Ideation and Concept Generation," in *Pdma Handbook of New Product Development*, Kenneth B. Kahn, ed. Hoboken, NJ: John Wiley & Sons, 263-78.

Moore, Geoffrey (1991), *Crossing the Chasm*. New York, NY: Harper Business.

Moreau, C. Page, Darren W. Dahl, Dawn Iacobucci and Eugene Anderson (2005), "Designing the Solution: The Impact of Constraints on Consumers' Creativity," *Journal of Consumer Research*, 32 (1), 13-22.

Parasuraman, A. (2000), "Technology Readiness Index (Tri) - a Multiple-Item Scale to Measure Readiness to Embrace New Technologies," *Journal of Service Research*, 2 (4), 307-20.

Perrow, C. (1967), " A Framework for the Comparative Analysis of Organizations," *American Sociological Review*, 32, 196-208.

Reid, Susan E. and Ulrike de Brentani (2004), "The Fuzzy Front End of New Product Development for Discontinuous Innovations: A Theoretical Model," *Journal of Product Innovation Management*, 21 (3), 170-84.

Riis, J., G. Loewenstein, J. Baron, C. Jepson, A. Fagerlin and P. A. Ubel (2005), "Ignorance of Hedonic Adaptation to Hemodialysis: A Study Using Ecological Momentary Assessment," *Journal of experimental psychology. General*, 134 (1), 3-9.

Rochford, Linda (1991), "Generating and Screening New Products Ideas," *Industrial Marketing Management*, 20 (4), 287-96.

Rogers, Everett M. (1962), *Diffusion of Innovations*, 4th edition ed. New York: Free Press.

Rust, Roland T. and P. K. Kannan (2002), *E-Service : New Directions in Theory and Practice*. New York: M.E. Sharpe.

Rust, Roland T. and Carol Miu (2006), "What Academic Research Tells Us About Service," *Communications of the ACM*, 49 (7), 49-54.

Scheffé, Henry (1959), *The Analysis of Variance*. New York: John Wiley & Sons, Inc.

Scheier, Michael F. and Charles S. Carver (1985), "Optimism, Coping, and Health: Assessment and Implications of Generalized Outcome Expectancies," *Health Psychology*, 4 (3), 219-47.

Sundbo, Jon (1997), "Management of Innovation in Services," *The Service Industry Journal*, 17 (3), 432-55.

Tidd, Joe, John Bessant and Keith Pavitt (2005), *Managing Innovation*: John Wiley & Sons, Ltd.

Tushman, Michael L. and Charles A. O´Reilly III (1996), "Ambidextrous Organizations: Managing Evolutionary and Revolutionary Change," *California Management Review*, 38 (4), 8 - 30.

Tzokas, N., E. J. Hultink and S. Hart (2004), "Navigating the New Product Development Process," *Industrial Marketing Management*, 33 (7), 619-26.

Ward, Thomas B. (1994), "Structured Imagination: The Role of Category Structure in Exemplar Generation," *Cognitive Psychology*, 27 (1), 1-40.

von Hippel, Eric (1988), *The Sources of Innovation*: New York : Oxford U.P.

------ (1994), ""Sticky Information" And the Locus of Problem Solving: Implications for Innovation," *Management Science*, 40 (4), 429-39.

von Hippel, Eric, Stefan Thomke and Mary Sonnack (1999), "Creating Breakthroughs at 3m," *Harvard Business Review*, 77 (5), 3-9.

Woodall, Regina D., Charles L. Colby and A. Parasuraman (2007), ""E-Volution" To Revolution," *Marketing Management*, 16 (2), 29-34.

Zhu, Z., C. Nakata, K. Sivakumar and D. Grewal (2007), "Self-Service Technology Effectiveness: The Role of Design Features and Individual Traits," *Journal of the Academy of Marketing Science*, 35 (4), 492-506.