# Developing successful technology-based services: the issue of identifying and involving innovative users

*Jonas Matthing, Per Kristensson and Anders Gustafsson*
Service Research Center, Karlstad University, Karlstad, Sweden, and

*A. Parasuraman*
Department of Marketing, University of Miami, Coral Gables, Florida, USA

**Abstract**
**Purpose** – The aim of this paper is to explore the identification of innovative customers and the effectiveness of employing such customers to generate new service ideas in a technology-based service setting.
**Design/methodology/approach** – The first study reported here employs the "technology readiness" (TR) construct and involves telephone surveys with randomly selected Swedish consumers. The second involves a field experiment.
**Findings** – Findings from Study I suggest that the TR is a useful tool for identifying users who exhibit both innovative attitudes and behaviors. The results from Study II show that users with a high TR are highly creative as reflected by the quantity and quality of new service ideas.
**Research limitations/implications** – The sample size for Study II was relatively small and making empirical generalizations with confidence should await results from studies involving larger samples. However, in sum the research demonstrates that TR appears to be an effective tool for identifying innovative customers who would be both willing to participate in new service development and capable of generating creative ideas.
**Originality/value** – Service businesses interested in using customers to help generate new ideas could benefit from this research.

**Keywords** Customer service management, Innovation, Design and development

**Paper type** Research paper

**An executive summary for managers and executive readers can be found at the end of this article.**

## Introduction

Increasing competition and more demanding customers imply that firms not focusing on new service development risk falling behind (Gray *et al.*, 2002; Kelly and Storey, 2000; Wymbs, 2000). At the same time, accelerating technological developments are also opening up tremendous opportunities for developing innovative services (e.g. Roberts, 2000; Menor *et al.*, 2002). Some companies have been capitalizing on these opportunities as illustrated by the introduction of various online, mobile, and "smart home" services. It is clear that traditional service provision is undergoing major transformations due to the infusion of technology into service encounters (Bitner *et al.*, 2000).

As technology-based service provision replaces face-to-face service encounters, companies risk losing touch with their customers, and thereby an important source of information for their new service development process (Curran *et al.*, 2003; Grönroos, 2000). As such, it is not surprising that the introduction of technology-related services in consumer settings has been problematic. For instance, the International Customer Service Association (2001) reported that only 26 percent of e-customers were satisfied with their internet purchase experiences. And, a study by the Boston Consulting Group found that four out of five online purchasers have experienced failure, and out of all online purchases 28 percent fail. Furthermore, as new technologies proliferate through everyday life, ample anecdotal as well as survey-based evidence suggests signs of growing consumer frustration and disillusionment (e.g. Alsop and Have, 1999; Parasuraman, 2000).

One reason for the apparent mismatch between technology-based services and people's needs is that conventional market research techniques are not effective for such services (Rust and Lemon, 2001; Trott, 2001) and they only manage to skim the surface of user needs (von Hippel and Katz, 2002). Surveying customers in a traditional fashion about new technology is problematic because it is difficult for customers to envision applications of a technology they have never experienced (Flint, 2002; Ulwick, 2002). Employing a "user involvement" approach would be more effective in this regard

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(Menor *et al.*, 2002; von Hippel, 2001). The involvement of customers will provide a deeper understanding of their needs and increase the likelihood that the new service ideas will meet those needs (Alam and Perry, 2002; Flint, 2002). Findings from recent empirical research about companies' intensified interaction with customers show that involving customers will improve the effectiveness of new service development (e.g. Alam, 2002; Magnusson *et al.*, 2003; Olson and Bakke, 2001; Thomke, 2003). However, an important challenge facing companies is the identification of innovative customers who are likely to be most helpful during new service development (Goldsmith and Flynn, 1992; Parasuraman and Colby, 2001; Rogers, 1995; von Hippel, 1988).

The overall aim of the research discussed in this paper is to explore the identification of innovative customers (i.e. end-users and consumers) and the effectiveness of employing such customers to generate new service ideas in a technology-based service setting. Specifically, the research addresses two key questions:

1 Can we identify customers with an innovative attitude that also translates into actual innovative behavior (i.e. can we make an informed a priori prediction about which customers are likely to be the first to adopt and use new technology-based services)?
2 Are these "lead" customers effective enough to be involved in new service development (i.e. do they generate a greater number of new service ideas than do other customers)?

The paper is organized as follows. We begin with a conceptual overview of past research pertaining to customer involvement in new service development in general and the development of technology-based services in particular. We then describe and discuss results from a study to identify innovative customers. After that we describe and discuss results from a second study investigating the extent to which innovative customers are effective in generating new service ideas. We conclude with a general discussion of the findings and their implications for researchers and managers.

## Customer involvement in new service development

Despite widespread recognition in the literature that interacting with customers during the development process is critical for market success, such customer involvement is insufficiently practiced (e.g. Gordon *et al.*, 1993; Martin and Horne, 1995). New service development has generally proven to be a difficult task because of many hidden obstacles related to a lack of understanding about how to involve customers in the development process (de Brentani and Ragot, 1996; Johne and Storey, 1998). These obstacles are particularly pronounced in the context of developing new technology-based services.

More specifically, researchers have proposed that firms should direct their energies towards a small sample of innovative users (Olson and Bakke, 2001; von Hippel, 1978, 1988; Thomke and von Hippel, 2002). These lead users are "early birds" in discovering and acquiring new technology, as well as new products and services (von Hippel, 1986). By observing the needs of these lead users and the solutions they have worked out, companies can foresee the services of tomorrow and adjust their own development work accordingly. Such lead users are skilled at predicting future conditions and also have strong needs for solving their present problems. Thus, capability and motivation are essential qualities that make lead users especially valuable to firms attempting to develop new technology-based services.

Lead users are not necessarily the same as "innovators" discussed in the literature on diffusion of new products (Rogers, 1995). Diffusion theory focuses on identifying and understanding different customer categories that are formed based on the timing of adoption. This theory defines innovators as the first adopters of an innovative product or service immediately after its introduction. While this theory is helpful for developing marketing strategies for different customer segments, it is of limited use in terms of providing insights during the new product or service development process, prior to full-scale market introduction. Thus, "innovators" as defined in the diffusion-of-innovations literature and "lead users" in the context of developing new products and services, while probably possessing some common characteristics, are distinct groups when it comes to providing ideas for new product or service development.

Previous research on lead users has focused primarily on business-to-business contexts involving industrial goods (Pitta and Franzak, 1996), perhaps because lead users can be more easily and reliably identified in those contexts than in contexts involving consumer packaged goods (von Hippel, 1986). Nevertheless, it has been suggested that lead users in both contexts would have similar characteristics such as having a strong, well-developed set of needs and a willingness to participate in fulfilling those needs (e.g. Morrison *et al.*, 2000). Thus, using the extant knowledge about lead users in industrial contexts as a starting point, it would be beneficial to develop a process for identifying lead users for developing new services (Martin and Horne, 1995; Slater, 2001). The research we report in this paper takes an exploratory step in that direction and develops such a process in the context of technology-based services.

## Challenges posed by technology-based service settings

Technology-based services are a relatively new phenomenon and are often highly innovative, in that the technology platforms on which they are based have not existed previously (e.g. the internet, 3G mobile-phone technology, geographic positioning systems, etc.). Therefore, most customers would find it difficult to envision and relate to such technologies, let alone come up with innovative ideas for applications (i.e. new services) based on those technologies. Only a small minority of customers are likely to be innovative and creative enough to be of help to companies interested in developing technology-based services. Thus, a process for identifying these customers is critical for successful development of new technology-based services.

Scholarly research focusing on technology-based products and services, and their use, points out the distinctiveness of technology contexts in that they involve behavioral concepts and processes that might differ from those in traditional contexts. Examples of such research include studies involving the technology acceptance model (TAM) developed by Davis (1989) for work contexts and a recent adaptation of the TAM to understand the online consumer behavior (Koufaris, 2002). Moreover, extensive studies focusing on the perceptions, emotions, and usage of new technology demonstrate that people harbor both favorable and unfavorable views about technology-based products (Mick

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and Fournier, 1998). These positive and negative feelings, referred to as "paradoxes," coexist within an individual and therefore must be considered in order to understand more completely how and why people adopt new technology. In other words, proneness to adopt new technologies is not solely a matter of consumers being curious and open-minded. It has been found, for example, that intentions to use self-service technologies are driven by multiple, hierarchical attitudes (Curran *et al.*, 2003).

In short, to be effective, any approach used for identifying "lead" users in technology-based service contexts needs to take into account the complex nature of consumer attitudes and behavior. We next turn to Study I, which investigates such an approach and examines its soundness.

## Study I

The goal of Study I was to explore the possibility of effectively identifying customers in a technology-based service setting who exhibit both innovative attitudes and behaviors. The conceptual underpinning for this study was the "technology readiness" (TR) construct proposed by Parasuraman (2000) and operationalized by him as the "technology readiness index" (TRI). This construct specifically addresses and incorporates the underlying paradoxical attitudes that individuals seem to experience when exposed to new technology. Therefore, the TRI seemed to be an especially appropriate tool for trying to identify lead users in the context of new technology-based services.

### TRI

TR can be viewed as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine one's overall predisposition towards new technologies. Parasuraman (2000) developed and tested the TRI based on an iterative scale-development process that began with a large pool of scale statements reflecting a variety of positive and negative feelings about technology. The final TRI scale consists of 36 statements, grouped into two enabler dimensions – optimism and innovativeness – and two inhibitor dimensions – discomfort and insecurity. The TRI scale has been shown to have strong psychometric properties (Parasuraman, 2000).

People can be segmented into distinct groups based on their patterns of scores on the four dimensions. For instance, an individual with a high degree of optimism and innovativeness, and a low degree of discomfort and insecurity is likely to be a "lead user" of new technologies. Based on cluster analyses of TR scores on the four dimensions, Parasuraman and Colby (2001) have identified five distinct customer segments, which they label as explorers, who are lead users most prone to adopt and experiment with new technologies, followed by (in decreasing order of adoption propensity) pioneers, skeptics, paranoids, and laggards.

### Hypotheses

If the TRI is to be used as a tool for identifying innovative users of technology-based services, then respondents with the highest TR scores should also be the first ones that actually adopt new technologies. While Parasuraman's (2000) study provides support for this expectation, that study did not take the perspective of new service-development, which is the focus of our research. Moreover, our study included a broader set of technology-based services than the primarily computer- and Internet-related services examined by Parasuraman (2000). Finally, our study was carried out in Sweden, in contrast to the US-based sample in Parasuraman's study. Thus, in Study I we examined the robustness of the following hypothesis in a context involving a broader set of technology-based offerings and a different country than the original study that produced the TRI:

*H1*. Technology readiness is positively correlated with adoption of new technology-based services.

Study I's second hypothesis relates to people's general attitudes towards and interest in finding solutions to technology-related problems. Because of potential start-up problems with newly developed technology-based services, the lead users of such a service ("explorers" in Parasuraman and Colby's (2001) classification scheme) may be above-average in terms of resourcefulness and propensity to solve problems in order to effectively use the service. More generally, it is reasonable to expect that the motivation and capacity to tackle technology-related issues will be positively associated with TR scores. Stating this expectation more formally:

*H2*. Technology readiness is positively correlated with propensity to actively seek new technologies and solve problems related to them. Specifically, this propensity is highest for explorers and lowest for laggards, and falls in-between for pioneers, skeptics and paranoids (in that order).

The third hypothesis concerns customers' willingness to participate in technology-based new service development. In industrial or business-to-business contexts, there is an economic incentive for customers to participate in the process of innovating suppliers' offerings (e.g. Schmookler, 1966, 1972; von Hippel, 1978). For instance, improving a supplier's manufacturing process can eventually lead to cost savings for the buying firms. Such an economic incentive is less likely to be present in consumer or end-user contexts. Therefore, although user groups have been observed to invest time and effort in improving products and services (Prahalad and Ramaswamy, 2000; Chesbrough, 2003), the extent to which end users are actually willing and motivated to participate in a company's developmental efforts is an open question (von Krogh, 2003). Nevertheless, in the context of technology-based service development, using an argument similar to the one that motivated *H2*, one can expect high TR customers to be more willing to participate in developmental efforts than are low TR customers. Therefore:

*H3*. Technology readiness is positively correlated with willingness to participate in the process of new technology-based service development. Specifically, this willingness is highest for explorers and lowest for laggards, and falls in-between for pioneers, skeptics and paranoids (in that order).

### Methodology

*Sample*

The data in Study I were collected through the Swedish National Technology Readiness Survey (SNTRS). The SNTRS included 1,004 randomly selected respondents who were representative of the adult population (18 years or older) of Sweden in terms of age, gender, education, and geographic

location (rural vs urban). The sampling frame was purchased from Statistics Sweden. Respondents were chosen randomly from this sampling frame and interviewed via computer-assisted telephone interviewing by a professional marketing research firm. Prospective respondents who were not available on the first call were called back seven times before a substitute was picked.

*Measures*

The SNTRS consisted of three parts. Part 1 contained a translated version of the 36-item TRI scale (Parasuraman, 2000). Part 2 consisted of a variety of questions focusing on attitudes and behaviors related to technology-based services and products; it also included some questions regarding willingness to participate in new service development. Part 3 included questions pertaining to respondents' backgrounds and demographics.

Respondents answered the TRI questions in Part 1 on a five-point Likert scale, with "strongly disagree" (1) and "strongly agree" (5) as anchors. Most of the questions in parts 2 and 3 were also close-ended with a five-point Likert scale. In addition, part 2 included a few open-ended questions to solicit verbal comments. The survey questionnaire was carefully constructed, reviewed in-depth by researchers as well as industry experts, and revised based on the feedback. The revised questionnaire was pre-tested in a pilot study of 500 randomly selected employees in one of Sweden's largest retail banks. The questionnaire was further modified based on the pilot-study results and then the final version was prepared.

The internal consistency (as measured by coefficient alpha) of the TRI items pertaining to the optimism, innovativeness, discomfort and insecurity dimensions were, respectively, 0.84, 0.75, 0.67, 0.84. With the exception of the reliability of the discomfort dimension, the values exceed the conventional minimum of 0.70. Given the somewhat exploratory nature of our study, the reliability for discomfort falling slightly below this minimum is not a major concern since coefficient alpha values as low as 0.60 can be considered acceptable in exploratory research (Peterson, 1994). Thus, the measures of all four TR dimensions were deemed to be satisfactory.

**Results**

We conducted two different analyses to test *H1* (positing a positive relationship between TR and adoption of new technology-based services) – one focusing on the timing of internet adoption and the other focusing on differences between adopters and non-adopters of a variety of technology-based services. In the first analysis, we cluster analyzed respondents' scores on the four TR dimensions (similar to the approach used by Parasuraman and Colby (2001)) and derived a five-segment classification consisting of explorers, pioneers, skeptics, paranoids and laggards. Then, using data on the respondents' year of adoption of the internet (if they had adopted it), we constructed "adoption curves" showing the cumulative Internet penetration rate over time within each of the five TR segments. These curves (shown in Figure 1) reveal adoption rates that are consistent with *H1* – i.e. the adoption rate is fastest for explorers, next fastest for pioneers, and so on. Moreover, the differences in adoption across the five segments are statistically significant at $p < 0.01$, thereby offering strong support for *H1*.

In the second analysis, we examined the differences in technology readiness between adopters and non-adopters of a variety of technology-based services shown in the first column of Table I. Table I also shows the mean TRI scores on a scale of 1-5 (averaged across the four TR dimensions) for the two groups. The mean TRI score for adopters is greater than that for non-adopters for every service – even for services such as ATM services and mobile phone subscriptions that already have very high penetration rates (over 90 percent) in Sweden. Moreover, for each service, the difference between mean TRI scores for the two groups is statistically significant at $p < 0.01$. The results augment the support for *H1*.

*H2* predicts a positive association between people's technology readiness and their propensity actively to seek new technologies and solve problems related to them. To measure the latter construct (i.e. the propensity) we included in the survey four statements, each rated by respondents on a five-point Likert ("Strongly disagree" to "Strongly agree") scale. The four statements, shown in the first column of Table II, focus on people's feelings and behaviors pertaining to thinking about and tackling problems associated with new technology-based services (this four-item scale had a Cronbach's alpha value 0.70, implying satisfactory reliability). As the second column in Table II shows, scores on each of the four statements are positively and significantly ($p < 0.01$) correlated with the overall TRI scores. Moreover, with just a couple of exceptions, the mean scores on each statement are highest for explorers, next highest for pioneers, and so on, as predicted by *H2*. Collectively, these findings support *H2*.

To test *H3*, which posits a positive association between technology readiness and willingness to participate in new technology-based service development, we included in the survey a "yes/no" question asking respondents whether they were willing to participate. About 35 percent of the total sample indicated they would be willing to participate. The mean TRI score for this sub sample was 3.03; and, as implied by *H3*, the mean TRI score for the rest of the sample was 2.63 (the mean scores were significantly different at $p < 0.001$). Furthermore, the five TR segments differed significantly in terms of the percentage of respondents within each that were willing to participate: explorers 64 percent, pioneers 41 percent, skeptics 28 percent, paranoids 23 percent, and laggards 15 percent. Thus, *H3* is supported.

The strong and consistent support for all three Study I hypotheses suggest that people's technology readiness is a good predictor of their propensity to adopt new technology-based services (*H1*), actively seek new technologies and solve problems related to them (*H2*), and be willing to participate in new technology-based service development (*H3*). Thus the TRI appears to be a robust tool that is appropriate for identifying "lead users" who are likely to be most effective and helpful in the process of developing new technology-based services. Are high TR people actually more effective and helpful in new-technology contexts? Study II addresses this question.

## Study II

In Study II we explored the association between customers' technology readiness and their creativity as reflected by the quantity and quality of new service ideas they were able to generate in a high Technology context. Specifically, based on

**Figure 1** Internet-adoption curves for different TR segments

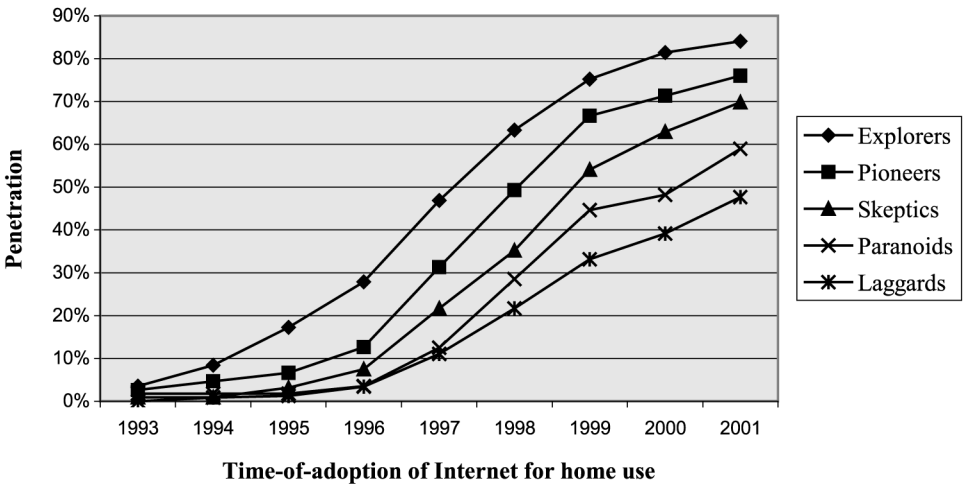


**Table I** Mean TR scores for adopters and non-adopters

| Technology-based service | TRI for adopters | SD | *n* | TRI for non-adopters | SD | *n* |
|---|---|---|---|---|---|---|
| **ATM card** | 2.80 | 0.52 | 941 | 2.59 | 0.63 | 62 |
| **Mobile phone (GSM)** | 2.82 | 0.51 | 911 | 2.49 | 0.60 | 93 |
| **Caller ID** | 2.82 | 0.52 | 727 | 2.71 | 0.53 | 276 |
| **Internet bank** | 3.00 | 0.44 | 536 | 2.54 | 0.50 | 465 |
| **Digital cable TV** | 2.93 | 0.50 | 218 | 2.75 | 0.53 | 785 |
| **Mobile phone (WAP)** | 3.04 | 0.52 | 197 | 2.73 | 0.51 | 797 |
| **PDA** | 3.10 | 0.46 | 126 | 2.74 | 0.52 | 876 |
| **GPS** | 3.01 | 0.43 | 101 | 2.76 | 0.55 | 898 |
| **Wireless computer connection** | 3.15 | 0.52 | 94 | 2.75 | 0.52 | 906 |

**Table II** Relationship between TR and attitudinal statements about new technologies

| Statement | Correlation between TR and statement score | Mean statement score on five-point scale | | | | | |
|---|---|---|---|---|---|---|---|
| | | Explorers | Pioneers | Skeptics | Paranoids | Laggards | Total sample |
| **1.** You enjoy thinking about novel technology-based services and solutions | 0.50 * | 3.69 | 3.51 | 2.53 | 2.42 | 2.00 | 2.82 |
| **2.** You often come up with new solutions to problems you experience with new technology | 0.40 * | 3.33 | 3.57 | 2.54 | 2.62 | 2.20 | 2.82 |
| **3.** You enjoy finding solutions to problems that accompany new technology | 0.52 * | 3.03 | 3.20 | 1.96 | 2.14 | 1.45 | 2.29 |
| **4.** You actively search for updates and launches of new technology-based services | 0.59 * | 3.72 | 3.62 | 2.72 | 2.64 | 2.02 | 2.92 |

**Note:** * $p < 0.01$

the findings from Study I as well as suggestions in the literature that explorers (i.e. the customer segment with the highest TR scores) should be able to generate innovative new service concepts (Parasuraman and Colby, 2001), our formal hypothesis in Study II was:

*H4.* In a technology-based service context, technology readiness is positively correlated with creativity in terms of both quantity and quality of innovative ideas generated.

## Methodology

A user-involvement project sponsored by a large telecom operator in Sweden provided the context for testing *H4*. This project involved seeking suggestions from customers for developing mobile phone services for the future. A group of customers were equipped with GSM mobile phones, as well as a platform for new types of mobile services beyond just voice (e.g. mobile internet), and were given the task of generating ideas for value-adding mobile phone services and,

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when possible, even creating (programming) ready prototypes. The instructions emphasized that their service ideas should provide benefits and functions in their own specific environments. The ideas generated were then evaluated to ascertain how creative they were. The following three subsections provide more details about the project.

*Sample*

The participants for Study II were recruited from a university campus in Sweden. They were screened to ensure they:

- were frequent users of mobile-phone communications;
- fit the profile of the sponsoring firm's target customers; and
- were willing to participate in the project by performing all the required tasks.

Because students (in Sweden) represent frequent users advanced GSM services other than voice, and therefore are familiar with the context, many (but not all) of the participants were university students. A total of 52 individuals (34 males and 18 females) participated in the project. Their mean age was 25.5 (range 20 to 45) and each participant had completed at least two years of university studies.

*Project phases*

The core of the project (after sample selection) consisted of four sequential phases: start-up, idea generation, termination, and evaluation. In the start-up phase, participants were provided with information and instructions about the project and asked to complete a brief survey containing an abbreviated version of the TRI (described in the Measures subsection) as well as questions about the participants' backgrounds and previous mobile-phone experience. After completing the survey, the participants were given mobile phones loaded with a prepaid card that permitted free usage of services and access to several test-services that gave participants a good "feel" for the possibilities and limitations of future mobile phone services. In the idea generation phase, which lasted for 12 days, participants logged into a diary (which was provided to each) all ideas that they could think of for new mobile phone services. In the termination phase the participants were asked to transcribe the ideas from the diaries into more detailed service descriptions. These descriptions followed a predefined format that called for specific details such as what the idea was, how it might benefit target customers, and an appropriate name for it. In the evaluation phase, panels of judges examined the detailed service descriptions, and coded the degree of creativity reflected by each participant's ideas (more on this in the next subsection).

*Measures*

Because of time and company-imposed constraints in the start-up phase, the full 36-item TR scale could not be administered to the Study II participants. Therefore, to measure the participants' technology readiness, we used a shorter version of scale, proposed by Parasuraman and Colby (2001) as being appropriate for classification studies such as Study II. The short version consists of five positive and five negative items about technology, and responses to these ten items can be scored to yield an overall technology readiness quotient (TRQ), ranging from $-20$ to $+20$ (the short-version scale and the scoring procedure can be found in Parasuraman and Colby (2001, pp. 25-6)).

To assess the degree of creativity of the new service ideas generated by the participants, we developed an approach involving the "creative performance" construct (Im and Workman, 2004), which consists of three dimensions derived from creativity literature: fluency, flexibility and originality (Guilford, 1967; Kristensson *et al.*, 2004; Mayer, 1999). Fluency refers to the number of ideas a person is able to generate. Flexibility refers to the number of different categories of ideas generated by the person. For example, if a person generates seven mobile-technology-based service ideas – three about information search (e.g. getting the timetable for the bus), one about remote control service (e.g. switching off/on a radiator in a building) and three about experience services (e.g. a game) – that person's fluency score would be seven and flexibility score would be three. Originality, often believed to be the most important trait of creativity (Runco and Sakamoto, 1999), is a qualitative dimension capturing a person's ability to think of truly novel ideas, which are critical for producing effective service innovations (Sundbo, 1997). To measure the originality of the ideas generated by the participants, we used the Consensual Assessment Technique (CAT), which was derived from Amabile (1996) and involved the use of panels of judges as described next.

We assembled four panels of judges. Three of the panels consisted of three judges each from three different departments (R&D, Technology Consulting and Marketing) in the sponsoring company. The fourth was a customer panel for which six individuals were recruited in the same way as the study participants. Every judge rated each idea's originality on a scale from 1 (lowest) to 10 (highest). In accordance with the CAT, we averaged the ratings of judges within each panel and performed interjudge reliability tests by examining the correlations (Pearson's $r$) across all pairs of panels (Amabile, 1996). The inter-panel correlations were all statistically significant ($p < 0.01$) and ranged from 0.69 to 0.79, implying satisfactory reliability.

## Results

The TRQ scores for the participants ranged from $-9$ to 16 (on the $-20$ to $+20$ scale), indicating a fairly wide dispersion, although somewhat skewed towards the high TR end (this was not surprising since, by design, all recruits for the user-involvement project were heavy users of mobile-phone services and were likely to have been more positively predisposed towards new technologies in general than typical customers). Using a median split we divided the participants into a high TRQ group (score range of 6 to 16, with an average of 8.89) and a low TRQ group (score range of $-9$ to 5, with an average of $-1.04$).

To test *H4* (predicting a positive relationship between technology readiness and creativity in coming up with new service ideas in a technology context), we conducted independent-samples $t$-tests comparing the mean scores for the high TRQ and low TRQ groups on each of the three dimensions of creativity: fluency (number of ideas), flexibility (number of distinct categories of ideas) and originality (newness of the ideas). The results, summarized in Table III, revealed statistically significant differences between the two groups on all three creativity dimensions. Compared to the low TRQ participants, high TRQ participants on average generated more new service ideas (6.15 vs 3.69) that covered a more diverse set of categories (3.93 vs 2.38) and were

**Table III** Fluency, flexibility and originality of ideas generated by high vs low TRQ groups

| | Fluency | | Flexibility | | Originality | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| **High TRQ group ($n = 26$)** | 6.15** | 3.93 | 4.00** | 1.88 | 5.83* | 1.62 |
| **Low–TRQ group ($n = 26$)** | 3.69 | 2.38 | 2.62 | 1.67 | 4.72 | 2.01 |

**Notes:** * Means significantly different at $p < 0.05$; ** Means significantly different at $p < 0.01$

judged to be more original (5.83 vs 4.72 on the ten-point originality scale). These results offer strong support for *H4*. Thus, potential "lead users," identified as a set of customers with the highest technology readiness scores, not only exhibit strong innovative attitudes and behaviors and a willingness to participate in new service development (as demonstrated in Study I), but also are capable of actually generating a large, diverse and original set of new service ideas.

## Discussion

Customer orientation is important for achieving effective performance in marketing as well as in other functional areas such as operations management and strategic management (e.g. Lengnick-Hall, 1997). Nevertheless, being customer oriented alone may not be sufficient because previous research suggests that the link between market orientation and performance of service companies is mediated by their ability to innovate (Agarwal *et al.*, 2003). As discussed earlier in this paper, the ability to effectively innovate in the context of new technology-based services depends on the extent of customer involvement. However, a key challenge facing service companies is how to identify lead users who are capable of generating truly innovative and valuable ideas for new services.

Findings from our two studies suggest that the TRI can be a useful tool for identifying such lead users. Study I's findings imply that a small group of customers with the highest TR scores (i.e. those who score high on the TR contributing dimensions of optimism and innovativeness and low on the TR inhibiting dimensions of discomfort and insecurity – "explorers" in Parasuraman and Colby's (2001) classification) would qualify as potentially valuable lead users. They adopt technology-based offerings earlier than do others, have a strong propensity to seek out new technologies and enjoy tackling problems associated with those technologies, and are willing to participate in the process of developing new technology-based services. Furthermore, and most importantly, as demonstrated by Study II's findings, such high TR customers also possess the creative capacity to generate a relatively large number of varied and original ideas when they are presented with a technology-based platform and asked to propose new services based on that platform.

The ability of high TR users to think in novel ways is perhaps explained by their curiosity and advanced needs. As Parasuraman and Colby (2001, p. 158) state, "the highly techno-ready consumer will instinctively try to solve the problem alone", which is one of the characteristics of lead users in industrial contexts as well (von Hippel, 1986). A similar explanation for the ability and motivation to innovate has been offered in a recent study of innovative users in a consumer-goods context. The willingness of high TR customers to participate and help in new service development is also consistent with Prahalad and Ramaswamy's (2000) contention that certain customers are very excited about being a source for companies seeking to develop new products and services.

In the remaining sections of the paper, we first acknowledge some limitations of our research. We then offer directions for future research and discuss managerial guidelines for involving users in developing new technology-based services.

### Limitations

While a sample of 1,004 respondents who were representative of the Swedish population participated in Study I, the sample size for Study II was relatively small (with just 52 participants) and skewed towards high TR customers. We chose this convenience sample for Study II by design since it was deemed to be adequate and appropriate for the sponsoring company's user-involvement project. However, making empirical generalizations with confidence about the hypothesized positive link between TR and creativity (i.e. *H4*) should await results from studies involving larger and more diverse samples of respondents. To enhance the reliability of the TR measure in such studies, it would also be desirable to include the full 36-item TR scale (as was done in Study I). Additionally, examining the TR-creativity link in technology contexts other than new mobile services would constitute a more robust test of *H4*.

### Directions for future research

As implied by the preceding section, studies aimed at overcoming the limitations of Study II are a potentially fruitful, if not necessary, direction for further research. Our research also raises several additional issues that are worth investigating in future studies. For instance, while our two studies demonstrate that high TR customers are a valuable resource for generating new service ideas in technology-based service contexts, an unanswered question is the extent to which services developed based on those ideas will appeal to lower-TR customers who enter the market later, especially since "lead" users and their preferences and desires may differ significantly from those of the mainstream market (Moore, 1991). Future research should examine in greater depth potential differences across different customer segments (e.g. explorers, pioneers, skeptics, paranoids and laggards (Parasuraman and Colby, 2001)), in terms of not only their ability to generate new service ideas, but also their preferences and reactions pertaining to new technology-based services.

A related issue worthy of research is whether the role of customer involvement is merely to generate truly innovative ideas at the earliest stage of new service development, or whether it should be viewed as an ongoing process to foster continuous learning about the market. If it is the latter, which customer types (e.g. high TR or low TR, or perhaps combination of the two) would be most appropriate for involvement in new service development, and what types of feedback should be sought from them?

Another area which is ripe for research concerns end-users' motivation to participate in new service development. According to Pitta and Franzak (1996), consumers who have little to gain but are rewarded with praise, fees, and early access to the products they have helped create, are likely to perform well in user-involvement projects. Findings from

Hertel *et al.*'s (2003) study suggests that social comparison motives can foster high performance in projects involving the development of new software based on open-source platforms such as Linux. Consistent with these findings, Amabile (1996) has shown that intrinsic motivation is likely to be a key determinant of creative performance of end users. In contrast, as mentioned at the beginning of this paper, participation and creative performance of industrial customers in business-to-business settings are likely to be driven by extrinsic motivation. Therefore, a systematic examination of the types of incentives which are likely to be most effective in motivating participation in new service development under different contexts and for different customer types are an interesting avenue for future research.

**Managerial implications**

The principal aim of our research was to explore whether:

1 end customers with an innovative attitude that also translates into actual innovative behavior can be identified;
2 such customers would be willing to participate in new service development in technology-based contexts; and
3 those customers would in fact generate a greater number of new service ideas than would other customers.

Results from our two studies answer all three questions in the affirmative. Specifically, the TRI appears to be an effective tool for identifying innovative customers would be both willing to participate in new service development and capable of generating creative ideas. Marketers of technology-based services can employ this tool for selecting the most appropriate end users for involvement in its new service development process.

Some companies might have already formed "customer advisory panels" (Berry and Parasuraman, 1997) to provide input into issues such as service employee selection, service design and improving service quality. For instance, at Southwest Airlines representatives from a group of loyal customers actively participate and provide input into the company's employee selection process. When a customer advisory panel already exists, a company can administer the TRI scale to members of the panel. The members obtaining high TR scores – especially those who score significantly above average on optimism and innovativeness, and below average on discomfort and insecurity – can be grouped into a subpanel and requested to generate ideas for new services that leverage emerging technologies.

If a service company does not have a customer advisory panel, or if an existing panel is not large or techno-ready enough to yield an appropriate group of "lead" customers, then the company needs to build such a group from scratch. A useful first step in this regard to compile a list of the company's loyal or most valuable customers (e.g. as measured by the frequency and volume of purchases from the company). A representative sample of these customers (or the entire list of these customers if the list is relatively small) can then be asked to fill out a survey that contains the TRI scale. Based on the respondents' TR scores, an appropriate group of innovative customers can be selected as outlined earlier.

One issue of practical significance relates to the number of lead customers to use in the new service development process. Though our research did not directly address this issue, results from Study II suggest that even a relatively small number of lead customers (the high TRQ group in Study II had 26 customers) – might be sufficient for a successful user-involvement project. As the "ideal" number of customers might vary across contexts, companies may want to start with a relatively small group of customers – say, ten to 20 high TR individuals – and then increase the group size if the original group does not generate a sufficiently large or diverse set of new service ideas.

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## Corresponding author

Jonas Matthing can be contacted at: jonas.matthing@kau.se

## Executive summary and implications for managers and executives

*This summary has been provided to allow managers and executives a rapid appreciation of the content of this article. Those with a particular interest in the topic covered may then read the article* in toto *to take advantage of the more comprehensive description of the research undertaken and its results to get the full benefits of the material present.*

### Developing successful technology-based services: the issue of identifying and involving innovative users

Using customers' expertise in a company's products and services to help generate new products or improved services is not uncommon. Many have discovered that an alternative research and development department can often be found by engaging loyal and informed customers whose expertise in what the company provides enables them to spot trends and suggest innovation

Companies have increasingly been turning their attention to identifying these "lead customers" who tend to be the first to use new products, are enthusiastic about them and eager to be involved in the process of pushing forward new ideas.

A problem for providers of technology-based services is that they are a relatively new phenomenon and often highly innovative, in that the technology had not existed previously (e.g. the internet, 3G mobile-phone technology, geographic positioning systems, etc.). Consequently, most customers would find it difficult to envision and relate to such technologies, let alone come up with innovative ideas for applications (i.e. new services) based on them.

Increasing competition, more demanding customers and indications that many customers are becoming frustrated and disillusioned with some of the increasing number of technology-based services they encounter, make it all the more important to identify and use suitable customers to have input into the next generation of these services.

They might just help make things better – and they need to improve. The International Customer Service Association (2001) reported that only 26 percent of e-customers were satisfied with their internet purchase experiences and a study by the Boston Consulting Group found that four out of five online purchasers experienced failure, and out of all online purchases 28 percent fail.

Accelerating technological developments are opening up new and exciting possibilities but if service providers who have replaced face-to-face encounters with technology are losing touch with their customers, it's a mistake which has to be rectified. Jonas Matthing *et al.* set about finding out if technology savvy customers could be identified and how effective would their involvement be in generating new service ideas.

The principal aim was to explore whether: end customers with an innovative attitude that also translates into actual innovative behavior can be identified; such customers would be willing to participate in new service development in technology-based contexts; and those customers would in fact generate a greater number of new service ideas than would other customers.

Finding suitable people from a study of a representative sample of Swedish consumers by means of the technology ready index (TRI) a concept proposed by Parasuraman in 2002, all the answers were affirmative.

The index seeks out dimensions of optimism and innovativeness or discomfort and insecurity with technology. People can be segmented into distinct groups based on their patterns of scores on the four dimensions. For instance, an individual with a high degree of optimism and innovativeness, and a low degree of discomfort and insecurity is likely to be a "lead user" of new technologies. Then there are the "explorers", who are lead users most prone to adopt and experiment with new technologies, followed by (in decreasing order of adoption propensity) pioneers, skeptics, paranoids, and laggards.

Matthing *et al.* say: "The technology readiness index appears to be an effective tool for identifying innovative customers who would be both willing to participate in new service development and capable of generating creative ideas. Marketers of technology-based services can employ this tool for selecting the most appropriate end users for involvement in its new service development process."

Some companies might have already formed "customer advisory panels" to provide input into issues such as service employee selection, service design and improving service quality. For instance, at Southwest Airlines representatives from a group of loyal customers actively participate and provide input into the company's employee selection process.

When a customer advisory panel already exists, a company can administer the TRI scale to members of the panel. The members obtaining high TR scores – especially those who score significantly above average on optimism and innovativeness, and below average on discomfort and insecurity – can be grouped into a sub-panel and requested to generate ideas for new services that leverage emerging technologies.

If a service company does not have a customer advisory panel, or if an existing panel is not large or techno-ready enough to yield an appropriate group of "lead" customers, then the company needs to build such a group from scratch.

A useful first step in this regard to compile a list of the company's loyal or most valuable customers (e.g. as measured by the frequency and volume of purchases from the company). A representative sample of these customers (or the entire list of these customers if the list is relatively small) can then be asked to fill out a survey that contains the TRI scale. Based on the respondents' TR scores, an appropriate group of innovative customers can be selected.

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