

Embedded Lead Users - The benefits of employing users for corporate innovation

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Abstract

While most of the literature views users and producers as organizationally distinct, this paper studies users within producer firms. We define “Embedded Lead Users” (ELUs) as employees who are lead users of their employing firm’s products or services. We argue that ELUs benefit from dual embeddedness in the user and producer domains; it shapes their cognitive structure and enables them to better absorb sticky need knowledge from the user domain. We hypothesize that ELUs are more active than regular employees in acquiring, disseminating, and utilizing market need information for corporate innovation. Using survey data from the mountaineering equipment industry (n=149), we test and support our hypotheses. Additional robustness checks reveal that the observed effects are indeed due to lead users rather than to affective product involvement or job satisfaction. We discuss theoretical and managerial implications, as well as directions for future research on this empirically important but hitherto under-researched phenomenon.

Research highlights

- We introduce the concept of Embedded Lead Users (ELUs) – employees who are lead users of their employing firm’s products or services.
- ELUs are dually embedded - in the firm and in the use context – which is likely to affect their cognition and organizational behavior.
- ELUs are more active than regular employees in acquiring, disseminating, and utilizing market need information for corporate innovation
- Specifically, they show more customer orientation, internal boundary spanning, and innovative work behavior.
- The paper contributes to theory at the intersection of user innovation and organizational behavior.

Keywords

Embedded Lead Users, organizational boundaries, sticky knowledge, user innovation, organizational behavior, market information processing

1 Introduction

Users and producers are mostly viewed as organizationally distinct – with users situated outside the boundaries of the organization (Porter, 1985; Priem et al., 2012; Schumpeter, 1926). However, the two realms are not entirely separate; new technologies and modes of organizing are extending their overlap, and blurring their boundaries (Baldwin and von Hippel, 2011; Bowen, 1986). Firms are increasingly opening their innovation processes in order to leverage external knowledge resources such as user communities (Bogers and West, 2012). User empowerment has increased, and firms are giving users a more active role in the value creation process (Nambisan, 2002). Users are even regarded as “partial”

employees (Mills et al., 1983) in service encounters, and in the co-development of new products and services (Bendapudi and Leone, 2003; Kelley et al., 1990).

This paper is the first quantitative investigation of a new and important mode of user-producer integration: The *employment of (lead) users inside producer firms*. Anecdotal evidence (e.g. Chouinard, 2005; Levitt, 2009) and three qualitative studies (Harrison and Corley, 2011; Herstatt et al., forthcoming; Hyysalo, 2009) indicate that, in many industries users abound inside producer firms. E.g., Patagonia, Inc., a large producer of high-end outdoor clothing, encourages their employees to test and use Patagonia products, and grants them slack time to do so (Chouinard, 2005). Northsails, a maker of high-quality sails for recreational and professional use, employs a large number of current and former sailing champions (Levitt, 2009); as part of their jobs, these employees sail races jointly with customers to collect new product ideas and feedback. Hewlett-Packard and Microsoft employ computer enthusiasts and encourage them to develop products that they themselves would want (Leonard, 1995). These “special” employees are known to be particularly good at eliciting and understanding latent customer needs because they are “twin to their customers” (Leonard, 1995, p. 195).

We define Embedded Lead Users (ELUs) as *employees who are lead users of their employing firm’s products or services*. (By definition, lead users are users who face needs that will be general in a marketplace months or years later, and who benefit significantly from obtaining a solution to those needs (von Hippel, 1986).) Note that a related but different phenomenon is learning by hiring (Singh and Agrawal, 2011) from downstream firms – e.g., the pharmaceutical industry hiring former doctors (Chatterji and Fabrizio, 2013; Wadell et al., 2013). In this case, employees cease to be active users when they enter their new employment situations. For ELUs, by contrast, the duality of their relationship to the product is contemporaneous.

We argue that ELUs are an attractive object for management research as they differ from both regular employees and external users in interesting ways. In this paper, we lay the foundations for future work by investigating *to what extent ELUs can help firms internalize and leverage user knowledge for innovation*. We seek to theorize the employment of (lead) users inside producer firms and to move beyond the above-mentioned anecdotal evidence of their effectiveness.

Innovation has often been conceptualized as problem solving (Alexander, 1964) – a cognitive process (Duncker, 1945). Adopting this cognitive perspective on innovation, we argue that differences in ELUs’ experience and cognition, compared to regular employees, explain differences in their innovation-related information processing. ELUs are more likely to have ties with other users, and they also possess need knowledge from their own personal experience. Both these aspects should facilitate the absorption and processing of need knowledge from other users (Cohen and Levinthal, 1990).

We develop and test hypotheses that link employees’ lead usersness to their customer orientation, internal boundary spanning, and innovative work behavior, i.e. their activities related to understanding customer needs, inside the firm, and creating and implementing superior customer solutions. Drawing on a sample of employees in the mountaineering (n=149), we show that employees’ lead usersness is associated with the hypothesized behavioral outcomes. Finally, we study product involvement and job satisfaction as antecedents to the innovation-related behaviors to delimit these effects from the ones of lead usersness.

Our findings contribute to our understanding of the interactions between the user and producer realms in innovation (Baldwin et al., 2006; Baldwin and von Hippel, 2011; Hyysalo, 2009). To our knowledge, this is the first paper to provide a quantitative analysis of the behavior of users inside producer firms. We re-contextualize lead usersness and bring it inside the producer firm boundaries to predict innovation behavior. Lead users are well known to be prolific innovators, but so far they have consistently been seen as external to the firm (e.g. Bogers et al., 2010; Lüthje and Herstatt, 2004; von Hippel, 1986). At the same time, employees’ innovation behavior has not been studied conditionally on their personal use expertise (e.g. Janssen, 2005; Scott and Bruce, 1994; Yuan and Woodman, 2010), despite it being well-known that employees draw on local knowledge in their jobs (Davis et al., 2012). Our findings have important implications for hiring and job design decisions and for open innovation strategy.

The remainder of the paper is structured as follows: Section 2 discusses the theoretical background to this study, defines embedded lead usersness, and formulates our research hypotheses. Section 3 describes the methodology and data. Section 4 presents the empirical findings and Section 5 discusses these findings and proposes some implications for research and practice.

2 Background and research model

2.1 (Embedded) lead users as sources of innovation

Innovation is often conceptualized as problem solving (Alexander, 1964). It addresses a specific problem or need that occurs in a use context, by applying solution techniques and principles. Need-related and solution-related knowledge must be collocated and combined for innovation to happen (Alexander, 1964; von Hippel, 1994); but this is often not the case (Magnusson, 2009): Need knowledge mostly resides with product users outside the firm boundaries, while knowledge about solutions tends to reside within producer firms (Ogawa, 1998; von Hippel, 1998). Thus, to enable innovation within producer firms, need knowledge must be transferred by users and internalized by firms (Priem et al., 2012).

Transferring user knowledge about needs (and potentially solutions) into producer firms has proved challenging (Lettl, 2007; Mahr and Lievens, 2011). User knowledge tends to be “sticky”, i.e. costly to transfer, because it is tacit (Polanyi, 1962) and context-bound (Nonaka, 1994). Further, either party may be unwilling or unable to participate in knowledge transfer (Cohen and Levinthal, 1990; von Hippel, 1994). Firm employees often have insufficient prior knowledge about use-related problems to be able to absorb new user knowledge. Their cognitive frames are bound by solutions rather than use problems, which lowers their cognitive empathy with users (Homburg et al., 2009).

These issues are addressed by various literature strands, including how to “understand your customer” through marketing research (Griffin and Hauser, 1993), lead user workshops (Lüthje and Herstatt, 2004), sponsored user communities (Jeppesen and Frederiksen, 2006), and innovation and mass customization toolkits (Franke and Piller, 2004). All these mechanisms are geared to “unsticking” user knowledge. However, they consistently position the user outside the company’s walls. The present study investigates a hitherto neglected way for firms to absorb user need knowledge and user innovations: employing users in producer firms.

When lead users become embedded in the producer organization, this can be expected to affect their cognition, attitudes, and behaviors. In particular, their innovation behavior will be influenced by use-related and firm-related forces, overlaying and sometimes countervailing each other.

Prior literature comparing innovation outcomes by external users and regular employees finds that user-created innovations are both more novel and more valuable than employee-created innovations (Chatterji and Fabrizio, 2012; Kristensson et al., 2004); but employee-created innovations are easier to realize within the organization (Magnusson et al., 2003). When users are embedded in producer firms, one would expect that these different effects are amalgamated and that ELUs-developed innovations lie in between those of external users and regular employees.

Unlike external users, ELUs are socialized by the firm and be exposed to corporate culture, rules and rigidities. They are bound by employment contracts that reduce coordination and transaction costs. Contracts align ELUs’ activities with the producers’ new product development objectives, strategies for intellectual property protection, and communication behavior. At the same time, employment and ensuing organizational socialization of ELUs introduce a new element of heterogeneity in the user community that might affect user-to-user interactions as well as their outcomes for producer firms (Chao et al., 1994; Van Maanen and Schein, 1979).

Compared to regular employees, ELUs have informational advantages. They have situated need knowledge gained from first-hand use experience and observing and interacting with other users. Being located in user networks outside the organization, they can be expected to be better able to span organizational boundaries and to transfer environmental information into the organization (Aldrich and Herker, 1977; Allen, 1971). ELUs are likely to take such boundary spanning positions, thus facilitating innovation inside the firm (Reid and de Brentani, 2004).

ELU’s motivations and incentives are likely to be hybrid, combining use-related and employment-related elements, with a potential for mutual reinforcement, but also crowding effects (Alexy and Leitner, 2011). Role conflicts can arise from ELUs’ dual affiliations inside and outside the firm, and from their multiple roles with regard to the product domain (Settles et al., 2002). User-producer interactions for innovation are sometimes conflict-laden, as research in the field of co-creation shows (Hoyer et al., 2010). Gebauer et al. (2013) point out that consumers may show negative behavior towards

the firm, if they feel treated unfairly or are dissatisfied with the outcome of the co-creation process. By the same logic, conflict between ELUs, as users, and the firm during the innovation process may also lead to counterproductive work behavior. This is less likely for regular employees, for whom neither expectations of personal benefits from use nor product affection are as closely tied up with their employment situation.

To summarize, the employment of lead users, while overlooked by the extant literature, can be expected to facilitate the absorption of need knowledge by producer firms and to support corporate innovation. Yet, embeddedness in the organization may also dampen ELU's innovative behavior or change its focus, as compared to external users; and it may engender new expectations and sources of potential conflict that are not germane to regular employees. In this study, we begin to disentangle these various effects by investigating whether ELUs can effectively help firms internalize and leverage user knowledge for innovation.

2.2 An information processing view on Embedded Lead Users

As previously mentioned, behavioral differences between ELUs and regular employees are most likely rooted in their knowledge advantage with respect to user needs and product use in context. ELUs are embedded in both the firm and the use context, and therefore can draw on both corporate and user knowledge structures. They have first-hand experience of using either their employing firm's products or those of a competing firm, and are likely also to learn from observing and interacting with other users (Faullant et al., 2012). Therefore, they can be expected to have different knowledge sets than regular employees, and to use different mental schemes to interpret and process product-related information (Hill and Levenhagen, 1995; Kanter, 1988; Woodman et al., 1993).

In marketing research, the extensive literature on *market information processing* analyzes the activities supporting learning from external sources of need knowledge. More specifically, market information processing encompasses four distinct information-related activities: acquisition, transmission, utilization, and storage (Moorman, 1995; Sinkula, 1994; Sinkula et al., 1997).

We apply the theoretical framework of market information processing to our analysis of how lead users affect employees' processing of need knowledge for innovation. We hypothesize that employees' lead usership should make a difference to how they perform the first three dimensions of market information processing. Information storage, the fourth dimension, is not considered here, as it is a multilevel process enabling the preservation of individual knowledge in organizational memory (Sinkula, 1994).

Since different behaviors are associated with each of the dimensions of market information processing (Sinkula et al., 1997), we will study employees' behaviors related to acquiring, disseminating, and utilizing needs information separately: The *acquisition* of market information, we will argue, is specifically tied to the extent to which employees try to understand and read their customers' needs (cf. Veldhuizen et al., 2006). Thus, employees' customer orientation behavior is central for acquiring market information (Brown et al., 2002; Donovan et al., 2004). The *dissemination* of market information inside the organization captures the extent to which employees engage in distributing such information and make it accessible within the organization (Sinkula et al., 1997). This behavior has been described and measured as internal boundary spanning behavior (Bettencourt and Brown, 2003; Bettencourt et al., 2005). Finally, the *utilization* of market information requires its combination with technical information (Alexander, 1964; von Hippel, 1994) and results in innovation in the organization (Troy et al., 2001). Thus, we will capture the utilization of market information by employees' innovative work behavior.

2.3 Research model

2.3.1 Information acquisition: Customer orientation behavior

Information acquisition involves understanding early signals from users (Teubal et al., 1976) and their translation into needs (Boon et al., 2011). To investigate employees' information acquisition effectiveness, we study their customer orientation behavior (COB), which is defined as the "employee's tendency or predisposition to meet customer needs" (Brown et al., 2002, p. 111; Donovan et al., 2004; Rafaeli et al., 2008). It captures activities related to understanding the customer and formulating customer needs (Brown et al., 2002). We hypothesize that the ability to understand customers, and therefore also customer orientation behaviors, are more pronounced in ELUs than in other employees.

Scholars in the field of organizational learning emphasize that individuals and organizations can better absorb external knowledge if they already possess some related knowledge (Cohen and Levinthal, 1990; Nooteboom, 2000). Compared to ordinary employees, ELUs have stronger personal exposure to use-related needs; they personally experience problems similar to those experienced by customers. Moreover, they are typically better connected with other users, e.g. through user communities, clubs, or special interest groups, and thus are able to observe their patterns of product use and frustrations.

Similarity of experience favors similarity in knowledge structures and cognitive frames (Nooteboom, 2000). According to Lüthje and Herstatt (2004, p. 558), lead userhood helps individuals to “make sense of innovation-related information because [such information] fits with their cognitive structure”. It enables ELUs to adopt the perspectives of other users, and to feel cognitive empathy. Cognitive empathy is a precursor to making sense of need information, to accumulating need knowledge, and to acting in customer orientated ways (Homburg et al., 2009; Widmier, 2002). Schlosser and McNaughton (2007) also show that higher levels of interaction with customers leads to stronger customer orientation.

Hypothesis 1: The lead userhood of employees is positively related to their customer orientation behavior.

2.3.2 Information dissemination: Internal boundary spanning behavior

To disseminate market need information within the firm, employees need to perform what Bettencourt et al. (2003, p. 353) call internal boundary spanning behavior (IBS): “taking the individual initiative in communications to the firm and coworkers to improve [product or] service delivery by the organization, coworkers, and oneself”. In general, boundary spanning behaviors comprise interactions across intra-organizational boundaries, or between the organization and its external environment (Aldrich and Herker, 1977). We focus on the former (spanning internal boundaries), particularly its cognitive aspects. (Other scholars have focused on how individuals overcome boundaries within the firm by their legitimized status or by exerting power (Rost et al., 2007).)

Internal boundary spanners have to make sense of new information, e.g. relating to newly emerging needs, and to give sense to that information in internal communications with other employees from different organizational units such as marketing or R&D (Hill and Levenhagen, 1995). We argue that the knowledge structures of ELUs facilitate both these processes by enabling the dual perspective of external user and co-worker.

As already explained, ELUs are quick to perceive emerging problems in the use domain, and thus are likely to possess novel information compared to other employees. By utilizing their dual knowledge of the user and the firm domains, ELUs can translate user information to make it “digestible” (Herstatt et al., forthcoming) and available to their co-workers (Reid and de Brentani, 2004). Information from ELUs can be expected to have higher credibility and expected value compared to other employees because it is based on practical application, and thus has survived some real-life checks (Herstatt et al., forthcoming). This makes those to whom their boundary spanning behaviors are addressed more likely to be receptive to the information.

Summarizing these arguments, we hypothesize that:

Hypothesis 2: The lead userhood of employees is positively related to their internal boundary spanning behavior.

2.3.3 Information utilization: Innovative work behavior

Employees need to combine knowledge on external needs with internal knowledge related to solutions, to create new or improved product offerings. The extent to which employees apply external market knowledge to innovate is best captured by their innovative work behavior (IWB) (Janssen, 2000). Innovative work behavior is defined as “an employee’s intentional introduction or application of new ideas, products, processes, and procedures” (Yuan and Woodman, 2010, p. 324). It involves utilization and implementation of knowledge (Kanter, 1988; Scott and Bruce, 1994).

At least three different strands of theory suggest a positive relationship between employees’ lead userhood and their innovative work behavior: the literature on innovation by lead users (albeit not embedded in firms), the literature on employees’ innovation behavior in organizations (albeit without

specific reference to their user characteristics), and the literature on cognition and creativity in situations of dual embeddedness.

First, the literature on lead users external to producer firms establishes a positive relationship between lead userness and innovativeness in a given product domain (Franke et al., 2006; Morrison et al., 2000). These findings arguably can be extended to ELUs, who, like external lead users, are exposed to emerging trends in the user domain. They experience needs arising only in extreme applications (Lüthje and Herstatt, 2004), and therefore are likely to be the first to identify problems. In addition, external lead users have been found to be more technically savvy than the average user (Kristensson et al., 2004; Magnusson, 2009), and thus better equipped and more likely to find new solutions to the problems they experience.

Second, the large body of literature on organizational behavior suggests that employees who are directly affected by problems (such as ELUs) are more likely to solve them (Van de Ven, 1986). Farr and Ford (1990) expect employees to be more innovative in the workplace if they recognize the need for change and are likely to profit personally from such change. ELUs, being confronted with problems during product use, are also likely to engage in problem-driven thinking, a cognitive pattern that is associated with more creative ideas (Gilson and Madjar, 2011).

Finally, the literature on creativity shows that the overlap between two disconnected cognitive domains promotes innovation (Burroughs and Mick, 2004; Hargadon, 2002; Kalogerakis et al., 2010; Scott and Bruce, 1994). Following this logic, Dougherty (1992) argues that linking knowledge from the market and technical knowledge is crucial to successfully develop new products. Outside the firm, users often innovate by linking the need knowledge from their product use and knowledge obtained in their professional life (Lüthje et al., 2005). In a similar vein, ELUs are able to connect the external need knowledge and internal technological knowledge domains (Herstatt et al., forthcoming).

For all these reasons, we propose

Hypothesis 3: The lead userness of employees is positively related to their innovative work behavior.

3 Method

3.1 Context

The empirical investigation of the ELU phenomenon requires a field of study where both producers and users innovate. In relation to producer innovation, a young and evolving industry is likely to be a more appropriate research field than a mature industry since we are interested in product rather than process innovation (Abernathy and Utterback, 1978). With respect to user innovation, theory suggests that users are more likely to innovate in markets where they have both sticky need knowledge and solution knowledge (von Hippel, 1994), where needs are heterogeneous (von Hippel, 1994), and where use intensity is high (Raasch et al., 2008).

We applied these criteria and selected the field of mountaineering equipment. The International Mountaineering and Climbing Federation (UIAA) defines mountaineering as “a range of different activities such as ice climbing, bouldering, ski touring, ski-mountaineering, mountain hiking, trekking, rock climbing and indoor climbing”. Requisite equipment comprises textiles (ropes, harnesses, clothing) and hardware (carabiners, axes, crampons) (Blackford, 2003).

This field fulfills all of our criteria. First, mountaineering is a young industry rich in product innovation (Handelsblatt, 2011; Harrison and Corley, 2011). The extant literature shows that the sports industry is suitable for studying user innovation (e.g. Franke and Shah, 2003; Lüthje et al., 2005; Schreier and Prügl, 2008). Prior studies highlight user innovation (Lüthje, 2004) and user entrepreneurship (Fauchart and Gruber, 2011) in mountaineering. Mountaineers have in-depth knowledge of the product use context, knowledge that is mainly tacit and sticky (Harrison and Corley, 2011). Users of mountaineering equipment are also highly heterogeneous: There is a lot of variety in the sport of mountaineering, as the level of professionalism ranges from occasional hiking to ascending steep slopes in extreme conditions. Finally, mountaineering equipment typically undergoes heavy use and often is vital for safety, which suggests high commitment to this product domain (Lüthje, 2004).

3.2 Data collection

Using search engines and online catalogues of retailers, we identified 28 manufacturing firms in the mountaineering equipment industry. We then asked each firm to participate in our study, and four firms agreed - two headquartered in Germany, one in Switzerland, and one in Italy. In each case, our contact person was the employee responsible for innovation who reported directly to the CEO.

We sent our contacts a link to the online survey, which they then distributed by e-mail to employees. The wording of questions was identical across firms. We calculated our reach and return rates based on the dissemination-related information provided by the four contact persons.

Data collection took place in 2011 and lasted for one month in each firm. In firms 1 and 2, we surveyed all the functions in one division, and in firm 4, with the exception of two support functions, we surveyed all the functions in all its divisions. In firm 3 we surveyed all its employees. The survey link was sent to 446 employees across the four firms (Table 1). A reminder was sent after two weeks.

We obtained a total of 173 responses, a response rate of 38.79%. Although this rate can be considered satisfactory, we tested for a non-response bias, following the procedure suggested by Armstrong and Overton (1977). At the 5% level of significance, we found no sample bias due to non-respondents.

| Firm | Employees total | Employees contacted | Functions contacted | Responses overall | Responses complete | Rate of complete responses |
|-------|-----------------|---------------------|-------------------------------------|-------------------|--------------------|----------------------------|
| 1 | 250 | 120 | All from one division | 49 | 45 | 37.50% |
| 2 | 400 | 50 | All from one division | 34 | 28 | 56.00% |
| 3 | 30 | 30 | All | 10 | 10 | 33.33% |
| 4 | 350 | 250 | All except operations and inventory | 80 | 66 | 26.40% |
| Total | | 450 | | 173 | 149 | 33.11% |

Table 1: Description of sample

Of the 173 responses received, 149 were sufficiently complete to be included in our analysis. They did not suffer from missing data in the focal constructs of our study. However, data on non-focal constructs was limited by two factors. Firm 1, for reasons not disclosed to us, was unwilling to include the question in the survey about job satisfaction. The management of firm 4 set a time limit of 10 minutes for employees to fill out the questionnaire, which forced us to drop the questions relating to product involvement. This obliged us to work with less than the full sample to analyze job satisfaction and product involvement, two non-focal constructs in our study.

We shared our results with our contact persons to check whether our findings were in line with their personal experience of ELUs. Such member checks are a common triangulation strategy, particularly in qualitative research, to establish the trustworthiness and validity of findings (Lincoln and Guba, 1985). The feedback from the four contact persons confirmed our findings and conclusions.

3.3 Measurement

3.3.1 Main variables

The main constructs employed in this study all use measures proven in the literature to have good psychometric properties, i.e. high reliability and validity (Nunnally and Bernstein, 1994). All latent constructs except use expertise are measured reflectively. For these constructs, reliability is assessed using Cronbach's α and item-to-total correlations. We retained all items with an item-to-total correlation above 0.3 (Ferketich, 1991) and a Cronbach's α exceeding 0.7 (Nunnally and Bernstein, 1994). All our items fit these criteria. Unless otherwise indicated, responses are scored on a 7-point Likert scale. Table 2 summarizes all measurement instruments.

| Item | Construct | Cronbach's | Item-Total-Correlation |
|--|---|------------|------------------------|
| Lead Userness | | | |
| LUAT1 | How high was the highest mountain you have climbed (in meters)? | 0.818 | 0.400 |
| LUAT2 | How long was the longest mountaineering trip you have been on? | | 0.441 |
| LUBE1 | While mountaineering, I am often confronted with problems that cannot be solved by mountaineering equipment available on the market | | 0.538 |
| LUBE2 | I am dissatisfied with some pieces of commercially available equipment | | 0.570 |
| LUBE3 | In the past, I have had problems with my equipment that could not be solved with manufacturers' conventional offerings | | 0.519 |
| LUBE4 | In my opinion, there are still unresolved problems with mountaineering equipment | | 0.577 |
| LUBE5 | I have needs related to mountaineering that are not covered by the products currently offered on the market | | 0.687 |
| LUBE6 | I often get irritated by the lack of sophistication in certain pieces of mountaineering equipment | | 0.571 |
| Customer Orientation Behavior | | | |
| COB1 | I try to help other users achieve their goals. | 0.916 | 0.738 |
| COB 2 | I achieve my own goals by satisfying other users | | 0.706 |
| COB 3 | I get other users to talk about their product needs with me. | | 0.795 |
| COB 4 | I take a problem-solving approach with other users | | 0.846 |
| COB 5 | I keep the best interests of other users in mind | | 0.759 |
| COB6 | I am able to answer a user's questions correctly | | 0.731 |
| Internal Boundary Spanning Behavior | | | |
| IBS1 | I make constructive suggestions for product improvement | 0.847 | 0.681 |
| IBS2 | I contribute many ideas for customer promotions and communication | | 0.624 |
| IBS3 | I share creative solutions to customer problems with other team members | | 0.713 |
| IBS4 | I encourage co-workers to contribute ideas and suggestions for product improvement | | 0.725 |
| Innovative Work Behavior | | | |
| IWB1 | At work, I search out new technologies, process, techniques, and/or product ideas | 0.934 | 0.736 |
| IWB2 | At work, I generate creative ideas | | 0.828 |
| IWB3 | At work, I promote and champion ideas to others | | 0.858 |
| IWB4 | At work, I investigate and secure funds needed to implement new ideas | | 0.806 |
| IWB5 | At work, I develop adequate plans and schedule for the implementation of new ideas | | 0.772 |
| IWB6 | At work, I am innovative | | 0.855 |
| Product Involvement | | | |
| For me, mountaineering equipment (is)... | | | |
| INV1 | matters | 0.895 | 0.695 |
| INV2 | important | | 0.849 |
| INV3 | useless (reverse coded) | | 0.687 |
| INV4 | boring (reverse coded) | | 0.562 |
| INV5 | not needed (reverse coded) | | 0.853 |
| INV6 | essential | | 0.715 |
| Use expertise | | | |
| UE1 | How frequently do you go mountaineering? | N/A | N/A |
| UE2 | For how many years have you done mountaineering? | | |

Table 2: Measures of constructs

Lead userness: User innovation theory defines lead userness as a two-dimensional construct (Lüthje and Herstatt, 2004; von Hippel, 2005) including “ahead of the trend” (which captures the likelihood of opportunity recognition or problem identification) and “high benefit expectations” (which relates to problem solving). However, all lead user studies but one (Franke et al., 2006) measure lead userness unidimensionally, including items for both components in one scale (e.g. Jeppesen and Frederiksen, 2006; Schreier and Prügl, 2008). We follow this tradition and constructed a single reflective measure for lead userness. The high-benefit component is measured on a scale of six indicators developed by Franke et al. (2006). The ahead-of-the-trend component is operationalized by two questions related to the highest mountain climbed and the longest mountaineering trek undertaken by the respondent. This captures the general mountaineering trend towards longer stays at higher altitudes (Blackford, 2003). Lead user research commonly assesses the ahead-of-the-trend component based on performance ratings rather than eliciting the ELU’s self-perceived position as a trendsetter, to curb upward bias (Franke et al., 2006). The overall 8-item construct shows high internal reliability ($\alpha = 0.818$), with the smallest item-to-total correlation 0.4.

Customer orientation behavior: We measure customer orientation behavior using the needs dimension of a scale developed by Brown et al. (2002) that includes six items. The scale shows high internal reliability ($\alpha = 0.916$) and item-to-total correlations all exceeding 0.7.

Boundary spanning behavior: Internal boundary spanning behavior is measured by an instrument developed by Bettencourt et al. (2003), encompassing four items. Internal reliability is satisfactory ($\alpha = 0.847$), with all item-to-total correlations well above 0.5.

Innovative work behavior: The construct captures three dimensions of innovative work behavior (idea generation, idea promotion, idea realization) (Kanter, 1988; Scott and Bruce, 1994). We use the six-item scale developed by Scott and Bruce (1994) and widely used ever since in its original or extended form (Janssen, 2003, 2004; Yuan and Woodman, 2010). We made very slight adaptations to the original phrasing which is geared to supervisors rating their reports. We obtain a Cronbach's α of 0.934 and item-to-total correlations all exceeding 0.4.

3.3.2 Other variables

In order to delimit the effect of lead users from other confounding effects, we include additional variables into our analyses, which might also affect the focal outcome variables. Next to demographic and firm controls these are: use expertise, distance to product domain, product involvement, and job satisfaction.

Use expertise: Use expertise and knowledge about customer needs is a predictor of lead users and the focal outcome behaviors (Homburg et al., 2009; Schreier and Prügl, 2008) and should thus be included as a control variable in our analysis. The two components of use expertise are frequency of use and duration of use (cf. Schreier and Prügl, 2008). Frequency of mountaineering is measured on a 6-point ordinal scale (ranging from "never" to "more than 11 times per month"); duration of mountaineering expertise is measured continuously (number of years). The two constituent scales are multiplied to build a formative index (Diamantopoulos and Winklhofer, 2001).

Distance to product domain: We account for distance to the product domain because unobserved differences in proximity to the product domain could explain why ELUs score more highly in terms of our dependent variables. Indeed, Kruskal-Wallis tests reveal significant differences in lead users across functions. Controlling for functional categories directly would require the introduction of eight dummy variables (there are nine functional categories in our sample), resulting in substantial loss of statistical power and generalizability. Instead, we split the sample into two groups: one group with low distance to the product and its users (R&D, product management, marketing, sales; $n=96$), and one group comprising support functions that are more distant from the product domain (finance, HR, operations, purchasing, and other; $n=53$). A dummy variable captures distance to the product domain thus defined, and equals 0 for the first group and 1 for the second.

Product involvement: Similar to other types of affective attachment, involvement is likely to affect pro-organizational behavior (cf. Meyer et al., 2002). It has also been shown to influence innovative behavior by users (Lüthje, 2004). To account for the possibly confounding effect, we measure product involvement, adapting the instrument by Zaichkowsky (1985) to the field of consumer studies (Franke et al., 2009). It comprises six items that are rated on a 5-point semantic differential scale. As in prior research, in our study the instrument exhibits good psychometric properties, with Cronbach's $\alpha = 0.895$ and all item-to-total correlations exceeding 0.55.

Job satisfaction: Job satisfaction is known to affect many aspects of organizational behavior (e.g. Donovan et al., 2004; Janssen and Van Yperen, 2004) and could conceivably also be associated with lead users. We should therefore control for the effect of job satisfaction. We follow common practice and use a single-item measure of job satisfaction (e.g. Lee et al., 2008) (Please indicate, to which extent the following statement applies to you: "Overall, I am satisfied with my job."). Scholars have pointed out that a single-item measure for overall job satisfaction can be more appropriate due to its inclusiveness and reliability (Scarpello and Campbell, 1983). Meta-analytic evidence supports this argument as single-item and multiple-item measures are highly correlated (Wanous et al., 1997).

Other control variables: All control variables are measured directly. Age is measured continuously. Gender is dummy coded (male=0, female=1). Organizational tenure is measured on an ordinal scale (less than 1 year, 1-2 years, 3-5 years, 6-10 years, 11-20 years, more than 20 years).

3.4 Data preparation

3.4.1 Ruling out common method bias

All items measured were obtained using self-ratings, which are the most common method of collecting data in the social sciences (Malhotra et al., 2006). Compared to supervisor ratings, a major advantage of self-reports is that they capture the content of constructs as perceived by and known to the employee (Janssen, 2000). This is important in our study since we focus on contextual stimuli from outside the firm, such as product use, that typically are not observable by supervisors.

However, self-ratings carry the risk of reduced validity due to relationships inflated by common method variance (CMV) (Podsakoff and Organ, 1986). We designed our study to minimize this potential risk, following Podsakoff et al.'s (2003) recommendations.

We also perform statistical tests for CMV, related to our main constructs (LU, IWB, IBS, COB): First, we conduct a Harman's single factor test to check whether a single unrotated factor solution accounts for most of the variance (Malhotra et al., 2006; Podsakoff et al., 2003). This is not the case; 7 factors emerge, the first of which explains 39.4% of the variance. Second, we check the bivariate correlations of the constructs for values above 0.9 which might indicate CMV (cf. Pavlou et al., 2007). Fortunately, our highest correlation is $r=0.659$ (Table 3). Third, we use partial least squares regression to model an unobserved latent common method factor on which all reflective items load, a procedure proposed by Liang et al. (2007) and Podsakoff et al. (2003). This factor explains all the variance that cannot be attributed to the substantiated relationships or to error, i.e., all the variance that can be attributed to CMV. We compare the squared path coefficients to the single-item first-order constructs, which are incoming from the common method factor and the theoretical constructs. The squared loadings can be interpreted as proxies for the explained variance. The variance caused by the original constructs is 18 times higher on average, than the variance attributed to the common method factor. In addition, all 24 paths caused by the theoretical constructs are significant at a level of 0.1% (using bootstrapping); but only 3 of the paths associated with the common method factor are significant at this level.

Based on all these tests, we conclude that CMV is immaterial in our study.

3.4.2 Descriptive data

Table 3 shows descriptive data and correlations for all our variables. Average age of respondents is 33.05 years ($SD=7.56$); 38.1% (61.9%) are female (male); 11% of respondents work in marketing, 24% in sales, 18% in R&D, and 12% in product management with the remaining 35% employed in operations (8%), purchasing (9%), HR (2%), finance (5%), and other support functions (11%). On average, respondents had worked for their respective firms for 1-5 years and been users for 18 years ($SD=9.09$).

| | Mean | SD | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
|------------------------|--------|--------|---------------------|---------------------|-----------------------|-----------------------|--------------------|-----------------------|--------------------|--------------------|
| 1. Tenure | 2.714 | 1.189 | | | | | | | | |
| 2. Age | 33.05 | 7.557 | 0.476*** | | | | | | | |
| 3. Lead usersness | 3.254 | 1.047 | -0.012 | 0.092 | | | | | | |
| 4. IWB | 4.57 | 1.634 | -0.037 | 0.118 | 0.333*** | | | | | |
| 5. IBS | 4.955 | 1.499 | 0.034 | 0.165 | 0.425*** | 0.643*** | | | | |
| 6. COB | 4.639 | 1.52 | 0.061 | 0.096 | 0.472*** | 0.474*** | 0.659*** | | | |
| 7. Use expertise | 68.667 | 39.623 | 0.184* | 0.454*** | 0.480*** | 0.239** | 0.359*** | 0.253** | | |
| 8. Product involvement | 4.229 | 0.850 | -0.109 ¹ | -0.171 ¹ | 0.438*** ¹ | 0.156 ¹ | 0.204 ¹ | 0.310*** ¹ | 0.209 ¹ | |
| 9. Job satisfaction | 5.639 | 1.301 | -0.124 ² | 0.022 ² | -0.060 ² | 0.303*** ² | 0.170 ² | 0.118 ² | 0.096 ² | 0.020 ³ |

n=149

* $p<0.05$ (two-tailed test)

** $p<0.01$ (two-tailed test)

*** $p<0.001$ (two-tailed test)

¹reduced dataset n=83 ²reduced dataset n=104 ³reduced dataset n=36

Table 3: Correlations, means and standard deviations

3.4.3 Analytic approach

The goal of this study is to test hypotheses about the relationship between multiple independent variables and a series of single dependent variables. As most of our latent constructs are measured on interval scales, and we expect linear relationships between variables, multiple linear regression analysis with ordinary least squares estimation (OLS) can be used, as long as the standard assumptions are met. We

checked for possible violations of the linearity and normality assumptions by conducting visual inspections of scatter plots, and Kolmogorov-Smirnov tests. In order to check for homogeneity of error variance, we performed White's test. We checked for multicollinearity of predictor variables. All of our variables show tolerance values higher than 0.6 (variance inflation factors lower than 1.7), well above the threshold tolerance value of 0.1. We conclude that all of the assumptions required for OLS estimation are satisfied.

4 Findings

In section 4.1, we present the results for our three main hypotheses that relate employees' lead usersness to behavioral outcomes. Sections 4.2 and 4.3 test and reject two alternative explanations of our findings: dependence on affective product involvement (4.2) and job satisfaction (4.3).

4.1 Behavioral consequences of lead usersness

Multiple regression analysis is performed for each of the three dependent variables, using a two-step regression procedure (e.g. Janssen, 2003, 2004). We first set up a baseline regression model that includes only the control variables as predictors of the dependent variable. Next, we introduce the focal independent variable(s) to test for the hypothesized effects. We control for demographics, firm effects, use expertise, and distance to the product domain.

We find that customer orientation behavior is positively associated with lead usersness, supporting Hypothesis 1. The baseline model is significant ($F=4.974$; $p<0.001$; adjusted $R^2=0.177$), with distance to product domain a significant predictor ($\beta = -0.379$; $p<0.001$). The model including lead usersness as a predictor has a better fit ($F=6.466$; $p<0.001$; adjusted $R^2=0.249$). Lead usersness is significant and is the strongest predictor of customer orientation behavior ($\beta = 0.348$; $p<0.001$). Distance to product remains significant in this model ($\beta = -0.261$; $p<0.01$). Use expertise is not a significant predictor of customer orientation behavior.

Internal boundary spanning (IBS) as the dependent variable shows similar results. Both the baseline model ($F=5.627$; $p<0.001$; adjusted $R^2=0.200$) and the main model ($F=5.946$; $p<0.001$; adjusted $R^2=0.231$) show good fit. Distance to product domain is significant in the baseline model ($\beta = -0.309$; $p<0.001$) and in the main model ($\beta = -0.229$; $p<0.01$). Use expertise is significant in the baseline model only ($\beta = 0.246$; $p<0.01$). In the main model, lead usersness has the strongest effect on internal boundary spanning behavior ($\beta = 0.239$; $p<0.05$). This supports Hypothesis 2 whereby lead usersness positively affects internal boundary spanning behavior.

Both the baseline and main models for innovative work behavior show good fit (baseline model $F=2.635$; $p<0.05$; adjusted $R^2=0.081$; main model $F=3.105$; $p<0.01$; adjusted $R^2=0.114$). Distance to product is significant in the baseline model ($\beta = -0.185$; $p<0.05$), but not in the main model. Use expertise is not significant in either model. In line with Hypothesis 3, we find a strong and significant impact of lead usersness on innovative work behavior ($\beta = 0.245$; $p<0.05$).

Table 4 summarizes our findings.

| | Customer orientation behavior | | | | Internal boundary spanning behavior | | | | Innovative work behavior | | | |
|-------------------------|-------------------------------|----------|----------|----------|-------------------------------------|----------|----------|----------|--------------------------|--------|---------|---------|
| | β | p | β | p | β | p | β | p | β | p | β | p |
| Firm 1 | 0.134 | 0.107 | 0.121 | 0.126 | 0.035 | 0.665 | 0.027 | 0.740 | -0.155 | 0.078 | -0.164 | 0.058 |
| Firm 2 | 0.179* | 0.029 | 0.130 | 0.103 | 0.163* | 0.045 | 0.129 | 0.110 | 0.068 | 0.433 | 0.033 | 0.705 |
| Firm 3 | 0.088 | 0.261 | 0.084 | 0.264 | 0.156* | 0.045 | 0.153* | 0.045 | 0.016 | 0.851 | 0.012 | 0.879 |
| Distance to product | -0.379*** | 0.000 | -0.261** | 0.002 | -0.309*** | 0.000 | -0.229** | 0.006 | -0.185* | 0.029 | -0.102 | 0.253 |
| Tenure | 0.059 | 0.496 | 0.067 | 0.420 | 0.008 | 0.922 | 0.014 | 0.869 | -0.061 | 0.505 | -0.055 | 0.538 |
| Age | 0.002 | 0.979 | 0.031 | 0.729 | 0.054 | 0.558 | 0.074 | 0.417 | 0.098 | 0.323 | 0.119 | 0.227 |
| Gender | -0.013 | 0.871 | 0.029 | 0.710 | 0.016 | 0.834 | 0.045 | 0.564 | 0.016 | 0.848 | 0.045 | 0.587 |
| Use expertise | 0.153 | 0.088 | 0.006 | 0.948 | 0.246** | 0.006 | 0.146 | 0.125 | 0.160 | 0.090 | 0.057 | 0.575 |
| Lead usersness | | | 0.348*** | 0.000 | | | 0.239* | 0.011 | | | 0.245* | 0.015 |
| F | | 4.974 | | 6.466 | | 5.627 | | 5.946 | | 2.635 | | 3.105 |
| R ² -Change | | 0.221*** | | 0.074*** | | 0.243*** | | 0.035* | | 0.131* | | 0.037* |
| Adjusted R ² | | 0.177*** | | 0.249*** | | 0.200*** | | 0.231*** | | 0.081* | | 0.114** |

n=149, standardized coefficients are shown

* p<0.05 (two-tailed test)

** p<0.01 (two-tailed test)

*** p<0.001 (two-tailed test)

Table 4: Consequences of lead usersness: Overview of regression results

4.2 Assessing the effect of product involvement as a key driver

There is a tradition of delimiting the effects of affective and cognitive factors on behavioral outcomes (e.g. McAllister, 1995; Organ and Konovsky, 1989). This is relevant for our study since it could be surmised that the effects we observe have affective rather than cognitive origins. In other words, we need to disentangle the effects of an affective feeling of relatedness to a product category, from the cognitive effects of being a lead user.

To capture affective “caring about a product”, we include in our analysis product involvement, and test whether our findings remain robust. Product involvement captures “[a] person’s perceived relevance of the object based on inherent needs, values, and interests” (Zaichkowsky, 1985, p. 342). It describes affective preoccupation with a specific product category, without requiring first-hand use experience (Zaichkowsky, 1987). E.g., engineers who have been engaged in improving a product category over a period of several years may have high affective involvement with that product category. Product involvement is known to influence the behavior of users external to the firm (Schreier and Prügl, 2008; Zaichkowsky, 1985), which suggests that it could also affect the organizational behavior of ELUs – internal users.

To test this, we conduct another stepwise regression analysis. As product involvement data are available only for the sub-sample, which reduces statistical power, we focus on firm effects and demographics as the control variables, and apply a 10% level of significance.

We find that product involvement has a significant effect in all three baseline models (COB: $\beta = -0.372$; $p < 0.01$; IBS: $\beta = -0.254$; $p < 0.01$; IWB: $\beta = -0.228$; $p < 0.05$), but becomes insignificant when lead usersness is included in the regression. For all three outcomes, the effect of lead usersness remains significant and thus robust to the inclusion of product involvement (COB: $\beta = -0.0356$; $p < 0.01$; IBS: $\beta = -0.346$; $p < 0.01$; IWB: $\beta = -0.237$; $p < 0.1$). Table 5 summarizes our findings.

Overall, this analysis confirms that first-hand need knowledge captured by lead usersness, as opposed to generally caring about the product category, drives the observed effects on innovation-related behaviors.

| | Customer orientation behavior | | | | Internal boundary spanning behavior | | | | Innovative work behavior | | | |
|-------------------------|-------------------------------|--------|---------|---------|-------------------------------------|--------|---------|---------|--------------------------|--------|---------|--------|
| | β | p | β | p | β | p | β | p | β | p | β | p |
| Firm 2 | -0.146 | 0.393 | -0.094 | 0.569 | -0.388* | 0.025 | -0.337* | 0.044 | -0.264 | 0.128 | -0.229 | 0.181 |
| Firm 3 | 0.064 | 0.713 | 0.024 | 0.886 | -0.151 | 0.386 | -0.190 | 0.257 | 0.039 | 0.826 | 0.012 | 0.946 |
| Tenure | -0.025 | 0.833 | -0.009 | 0.939 | -0.030 | 0.802 | -0.014 | 0.903 | -0.108 | 0.367 | -0.097 | 0.411 |
| Age | 0.107 | 0.373 | 0.098 | 0.397 | 0.094 | 0.434 | 0.084 | 0.463 | 0.109 | 0.368 | 0.103 | 0.390 |
| Gender | -0.092 | 0.408 | 0.006 | 0.960 | -0.142 | 0.199 | -0.048 | 0.669 | -0.102 | 0.363 | -0.037 | 0.751 |
| Product involvement | 0.372** | 0.001 | 0.197 | 0.118 | 0.254* | 0.027 | 0.083 | 0.505 | 0.228* | 0.048 | 0.111 | 0.391 |
| Lead usersness | | | 0.356** | 0.006 | | | 0.346** | 0.007 | | | 0.237† | 0.072 |
| F | | 2.394 | | 3.392 | | 2.480 | | 3.400 | | 2.228 | | 2.445 |
| R ² -Change | | 0.159* | | 0.082** | | 0.164* | | 0.077** | | 0.150* | | 0.036† |
| Adjusted R ² | | 0.093* | | 0.170** | | 0.098* | | 0.170** | | 0.082* | | 0.110* |

n=83, standardized coefficients are shown

† p<0.1

* p<0.05 (two-tailed test)

** p<0.01 (two-tailed test)

*** p<0.001 (two-tailed test)

Table 5: Product involvement: Overview of regression results

4.3 Assessing the effect of job satisfaction as a key driver

Another alternative explanation of our findings might be that the positive relationships found between lead usersness and organizational behavior are due to, or affected by, job satisfaction. Job satisfaction is known to be an important predictor of organizational behavior (e.g. Donovan et al., 2004; Janssen and Van Yperen, 2004). Lead usersness could well be associated with higher job satisfaction since ELUs manage to “make their passion their profession” (Herstatt et al., forthcoming), and to work on products that are meaningful to them personally (Hackman and Oldham, 1980). However, we find no significant correlation between these variables ($r = -0.050$; $p > 0.05$).

To account for the potential effect of job satisfaction on our outcome variables, we check whether lead usersness remains a significant predictor of organizational behavior if job satisfaction is included in the regression model (Table 6). We find that the impact of lead usersness on all three dependent variables is robust, in terms of magnitude and of significance (COB: $\beta = -0.561$; $p < 0.001$; IBS: $\beta = -0.450$; $p < 0.001$;

IWB: =0.367; $p < 0.001$). As expected, we also find that job satisfaction is a significant predictor of behavioral outcomes (COB: =0.238; $p < 0.01$; IBS: =0.273; $p < 0.01$; IWB: =0.378; $p < 0.001$).

Based on these results, we can refute the concern that the influence of lead usersness on the behavioral outcomes under investigation, might disappears if job satisfaction were controlled for.

| | Customer orientation behavior | | | | Internal boundary spanning behavior | | | | Innovative work behavior | | | |
|-------------------------|-------------------------------|--------------|----------|----------|-------------------------------------|--------|----------|----------|--------------------------|--------|----------|----------|
| | β | p | β | p | β | p | β | p | β | p | β | p |
| Firm 2 | 0.213* | 0.044 | 0.179* | 0.044 | 0.224* | 0.029 | 0.197 | 0.032 | 0.163 | 0.110 | 0.141 | 0.140 |
| Firm 3 | 0.172† | 0.090 | 0.141† | 0.097 | 0.270** | 0.006 | 0.246** | 0.006 | 0.096 | 0.328 | 0.076 | 0.407 |
| Tenure | 0.131 | 0.278 | 0.190† | 0.062 | 0.004 | 0.969 | 0.052 | 0.616 | 0.009 | 0.941 | 0.047 | 0.668 |
| Age | -0.017 | 0.883 | -0.102 | 0.312 | 0.159 | 0.167 | 0.091 | 0.376 | 0.177 | 0.124 | 0.123 | 0.256 |
| Gender | -0.056 | 0.575 | 0.106 | 0.227 | -0.001 | 0.999 | 0.130 | 0.150 | 0.104 | 0.283 | 0.209 | 0.029 |
| Job satisfaction | 0.188† | 0.073 | 0.238** | 0.007 | 0.233* | 0.022 | 0.273** | 0.003 | 0.346** | 0.001 | 0.378*** | 0.000 |
| Lead usersness | | | 0.561*** | 0.000 | | | 0.450*** | 0.000 | | | 0.367*** | 0.000 |
| F | | 1.638 | | 8.059 | | 2.971 | | 6.896 | | 2.866 | | 4.963 |
| R ² -Change | | 0.092 (n.s.) | | 0.278*** | | 0.155* | | 0.179*** | | 0.150* | | 0.115*** |
| Adjusted R ² | | 0.036 (n.s.) | | 0.324*** | | 0.103* | | 0.286*** | | 0.098* | | 0.212*** |

n=103, standardized coefficients are shown
† p<0.1
* p<0.05 (two-tailed test)
** p<0.01 (two-tailed test)
*** p<0.001 (two-tailed test)

Table 6: Job satisfaction: Overview of regression results

5 Discussion

5.1 Summary

According to Nooteboom (2000, p. 71), “different people in a firm will to a greater or lesser extent introduce elements of novelty from their outside lives and experience [...] and this is a source of both error and innovation”. To the best of our knowledge, this study is the first to analyze the behavior of employees related to “introducing elements of novelty” based on their personal experience as product *users*. Its contribution lies at the little-explored intersection between the user innovation literature and organizational behavior studies.

We have introduced the concept of Embedded Lead Users (ELUs) – defined as employees who are lead users of their employing firm’s products or services. We argued that ELUs exhibit unique cognitive structures that combine user and employee knowledge. Applying market information processing theory and its three dimensions of information acquisition, dissemination, and utilization, we investigated to what extent ELUs can help firms internalize and leverage user knowledge for innovation. Our survey data from the mountaineering equipment industry revealed large and significant differences in the behavior of ELUs and regular employees: As hypothesized, ELUs are more customer-oriented and thus more effective at acquiring need information. They are also more active in internal boundary spanning and disseminating market information within the firm. Finally, they undertake more innovation effort than regular employees, utilizing market need information for product innovation. We confirmed the cognitive origins of these differences, delimiting them from affective product involvement, and also controlling for the potential influence of job satisfaction.

5.2 Discussion of contribution and future research

Our findings contribute to theory in several important ways. In this section, we consider the contributions of this study to research in the areas of user innovation, organizational behavior, and organizational learning and innovation. Moreover, we extensively discuss directions for subsequent research, which we hope will address a number of interesting questions raised by this initial study of the ELU phenomenon.

5.2.1 Relevance for user innovation research

Our findings contribute to theory in several important ways. First, they extend the growing body of research exploring overlaps between the spheres of user innovation and producer innovation (e.g. Baldwin and von Hippel, 2011; Hyysalo, 2009). Specifically, we extend the reach of lead user theory by showing that lead usersness is not limited to external users, but actually plays a significant role inside

producer firms. This implies that much of what we have learnt from the large and thriving literature on user innovation can conceivably be re-contextualized and applied to producer organization contexts.

This raises the interesting question under what conditions leveraging internal (lead) users for innovation projects is more, or less, effective than involving external (lead) users, e.g. in lead user workshops, focus groups, or online idea contests. Hiring and leveraging ELUs for innovation constitutes a new option in firms' open innovation strategy space, and we yet need to understand when and how it is best employed.

We expect ELUs to differ from external users not just in terms of their formal contractual situation but also in their motivations, cognitive structures, and problem solving heuristics – all of which seem likely to affect their comparative innovation performance. These differences need to be considered to assess how and when and how the employment of ELUs can complement or substitute for other modes of involving users in new product development.

Some scholars have pointed out that listening to existing customers can lead to trivial innovations and increase the risk of being disrupted (Christensen, 1997; Slater and Narver, 1998). On the one hand, listening to users inside the firms might even increase this risk because they are, in addition to being users of existing products, embedded in the incumbent firm. On the other hand, internal lead users are likely to recognize latent needs, which is crucial for generating long-term value (Slater and Narver, 1998). Thus, they could also pick up early signals to detect disruption.

5.2.2 Relevance for research on organizational behavior

The present study also contributes to the field of organizational behavior by building and testing theory to show that employees' lead usersness, a hitherto overlooked variable, strongly affects organizational behavior. This is important, as some share of employees is likely to be users in many, if not most consumer goods industries. Our findings suggest that extra-organizational experience, particularly leisure-time activity, shapes pro-organizational outcomes. In the literature, engagement with outside targets has often been regarded as detrimental to the organization, e.g. in the case of work-family conflict (e.g. Byron, 2005), or conflict between the profession and a specific employment relationship (e.g. Hekman et al., 2009). By showing that lead usersness, in particular, is an important predictor of innovation-related behaviors, we contribute to the growing literature of how extra-organizational involvement can lead to pro-organizational outcomes (Davis et al., 2012; Johnson and Ashforth, 2008).

Our findings also inform the literature on organizational slack, which has proposed that intermediate levels of resource slack, e.g. time, support innovation (Nohria and Gulati, 1996). Our findings suggest that these positive effects cannot only be achieved by granting slack time at work. ELUs experiment and tinker outside the firm, during their leisure time, which, in turn, fosters innovation at work. Thus, innovation can be induced by "slack" time outside the organization.

Future research should proceed to examine the conditions, under which ELUs are more, or less, effective than regular employees. It seems unlikely that ELUs perform universally better. Several factors – such as the nature of the task, the employing firm, or the market environment – can be expected to bound the positive effects of lead usersness on innovation-related behavior that we have found in this study. E.g., we may hypothesize that ELUs are less effective than other employees at promoting and selling new products to customers, if those products do not conform to their views of design priorities, quality, or innovativeness. We would surmise that ELUs would be more aware of product shortcomings, more careful of their reputation in the user community, and thus more reluctant to advocate such products to their peers. This would suggest that there may be difficulties in the form of role conflicts (Jackson and Schuler, 1985), identity conflicts (Ashforth et al., 2008), and dual allegiance (Chan and Husted, 2010). More generally, role conflicts may arise if the demands of the firm and the interests of the user community are perceived to be incompatible. Employees who perceive their roles to be multiple and conflicting, are more likely to suffer from job stress (Jackson and Schuler, 1985).

In our empirical analyses, it was somewhat surprising to find no correlation between lead usersness and job satisfaction. After all, lead users have made "their passion their profession" and work in a job that is personally meaningful to them (Berg et al., 2010). Our result may be due to two countervailing effects: While occupations that are closely related to employees' personal interests should offer higher meaning and identification and thus higher job satisfaction (Berg et al., 2010; Hackman and Oldham, 1980), they are also more likely to engender role conflicts and job stress (Hekman et al., 2009). Future research

should seek to disentangle these effects and identify the bounds to the kinds of tasks where ELUs will be most effective.

Future research should also investigate how the cognition, behavior, and performance of ELUs change as ELUs are hired and socialized in producer firms. The present paper provides a cross-sectional study of ELUs' behaviors within firms, but does not shed any light on the dynamic processes involved. For instance, future work could consider whether lead usersness typically precedes employment, or vice versa; whether employees' lead usersness and their allegiance to other users tend to increase or decrease with tenure at the producer firm; and what the effects are in terms of organizational behavior change. Increasing socialization and embeddedness in firm routines seems likely to affect ELUs' performance. They may start their job with a user mindset and then gradually acquire solution and organizational knowledge that change their cognitive frames. Corporate innovation knowledge might foster ELUs' problem solving but also might constrain their creativity (Ashforth and Saks, 1996; Herstatt et al., forthcoming). If this were the case, this would suggest that there are temporal bounds to ELUs' cognitive advantage in innovation. This reasoning is supported tentatively by empirical results by Chatterji and Fabrizio (2012), which suggest that organizing former users within the firm can have a negative effect on their original need knowledge.

5.2.3 Relevance for organizational learning and information processing

Finally, our study also informs the field of organizational learning about market needs and the nascent literature on the micro-foundations of organizational learning with respect to need knowledge (Homburg et al., 2009). We highlight that ELUs' characteristics and behaviors act as micro-level antecedents to organizational innovation. We also introduce other novel contingencies such as the effect of job satisfaction and distance to product domain as precursors to market information processing. This informs marketing research, which empathizes the importance of organizational learning, focusing on need knowledge (Sinkula, 1994).

Relatedly, the literature on organizational learning emphasizes specific mechanisms, such as learning-by-hiring and absorptive capacity, which support the transfer and absorption of technological solution knowledge (Cohen and Levinthal, 1990; Lane et al., 2006; Singh and Agrawal, 2011). We show that such mechanisms may also exist for need knowledge and thus contribute to this stream of research. We show at the individual level how ELUs facilitate the acquisition, dissemination, and utilization of need knowledge for corporate innovation. These individual activities may well aggregate to an organizational capacity to absorb need knowledge.

Future research should investigate further how individual-level factors contribute to organizational absorptive capacity for need knowledge. It could also explore to what extent ELUs support the externalization of relevant knowledge, e.g. to influence outside user communities or to help setting standards in industries.

5.3 Practical implications

Our findings can benefit management practice in several ways. First, this paper highlights the empirical salience of ELUs. In the industry we studied, mountaineering equipment, we found the presence of ELUs in every firm sampled. Anecdotal evidence and initial research by the authors suggest strongly that ELUs exist in many business-to-consumer industries. Still, managers may not be fully cognizant of the depth of use expertise available inside their firms. In fact, our research suggests that "hidden ELUs" are quite common. It is also noteworthy that, in our sample as well as more generally, ELUs are not always located in departments commonly associated with innovation. Thus, managers have to search for these individuals proactively to profit from their innovation-related behaviors.

Second, we show that employing lead users can be an effective way of harnessing user knowledge for innovation. Firms can benefit from ELUs' use expertise, their innovative behavior, and their special ability to span boundaries inside the firm. All of this suggests that firms should seek to capture need knowledge from internal users and put them in positions to employ their knowledge. E.g., firms, particularly in B2C industries, should organize embedded lead workshops to elicit ideas (Lüthje, 2004) and use ELUs to test prototypes. Firms should also encourage use-related activities among employees (like Patagonia, our initial example) and systematically gather information from these activities. They could offer intensive product trials and field secondments, for instance, in which innovation personnel

gains first-hand experience in using the firms' products. Finally, our research can inform hiring decisions – it suggests that it may pay to preferentially hire users. (More research is required, however, to understand whether to select leading-edge or average users; in what functions, roles, and situations to employ them; and how to design their job profiles.)

Third, the present study enriches the dialectic view of producer vs. user innovation (cf. Baldwin and von Hippel, 2011). National representative surveys have recently been conducted in several countries to measure the prevalence of user innovation as opposed to producer innovation (e.g. von Hippel et al., 2012). The findings of the present study suggest that users can play a crucial role in the producer realm, too. It may be that a considerable fraction of what we have hitherto considered to be producer innovation is down to the work of users. This would affect our estimations of the value of user innovation in the economy.

6 References

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