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Who are Lead users?

Andréa Boisadan[1] and **Stéphanie Buisine**[2]

1 CESI, LINEACT, Nanterre, France, ORCID: 0000-0002-6674-1894
2 CESI, LINEACT, Nanterre, France, ORCID: 0000-0002-1389-570X

ABSTRACT

Lead users are invaluable resources to generate user-centric radical innovation, but they remain difficult to detect and recruit in the general population. Lead userness, which draws both on the ability to identify unstated customer needs and find creative solutions to those needs, has been conceptualized as domain-dependent: this means that a lead user may generate innovation only in a specific domain for which they are an expert. In the present study, we aim to better understand the extent to which lead userness is a domain-dependent state (as elaborated in the literature) or a domain-independent trait. Following a questionnaire survey with 126 participants, we managed to reliably assess the empathetic side of lead userness (ability to identify needs) and showed that it was related both to domain-dependent characteristics (competences) and domain-independent trait (emotional intelligence). These results open up new avenues for implementing the lead user method in innovation projects.

KEYWORDS:

lead user, extraordinary users model, innovator's dilemma, need seeker strategy, self-determination theory, empathy

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Corresponding author at:

Andréa Boisadan
E-MAIL: aboisadan@cesi.fr
Stéphanie Buisine
E-MAIL: sbuisine@cesi.fr

INTRODUCTION

One of the major barriers to radical innovation was conceptualized by Christensen (1997–2016) as "the innovator's dilemma." It highlights antagonistic decision-making between developing disruptive innovation that remains uncertain and in which end-users generally do not project themselves and developing existing business by proposing incremental innovations based on market research. A valuable approach to override this limitation can be to adopt a Need Seeker innovation strategy (discovery or creation of new needs; Buisine et al., 2021), which outperforms other strategies (i.e., Technology Driver and Market Reader) in terms of needs identification, leading position on the market, and financial return on investment (Jaruzelski et al., 2007–2014). Several methodological approaches have been elaborated to support a need-seeker innovation strategy, for example the Extraordinary User method (Buisine et al., 2018, 2021; Boisadan et al., 2020, 2021). The Lead User method can also be considered as one of the most efficient need-seeker strategies, likely to help companies develop user-centric radical innovation and circumvent the innovator's dilemma.

The Lead User method was developed by von Hippel (1999, 2005), an MIT Sloan School economist. Lead users are users who, in response to their particular needs, will come up with solutions that can meet more widespread needs. These needs are then likely to be generalized and experienced by a large number of people, which may result in market creation. This method can therefore be fully integrated as part of a Need-seeker innovation strategy. Researchers showed that ideas from lead users are superior in terms of market attractiveness and success rates (Lilien et al. 2001; Franke et al., 2006). Relative to Rogers' diffusion of innovation curve (1995), lead users are positioned even before a commercial solution exists. The difference between lead users and early adopters is that lead users contribute to the development of products that do not exist yet, while early adopters buy and use products newly introduced in the market (von Hippel, 2005).

Lead-userness is conceptualized as a continuum, users ranging from low to high degrees of lead userness (Morrison et al., 2004; Schreier & Prügl, 2008). Lead users present two main characteristics (von Hippel, 1988; Franke et al., 2006): 1) being ahead of the trend, which means "forward thinking" and refers to the upstream expression of a need that many people have but do not express, and for which there is no existing solution, and 2) high expected benefit, that is: they have the skills to develop the solution to this newly-identified need. One may consider that the first dimension corresponds to the ability to identify needs while the second one corresponds to the ability to identify solutions. Individuals considered as lead users score high on both dimensions. They are users / self-manufacturers but nobody is expected to be a lead user in the absolute: it is generally accepted that lead userness is linked to a specific domain. They are experts with a domain's knowledge and hold a strong familiarity in using the related kind of products (see Schreir et al., 2007 for an example). Both the early identification of needs and the capacity to provide a creative answer are deemed to be linked to the fact that lead users are, above all, experts in their field.

The Lead User method proved to be highly fruitful in innovation projects. The method consists in involving lead users into the project in order to draw attention to needs that are unsatisfied by current dominant designs. Although ordinary users seem happy with a given product, lead users have the capacity to detect the product shortcomings that others would not have seen at first sight. Hence, they provide the design team with valuable insights as to how to improve the product of interest. Furthermore, lead users can also come up with disruptive ideas to transform existing products or create brand-new products. For example, kite surf was invented by lead users (von Hippel, 2005). In the industrial sector, the most famous Lead User case study was conducted with 3M company in the domain of medical supplies, in particular with the development of a disruptive surgical drape (von Hippel et al., 1999). Beyond the search for new products to launch into this market, the study also served as an experimental validation of the effectiveness of the method to generate innovation. Lilien, Sonnack, and von Hippel (2001) formed two groups of users of medical supplies: one group of carefully-recruited lead users and a group of mainstream users to generate new ideas. After accurate evaluation, it follows that the ideas generated in the group of lead users were more innovative and the sales estimated within 5 years were 8 times larger – an average sales forecast of $146 million. To remain competitive and be market leaders, companies should benefit from collaborating with lead users. According to Eisenberg (2011), lead users help companies to uncover unmet user needs and thus fit into a need-seeker strategy (Jaruzelski, Staack, & Goehle, 2007–2014) because "they are motivated to innovate in order to solve [their] own problems rather than to sell a product or service" (Eisenberg, 2011, p. 51).

Nevertheless, as the literature points out, it is very difficult for companies to identify lead users in order to design radically-innovative products (see Lehnen & Herstatt, 2016) because they are rare and hold atypical profiles (von Hippel, Thomke & Somnack, 1999; von Hippel, 2005; Sukhouroukova et al., 2012; Kratzer, Lettl, Franke, & Gloor, 2016). Subsequently, recruiting lead users generates high investment costs and time expenditures (von Hippel et al., 1999; von Hippel, 2005; Pajo et al., 2015). To-date, three methods allow companies to identify lead users (Franke et al., 2003; von Hippel, 1999): 1) the screening method, 2) the pyramid method, and 3) the self-selection method. Because of the time and difficulties for recruiting lead users, the method seems highly underutilized with regard to its potential benefits both for satisfying needs of the general population and in terms of business success.

Faullant et al. (2012) investigated the characteristics of lead users and examined both state and trait features. To capture the state dimension of lead userness, they adapted a questionnaire (Lüthje, 2000) measuring the extent to which someone is ahead of the trend in a given domain and capable of finding new solutions in this same domain. In addition, they designed items to assess product-related knowledge, use experience, intrinsic, and extrinsic motivation for the domain. They also measured creativity through a divergent thinking scale (Kreuzing, 1981), which is a more stable individual characteristic. Their results show that divergent thinking skills, product-related knowledge, and use experience are significant predictors of lead userness (ahead of the trend and high expected benefits). Contrary to expectations, motivation did not impact lead userness. There

were very few attempts to understand lead users' personality aside from Faullant et al. (2012) study. For example, Schreier and Prügl (2008) measured lead users' innovativeness, while other scholars rated the two dimensions of lead userness (ahead of the trend and high expected benefits) as personality traits (Koning, 2016), but they did not refer to dominant models of personality validated in psychology literature. Besides, Faullant et al. (2012) are acknowledged to be the first to have formalized the link between lead userness and creativity. Below, we develop this link to creativity, then elaborate on potential links between lead userness and mainstream personality traits through the notion of creative personality.

It is accepted that lead users are creative (Martin et al., 2021), but creativity is not so easy to handle, as it is usually modeled through a multivariate approach (Lubart et al., 2003). As a reminder, creativity is the ability to produce ideas that are both new and adapted to the context (Lubart et al., 2015, p.23), It is also the production of novel and useful ideas (Barron, 1955; Runco & Jaeger, 2012 cited by Steele et al., 2017). Three types of creativity can be distinguished: everyday creativity, artistic creativity, and scientific creativity (Fürst & Lubart, 2017). According to the multivariate approach, a creative person is defined by a combination of cognitive (intelligence, knowledge, expertise), conative (cognitive styles, personality and motivation), and emotional (emotional intelligence) factors associated to favorable environmental conditions (Lubart et al., 2003; 2015). Creative performance is influenced by knowledge (Amabile, 1990) and by expertise (skills and knowledge in a field; Baer, 2015). Besides, the literature repeatedly highlighted the positive link between intrinsic motivation and creativity (see Amabile, 1985). It was shown that when individuals are intrinsically motivated by a task, they have better performance and higher level of creativity, satisfaction and learning.

With regard to the Four C model of Kaufman and Beghetto (2009), lead users demonstrate Little-C (everyday creativity) through their ability to find solutions to needs. But if they are involved in innovation projects in a professional setting, their creativity can reach a Pro-C level with potentially disruptive ideas. Furthermore, lead userness may be partly linked to the domain of interest (cognitive and conative dimensions: product-related knowledge, use experience, and intrinsic motivation) and partly determined by individual dispositions (conative and emotional dimensions: personality and emotional intelligence). However, to the best of our knowledge, the extent to which lead-userness is a state or a trait has never been formally studied.

Despite the results of Faullant et al. (2012), motivation for the domain remains a key factor to examine in relation to lead userness. Eisenberg's view (2011) suggests that the relevance of lead users' ideas may be linked to their intrinsic motivation to innovate in order to improve their own utilization of the products. Currently, the most acknowledged theory of human motivation is the Self-Determination Theory (see Deci & Ryan, 1985), which is based on a continuum ranging from amotivation to intrinsic motivation (Ryan & Deci, 2000; see Cook & Artino, 2016). Between these two ends, there are four forms of extrinsic motivation (external regulation, introjected, identified, and integrated regulation). According to Ryan and Deci (2000), "Intrinsic motivation is defined as the doing of an activity for its inherent satisfaction rather than for some separable consequence.

When intrinsically motivated, a person is moved to act for the fun or challenge entailed rather than because of external products, pressures or reward" (p. 56), whereas "extrinsic motivation is a construct that pertains whenever an activity is done in order to attain some separable outcome. Extrinsic motivation thus contrasts with intrinsic motivation, which refers to doing an activity simply for the enjoyment of the activity itself, rather than its instrumental value" (p. 60).

Conative factors associated to creativity also include the individual's personality. According to the American Psychological Association, personality "refers to individual differences in characteristic patterns of thinking, feeling and behaving" (APA, p. v). To-date, the most widely used model for assessing the personality of individuals is the Big Five Model (Goldberg, 1990), especially in the context of creativity (Baruch, 2017). This model was tested and evaluated across multiple continents and cultures and a wide variety of populations. The Five Factors (NEO-PI-R; Costa & McCrae, 1992) are:

- Openness to experience: fantasy, aesthetics, feelings, actions, ideas and values;
- Conscientiousness: competence, order, dutifulness, achievement striving, self-discipline and deliberation;
- Extroversion: warmth, gregariousness, assertiveness, activity, excitement seeking and positive emotion;
- Agreeableness: trust, straight-forwardness, altruism, compliance, modesty and tender mindedness;
- Neuroticism: anxiety, depression, impulsiveness, hostility, vulnerability to stress and self-consciousness.

Literature shows that personality traits influencing creativity include perseverance, tolerance to ambiguity, openness to new experiences, individualism, risk-taking, and psychoticism (Lubart et al., 2003; 2015). Regarding the Big Five Model, creativity would be mainly related to the Openness dimension (see for example, George & Zhou, 2001; Puryear, Kettler, & Rinn, 2017), which is positively linked to the three types of creativity (everyday, artistic, and scientific; Conner & Silvia, 2015; Feist, 1998; Ivcevic & Brackett, 2015; Fürst & Lubart, 2017). Moreover, open persons are often strongly intrinsically motivated because they love to learn from experience and they are open to new ideas (Baruch, 2017). The relationships between creativity and the other dimensions of the Big Five are more contrasted. Extraversion, which incorporates traits such as self-confidence, dominance, and taste for novelty may be conducive to creativity (Feist, 1998; Schweizer, 2006 cited by Fürst, Barbot & Lubart, 2023), especially among the more outgoing artists. Extraversion is also positively linked to everyday creativity and divergent thinking (Batey & Furnhan, 2006). Regarding the Neuroticism dimension, the link is more complex and may depend upon individuals' domain (scientific or artistic; Baruch, 2017; Clark & DeYoung, 2014 cited by Baruch, 2017). Among artists, neurosis would be positively correlated to creativity, as they may use the creative act to regulate their mood (Fürst et al., 2023). The Conscientiousness dimension may not promote creativity, because of the need for

control and framework that interferes with the act of generating ideas and thinking out of the box, especially in artistic professions (Feist, 1998). Lastly, the Agreeableness factor may show a negative correlation with creativity: according to Feist (1998), creative individuals are more hostile, asocial, unconventional, and norm-rejecting.

Finally, we anticipate that emotional intelligence could play a role in lead userness, fostering both lead users' ability to detect needs and their ability to find solutions. According to Salovey & Mayer (1990), emotional intelligence is the ability of an individual to control their emotions and those of others, as well as to distinguish their emotions in order to direct their thoughts and actions. There are four dimensions of emotional intelligence (Salovey & Mayer,1989; Baron & Parker, 2000):

- Self-awareness: emotional self-awareness, accurate self-assessment, self-confidence
- Self-management: emotional self-control, transparency adaptability, achievement, initiative, optimism,
- Social empathy, organizational awareness, service,
- Relationship-management: inspirational leadership (see the transformational leadership theory; Bass, 1985), influence, developing others, change catalyst, conflict management, building bonds, teamwork and collaboration.

In lead userness, detection of needs that can be generalized to the main population could result both from awareness of one's own needs (self-analysis of one's own emotions) and of others' needs (empathy). Furthermore, according to the multivariate approach of creativity (Lubart et al., 2003), emotional intelligence may also foster creativity. Consistently, Geher, Bettancourt and Jewell (2017) showed that emotional intelligence predicts creativity.

RESEARCH QUESTION AND HYPOTHESES

In this article we are interested in understanding what makes someone be or become a lead user. Our purpose is to promote innovation through the Lead User method by making recruitment of these extraordinary individuals more accessible to any company. Therefore, the aim of this article is to contribute to answering whether lead-userness is more of a state or a trait. If it is more of a state, as the literature suggests, it remains domain-dependent and a pool of lead users will be qualified to identify needs and generate ideas only for a given product. For another kind of product, another pool of lead users will have to be recruited. Conversely, if lead userness is more of a trait, a lead user for a given product may also be able to find outstanding needs and solutions for a totally different domain. In this view, one can imagine training a pool of lead users to innovate in a variety of domains and overcome the necessity of recruiting new lead users for each new project.

Our work is in line with a previous investigation by Faullant et al. (2012) as well as with the multivariate approach of creativity, which includes cognitive (knowledge, expertise), conative

(motivation and personality), and emotional (emotional intelligence) factors. In this respect, we will examine two main concurrent hypotheses:

H1: Lead-userness is more of a state and will mainly be predicted by domain-dependent variables, such as product-related knowledge, use expertise and domain-dependent intrinsic motivation.

H2: Lead-userness is more of a trait and will mainly be predicted by personality and emotional intelligence factors.

To this aim, we conducted a questionnaire survey.

METHODS

Participants

The sample was composed of 126 students in computer science (81% men, 19% women), aged 17 to 22 years (mean = 18.9, SD = 0.99). They were recruited on a voluntary basis following a call for participation in a graduate school of engineering. They were not compensated for their participation.

Material

We designed a questionnaire composed of five parts. The first one addressed the areas of interest for each respondent. This part took the form of an open-ended question. Respondents were instructed to think of products they particularly like or are attracted to (for example, technologies they use in their professional activities, equipment for their sport activities, dedicated accessories, products they use in their leisure time or everyday life such as cars, phones or kitchen appliances) and invited to list them.

The second part of the questionnaire was adapted from Lüthje's (2000) scale of lead userness. The aforementioned areas of interest served as target domain to assess the respondents' level of lead userness. In the third part, they had to rate their level of intrinsic motivation with regard to the same domain using the Intrinsic Motivation Inventory (IMI; Ryan & Deci, 2000). The IMI scale measures 4 sub-scales: 1) interest/satisfaction (self-assessment of intrinsic motivation), 2) perceived choice, 3) perceived competence (positive predictors of both self-assessment and intrinsic motivation behavior), and 4) pressure/tension (negative predictor of intrinsic motivation).

The fourth and fifth parts were meant to collect the participants' personality traits (BFI John et al., 1991) and their emotional intelligence level (BEIS; Schutte et al., 1998) respectively. All items were answered on a seven-point Likert-type scale ranging from strongly disagree (=1) to strongly agree (=7).

Table 1 shows some examples of items for each sub-dimension.

Table 1. Examples of items

Dimensions	Sub-dimensions	Examples of items
Lead userness	Ahead of the trend	I usually find out information about my area(s) of interest before others do.
		I have benefited significantly from early adoption and use of new products in my area(s) of interest.
	High expected benefit	I have often noticed technical problems with products in my area(s) of interest.
		I am dissatisfied with the existing equipment offered on the market in my area(s) of interest.
Motivation	Intrinsic motivation	While I am engaged in my area(s) of interests, I think about how much I enjoy it.
		I find my area(s) of interests very interesting.
	Perceived choice	I feel that it was my choice to engage in my area(s) of interests.
		I feel like I am doing what I want to do while being engaged in my area(s) of interests.
	Perceived competence	I think I am pretty good at my area(s) of interests.
		I am satisfied with my performance in my area(s) of interests.
	Pressure / tension	I feel tense while being engaged in my area(s) of interests.
		I feel pressured while being engaged in my area(s) of interests.
Personality	Extraversion, energy, enthusiasm	I see Myself as someone who is talkative.
		I see Myself as someone who is curious about many different things.
	Consciousness, control, constraints	I see Myself as someone who does a thorough job.
		I see Myself as someone who does things efficiently.
	Agreeability, altruism, affection	I see Myself as someone who is helpful and unselfish with others.
		I see Myself as someone who has a forgiving nature.
	Negative emotions, neurosis, nervousness	I see Myself as someone who is depressed, blue.
		I see Myself as someone who can be tense.
	Openness, originality, open-mindedness	I see Myself as someone who is original, comes up with new ideas.
		I see Myself as someone who is ingenious, a deep thinker.
Emotional intelligence	Emotional intelligence quotient	I know why my emotions change.
		When I am in a positive mood, I am able to come up with new ideas.

Table 2 details the scales and dimensions collected with their reliability scores. All dimensions proved reliable, except the "High expected benefit" dimension of lead userness as well as the lead userness score itself. For this reason, we analyzed only the "Ahead of the trend" dimension of

lead userness. The "Perceived choice" dimension of intrinsic motivation was also disregarded for reliability reasons.

Table 2. Reliability scores' results

Dimensions	Sub-dimensions	Cronbach's alpha
Lead userness	Ahead of the trend	.686
	High expected benefit	.541
	All items	.596
Motivation	Intrinsic motivation	.770
	Perceived choice	.599
	Perceived competence	.838
	Pressure / tension	.609
Personality	Extraversion, energy, enthusiasm	.842
	Consciousness, control, constraints	.758
	Agreeability, altruism, affection	.733
	Negative emotions, neurosis, nervousness	.797
	Openness, originality, open-mindedness	.763
Emotional intelligence	Emotional intelligence quotient	.695

Procedure

The survey was circulated on a paper form during a class session. The experimenter explained the context of the study and stayed to help participants if needed. The completion time was 30 minutes.

RESULTS

We analyzed descriptively the areas of interest listed by the respondents. Each participant mentioned 4 areas of interest on average (min = 1; max = 9). The most often cited areas of interest were sports (n = 55), video games (n = 14), automotive (n = 12), computer science (n = 9), and music (n = 8). Sport encompasses several types of activities, such as football, gymnastics, cycling, and volleyball. It is interesting to note that only 9 respondents cited computing as an area of interest, while being engaged in computer science studies. This confirms that they answered the survey as lead users and not as professional experts.

To test our hypotheses, we performed a Multiple Regression Analysis to identify significant predictors of the "Ahead of the trend" dimension of lead userness. The results highlight two

significant factors (Table 3), namely the "Perceived competence" dimension from the IMI scale ($\beta = 0.280$, $p = 0.008$) and the Emotional Intelligence Quotient ($\beta = 0.251$, $p = 0.026$). Our results tend to support hypothesis H1 in a sense that beta coefficient for domain-dependent competence is higher than the emotional intelligence trait coefficient.

Table 3. Multiple Regression Analysis' results

Dimensions	Sub-dimensions	Beta	t	Sig.
Motivation	Intrinsic motivation	-.022	-.195	.846
	Perceived competence	.280	2.710	.008
	Pressure / tension	.111	1.180	.240
Personality	Extraversion	.125	1.204	.231
	Consciousness	-.078	-.861	.391
	Agreeability	-.133	-1.462	.146
	Negative emotions	.117	1.184	.239
	Openness	0	0	1.000
Emotional intelligence	Emotional intelligence quotient	.251	2.256	.026
Dependent variable: Ahead of the trend				

DISCUSSION

Regarding the state dimension of lead userness (hypothesis H1), we failed to find a link between intrinsic motivation and the "Ahead of the trend" dimension. Although surprising with regard to the Lead User theory, this result is consistent with Faullant et al.'s (2012) findings. It also challenges the well-known link between intrinsic motivation and creativity but, as previously elaborated, the creative dimension of lead userness may rather be associated with the "High expected benefit" dimension, which we could not study for reliability reasons. Therefore, in the current state of our knowledge and in light of our results, intrinsic motivation does not seem to be a prerequisite of the ability of lead users to identify needs ahead of the trend. At most, intrinsic motivation may stimulate their creative capacities to find new solutions to such needs, but we could not verify it in our study.

Among the predictors of intrinsic motivation that are measured by the IMI (Ryan & Deci, 2000), the perceived competence proved to be a significant factor of the "ahead of the trend" dimension. This result is in line with the literature on lead userness and supports the state dimension of lead userness (H1) as expertise in the target domain.

Regarding the dimension of lead userness trait (hypothesis H2), we investigated the influence of the five personality profiles assessed through the Big Five. The results of the multiple regression

analysis show that none of the personality traits (openness, consciousness, extroversion, agreeableness, and neuroticism) seem to influence the capacity of lead users to identify needs ahead of the trend. Here also, it could appear surprising that openness to experience (which includes risk-taking and tolerance to ambiguity) was not a significant predictor, but it may more likely be related to the creative side of lead userness, just like intrinsic motivation.

Finally, our results emphasize that emotional intelligence is a significant predictor of the ahead of the trend dimension of lead userness, which is in line with our H2 hypothesis. It seems that this ability to identify and act on one's own emotions and those of others allows lead users to better understand the emotions and therefore the needs. Emotional intelligence and empathy are two very close but distinct notions, empathy being part of emotional intelligence. Empathy is the ability to share and understand the states of mind and emotions of others, to put oneself in the place of another (Ioannidou & Konstantikaki, 2008). The fact that emotional intelligence is a key factor of the ahead of the trend dimension suggests that this could be the empathetic side of lead userness. However, further research would be necessary to substantiate this view more accurately. According to Demetrou and Nicholl (2021), creativity and empathy have similar characteristics, such as unusual perceptual and personal openness, resistance to closure, non-judgmentally, egoless state of flexible ego-control, low defensiveness, and a desire to work beyond the boundaries of self. Hence, emotional intelligence could also play a role in the creative side of lead userness, but we could not test it.

Our inability to measure reliably the "High expected benefit" dimension of lead userness constitutes the main limitation of our study and prevented us from fully testing our hypotheses. This can be due to a problem of translation, as Faullant et al. (2012) had translated the scale into German (Luthje, 2000), which we ourselves translated into French. Because of the translation, the scale may have lost sensitivity and reliability. The problem can also come from the population we studied, as our participants were students, aged 17 to 22, likely with lower experience in any kind of product than the participants to Faullant et al.'s (2012) study (who had a mean age above 43). Furthermore, we accepted lead users for any area of interest, which resulted in a heterogeneous sample of domains, whereas participants in the study of Faullant et al. (2012) all focused on the domain of kitchenware.

All in all, our body of results highlights several interesting and original findings related to the ability of lead users to identify new needs. First of all, emotional intelligence, which is a trait and not a state, appeared as a significant predictor of the "ahead of the trend" side of lead userness. This suggests that lead users could be spotted in the general population more easily than the costly procedures implemented in classical lead user studies (screening method, pyramid method and self-selection method). Our intuition of detecting a pool of lead users with high emotional intelligence who could take part in a variety of innovation projects, even out of their own areas of interest, could be plausible. According to our results, the main situational component required for the need-seeking side of lead userness is competence. This means that such a pool of emotional lead users would have to get informed on the target domain and products for each new innovation

project. This seems largely achievable, as they do not have to personally like the domain or be intrinsically motivated to be able to understand user needs and issues related to product use. Their insights into unexpressed user needs may come both from their high emotional intelligence and their newly gained competence in the target domain. Implementing this way, the Lead User method may help researchers and practitioners democratize need-seeking strategies and radical innovation, overcome the innovator's dilemma, thereby supporting business development, entrepreneurship, and meaningful innovation.

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20 Swierkowa St., 15-328 Bialystok, Poland
tel. +48 857457283
e-mail: creativity@uwb.edu.pl
http://www.creativity.uwb.edu.pl