Are Social Entrepreneurs Lead Users? The First Scale to Retrospectively Analyze whether Social Entrepreneurs are Lead Users.

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ABSTRACT:

Innovations developed by users are ubiquitous nowadays. In previous studies, it has been found that successful and commercially attractive user innovations are developed by so called lead users that have been triggered by personal unmet needs to innovate. Lead users are characterized as being ahead of a trend and they expect to benefit from their innovations. What the present paper conducts is proposing a scale that can measure whether lead users have been triggered by personal unmet needs to innovate and develop commercially attractive social innovations. In other words, the present paper proposes a scale that is in a position to retrospectively measure whether social entrepreneurs are lead users. By examining whether social entrepreneurs are lead users, new insights into the antecedents of social entrepreneurship might be provided and a new avenue that lead users take when they decide to commercialize user innovations might be revealed. Existing scales that aim to determine lead users among user populations have been modified to come up with the proposed scale. The proposed scale finds its origins in Lepoutre, Justo, Terjesen, & Bosma (2013) to identify social entrepreneurs, in Luehtje, Herstatt, & von Hippel (2005) to differentiate between user innovators and non-user innovators, in Franke, von Hippel, & Schreier (2006) to assess the 'expected benefit' component and in Franke & Shah (2003) and Vernette, Bej-Becheur, Gollety, & Hamdi-Kidar (2014) to assess the 'ahead of a trend' component of the lead user definition. It needs to be noted that the present paper solely modifies existing scales and proposes a scale that meets this research's objective and does not conduct any statistical measurements that verifies the reliability and validity of the proposed scale or draws any generalizations from the findings.

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Introduction

1.1 Situation

Freelancers Union is a social organization and community for freelancers in the US that gives freelancers professional benefits, adequate rights and protection (Horowitz, Freelancersunion, Unknown). The founder, Sara Horowitz, is regarded as an innovator for the American workforce of tomorrow by building up a business that is social purpose driven. Nowadays, the organization has more than 250.000 members and received grants and other support from leading foundations due to its social mission. Before founding the organization and early in her career, Sara Horowitz has been classified as a freelancer and therefore, could not get health insurance as full-time employees do to an affordable price (Forbes, Unknown). Based on her personal experience, she recognized an unmet need that could not be satisfied by offers currently available for freelancer and she knew what was needed, namely an organization that aims to ensure and protects rights of freelancers. Before she founded Freelancers Union, she has earned a law degree and a master's degree at the Harvard Kennedy School of Government and she worked as a union organizer and labor lawyer (Horowitz, Unknown). Hence, she obtained information about how to solve her problem through her study and profession prior to founding the organization. The number of independent workers in the US is growing. Nowadays, almost 54 million people are already independent workers. Therefore, Sara Horowitz innovation has been ahead of a trend by providing support for a growing number of people who have been and will be in a similar situation as Sara Horowitz has been prior to funding "Freelancers Union" (Horowitz, Unknown). Freelancers Union is one of many examples of a social organization.

The example of Freelancers Union reflects what social entrepreneurship is about, namely that the primary objective of social entrepreneurship is to create social value (Mair & Marti, 2006; Alvord, Brown, & Letts, 2004) by combining resources in new and innovative ways (Lepoutre, Justo, Terjesen, & Bosma, 2013). However, different types of social organizations create social value in distinct ways. This is because individuals have different motives to become social entrepreneurs, have distinct social objectives, and achieve their objectives by conducting different activities (Zahra, Gedajlovic, Neubaum, & Shulman, 2009). The consequence is that many different definitions of the concept exist and social entrepreneurship remains a poorly defined construct (Mair & Marti, 2006; Dacin & Dacin, 2011; Lepoutre, Justo, Terjesen, & Bosma, 2013; Braga, Proenca, & Ferreira, 2015; Choi & Majumdar, 2014).

To shed more light on the concept, the currently poorly defined antecedents need to be further explored (Zahra, Rawhouser, Bhawe, Neubaum, & Hayton, 2008; Lepoutre, Justo, Terjesen, & Bosma, 2013). What precedes all social entrepreneurial activity is how and why individuals identify social opportunities (Zahra, Gedajlovic, Neubaum, & Shulman, 2009) and are motivated to come up with a solution that might be innovative and aims to enhance societal value (Lumpkin, Moss, Gras, Kato, & Amezcua, 2013).

The example of Freelancers Union indicates that influences such as personal experience may have let to the recognition of an unmet need. An unmet need may have been the motivator for an individual, in that case, Sara Horowitz, to innovate and solve a personal problem and at the same time that of many other freelancers by becoming a social entrepreneur. In the example, indications are provided that information on how to solve a problem and satisfy an unmet need may have been acquired elsewhere, for example, through an education or a profession.

What we know is that some individuals, as users, experience an unmet personal need and are motivated to innovate by the attempt to satisfy that unmet need because products offered on the market may not suffice (Luethje C. , 2004). Users who innovate by expecting to benefit from the innovation are referred to as user innovators (von Hippel E. , 2005). User innovators, in their innovation process, have often been triggered by personal experiences and often rely on information they already possess or have in-stock to come up with innovative ideas that lead to user innovations (Luethje, Herstatt, & von Hippel, 2005). When user innovators expect to personally benefit from innovating by satisfying unmet personal needs and when the innovators are ahead of a trend, the user innovators are lead users (von Hippel E. , 1986; von Hippel E. , 2005). If user innovators go one step further and commercialize their innovation, they become user entrepreneurs (Shah & Tripsas, 2007).

What we do not know yet is whether social entrepreneurs, similar as user entrepreneurs, started off as user innovators that recognized an unmet personal need through repeated personal experience. Based on this unmet personal need, the user innovator has been motivated to innovate by expecting to benefit from the innovation and by doing so relying on information that have already been available to the user innovator prior to innovating. In other words, we do not know yet whether social entrepreneurs have started off as user innovators and later on commercialized their innovation and became social entrepreneurs due to the realization that the innovation has been commercially attractive, which indicates that the user innovator was ahead of a trend.

1.2 Research Objective

One of the ways of addressing this is by using insights from lead user and user innovation theory (von Hippel E. , 1986; 2005). Deriving from this, the research objective of the present study is to provide a measurement instrument that can provide first insights on whether lead user innovation characteristics may have influenced social entrepreneurs in the social entrepreneurial process.

1.3 Research Question

The following research question has been formulated to meet the previously described research objective:

What existing scales can be modified to identify lead user innovation characteristics among social entrepreneurs?

To answer the research question, this paper modifies existing scales that measure lead userness of individuals by modifying items in such a way that the modified items can operationalize and measure whether social entrepreneurs are lead users. To answer the research question, first, an examination of the current situation regarding social entrepreneurship, user entrepreneurship and lead user innovation studies has been conducted. Existing scales that measure the lead user construct have been identified, critically assessed and some have been modified to capture the research topic under study

in a holistic manner. The scale that this paper proposes finds its origins in Franke, von Hippel, & Schreier (2006) to measure the 'expected benefit' component of the lead user definition. To measure the 'ahead of a trend' component, items provided by Franke & Shah (2003) and Vernette, Bej-Becheur, Gollety, & Hamdi-Kidar (2014) have been modified. Those existing scales have been chosen to answer the research question, since those scales provide the best available items to measure indicators that have been derived from existing lead user literature. To identify social entrepreneurs, face-to-face interview questions provided by Lepoutre, Justo, Terjesen, & Bosma (2013) have been modified, since the authors aim to figure out whether respondents pursue a social mission by innovating or creating something new. Additionally, items provided by Luehtje, Herstatt, & von Hippel (2005) have been incorporated to differentiate between user innovators and non-user innovators.

1.4 Theoretical Significance

Scholars encourage studies that gain insights into the antecedents of different social organizations (Zahra, Rawhouser, Bhawe, Neubaum, & Hayton, 2008; Short, Moss, & Lumpkin, 2009; Mair & Marti, 2006; Lepoutre, Justo, Terjesen, & Bosma, 2013) including what has motivated individuals to pursue social entrepreneurial activities. The scale that this paper proposes supports research into the antecedents of social entrepreneurship by being in a position to shed light on whether social entrepreneurs are lead user innovators that were motivated to innovate based on a personal unmet need that has been triggered by personal experience. By identifying the antecedents of social entrepreneurship, the phenomenon might become more concrete for future studies (Short, Moss, & Lumpkin, 2009) and researchers can define the concept's boundaries more precisely (Zahra, Rawhouser, Bhawe, Neubaum, & Hayton, 2008).

1.5 Practical Significance

The findings of this study are two folded. They may open a new avenue of social entrepreneurship studies, since the scale that has been developed is the first measurement instrument that measures whether social entrepreneurs are lead users. The scale opens up a new avenue for lead user studies, namely whether lead users purse social entrepreneurial pathways.

1.6 Structure

Section two presents the theoretical framework that provides boundaries for the concepts under study by introducing methodologies to identify social entrepreneurs and user innovators and by deriving indicators to identify lead users among user populations. In section three, the methods part is introduced and provides selection and evaluation criteria for existing scales. Section four comprises the results and explains why and how selected scales can be used to answer the research question. Section five discusses and concludes the paper.

2.0 THEORETICAL FRAMEWORK

2.1 Social Entrepreneurship

Social entrepreneurship receives an increasing amount of attention (Rey-Marti, Ribeiro-Soriano, & Sanchez-Garcia, 2016), ranging from literature to business courses in leading business schools over whole organizations devoting their time in studying and implementing social entrepreneurship (Peredo & McLean, 2006). For more than 20 years now, scholars put research effort in social entrepreneurship (Short, Moss, & Lumpkin, 2009; Lumpkin, Moss, Gras, Kato, & Amezcua, 2013). There are many reasons why the concept receives a great deal of attention. One of them is that popular social entrepreneurs have great ideas, put them into practice by creating new products and by doing so improve people's lives (Martin & Osberg, 2007). Even though social entrepreneurship contributes to society, it is still a poorly defined construct (Mair & Marti, 2006; Dacin & Dacin, 2011; Lepoutre, Justo, Terjesen, & Bosma, 2013; Braga, Proenca, & Ferreira, 2015; Choi & Majumdar, 2014). Some definitions are extensive others are more restricted (Austin, Stevenson, & Wei-Skillern, 2006). The common denominators among most of the existing definitions of social entrepreneurship are that the primary objective of a social enterprise is to exploit opportunities that strive for social value enhancement by means of innovation or the creation of something new, rather than to capture economic return (Dees, 1998; Mair & Marti, 2006; Zahra, Gedajlovic, Neubaum, & Shulman, 2009).

To answer the research question, a methodology is required to identify social entrepreneurs. Lepoutre, Justo, Terjesen, & Bosma (2013) provide a methodology to measure the extent to which an organization can be referred to as a social enterprise and whether the organization provides an innovative product. Of interest for the present paper is that the social entrepreneur's intentions are to pursue a social objective and whether the social entrepreneur offers a new product or innovation to meet the social objective since that are basic characteristics of social entrepreneurship that most scholars have agreed on. Their provided questionnaire is an extension of the Global Entrepreneurship Monitor (GEM). The GEM is a research program that aims to assess the impact of entrepreneurial activities on a nation's economic growth. Adults who are in the process of setting up a business or at least partly own and manage an operating enterprise are the targeted respondents (Reynolds, et al., 2005).

With the methodology provided by Lepoutre, Justo, Terjesen, & Bosma (2013) social entrepreneurs can be identified. However, the question why and how individuals are motivated to exploit opportunities and transform them into social enterprises remains. Solely a limited number of studies have researched why and how social entrepreneurship occurs (Zahra, Gedajlovic, Neubaum, & Shulman, 2009; Lumpkin, Moss, Gras, Kato, & Amezcua, 2013). However, none of these studies have analyzed whether social entrepreneurs are lead users and followed the user innovation process.

2.2 Are Social Entrepreneurs User Innovators?

It is interesting to analyze whether social entrepreneurs started off as user innovators, since research has shown that the development of many important new products and processes has been conducted by user innovators (Baldwin, Hienerth, & von Hippel, 2006). User innovators are individuals that are motivated to innovate based on the notion that they have an unmet need and they expect to personally benefit from innovating (von Hippel, 2005; Prandelli, Pasquini, & Verona, 2016). Users that innovate can come up with innovations that

are tailored exactly to their wants and needs (von Hippel, 2005).

This has been empirically validated by Luethje, Herstatt, & von Hippel (Luethje, Herstatt, & von Hippel, 2005). They differentiated between innovators and non-innovators in the field of mountain bike equipment based on the extent to which individuals pursued and developed ideas for new products and solutions. They found that user-innovators have been motivated and triggered to come up with an innovative idea by repeated and personal usage experience with the need to improve the currently available equipment on the marketplace. The currently available equipment happened to not meet unmet personal user needs in a satisfactory manner since a certain problem repeatedly occurred.

When users expect to benefit from their innovation by personally using it and this way solving a problem, then it is expected that user innovators rely on information they already have in-stock (Luethje, Herstatt, & von Hippel, 2005). In-stock information is referred to as 'local' information, which is information that users already possess prior to innovating or that a user gains within the innovation process (Luethje, Herstatt, & von Hippel, 2005). 'Local' information is divided into need and solution information. Users are in possession of the required need information by repeatedly experiencing unmet needs during the course of undertaking certain activities and are expected to draw upon need information when the primary incentive to innovate is personal usage (Luethje, Herstatt, & von Hippel, 2005; von Hippel, 2005). Concerning solution information, user innovators in their innovation process increasingly rely on 'local' solution information as the acquisition cost of non-local solution information exceeds the expected benefit from the innovation (Luethje, Herstatt, & von Hippel, 2005).

When users commercialize their solution, they become user entrepreneurs (Shah & Tripsas, 2007). Shah & Tripsas (2007, p. 126) refer to user entrepreneurs as 'accidental' entrepreneurs who have an idea for an innovation that they could use themselves, create the product and only after the product has been adopted by the user, users think about receiving monetary return by commercializing their innovation. User-entrepreneurs are ubiquitous and many examples are provided in the literature (Shah S. , 2000; Baldwin, Hienerth, & von Hippel, 2006; Hienerth, 2006).

Coming back to social entrepreneurship, Stuiver (2015) argues that the social bricoleur proposed by Zahra et al (2009) provides the most resemblances with user entrepreneurs. Social bricoleurs rely on local knowledge in their social entrepreneurial process. They are, due to their local knowledge and expertise, in a position to identify opportunities that have not been addressed yet because external entities do not have the required local knowledge to discover the corresponding opportunities. Social bricoleurs are motivated to address local social needs themselves, because from afar, social needs that social bricoleurs identify due to their local knowledge are easily misunderstood. Recall that user innovators identify a personal unmet need and may rely on 'local' information when it comes to solving a personal unmet need by innovating.

However, research on whether user innovators become social entrepreneurs does not exist yet. To solve the question whether social entrepreneurs have been user innovators, it is important to understand what kinds of users develop attractive user innovations.

2.3 Are Social Entrepreneurs Lead Users?

Von Hippel (von Hippel E. , 1986) developed the lead user theory to gain insights into what type of users develop attractive user innovations. Lead users are defined as users – individuals and organizations - that are ahead of a market trend seeking to develop products were lead users personally benefit from by satisfying unmet needs (von Hippel E. , 1986; 2005).

The rationale behind the 'expected benefit' component is the following. User needs are often heterogeneously distributed among the user population (Franke & von Hippel, 2003; Franke, Reisinger, & Hoppe, 2009). This refers to the variance in user needs among the user population. Manufacturers tend to develop products that satisfy a large market segment – the average or regular user – due to the fact that risk to serve and size of the target market where lead users experience an unmet need can hardly be determined by manufacturers (Morrison, Roberts, & Midgley, 2004; von Hippel E. , 2005; Franke, von Hippel , & Schreier, 2006). The average or regular user tends to be satisfied with products offered on the marketplace (Hienerth & Lettl, 2016). Lead users tend to be dissatisfied with products available on the marketplace that serve the average customer (von Hippel, 2005; Vernette, Beji-Becheur, Gollety, & Hamdi-Kidar, 2014). The motivation that drives lead users to innovate is that lead users experience unmet needs that have not been satisfied by products on the market prior to innovating (Luethje C. , 2004; von Hippel, 2005; Eisenberg, 2011). Hence, lead users expect to gain a high benefit from innovating by satisfying currently unmet personal needs (von Hippel E. , 2005; Hienerth & Lettl, 2016). The previous argumentation has been empirically validated by Franke, von Hippel, & Schreier (2006). They found that the high expected benefit component predicts the likelihood of individuals to innovate since the greater the expected benefit from a needed innovation, the higher the individual's investment resulting in enhanced innovation likelihood.

The rationale behind the 'ahead of a trend' component is that underlying trends are predecessors of market needs that become general in a market place (von Hippel, 2005; Schreier & Pruegl, 2008). Lead users are ahead of a trend because they have personal unmet needs today that the average user will have tomorrow and comes up with innovative ideas to solve those needs (Schreier & Pruegl, 2008; Hienerth & Lettl, 2016). It has been found that lead users generally find out about new products and solutions earlier than the average user and that lead users tend to significantly benefit through the early adoption and use of new products (Franke & Shah, 2003). An additional indicator for being ahead of a trend is that lead users tend to act as test-sites for prototypes developed by manufacturers (Franke & Shah, 2003). What, Franke, von Hippel, & Schreier (2006) found is that lead user innovations tend to be commercially attractive due to the reason that lead users are ahead of a trend and express needs that may become general in a marketplace or market niche.

As indicated in the previous review, the 'high expected benefit' component predicts the likelihood of individuals to innovate. Recall that for user innovators, repeated personal experience leads to the recognition of an unmet personal. The unmet personal need acts as the motivator for users to come up with an innovative idea that has been built into an

innovation that benefits the user innovator by personally using it. Most of the definitions of social entrepreneurship agree on that social entrepreneurs come up with innovations or create something new. Therefore, of interest for this paper and what the proposed scale attempts to test is whether individuals, prior to becoming a social entrepreneur, followed the previous described process and were users in certain market domains that have been motivated to innovate because commercially available products could not satisfy personal unmet needs.

To be recognized as a lead user, individuals need to be ahead of a trend in a certain market domain. The 'ahead of a trend' component is of interest for the purpose of the present paper since social entrepreneurs aim to enhance societal value and therefore need to offer somethings that actually adds value to the lives of other people. Hence, innovations that are commercially attractive are required otherwise the added social value would be rather limited since the commercial attractiveness of an innovation indicates that others actually demand and need the innovation. The developed scale covers the 'ahead of a trend' component as well to be able to test whether social entrepreneurs that are user innovators come up with innovations that are likely to be commercially attractive.

Figure 1 visualized the theoretical relationship between the distinct concepts and its characteristics.

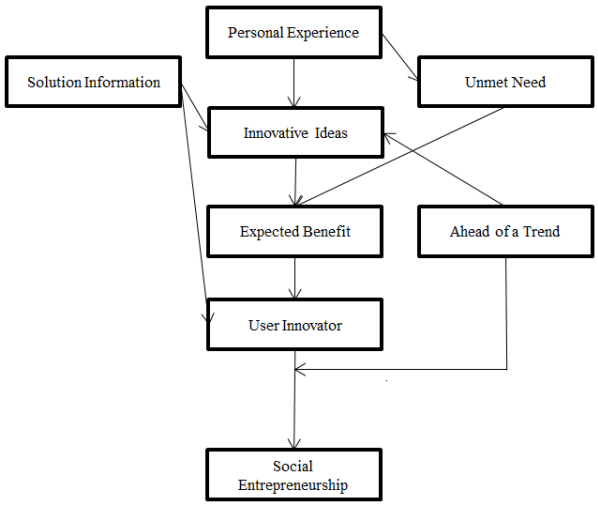

Figure 1: Conceptual model: Social user innovation

3.0 METHODS

This part of the paper discusses the methodology that is used to answer the research question. This research's aim is to propose a scale that can measure whether social entrepreneurs are lead users and followed the user innovation process. To approach the objective, lead user theory and user innovator theory have been analyzed on the premise to identify existing scales that are in a position to identify lead users among populations. Since existing research did not assess yet whether social entrepreneurs are lead users and followed the user innovation process, theoretical analogies (Figure 1) needed to be identified.

3.1 Research Design

This research sets the first steps for a descriptive research approach. Descriptive approaches investigate on characteristics of a particular individual or groups (Kothari, 2004). In a descriptive approach, the first step is to ensure that the research objective is sufficiently specified (Kothari, 2004). Then, an appropriate measurement needs to be determined to meet the research objective in a holistic manner. A commonly used method for collecting data is a measurement instrument in form of a scale that can operationalize the concepts under investigation (Kothari, 2004). Since this research solely provides the first steps of a descriptive approach, the research stops after an appropriate scale has been provided, which remains to be validated. By using existing theory of the concepts under investigation, boundaries for what the scale intends to measure can clearly be set and items can be selected or created based on the measurement goals (De Vellis, 2003). As introduced in the theory part and summarized in table 1, indicators that have been derived from existing literature serve as a guideline for item selection and modification to meet this study's objective.

The proposed measurement instrument to fulfill the research objective is divided into two sections. The first section is aimed to identify social entrepreneurs that are user innovators among the population. The second section is a summated rating scale to probe the underlying constructs (Santos, 1999), namely whether a respondent who self-identifies as a social entrepreneur and user innovator is also a lead user that has been triggered by personal experience to come up with innovative ideas.. A summated rating scale is a selection of multiple items to measure a construct (Spector, 1992) . Each item is measured quantitatively by attributing different scores to different answer possibilities. On each item, a respondent needs to give a rating of his extend of, for example agreement or disagreement, and items have no correct or wrong answer. Advantages of a summated rating scale are that it can have a good reliability and validity, a well-developed scale is usually fast and simple for respondents to answer and it requires solely a limited number, between 100 to 200 respondents for the initial development (Spector, 1992). Disadvantages of a summated rating scale are that respondents need to have a rather high literacy to understand the questions properly and a high level of statistical expertise is required to develop a good scale (Spector, 1992).

To come up with an appropriate scale, it is necessary to identify all relevant existing scales in the literature (Fink, 2014) that are in a position to identify lead users among user populations. Appendix I displays a list with existing articles that provide scales, the number of times those articles have been cited and the journal where they have been published. Since appendix I provides a list with 21 existing scales, criteria for scale selection need to be formulated to meet the research objective in the best possible manner. Among the 21 scales, several distinct approaches have been identified that correlate with the lead user construct and some of them happen to be valid to identify lead users among populations (Appendix II). Criteria for scale selection have been described in detail in the 'existing scale analysis' part of this paper. The chosen existing scales that measure the lead userness of individuals have been modified to come up with a scale that measures whether social entrepreneurs are lead user in a holistic manner.

3.2 Data Collection Process

To find existing scales that measure the lead userness of individuals, this paper used databases such as Google Scholar and the Web of Knowledge as initial sources. Entries such as

"lead user scales", 'lead user scales', 'identifying lead users', 'items lead users', and 'lead user measurement' have been used and sorted by relevance and recentness. Correspondingly, the first ten articles in the distinct databases with the distinct sorting mechanisms have been screened based on whether those articles provide scales that measure the lead userness of individuals. Articles that provided scales have been read and analyzed carefully based on their study context, objective and reported reliability and validity. Articles that did not provide scales have been discarded. Most of the time, articles that provide scales make cross-references to other articles that provide scales, hence, another source of existing scale identification could be identified, namely articles suggested by another article. In total, 21 articles that provide existing scales could be identified (Appendix I). Two articles provided in appendix I could not be further examined because they were not freely accessible or were not provided in the English language.

An analysis of social entrepreneurship literature serves two purposes, namely to find indicators that can identify social entrepreneurs and to make out analogies between the 'lead user' and 'user innovator' concept and the concept of social entrepreneurship. The components identified in lead user and user innovation literature have been used as reference points to find indications in social entrepreneurship literature that social entrepreneurs might be lead users. Google Scholar and the Web of Knowledge have been used as search databases.

3.3 Concepts and Operationalization

An important matter in scientific research is to introduce the concepts under investigation and defining the concepts boundaries (Spector, 1992). Concepts are underlying and unobservable aspects of reality (Dooley & Vos, 2009; Carmines & Zeller, 2014) which can be further divided into distinct components. Components are underlying factors that are distinct parts of the same concept. An operationalization of a construct aims to translate the construct into an observable and tangible form (Dooley & Vos, 2009). This can be achieved by means of assigning indicators to certain components.

The objective of this paper is to provide a measurement instrument that can yield first insights on whether social entrepreneurs are lead users and followed the user innovation process. To answer the research objective, existing scales need to be identified that are in a position to measure the concepts that have been introduced in the literature review and visualized in the conceptual model (Figure 1). The concepts under investigation are 'social entrepreneurship', 'user innovation', 'local information' and 'lead user characteristics'. Indicators to identify social entrepreneurs are that individuals pursue a social mission by means of an innovating or creating something new. The 'user innovator' concept is used in this study to identify individuals that have had an innovative idea and based on these ideas, built a product that has either been used solely for personal usage or has been used by other users as well. The 'lead user' concept is introduced to identity user innovators that develop promising user innovations. The concept consists of two components, namely 'expected benefit' and 'ahead of a trend'. Lastly, for the purpose of the present paper, it is of interest whether social entrepreneurs, if they can be identified as lead users, relied on 'local' information in the user innovation process. 'Local' information consist of two component, namely need and solution information. Whereas 'need' information is solely tested by whether the respondent has been triggered to come up with innovative ideas by repeatedly experiencing a problem or unmet need.

An overview of the concepts under investigation, its corresponding components, indicators and dimensions can be found in table 1.

Table 1: operationalization of the concepts

Concept/Code	Component/Characteristic	Indicators	Dimensions
1.0) Social entrepreneurship		-> Social objective -> Innovativeness	-> organization that particularly has social, environmental or community objective -> quantifying intentions (economic, societal or environmental value creation) -> creation of new product or service -> satisfying needs that cannot be satisfied by products offered on the market
2.0) User innovation		-> idea generation -> idea realization	-> Idea for solution in mind -> idea has been sketched ->user developed prototype or product for personal use -> user developed prototype or product for personal use and others are using product as well
3.0) 'Local' information	3.1) Need information	-> experience-related trigger	-> recognition of problem by personally experiencing it -> frequently experiencing problem
	3.2) Solution information	-> in-stock information -> non-in-stock information	-> solution information due to professional background -> solution information due to hobby -> solution information acquired by actively learning how to solve problem

4.0) Lead user characteristics	4.1) Expected benefit	-> dissatisfaction -> unmet needs -> expected personal usage benefit	-> dissatisfaction with products available on the market -> unmet needs that cannot be satisfied with currently available products -> expected benefit from early adoption and use of innovations
	4.2) Ahead of a trend	-> quick information gathering -> benefits through early adoption -> test-site for prototypes -> early need recognition / face needs earlier than others	->information about new products and solutions earlier than others -> significant personal benefit from early adoption of new products -> test prototypes for manufacturers -> improve and develop new products -> needs that others will have at a later point in time

3.4 Criteria for Existing Scale Evaluation and Selection

The first criterion that existing scales need to fulfill to come into consideration for modification to meet this research's objective is that existing scales need to measure what this paper intends to measure. By reviewing existing literature on the distinct concepts that are introduced in the methods part, several characteristics and corresponding indicators (Table 1) could be identified that need to be covered by the proposed scale (Fink, 2014). To ensure that all indicators are covered several requirements have been formulated. Existing scales are chosen for modification according to the extent to which they fulfill certain requirements that the developed scale of the present paper attempts to exhibit. Existing scales can only be taken into account when they contribute to the fulfillment of the formulated requirements.

Requirements that the scale that the present paper proposes needs to meet are the following. Firstly, the scale needs to identify social entrepreneurs by means of whether the respondent pursued a social objective by innovating or creating something new. Secondly, the scale needs to incorporate a measurement that identifies user innovators among the respondents. It is of interest to differentiate between respondents that are social entrepreneurs and user innovators and respondents that are not. If respondents can be identified as user innovators, the proposed scale needs to also measure whether respondents are lead users, since lead users are user innovators that develop innovations that are ahead of a trend and derive a personal benefit from the innovator (von Hippel E. , 1986). Even though, most user innovators are lead users (von Hippel E. , 2005), it is still important to ensure that respondents are actually lead users. This can be achieved by incorporating the original lead user characteristics, namely whether user innovators expect to benefit from their innovation and whether the innovators can be regarded as ahead of a trend. Each distinct part - social entrepreneurship, user innovator, and lead user characteristics - is divided into several indicators for the distinct concepts and its components (Table 1) which have been derived from the literature. Each indicator needs to be measured by one or several items to ensure that all the concepts are covered in a holistic manner.

To gain insights into whether social entrepreneurs relied on 'local' information in their social entrepreneurial process, the developed scale needs to incorporate items that measure to what extent social entrepreneurs derived need information through personal experience and solution information through their profession or a hobby.

If existing scales can be identified that measures what the research objective of the present paper proposes, the next step is to ensure to select the existing scale with the best available evidence of reliability and validity (Fink, 2014). Reliability of an indicator refers to the degree to which an experiment, test or measurement procedure produces consistent results on multiple trials (Carmines & Zeller, 2014; Fink, 2014). Validity is the degree to which an indicator measures what it intends to measure (Carmines & Zeller, 2014; Fink, 2014). An indicator can be referred to as being valid and reliable if it measures the underlying concept that it intends to measure in a consistent manner over multiple measurements.

To estimate the reliability of a scale, Carmines & Zeller (2014) propose four distinct methods. The most popular among those is the internal-consistency measured by the Cronbach's alpha. This test is typically used when a researcher is trying to determine if a number of individual items of a questionnaire all measure the same characteristic of the same construct (Carmines & Zeller, 2014; Fink, 2014). If all the items measure the same construct, they are going to be related and complement each other. The Cronbach's alpha is reflected on a scale from 0 to 1. The closer the value of the Cronbach's alpha to 1, the more reliable is the scale (Santos, 1999). If the Cronbach's alpha is above 0.7, the scale is considered to be adequate (Field, 2009). Existing scales can only come into consideration when the Cronbach's alpha levels at least exceed the threshold of 0.7 because otherwise it can statistically not be guaranteed that the items used in an existing scale are reliable.

The most precise measures are measures that have construct validity (Clark & Watson, 1995). Construct validity is concerned with the degree to which the empirical measurement can be placed in the theoretical context that it intends to measure (Cronbach & Meehl, 1955). A measure is construct valid if the performance of the measure is in line with expectations that this particular measure should yield. One way to assess construct validity is by conducting factor analysis. Factor analysis is a collective term that captures methods, such as confirmatory factor analysis, that deal with the explanation of correlations of variables, which have been

recognized in empirical data, concerning underlying factors (Cudeck, 2000; Hoyle, 2000).

4.0 RESULTS

The aim of the present paper is to propose a scale that is based on existing scales to measure whether social entrepreneurs are lead users and followed the user innovation process. The characteristics identifying user innovators that are lead users have been derived from literature and the most important concepts with its corresponding indicators have been summarized in table 1. Existing scales have been analyzed according to criteria mentioned in the methods part of this paper. What needs to be noted is that no existing scale could be identified that could be adopted without modification. This means that the check for reliability and validity of existing leas user scales is of minor importance but still reported in the following part. Table 2 introduces the proposed scale with its corresponding items that have been modified from existing scales and that operationalize the concepts under study in a holistic manner.

Table 1: The scale to measure whether social entrepreneurs are lead users

Concept	Measured Variables	Indicators & Items: Adopted or Modified	Measurement Instrument:	Source:
1.0) Social Entrepreneurship	1.1 Social Objective	Item 1: Social Objective: Adapt/ Modify: "Are you alone or with others with others, currently managing any kind of activity, organization, or initiative that has a particularly social, environmental or community objective? This might include providing products that help other people, using profits for socially-oriented purposes, organizing self-help groups for community action, etc"	Answer possibilities: - "Yes, currently owning-managing" - "No"	Lepoutre, Justo, Terjesen, & Bosma (2013)
	1.2 Innovativeness	Item 2: Social objective: Adapt/Modify: "Organizations may have goals according to the ability to generate economic value, societal value and environmental value. Please allocate a total of 100 points across these three categories as it pertains your goals."	Answer possibilities: - "percentage"	Lepoutre, Justo, Terjesen, & Bosma (2013)
		Item 3: Innovativeness: Adopt: "Is your activity, organization or initiative offering a new type of product or service"	Answer possibilities: - "Yes" - "No"	Lepoutre, Justo, Terjesen, & Bosma (2013)
		Item 4: Innovativeness: Adopt: "Is your activity, organization or initiative attending a new or so far unattended market niche or customer"	Answer possibilities: - "Yes" - "No"	Lepoutre, Justo, Terjesen, & Bosma (2013)
		Item 5: Innovativeness: Adopt: "Do you believe that if your activity, organization or initiative did not exist, your customer's needs would be served elsewhere in the market?"	Answer possibilities: - "Yes" - "No"	Lepoutre, Justo, Terjesen, & Bosma (2013)
2.0) User Innovator	2.1) Idea Generation	Item 6: Adapt/Modify: Have you ever had an idea for a new or improved product?	Answer possibilities: Yes/No	Luethje, Herstatt, & von Hippel (2005)
		Item 7: Adapt/Modify: How far have you developed your idea?	Answer possibilities: -> I have possible solutions in mind -> I have made concept descriptions/drawing -> I have built a new or improved product that is reliable enough so that I can use it -> Others and I are using new or improved products based on my innovation	Luethje, Herstatt, & von Hippel (2005)
3.0) 'Local' information	3.1) Need information	Item 8: Experience-related trigger: Adapt/Modify "How did you recognize the problem/need solved by your idea? Because of your personal experience or because you learned that other people experienced it?"	6-point rating scale: 1= because of my personal experience 6 = because other people experienced it	Luethje, Herstatt, & von Hippel (2005)
		Item 9: Experience-related trigger: Adopt "How did you recognize the problem/need? As a result of frequently repeated experience or as a result of a single incident?	6-point rating scale: 1 = very frequently repeated experience 6 = single incident	Luethje, Herstatt, & von Hippel (2005)
	3.2) Solution information	Item 10: In-stock information: Adapt/Modify "How did you obtain the information needed to develop your solution? I had it due to my professional background"	7-point rating scale: 1 = not at all true 7 = very true	Luethje, Herstatt, & von Hippel (2005)
		Item 11: In-stock information: Adapt/Modify "How did you obtain the information needed to develop your solution? I had it from a hobby"	7-point rating scale: 1 = not at all true 7 = very true	Luethje, Herstatt, & von Hippel (2005)
		Item 12: Non-in-stock information: Adapt/Modify "How did you obtain the information needed to develop your solution? I learned it to develop this idea"	7-point rating scale: 1 = not at all true 7 = very true	Luethje, Herstatt, & von Hippel (2005)

4.0) Lead User Characteristics	4.1) Ahead of a Trend	Item 13: Quick information gathering: Adopt "I usually find out about new products and solutions earlier than others"	7-point rating scale: 1 = very accurate 7 = not accurate at all	Franke & Shah (2000)
		Item 14: Benefits through early adoption: Adopt "I have benefited significantly by the early adoption and use of new products"	7-point rating scale: 1 = very accurate 7 = not accurate at all	Franke & Shah (2000)
		Item 15: Test-sites for prototypes Adopt "I have tested prototype versions of new products for manufacturers"	7-point rating scale: 1 = very accurate 7 = not accurate at all	Franke & Shah (2000)
		Item 16: Innovativeness: Adapt/Modify "I improved and developed new products to meet my personal needs"	7-point rating scale: 1 = very accurate 7 = not accurate at all	Franke & Shah (2000)
		Item 17: Early need recognition: Adapt/Modify "Products available on the market today finally respond to needs that I have expressed for a long time"	5-point rating scale: 1 = very accurate 5 = not accurate at all	Vernette, Bej-Becheur, Gollety, & Hamdi-Kidar (2014)
	4.2) Expected Benefit	Item18: Dissatisfaction: Adapt/Modify "I was dissatisfied with some pieces of commercially available products"	5-point rating scale: 1 = strongly disagree 5 = strongly agree	Franke, von Hippel, & Schreier (2006)
		Item 19: Unmet need: Adapt/Modify " I had problems that could not be solved with the manufacturer's conventional offerings"	5-point rating scale: 1 = strongly disagree 5 = strongly agree	Franke, von Hippel, & Schreier (2006)
		Item 20: Dissatisfaction: Adapt/Modify "In my opinion, there are still unresolved problems with products"	5-point rating scale: 1 = strongly disagree 5 = strongly agree	Franke, von Hippel, & Schreier (2006)
		Item 21: Expected personal usage benefit: Adapt/Modify "I am constantly searching for improved products that solve my problems"	5-point rating scale: 1 = strongly disagree 5 = strongly agree	Franke, von Hippel, & Schreier (2006)
		Item 22: Dissatisfaction: Adapt/Modify I often get irritated about the lack of sophistication of certain pieces of products	5-point rating scale: 1 = strongly disagree 5 = strongly agree	Franke, von Hippel, & Schreier (2006)

4.1 Analysis of Modified Scales

4.1.1 Social entrepreneurship

Recall from the literature review that despite many years of research, many distinct definitions of the concept of social entrepreneurship exist. What most scholars agreed on is that social entrepreneurs strive for pursuing a social objective by means of innovating or creating something new. Therefore, the indicators used in this paper to operationalize the concept social entrepreneurship based on the intention to identify social entrepreneurs, are the pursuing of a social objective and the aspect of innovativeness. The items that have been chosen to identify social entrepreneurs are based on face-to-face interview questions provided by Lepoutre, Justo, Terjesen, & Bosma (2013).

Whether respondents pursue a social objective is measured based on two items, item 1 and item 2 (Table 2). The first item measures whether respondents self-identify as being involved in any kind of social activity. The second item intents to examine which goals respondents follow. Respondents are asked to distribute 100 points to three objectives that their organization may follow, namely social, environmental and economic. All respondents that indicate at the first item that they are involved in social entrepreneurial activities and/or indicate at the second item that their primary organizational objective is to either accomplish a social or environmental goal (rating higher on these aspects than on economic) can be considered as potential social entrepreneurs. The second indicator, namely the innovativeness of the product or service that the respondent offers is measured based on item 3, item 4 and item 5 (Table 2). Respondents that agree to any of these three items are considered to be innovative.

4.1.2 User Innovator & 'Local' Information

To achieve this study's objective, the first step to identify whether social entrepreneurs are lead users is to find out if respondents are user innovators. User innovators are characterized by developing innovations that have the primary intention to personally benefit the user innovator (von Hippel, 2005).

Prior to becoming a user innovator, individuals need to come up with innovative ideas for innovations. To identify user innovators among social entrepreneurs, this paper modifies items proposed by Luethje, Herstatt, & von Hippel (2005). If modified, the items provided by the authors meet the requirements concerning user innovation formulated in the previous part, since the scale is in a position to differentiate between user innovators and non-user innovators among the respondents. Whether respondents are user innovators is measured based on item 6 and item 7 (Table 2). Item 6 is aimed to figure out whether respondents had ideas for new or improved products themselves. Item 7 measures how far an idea for a new or improved product has been realized. If item 6 can be answered positively by respondents and if respondents indicate by answering item 7 that they have built a new or improved product for personal usage or that the user himself or herself and other people adopted the innovation, the respondent can be regarded as a user innovator.

Recall from the theory part that social bricoleurs are in a unique position, due to local knowledge, to identify and enhance social needs (Zahra, Gedajlovic, Neubaum, & Shulman, 2009). Users that innovate are expected to rely on 'local' information if the intention to innovate is to personally benefit (Luethje, Herstatt, & von Hippel, 2005).Consequently, it is of interest to assess the impact of 'local' information on a respondent's innovative idea and its corresponding innovation since when respondents relied on 'local' information, especially on need information, it can be expected that the primary incentive to innovate has been to derive a personal benefit (Luethje, Herstatt, & von Hippel, 2005).

The only scale that could be identified among the 21 scales revealed by the literature review that measures 'local' need information based on items that examine to what extend a user innovator has been trigged by repeated personal experience to come up with an innovative idea to satisfy a personal unmet need is the scale provided by Luehtje, Herstatt, & von Hippel

(2005). The same authors also provided a scale that is aimed to gather information about required solution information. As indicated in Table 2, Item 19 and Item 20 measure whether respondents derived required need information to recognize an unmet need from repeatedly personally experiencing a problem. If respondents indicate that they have repeatedly and personally experienced a problem or need, it can be derived that, if the respondent came up with an innovative idea, the idea was aimed to solve a personal unmet need. Respondents that affirm item 21 and item 22 have solved their problem by relying on solution information that has been in-stock prior to innovating.

4.1.3 Lead Users Characteristics

Recall from the theory part that lead users are the kind of users that develop attractive user innovations (von Hippel E. , 1986). In most of the cases user innovators are lead users (von Hippel E. , 2005). However, since not all user innovators are lead users and since research has not been conducted yet that measures whether user innovators become social entrepreneurs, it is required to assure that respondents are not only user innovators but also lead users to answer the research question. Lead users expect to benefit from an innovation and they are ahead of a trend (von Hippel E. , 1986; 2005).

4.1.3.1 'Expected Benefit'

Recall from the theory part that individuals that have a personal unmet need and that are dissatisfied with products available on the market have an incentive to innovate based on the expectation to benefit from the innovation. As Franke, von Hippel, & Schreier (2006) found the 'expected benefit' component predicts the likelihood of individuals to innovate. Since social entrepreneurship is characterized by innovation or the creation of something new, it is of interest to assess whether the urge for social entrepreneurs to innovate originated from an unmet personal need and dissatisfaction with products currently available on the market.

This paper modifies five items proposed by Franke, von Hippel, & Schreier (2006) to measure the expected benefit component. Items proposed by these authors have been chosen and modified (Table 2) because these items, if modified, are tailored to the indicators (Table 1) of the expected benefit component that have been derived from the literature and fit the study context of the present paper.

The researchers have developed and validated the scale in the context of European kite surfers. Hence, it might be questionable to modify items that have been developed for such a target respondent group. However, several articles (Schreier, Oberhauser, & Pruegl, 2007; Schreier & Pruegl, 2008; Kratzer & Lettl, 2009) in distinct contexts that have used and validated a measure to identify lead users among user populations build on the scale proposed by Franke, von Hippel, & Schreier (Franke, von Hippel , & Schreier, 2006), which indicates that the scale is a strong measure that can, if modified, be applied to distinct contexts. Additionally, the Cronbach's alpha of the original scale for the 'expected benefit' component is sufficiently large (Cronbach's alpha = 0.84), which indicates that, in the original scale, all items that are intended to measure the 'expected benefit' component are actually measuring it. Construct validity has been verified by means of a confirmatory factor analysis, which revealed satisfying results (Appendix III: GFI = 0.92; AGFI = 0.90; = CFI = 0.96; IFI = 0.95; TLI = 0.95; RMSEA = 0.05).

Item 18, 20 and 22 (Table 2) measure whether respondents have been dissatisfied with commercially available products and item 19 measures whether respondents had an unmet need that could not be satisfied by products available on the marketplace. Item 21 (Table 2) implies the respondent's expected usage benefit from innovations in general. The more a respondent agrees to these items, the more a respondent has been dissatisfied with products available on the market, the more bothers a respondent an unmet need that cannot be solved with products available on the market and the higher is the expected usage benefit from innovations.

4.1.3.2 'Ahead of a Trend'

Recall from the theory part that an innovation that is not commercially attractive is unlikely to add societal value to the lives of other people. As found by Franke, von Hippel, & Schreier (2006), the 'ahead of a trend' component indicates the commercial attractiveness of the innovation.

To measure whether respondents are ahead of a trend, four items proposed by Franke & Shah (2003) and one item proposed by Vernette, Bej-Becheur, Gollety, & Hamdi-Kidar (2014) have been modified. Most importantly, those items, if modified (Table 2), are in a position to operationalize the 'ahead of a trend' component based on indicators (Table 1) that have been derived from the literature and that fit the study context of the present paper.

Franke & Shah (2003) conducted a research to investigate how innovators among sport enthusiasts gather innovation related information and resources. The Cronbach's alpha for the 'being ahead of a trend' component measures 0.81, which clearly surpasses the 0.7 threshold. The construct validity of the scale has not been tested by any means of statistical tests, however, the results concerning the strong difference between innovator and non-innovators can be interpreted as a construct validation (Appendix III). The scale proposed by Vernette, Bej-Becheur, Gollety, & Hamdi-Kidar (2014) has been tested and validated in several distinct consumer markets. The Cronbach's alpha of the entire scale is sufficiently large (Cronbach's alpha = between 0.8 – 0.9) and confirmatory factor analysis reveals satisfying results (Appendix III).

As introduced in table 2, item 13 measures whether respondents gather information about new products and solution faster than others do. This item indicates the general interest in products that are at the leading edge of a market. Item 14 measures whether respondents, in general have personally benefited through the early adoption and use of new product. Item 15 indicates whether the social entrepreneur has had experience with products that aimed to cover the demand of an average consumer in a market niche prior to the release of the accumulated product. Item 16 measure the respondent's willingness to develop innovative solutions. This item gives indication on whether the social entrepreneur has an innovative personality. Item 17 indicates whether the respondent recognizes needs early that cannot be met with products available on the market.

5.0 DISCUSSION & CONCLUSION

The objective of the present paper was to propose a measurement instrument that is in a positon to figure out whether social entrepreneurs are lead users to shed more light into the antecedents of social entrepreneurship and into what motivates social entrepreneurs to pursue social entrepreneurial

activities. The following research question has been formulated to achieve the objective:

What existing scales can be modified to identify lead user innovation characteristics among social entrepreneurs?

The requirements that the proposed scale needs to fulfill are to clearly identify social entrepreneurs and differentiate between respondents that are user innovators and that are not. If respondents are identified as social entrepreneurs that are user innovators, the research objective can be met by modifying items of existing scales that are in a position to measure whether respondents are lead users.

The research question has been answered and the stated requirements have been fulfilled to a certain extent by the scale that the present paper has proposed. The proposed scale is in a position to identify social entrepreneurs that started off as user innovators and are lead users. No scale could be adopted without modification.

To identify social entrepreneurs, items have been proposed that find its origins in face-to-face interview questions provided by Lepoutre, Justo, Terjesen, & Bosma (2013) that are based on the common denominators among social entrepreneurship definitions, namely to provide social value by means of innovation or the creation of something new. To differentiate between user innovators and others, several items that find its origins in Luethje, Herstatt, & von Hippel (2005) have modified. User innovators among the target respondents can be identified by modified items that aim to find out whether repeated personal experience led to the identification of a personal unmet need and in turn has triggered an innovative idea that has been built into a prototype with the mainly intention to benefit the user innovator. When respondent can be identified as social entrepreneurs and user innovators, additional items have been included to find out whether social entrepreneurs are lead users based on the original lead user characteristics developed by von Hippel (1986). Items that have been modified find its origins in scales provided by Franke, von Hippel, & Schreier (2006), Franke & Shah (2003) and Vernette, Bej-Becheur, Gollety, & Hamdi-Kidar (2014). Concerning the 'ahead of a trend' component of the lead user definition, modified items measure the extent to which respondents face needs earlier than others, benefited through the early adoption of innovations, acted as test sites for prototypes and how fast respondents gather information. Regarding the 'expected benefit' component, modified items measure the degree to which respondents have experienced personal unmet needs, the degree to which respondents have been dissatisfied with commercially available products and whether respondents expected a personal usage benefit from innovations.

As previously mentioned, the proposed scale presented in this paper focuses on modifying items from existing scales that aim to measure the original lead user characteristics. Alternatives to this approach would be to measure the lead userness of individuals based on other characteristics that scholars have found to be in a positon to identify lead users among user population. For example, other concepts would be 'opinion leadership' of individuals (Ozer, 2009; Spann, Ernst, Skiera, & Soll, 2009) and the 'locus of control' (Schreier & Pruegl, 2008) (Appendix II). However, by reviewing items that have been used to measure those concepts, it became clear that they deviate from the indicators (Table 1) that form the guidance for item modification to achieve the present paper's objective and that those characteristic deviate from the original lead user characteristics proposed by von Hippel (1986) to identify attractive user innovations.

5.1 Limitations

The scale proposed by the present paper does not come without its limitations. Items to identify social entrepreneurs originated from face-to-face interview questions developed by Lepoutre, Justo, Terjesen, & Bosma (2013). Hence, the interview questions are handled as an exploration of survey questions. To distinguish between user innovators and non-user innovators, items have been modified from a scale proposed by Luethje, Herstatt, & von Hippel (2005) that has been put to practice in a distinct context and the authors that built the scale did not report reliability and validity of the scale. Items measuring the two lead user components stem from distinct scales and not all items that those distinct scales propose have been modified, some have been discarded. Since current research did not develop a scale that measures whether social entrepreneurs are lead users, all items that have been modified from existing scales originate from scales that have been developed for different contexts. Therefore, in order to use the developed scale for further research, statistical measurements remain to be conducted to ensure the reliability and validity of the scale. Statistical measurements exceed the frame of the present paper. Additionally, most of the items that have modified to measure 'local' information, the 'expected benefit' component and the 'being ahead of a trend' component are stated either in the simple past tense or present perfect to measure retrospectively whether social entrepreneurs have been influenced by lead user characteristics. In other words, the items attempt to identify what the respondent's perception concerning commercially available products was prior to innovating. Question that have been formulated in the past tense may bear some biases due to the reason that respondent are asked to remember what has had influence on their behavior in the past and not in the present.

5.2 Future Research Recommendations

This paper proposes a scale that is based on modified items provided by existing scales. Further research is needed that pilot tests the proposed scale to ensure that the items are reliable and valid to measure the concepts under study. When the pilot study reveals satisfying results, it is recommended to send the developed scale to a large array of target respondents and gather more data on whether social entrepreneurs are lead users. After conducting empirical research with the proposed scale, generalizations about whether social entrepreneurs are lead users can be derived to shed more light into the antecedents of social entrepreneurship and to possible identify another pathway that lead users take when they decide to commercialize their innovations, namely the social entrepreneurial pathway.

Additionally, if it can be empirically justified that social entrepreneurs are lead users based on the original lead user characteristics proposed by von Hippel (1986) , further research is invited to measure whether additional variables that have been found in the literature (Appendix II) and that are associated to have influence on the pathway that user innovators take have influence on whether an user innovator decides to take a social entrepreneurial pathway.

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Appendix:

I Literature review: Existing scales lead user

Title	Author	Year	Where to find	Published in	Cited by:
Finding commercially attractive user innovations: A test of Lead-User Theory	Franke, von Hippel, & Schreier	2006	Google Scholar	The Journal of Product Innovation Management	604
The "right" consumers for better concepts: Identifying consumers high in emergent nature to develop new product concepts	Hoffman, Kopalle, & Novak	2010	Google Scholar	Journal of Marketing Research	87
Determinants of user innovation and innovation sharing in a local market	Morrison, Roberts, & von Hippel	2000	Google Scholar	Management Science	633
Extending lead user theory: Antecedents and consequences of consumer lead userness	Schreier & Pruegl	2008	Google Scholar	The Journal of Product Innovation Management	226
Lead user analysis for the development of new industrial products	Urban & von Hippel	1988	Google Scholar	Informs – Institute for Operations Research and the Management Sciences	1201
Distinctive roles of lead users and opinion leaders in the social network of schoolchildren	Kratzer & Lettl	2009	Google Scholar	Journal of Consumer Research	101
How communities support innovative activities: An exploration of assistance and sharing among end-users	Franke & Shah	2003	Google Scholar	Research Policy	1258
The social network position of lead users	Kratzer, Lettl, Franke, & Goor	2016	Google Scholar	The Journal of Product Innovation Management	6
User-innovators and 'local' information: The case of mountain biking	Luethje, Herstatt, & von Hippel	2005	Suggest by another article	Research Policy	434
Towards a finer understanding of lead users	Morrison, Roberts, & Midgley	1999	Suggest by another article	ISBM Report 15 – 1999; Institute for the Study of Business Markets	16
The nature of lead users and measurement of leading edge status	Morrison, Roberts, & Midgley	2004	Web of Knowledge	Research Policy	326
Co-creation with consumers: Who has the competence and wants to cooperate?	Vernette & Hamdi-Kidar	2013	Google Scholar	International Journal of Market Research	32

Characteristics of innovating users in a consumer goods field: An empirical study of sport-related product consumers	Luethje	2004	Suggest by another article	Technovation	526
Finding commercially attractive user innovations: An exploration and test of 'lead user' theory–WP	Franke & von Hippel	2003	Suggested by another article	Working Paper No. 4402 - 03 – MIT Sloan School of Management	17
Who is at the cutting-edge of market trends? Development of a scale for identifying 'lead users'	Mujika-Alberdi, Gibaja-Martins, & Garcia-Arrizabalaga	2015	ScienceDirect (cannot be accessed)	Cuadernos de Economia	-
The role of lead users in knowledge sharing	Jeppesen & Laursen	2009	Suggested by another article	Research Policy	87
The roles of product lead-users and product experts in new product evaluation	Ozer	2009	Suggested by another article	Research Policy	47
Identification of lead users for consumer products via virtual stock markets	Spann, Ernst, Skiera, & Soll	2006	Suggested by another article	The Journal of Product Innovation Management	103
Lead-users in marketing: Questions and new psychometric contributions	Vernette, Beji-Becheur, Gollety, & Hamdi-Kidar	2014	Suggested by another article	Recherche et Applications en Marketing (English Edition)	2
Opinion leadership amongst leading edge users	Morrison, Roberts, & Midgley	2000	Suggested by another article	Australasian Marketing Journal	40
Lead users and the adoption and diffusion of new products: Insights from two extreme sports communities	Schreier & Oberhauser	2007	Suggested by another article	Marketing Letters	160
Validation d'une echelle de mesure du profil de lead user	Becheur & Gollety	2006	Suggested by another article	Revue Francaise du Marketing	20

II Additional concepts and variables related to the lead user concept

Variables	Sources
➔ Expected benefit	a) Franke, von Hippel, & Schreier (2006) b) Urban & von Hippel (1988) c) Franke & Shah (2003) d) Spann, Ernst, Skiera, & Soll (2009)
➔ Ahead of a trend	a) Franke, von Hippel, & Schreier (2006) b) Urban & von Hippel (1988) c) Franke & Shah (2003)
➔ Technical Expertise	a) Franke, von Hippel, & Schreier (2006)
➔ Community based resources	a) Franke, von Hippel, & Schreier (2006)
➔ Lead userness	a) Hoffman, Kopalle, & Novak (2010) b) Schreier & Pruegl (2008) c) Kratzer & Lettl (2009) d) Kratzer, Lettl, Franke, & Goor (2016) e) Vernette & Hamdi-Kidar (2013) f) Ozer (2009) g) Vernette, Beji-Becheur, Gollety, & Hamdi-Kidar (2014)
➔ Leading edge status	a) Morrison, Roberts, & von Hippel (2000) b) Morrison, Roberts, & Midgley (1999) c) Morrison, Roberts, & Midgley (2000) d) Morrison, Roberts, & Midgley (2004) e) Jeppesen & Laursen (2009) f) Schreier & Oberhauser (2007)
➔ Consumer knowledge	a) Schreier & Pruegl (2008)
➔ Use experience	a) Schreier & Pruegl (2008)
➔ Locus of control	a) Schreier & Pruegl (2008)
➔ Innovativeness	a) Schreier & Pruegl (2008)
➔ Experience related trigger	a) Luethje, Herstatt, & von Hippel (2005)
➔ Knowledge information sources	a) Luethje, Herstatt, & von Hippel (2005)
➔ Opinion leadership	a) Morrison, Roberts, & Midgley (2000) b) Spann, Ernst, Skiera, & Soll (2009) c) Schreier & Oberhauser (2007)
➔ Organizational dispositional innovativeness	a) Morrison, Roberts, & Midgley (2004)
➔ Time in community	a) Franke & Shah (2003)
➔ Role in community	a) Franke & Shah (2003)
➔ Expertise	a) Spann, Ernst, Skiera, & Soll (2009)
➔ Opinion seeking	a) Schreier & Oberhauser (2007)
➔ Domain-specific innovation	a) Schreier & Oberhauser (2007)
➔ Perceived complexity	a) Schreier & Oberhauser (2007)

III Analysis and evaluation of modified scales

Context	Objective	Reliability	Validity	Measurement Instrument	Source
Kite surfers	Analyzing relationship between commercial attractiveness of user innovation and to what extend user innovators display lead user characteristics	Expected benefit: Cronbach's alpha: = 0.84 Ahead of trend: Cronbach's alpha: = 0.91 Technical expertise: Cronbach's alpha = 0.82 Community based resources: Cronbach's alpha = 0.88	*CFA:* GFI = 0.92 AGFI = 0.90 TLI = 0.95 CFI = 0.96 IFI = 0.95 RMSEA = 0.05	Personal benefit: 6-item rating scale Ahead of Trend: based on index Technical expertise: 6-item rating scale Community based resources: 6-item rating scale	Franke, von Hippel, & Schreier (2006)
User-developed innovations In mountain bike equipment	Examine the specificity with which innovations developed by user-innovators address their in-house needs by comparing characteristics of a sample of user-developed innovations in mountain biking equipment with the direct need experience of the user developing them	Experience related trigger of user innovations: Cronbach's alpha = N/A Knowledge information source: Cronbach's alpha = N/A	-	Experience related trigger of user innovations: 2-item rating scale Knowledge information source: 3-item rating scale	Luethje, Herstatt, & von Hippel (2005)

Sailplaning, bordercross , snowboarding, handicapped cyclists and canyoning communities	Measure innovation-related activities of sport-enthusiasts; how innovators obtain information and assistance	Personal benefit: Cronbach's alpha = 0.64 Ahead of a trend: Cronbach's alpha = 0.81 Time in community: Cronbach's alpha = N/A Role in community: Cronbach's alpha = N/A	Two-tailed t-test for independent samples indicates strong differences between innovators and non-innovators.	Personal benefit: 2-item rating scale Ahead of a trend: 5-item rating scale Time in community: 3-item count data Role in community: 3-item rating scale	Franke & Shah (2003)
French population for three products and video game co-creation, and several product categories	Develop a new measure (scale) to identify lead users	Lead userness: Study 2: Cronbach's alpha = between 0.8 and 0.9 (depending on the studies and products)	Study 2: *CFA: (cakes)* GFI = 0.99 AGFI = 0.99 RMR = 0.024 NFI = 0.99 *CFA: (drinks)* GFI = 0.99 AGFI = 0.99 RMR = 0.025 NFI = 0.99 *CFA: (yoghurt)* GFI = 0.99 AGFI = 0.99 RMR = 0.020 NFI = 0.99	Lead userness: Study 1 and 2 (same scale): 4-item rating scale Study 3 (different scale): 4-item rating scale	Vernette, Beji-Becheur, Gollety, & Hamdi-Kidar (2014)

IV Original existing scales that have been modified

User Innovation: (Source) Luethje, Herstatt, & von Hippel (2005)

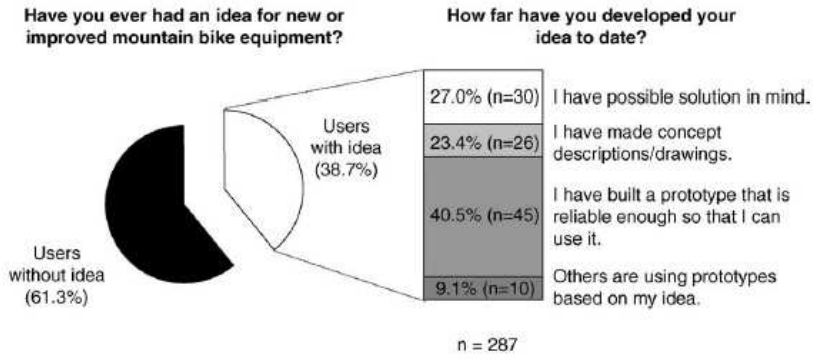

Fig. 1. Frequency of idea and prototype generation by serious mountain bikers.

'Local' Information: (Source) Luethje, Herstatt, & von Hippel (2005)
a) Experience-related trigger:

Experience-related triggers of user innovations

	Mean	Median	Percentage of users
"How did you recognize the problem/need solved by your idea? Because of your personal experience or because you learned that other riders experienced it?"[a]	2.15	2	84.5% rather personal experiences
"How did you recognize the problem/need? As a result of frequently repeated experience or as a result of a single incident?"[b]	2.07	2	87.3% rather frequently repeated experience

$n = 110$.
[a] Measured on 6-point-rating-scale (1 = because of my personal experiences; 6 = because other riders experienced it).
[b] Measured on 6-point-rating-scale (1 = very frequently repeated experience; 6 = single incident).

b) Solution information:

How did you obtain the information needed to develop your solution?

	Mean	Median	Very high or high agreement (%)
"I had it due to my professional background."	4.22	4	47.5
"I had it from mountain biking or another hobby."	4.56	5	52.4
"I learned it to develop this idea."	2.11	2	15.6

$n = 61$; all responses were measured on a 7-point-rating-scale (1 = not at all true; 7 = very true).

Lead user characteristics:

a) 'Ahead of a trend': (Source) Franke, von Hippel, & Schreier (2006)

Construct	Items[a]	Item-to-Total Correlation	Cronbach's Alpha	Explained Variance of First Extracted Factor (%)
High Benefit Expected (HBE) ($n = 30$)	HBE 1: While kite surfing, I am often confronted with problems that cannot be solved by kite-surfing equipment available on the market.	0.71	0.88	54.55
	HBE 2: The equipment available in kite-surfing stores is sufficient for my needs.[b]	0.51		
	HBE 3: I am dissatisfied with some pieces of commercially available equipment.	0.78		
	HBE 4: I have already had problems with my equipment that could not be solved with the manufacturer's conventional offerings.	0.81		
	HBE 5: In my opinion, there are still unresolved problems with kite-surfing equipment.	0.68		
	HBE 6: I am constantly searching for improved kite-surfing equipment.[b]	0.45		
	HBE 7: I have needs related to kite surfing that are not covered by the products currently offered on the market.	0.64		
	HBE 8: I often get irritated about the lack of sophistication in certain pieces of kite-surfing equipment.	0.55		
Technical Expertise (TE) ($n = 30$)	TE 1: I can repair my own equipment.	0.61	0.88	55.55
	TE 2: I always try to keep up to date with regard to the materials, innovations, and possibilities with regard to my equipment.[b]	0.53		
	TE 3: I can help other kite surfers solve problems with their equipment.	0.74		
	TE 4: I am handy and enjoy tinkering.	0.73		
	TE 5: I can make technical changes to my kite-surfing equipment on my own.	0.82		
	TE 6: I am a huge fan of the technical aspects of this area.[b]	0.76		
	TE 7: I come from a technical background in my profession or education (e.g., engineering).[b]	0.50		
Community-Based Resources (CR) ($n = 28$)	CR 1: If I wanted to make changes to my equipment, I would know enough people who could help me do so.	0.71	0.90	68.35
	CR 2: When I encounter technical problems, I know exactly who to ask for advice.	0.63		
	CR 3: I know kite surfers who are capable of repairing their own equipment.	0.83		
	CR 4: I know many kite surfers who have a thorough knowledge of kite-surfing equipment.	0.85		
	CR 5: In my surroundings, I can find people who possess all of the abilities I would require to make improvements to kite-surfing equipment.	0.64		
	CR 6: If I were to make changes to my kite-surfing equipment, I could count on getting positive feedback about the changes from my fellow kite surfers.	0.76		

b) 'Expected benefit': (Source) Franke & Shah (2003)

Innovators vs. non-innovators

Characteristic	Innovator[a]	Non-innovator[b]	Difference (*P*-value)[c]
Lead user characteristics (1): being ahead of the trend[d]			
I usually find out about new products and solutions earlier than others	2.71	4.03	<0.001
I have benefited significantly by the early adoption and use of new products	3.58	4.34	<0.01
I have tested prototype versions of new products for manufacturers	4.94	5.65	<0.05
In my sport I am regarded as being on the "cutting edge"	4.56	5.38	<0.01
I improved and developed new techniques in boardercrossing	4.29	5.84	<0.001
Lead user characteristics (2): high benefit from innovation[d]			
I have new needs which are not satisfied by existing products	3.27	4.38	<0.001
I am dissatisfied with the existing equipment	3.90	5.13	<0.001
Time in community			
Years as a community member	4.46	3.17	<0.01
Days per year spent with community members	43.07	32.73	<0.05
Days per year spent participating in the sport	72.48	68.71	n.s.
Role in community[d]			
I am a very active member of the community	2.85	3.82	<0.01
I get together with members of the community for activities that are not related to the sport (movies, dinner parties, etc.)	3.39	4.14	<0.05
The community takes my opinion into account when making decisions	2.89	3.61	<0.05

[a] All values are means; $n = 60$.
[b] All values are means; $n = 129$.
[c] Two-tailed *t*-tests for independent samples.
[d] Seven-point rating scale: 1 very accurate; 7 not accurate at all.

'Expected benefit': (Source) Vernette, Bej-Becheur, Gollety, & Hamdi-Kidar (2014)

Evaluation of the content validity of the lead-user scale.

Essential characteristics of the lead-user concept	Items of the final scale
(1) **Disatisfaction** with products currently available on the market	Item 1: I have already expressed one or several specific expectations for … long before the people around me
(2) Expectations and **strong anticipated benefits** for products that would resolve problems encountered	Item 3: The … available on the market today finally respond to needs that I have expressed for a long time
(3) **Needs** that are **precursors** to future market trends	Item 2: I have already had ideas for improving the … that have subsequently been taken up by a lot of manufacturers Item 3: The … available on the market today finally respond to needs that I have expressed for a long time
(4) **Innovative ideas** for solutions able to satisfy these needs	Item 2: I have already had ideas for improving the … that have subsequently been taken up by a lot of manufacturers Item 4: My ideas for new … are innovative compared to what manufacturers currently propose

Social Entrepreneurship: (Source) Lepoutre, Justo, Terjesen, & Bosma (2013)

GEM adult population survey questions on social entrepreneurial activity

Question number	Question objective	Question	Answers
1	Explicit social enterprise	Are you, alone or with others, currently trying to start or currently owning and managing any kind of activity, organization or initiative that has a particularly social, environmental or community objective? This might include providing services or training to socially deprived or disabled persons, using profits for socially-oriented purposes, organizing self-help groups for community action, etc.	Yes, currently trying to start/Yes, currently owning-managing/Yes, currently trying to start and owning-managing/No/Don't know/Refused
2	Actual involvement	Over the past 12 months have you done anything to help start this activity, organization or initiative, such as looking for equipment or a location, organizing a start-up team, working on a business plan, beginning to save money, or any other activity that would help launch an organization?	Yes/No/Don't know/Refused
3	Determine potential overlap between social and regular activities in 'regular' business activity	Can I check, is this activity, organization or initiative the same one that you described in detail earlier, or is it a different one?	Same/Different/Don't know/Refused
4	Revenue sources (1)	Will any of the revenue for this activity, organization or initiative come from income, for example, through sales of products or charging for services? (nascent enterprise)	Yes/No/Don't know/Refused
		Does any of the revenue for this activity, organization or initiative come from income, for example, through sales of products or charging for services? (new or established enterprise)	
5	Revenue sources (2)	What percentage of total income will come from the sale of products or services? (nascent enterprise)	Percentage/Don't know/Refused
		What percentage of total income comes from the sale of products or services? (new or established enterprise)	
6	Economic, societal and environmental value	Organizations may have goals according to the ability to generate economic value, societal value and environmental value. Please allocate a total of 100 points across these three categories as it pertains to your goals. For example, an organization's goals may allocate 80 points for economic value, 10 points for societal value, and 10 points for environment value.	Percentage/Don't know/Refused
		How many points for economic value?	
		And how many points for societal value?	
		And, finally, how many points for environmental value?	

Question number	Question objective	Question	Answers
7	Innovation	Is your activity, organization or initiative offering a new type of product or service?	Yes/No/Don't know/Refused
		Is your activity, organization or initiative offering a new way of producing a product or service?	
		Is your activity, organization or initiative offering a new way of delivering a product or service?	
		Is your activity, organization or initiative offering a new way of promoting or marketing a product or service?	
		Is your activity, organization or initiative attending a new or so far unattended market niche or customer?	
		Do you believe that if your activity, organization or initiative did not exist, your customers' needs would be served elsewhere in the market?	
8	Part of daily job or not	Is this intended activity, organization or initiative your daily job, part of your daily job, or outside your daily job?	Daily job/Part of daily job/Outside daily job/Don't know/Refused
9	Beginning of actual activity	What was the first year the activity, organization or initiative provided services to others, or received external funding?	Year/No payments yet/Don't know/ Refused
10	Activity type	What kind of product or service will be provided by the activity, organization or initiative you are trying to start?	Qualitative indication
11	Organization size	Right now how many people, not counting the owners but including subcontractors, part-time workers and volunteers, are working for this activity, organization or initiative?	Numbers/Don't know/Refused
		And how many of these people are working as volunteers?	
		And how many of these people are working part-time?	
		How many people will be working for this activity, organization or initiative, not counting the owners but including part-time workers, volunteers or subcontractors, when it is 5 years old?	
12	Impact measurement	Are you indeed measuring or planning to measure the impact along these three categories?	Currently measuring/Planning to measure in the future/ Not currently measuring or planning to measure/Don't know/Refused