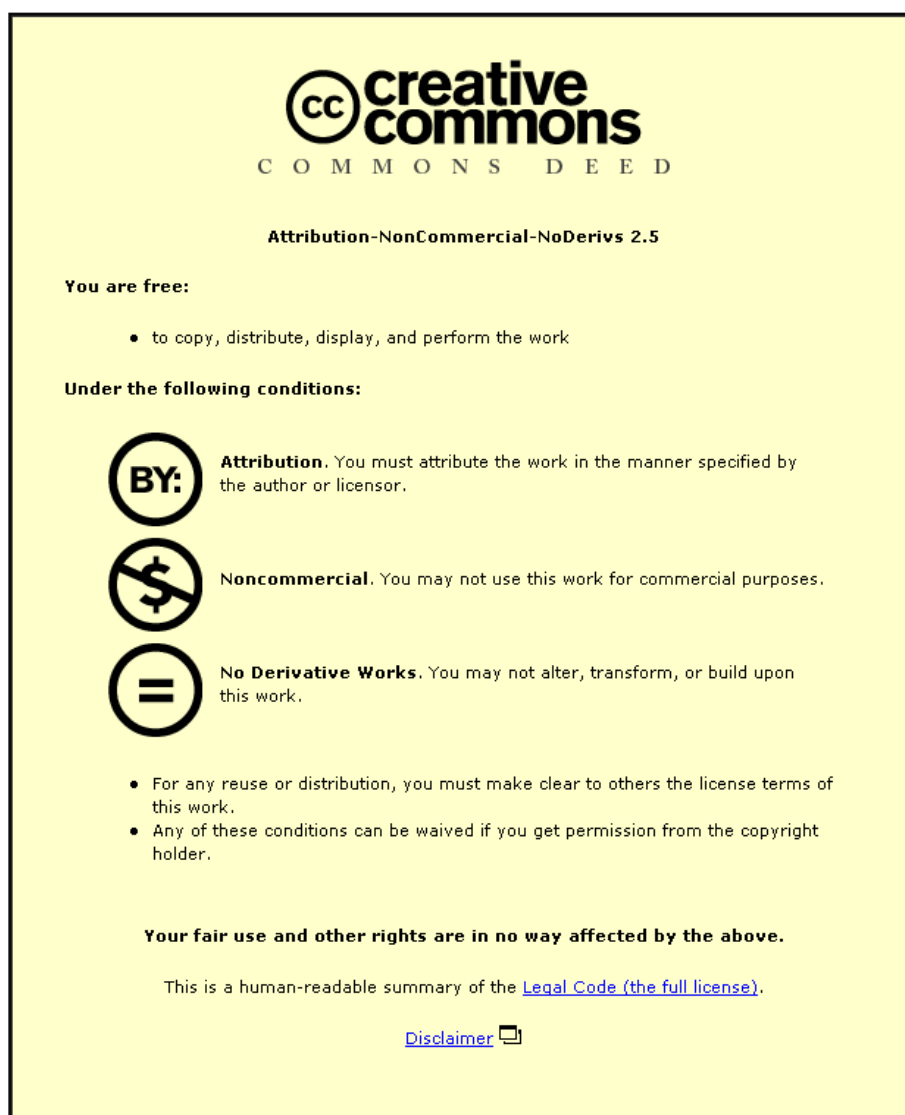




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LEAD USER NEEDS AND TRENDS WITHIN SUSTAINABLE TRANSPORT

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ABSTRACT

Initiation of the lead user method depends upon successful collection of lead user needs and trends. These pieces of information are determined from secondary sources, and interviews with market and technology experts. Specifically, the trends provide an overview of prevailing issues in the area, and their associative user needs can be useful for understanding the elements which must constitute future products, processes and services. Both of these types of information are essential for identification and recruitment of 'lead users', an innovative type of user. This study documents the process of collecting this information within the sustainable transport domain, and subsequently presents the collected future needs and underlying behavioural trends. Finally, it suggests a high-level replication procedure for conducting similar processes within alternative domains.

INTRODUCTION

Integrating leading edge users into new product development processes is vital for firms striving to create innovative products, processes and services. Such leading edge users are typically identified within progressive segments of user communities, and are innovating by themselves (Lüthje, Herstatt 2004). Leading edge users like these possess two defining characteristics which distinguish them from others. Firstly, they are positioned ahead of a trend resulting in them undertaking specific activities that causes them to possess user needs which other individuals encounter in the future (Herstatt, Von Hippel 1992). Secondly, they perceive a high expected benefit from attaining solutions to these needs, and therefore this provides them with the motivation to initiate innovation efforts. Scientifically, users possessing these characteristics have been termed 'lead users' and a promising approach for incorporating them into design processes is the lead user method. However, whilst this might be the case, successful initiation of the lead user method is contingent upon identifying existing trends, and related future user needs within the application domain. Once

identified these lead user trends and needs constitute the main directions for searching for lead users. Generally, it is an accepted consensus that secondary sources of data can be consulted for this purpose, which includes scientific journals and conference papers, newspaper and magazine articles alongside any other sources of information available on the internet. Furthermore, interviews can be used to cross-validate, supplement and verify this information. These interviews are conducted with market and technology experts and crucial to distinguish not the lead users themselves. Additionally, whilst the skills and experience of those collecting this lead user identification information are important, more influential are the procedures that underpin such processes.

Surprisingly, despite the importance of these processes which acquire lead user identification information (i.e. trends and needs), there is an absence of studies focussing upon this stage of the lead user method specifically. Instead, existing studies report applications of the lead user method overall limiting the amount of emphasis placed upon each stage independently. Therefore, currently very abstract guidance exists about this identification process for lead user trends and needs, which not only includes precise selection of experts for interview, but also the procedure used to conduct background research using secondary sources. Consequently, there is a necessity to undertake studies concentrating upon this stage particularly, reporting both the findings and methodologies used to collect lead user trends and needs. Additionally, these studies should attempt to identify the specific circumstances, situations and factors which resulted in successes alongside the particularly useful tactics and strategies also. Once identified, this information can be reported as high level replication procedures allowing others to identify lead user trends and needs within alternate domains more easily.

An area where such exploration is particularly suited is the sustainable transport sector, which can be broadly defined as promotion of the most environmentally friendly forms of travel, with the agenda to reduce particulate and CO₂ emissions. This suitability is due to continually highlighted requirements for innovative products, processes and services within the area by

sustainable transport policies, and the fact that lead user methods have been shown to result in such innovative outcomes within a range of alternate domains. For example, pipe-hangers, electronic banking systems, computer hardware and software are just a few. These requirements have probably arisen due to innovative products, processes and service having societally beneficial qualities attributed to them by existing research (Heye 2006), with this research suggesting that they have the capabilities to change the way individuals live. Such transformative capabilities are vital to reduce co2 emissions of the transportation sector, because this overarching goal of sustainable transport is also societally beneficial. Therefore, the emphasis placed upon their integration is a well-established consensus driving the formulation of sustainable transport policies worldwide.

Outcomes from this study include a number of lead user needs, and trends specifically for the sustainable transport sector. Ideally, this information should be used for subsequent recruitment of lead users. More generally, these product related needs may be used by business managers wishing to understand the essential elements which must constitute future innovative products, processes and services within the domain of sustainable transport. However, most importantly methods used to collect this information about trends and future user needs are accurately documented enabling potential replication within other domains, and allowing the initiation of the lead user method.

LITERATURE AND THEORY

Although there are some reported variances, typically lead user methods consist of four stages, which are (1) defining the problem space, (2) identification of trends and needs, recruiting lead users, lead user workshop and concept creation, and evaluation. Most importantly, initial stages of the lead user method involve collecting future user needs and trends, because once collected they constitute the main directions for searching for lead users. Subsequent sections highlight some of the obstacles discussed within existing literature for collecting this information, and potential ways to counteract them.

Since the lead user method and lead user recruitment is heavily contingent upon possessing the most appropriate trends and needs, it is likely that widespread uptake of these methods requires future research to document and investigate means to acquire this information. Currently, existing research provides very little guidance about this issue, apart from suggesting that secondary sources (i.e. existing research, media articles, data-banks) might be consulted, and that interviews with experts are especially valuable (Lüthje, Herstatt 2004). Crucial to emphasize is that such experts are distinct to lead users who generate outcomes within subsequent stages of the lead user method. Instead, these experts contribute towards providing the lead user needs and trends, which are used to identify and recruit lead users. Specifically,

an issue highlighted within this limited amounts of guidance is the necessity to identify the most suitable of these experts for interview. However, almost no information is available about the characteristics and qualities that these experts must possess as well as appropriate sample sizes facilitating an adequate interview process. Moreover, further exacerbating this situation, the limited information is also controversial. For example there are applications of the lead user method indicating that smaller samples of experts are favourable due to them limiting the opportunities for information overload (i.e. (Herstatt, Von Hippel 1992)), whilst others suggest that broader searches for identifying should take place both within the domain under consideration and outside (Lüthje, Herstatt 2004). Information overload is a typically stated yet unaddressed phenomenon within the lead user method relating to determining needs and trends, and characterises negative situations where lead user teams collect excessive amounts of inappropriate information making it difficult to manage and prioritize. It could occur in part or whole from selecting incorrect and unsuitable experts. Once information overload has occurred no formal guidance exists of how to manage it emphasizing the requirements to collect the most relevant information first time around.

Despite these issues, a generally accepted consensus for collecting lead user trends and needs is to limit sample sizes of experts for interview through their precise and considered selection. This reduces the chances of information overload, and affords the best possible opportunities for identifying experts possessing the required intuition, skills, and experience. Practically, this involves developing a detailed understanding of the experts to be interviewed prior to initiating contact, and can be accomplished by viewing online profile information, interests both academic and extra-curricular, and specifically in the case of experts developing solutions, the types of products, processes and services they have created.

METHODS

Sixteen market and technology experts were interviewed using semi structured interviews via the telephone. Eight of them were experts in technology, whilst the remainder consisted of academics with interests and specialisms in sustainable transport. Two distinct sets of interview questions were implemented that were applied to the market and technology experts. More specifically, the first set which was applied to the sustainable transport academics established key issues in the area, and associative sustainable transport behavioural trends. These questions were formulated in-line with existing literature especially that concerned with sustainable transport policies (department for transport 2007, Goldman, Gorham 2006). The second set of questions predominantly addressed issues related to future needs, which could arise from the sustainable transport behavioural trends captured previously. These questions were developed to interview market and

technology experts according to a guidelines contained within a lead user handbook (Churchill, Von Hippel et al. 2009). Questions were developed to counteract any personal biases, by asking for both general views and those relating to their own specific opinions.

Experts were identified through background research, which specifically involved assessing online profile information, academic publications, and solutions created by manufacturers as well as application developers. All interviews were conducted over the telephone, and typically lasted between 15-45 minutes in duration. Interviews were ceased when they stopped delivering new insight. All interviews were recorded, and transcribed in full.

EVALUATION OF DATA

Thematic analysis was utilised to define codes for the data, and extract appropriate themes. Collected data was reviewed several times ensuring that the most relevant themes were identified, driven by theoretically and latent approaches to thematic analysis (Aronson 1994).

RESULTS & DISCUSSION

Due to the predominant focus of this research being methodological, initially a potential replication procedure is presented which complements, and was extracted from the method described earlier. More specifically, it illustrates each stage of the process followed for data collection. Subsequently, the actual lead user trends and needs that emerged from this process are documented.

1)	Review related scientific literature, newspaper articles and webpages. Identify any eminent authors in the field.
2)	Investigate solutions in the field, establishing commonalities between them, and document any prominent manufacturers or developers.
3)	Develop two sets of interview questions based upon the above information, one to establish the problem space, specifically including determining trends in user behaviours, whilst others ascertain particular future user needs arising from being ahead of these trends.
4)	Identify potential interviewees based upon content of the interview questions, including referring back to the eminent authors, predominant manufacturers and developers collected at stages one and two. Conduct background research on them, ensuring that there interests and specialities are aligned to the focus of the questions.
5)	If required initiate preliminary contact with the potential experts to acquire additional information to better ascertain their suitability.
6)	Uniformly, conduct interviews transcribing data, and appropriately analysing it, using a method such as thematic analysis.

Sustainable Transport Behavioural Trends

According to the interviews conducted within this research, and other studies (e.g. (Greene, Wegener 1997, Department for Transport 2009)) sustainable transport is broadly defined as reducing CO₂ and particulate emissions through selecting the most appropriate transportation choices, as well as clustering communities and facilities to reduce distances travelled. Sustainable transport behaviours are the specific behaviours that individuals undertake which contribute to the overarching sustainable transport agenda, typically addressed within current policy and legislation. Sustainable transport behaviour trends are group level behavioural changes contributing to the sustainable transport agenda. Subsequently, those identified within this research are introduced and described in more detail.

Generally, increasing greener awareness was an issue emerging from interviews, and more specifically required individuals on both a local and governmental level to acknowledge the importance of reducing transportation related co₂ emissions. Such findings are unsurprising given the numerous studies, which have attempted to address issues associated with increasing greener awareness in multiple domains (i.e. (Pattinson, Oram et al. 2011, Booth, Shirt 1998)) Furthermore, another trend emerged about the decrease in car usage and ownership. Numerous attributions were attached to this decrease, including the cost of petrol relative to public transport, and the increasingly implemented planning restraints in town centres, which might reduce the convenience of parking close to commercial attractions. Additionally, attitudinal factors were also stated as further factors creating tendencies for people to drive less, as people were presently more accepting towards alternate transport modes (i.e. public transport modes). Contributing to this reduction, it was often specified that there was lesser car ownership amongst the younger generation with this being ascribed to shifts in perceptions amongst these users. Such perceptual shifts relate to the car being considered more of a practical item by this user group, unlike previously where it was usually thought of as a status symbol. The previous perception of the car as a status symbol accelerated the desire for car ownership; however, nowadays various technologies such as the mobile phone have probably substituted them from this status and image perspective. Underpinning this trend of reduced car use is the peak car theory, which states that increasing car usage has stabilised after continuous exponential growth within the previous 40 years and various conflicting attributions have been deduced, although, perhaps one of the more promising explanations is the reduction in company car use (Goodwin 2011).

Additionally, a number of participants reported growths in cycling culture and actual cycling. This might be due to cycling becoming a more commonly accepted phenomena, and individuals understanding the benefits of it. These benefits probably relate to increasing

concerns about maintaining healthier lifestyles, the more detailed understanding about sustainable transport and related to this the increased desire to reduce CO₂ emissions amongst individuals. Such changes may have also stemmed from sustainable transport policies which actively seek to promote alternate forms of transport to the car. Other trends included increasing fuel prices, positive attitudinal changes towards public transport, changes in the car buying market, and the increasing reliability and efficiency of alternatives to the car. Subsequent sections, document some of the related user needs that must be considered when developing innovative products, processes and services for the domain of sustainable transport.

Actual outcomes from the technical interviews concretely demonstrate that commonalities exist amongst user needs associated with existing products, processes and services. Therefore, these findings support those recently established by (Kujala, Kauppinen 2004) within user centred design which demonstrate that a common core set of needs can be identified. These user needs are the types of considerations that must be made when developing sustainable transport solutions, and could arise from the previously discussed sustainable transport behavioural trends. Within further detail, general technological trends for the sustainable transport sector included requirements for faster and cheaper technologies, simplification of features and tasks alongside the incorporation of social networking facilities into technologies for leveraging the use of car sharing.

Whilst the identified requirements for faster and cheaper sustainable transport solutions are self-explanatory and consistent with technology generally and those found within other domains such as user centred design (Vredenburg, Mao et al. 2002), other user needs mandating additional description are introduced next. For example, some of the participants suggested that there were requirements to simplify tasks, and consequently achieve more functionality with less features. Specifically, this might refer to sustainable transport solution interfaces, or even the hardware underpinning them. Existing literature has generally referred to such designs as 'sweet designs', because they achieve large amounts in a simplistic way (Gosling 2007). Such results are in line with studies in human computer interaction and particularly user centred design that have emphasized the requirements to simplify use of technology making it easier to use (i.e. (Kujala, Kauppinen 2004)), which is integral for achieving usability. A further viewpoint which arose frequently was the requirements to integrate social networking sites into sustainable transport solutions such as car sharing websites for increasing trust amongst individuals using them. This is unsurprising as multiple studies have addressed social networking, evaluating its potential for integration into car sharing particularly for leveraging trust, and suggest that it is a

beneficial addition for such purposes (Chan, Shaheen 2012, Chaube, Kavanaugh et al. 2010).

Additionally, further themes arose relating to interoperability and differing types of sustainable transport solutions. In fact, this trend was specified upon multiple occasions, by a variety of interviewees. Practically, this highlights the requirements to aspire for creation of sustainable transport solutions enabling people to use multiple modes of transport within one journey. Such issues might arise on a planning and booking level (i.e. online journey planners and online ticket booking systems), or alternatively within real time when actually travelling. Exemplifying this, one participant discussed the recent developments in real-time mobile application supported ride sharing, and subsequent expansion plans for it to operate seamlessly with other public transport modes. In practice, they stated that car sharing should be seen as a means to extend the public transport network, and hence it might support individuals wishing to use a bus for one part of their journey, a train for another, and finally share a car for the last segment. It was emphasized that technology to facilitate this was required, which would probably include providing real time alerts and notifications for individuals wanting to migrate from one mode of transport to another. Such requirements for interoperability are supported within studies by (Chan, Shaheen 2012) which suggest that although the directions and growth for ridesharing are uncertain, the next decade is likely to include increased interoperability and technological integration.

Likewise, with respect to online booking systems, it is considered a simplifying procedure to enable multiple modes of transport to be booked in a singular place. However, there is a distinct lack of such solutions which emphasizes the requirements to implement them. Coinciding with these requirements, (Sauter-Servaes, Nash 2009) suggests that while such booking systems are beneficial, they are almost still non-existent. Supplementing this, they state that despite it being a complicated procedure, there are no technical or scientific reasons prohibiting their creation. Such a situation characterised by the absence of solutions caused one participant to become compelled to create their own solution. More specifically, they created a specialised website providing instructions to overcome difficulties associated with the absence of such multimodal online ticket booking systems. Interrelated to these issues, some participants stated, that the accelerated use of ride sharing was contingent upon centralising every ride sharing database ensuring that users could search for all rides within one place, instead of visiting several.

Moreover, user needs also existed related to the personalisation of sustainable transport solutions, and mobile localization which is dependent upon real time information. Broadly speaking, it aids individuals to monitor the actual location of local public transport vehicles in real time, and visually observe upcoming

vehicles on their mobile phone screens. Personalization of preferences is a further emerging user need, and suggests that sustainable transport solutions such as journey planners, should learn more about users, based upon their inputted data, and make recommendations according to this.

CONCLUSIONS AND FURTHER WORK

To emphasize points of importance, generally as recommended by existing literature, consulting secondary sources provided a concrete basis to subsequently conduct interviews. These interviews complemented existing literature, and provided a useful mechanism to acquire information about more specific issues unexplored within current research. Generally, findings suggest that there are commonalities in user needs associated with existing technologies, which included the necessity for interoperability amongst transport types and supporting ticketing systems, facilitating personal carbon emissions monitoring through mobile phone applications and websites, increased sophistication in mobile phone hardware, and additionally advanced mobile localization. Associative trends and information emerging from the interviews with sustainable transport related academics (whilst being diverse) also demonstrated commonalities amongst differing participants. Specifically, prevalent issues were reduced car ownership and usage, increased cycling alongside the overarching trend of increasing greener awareness.

Additional studies are needed that use the collected information to actually recruit lead users. Ordinarily, existing studies have reported two mechanisms to achieve this, which are using surveys and networking via interview. Whilst both approaches are different, essentially they achieve the same objective which is ascertaining whether individuals possess future needs, and motivation to initiate innovation efforts. Specifically, further studies should establish ways to evaluate collected trends and associated user needs in order to determine the most appropriate ones for initiating lead user studies. Practically, this might involve collecting alternative trends alongside user needs, and subsequently recruiting lead users using them for idea generation workshops followed by comparing the quality of outcomes to determine which ones were most appropriate. Further research also involves reapplying the replication procedure documented in this research within alternative domains. Such research should seek to contribute to a body of knowledge intending to define and substantiate universal recruitment procedures such as those presented within this research. Finally, this should also help to reduce the biases/issues associated with external validity.

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