USER EXPRESSSIONS TRANSLATED INTO REQUIREMENTS

Birgitta Bergvall-Kåreborn
Social Informatics
Luleå University of Technology
Sweden

Anna Ståhlbröst
Social Informatics
Luleå University of Technology
Sweden

Abstract: *Grounding the development of mobile and ubiquitous services on actual needs and behaviors of users, rather than on designers' intuition, is a well-established tradition. However, gathering data about users in different contexts usually results in large amounts of data that have to be analyzed and translated into requirements. This crucial activity and its outcome are often shaped by the preconceptions of the developers or researchers. Despite this subjectivity, the translation process is seldom transparent. The aim of this paper, therefore, is to contribute to the field by presenting a process for translating user expressions into needs and later into requirements using Reiss' taxonomy of human needs. By adopting this process of translation, we were able to identify two hierarchical levels of needs: needs of a service and needs in a service. These two levels provide a transparent bridge between user expressions and system requirements.*

Keywords: *user needs, mobile services, eGovernment, user involvement, motivators.*

INTRODUCTION

As the demand for innovation increases and the number of services linked to voluntary use in mobile, ubiquitous, or pervasive contexts are increasing, it is possible to discern a growing interest among researchers to understand users' needs, preferences, and everyday behavior. One illustration of this interest is Oulasvirta (2005), who stated that, "innovation, development, and evaluation of design ideas cannot be based only on the designer's intuitions but must be grounded in users' actual needs and behaviors" (p. 60).

Adopting a needs-driven approach to product and service development also provides a number of benefits. Appreciating human needs is a valuable approach since needs last longer than any specific solution and a need can be met with many different products or services (Bergvall-Kåreborn, Holst, & Ståhlbröst, 2008; Ericson & Ståhlbröst, 2005; Kankainen & Oulasvirta, 2003; Patnaik & Becker, 1999); human needs are opportunities waiting to be explored, rather than guesses at the future; (Kankainen & Oulasvirta, 2003; Patnaik & Becker, 1999); human needs provide a roadmap for organizational development (Kankainen &

Oulasvirta, 2003; Patnaik & Becker, 1999); discovering needs is beneficial for innovating new design ideas (Kankainen & Oulasvirta, 2003); uncovering needs offers product developers a different dynamic for understanding customers (Patnaik & Becker, 1999; Tiitta, 2003); and the empirical data on which needs are identified and interpreted is valuable in later stages of development, such as user interface design (Kankainen & Oulasvirta, 2003).

In order to obtain a richer understanding of various user groups and contexts, some user-centered approaches, combined with data-gathering methods inspired by anthropology and sociology, have been adopted in a number of studies (Esbjörnsson, Juhlin, & Östergren, 2004; Ha, Jung, & Oh, 2006; Holtzblatt, 2005; Kaasinen, 2003; Kankainen & Oulasvirta, 2003; Kankainen, Titta, & Rantanen, 2003; Tiitta, 2003). The gathered data in these studies are then consolidated, translated, and used to create an understanding of important requirements for the new products and services that are to be developed.

This consolidation and translation process plays a key role in systems development processes, yet it has attracted limited attention in the research literature. When it comes to guidance on how needs can be elicited, classified, and translated to systems requirements, there are few detailed guidelines given within the existing literature. Few authors use any particular taxonomy to classify and analyze needs; instead, needs are classified and analyzed from a "common sense" point of view. This can be seen in studies by, for example, Titta (2003), Kaasinen (2003), Kankainen and Oulasvirta (2003), and Oulasvirta (2004).

Kankainen and Oulasvirta (2003) focus on mobile and ubiquitous computing and they identify a number of needs among diverse user groups in the context of everyday activities that occur when people move through places occupied by other people and/or technological devices. No particular taxonomy was employed to classify the needs; instead "needs and motivations driving the behavior described in a narrative form were approached from a 'common sense' point of view" (p. 460). The categories constituted the technical solutions that the needfinding resulted in, but the translation from need to solution appeared as an opaque process. In later writings, Oulasvirta (2004) categorized the identified needs into three types: personal needs, navigational and cognitive needs, and, socially determined needs. Here, the needs also seemed to be categorized using a common sense approach and no taxonomy was presented. Further, not all of the examples given were stated in the form of needs. Examining the given examples of personal needs, some were stated as concerns, such as a concern of losing control over one's money when paying or sharing costs in public places. Others indicated a need but were not clearly communicated as such; for instance, the expression that moving around certain places triggered memories or opinions that the study subjects considered worth preserving. The same was true for the navigational and socially determined needs.

Tiitta (2003) focused on identifying everyday motivational needs concerning communication and mobility by elderly people. He used narratives cited by the participants and analyzed the narratives via contextual design methods to understand user needs. A key question in the analysis was, "Why is he or she doing or saying this?" Through an iterative process, phenomena with similar motivational needs were then clustered together in the same category. This resulted in the identification of 20 motivational needs within the following categories: group coherence, utility and experience, easy traveling, and security. As with Kankainen and Oulasvirta, the needs seemed to be categorized using a common sense approach: No taxonomy was given.

However, Oulasvirta (2005) was not unaware of these problems. Instead, he argued that the concept of user need is inflated by divergent definitions and uses. He also pointed to the weak linkage between the needfinding notion in human–computer interaction and the related discussions and typologies in modern psychology. According to Oulasvirta, this is problematic since attributing needs to users is not a straightforward process and categorizations of user data are inherently laden with the preconceptions of the researcher. Such processes, therefore, need to be based on sound scientific theories and methods. Finally, he argued that the notion of user needs is almost entirely individualistic, and, as such, does not address emergent needs that pertain to groups and organizations of users.

The above examples indicate the necessity for greater clarity regarding needs along with an understanding of how to elicit, analyze, categorize and translate needs into requirements. Hence, the aim of this paper is to present a method for translating user expressions into needs and later into requirements. The method adopts a framework based on psychological motivators and its application is illustrated through a project case study focused on increasing citizens' involvement in municipality matters. Our role in the project was to elicit citizens' needs related to communication with local authorities and translate these into system requirements.

In the next section, Reiss' framework of psychological motivators, which provides an organizing framework for the study, is explained. This is followed by a presentation of the case study, which is centered on a European Union project that aims to increase citizen involvement in municipality matters through the use of information and communication technologies (ICTs). The next section afterward details the translation process based on three illustrative user expressions. Finally, the paper concludes with a discussion and some final remarks.

RELATING USER NEEDS TO A PSYCHOLOGICAL FRAMEWORK

The concept of needs is closely related to the concept of motivation, as can be seen in Herzberg, Mausner, and Snyderman (1959), Madsen (1970), Maslow (1954), and Schein (1970). *Motive* is generally defined as something that stimulates or drives an individual to act in a certain way, and the motive is usually a need or a desire of some kind. Due to this close relation between the two concepts, they are often used nearly synonymously in the literature (see, e.g., Maslow, 1954).

Within the information systems (IS) field, the concept of needs is used in a wide variety of ways, as was illustrated in this paper's Introduction. In this article, we do not clearly separate the related concepts of needs, motives, and desires. Instead we view all of these concepts as underlying rationales that motivate people and, as such, trigger behavior and drive the requirement specification. We do, however, make a clear distinction between needs and requirements, and propose that *needs* are used in relation to humans and *requirements* are used in relation to solutions, products and services. Distinguishing clearly between needs and requirements is also supported by Sharp, Rogers, and Preece (2007).

Further, we aim to address the weaknesses related to the concept confusion identified by Oulasvirta (2005) by presenting and applying Reiss' and Havercamp (1996, 1998) psychological theory of human motivators. Their theory has been developed and continuously validated in studies since 1995, and it is, according to Reiss (2001), one of the first scientific studies that is based on what people value the most. The aim of the theory is to explain what

people experience as meaningful behavior, or what motivates them to act. Their work resulted in a framework consisting of 16 basic desires, or motives (Reiss and Havercamp 1998; Reiss, 2000). According to this theory, nearly all meaningful human behavior is motivated by some compound variation of the 16 basic desires or motives (see Table 1; Reiss, 2001, 2004).

Each of Reiss' 16 basic desires constitutes an end motive. The idea of *end motives* started with Aristotle, who divided motives into ends and means (Reiss, 2000). End motives are things people enjoy for their own sake, whereas means are methods for satisfying end motives. The number of means used to reach an end is limited only by imagination, while the number of ends is limited by human nature (Reiss, 2004).

The 16 motives are satisfied by meaningful behavior usually sought out in relationships, careers, families, sports, and spirituality (Reiss, 2001). We feel secure, for example, when we are in an environment with a degree of stability and order. We experience love when we spend time with our children and satisfy the desire for family. The satisfaction of each basic desire gives rise to a different joy, so we go through life trying to experience 16 different types of intrinsically valued feelings. Once we satisfy a basic desire, the joy soon dissipates and that specific desire reasserts itself. Therefore, we seek activities that make possible repeated satisfactions of our basic desires (Reiss, 2004, 2005).

Each basic desire is a continuum between two extremes, indicating a strong versus weak variation of that desire. Although all people are motivated by each basic desire, they are not motivated to the same extent (Reiss, 2005). The importance that people place on a desire often varies by factors such as personality type and cultural influences. Even from an individual's point of view, the importance of a desire and the form it takes on the continuum is dependent on both context and time. This implies that what motivates one person might not motivate another person, nor the same person in different contexts. Hence, human motivation is fundamentally multifaceted, as people seek to experience different intensities and frequencies

Table 1. Human Motivators, Motives, and Their Intrinsic Feelings (Drawn on Reiss, 2004).

Motivator	Motive (the driving force)	Intrinsic Feeling (the feeling obtained)
Power	Desire to influence (including leadership)	Efficacy
Curiosity	Desire for knowledge	Wonder
Independence	Desire to be autonomous	Freedom
Status	Desire for social standing (including desire for attention)	Self-importance
Social contact	Desire for peer companionship (including desire to play)	Fun
Vengeance	Desire to get even (including desire to win)	Vindication
Honor	Desire to obey a traditional moral code	Loyalty
Idealism	Desire to improve society (including altruism, justice)	Compassion
Physical exercise	Desire to exercise muscles	Vitality
Romance	Desire for sex (including courting)	Lust
Family	Desire to raise own children	Love
Order	Desire to organize (including the desire for ritual)	Stability
Eating	Desire to eat	Satiation (avoidance of hunger)
Acceptance	Desire for approval	Self-confidence
Tranquility	Desire to avoid anxiety, fear	Safe, relaxed
Saving	Desire to collect, value of frugality	Ownership

of each of the 16 desires in different situations (Reiss, 2005). From this follows that these 16 motives direct almost everything humans do and they constitute the foundation upon which humans become individuals. Because the 16 basic desires are irreducible (Reiss, 2005) they cannot be organized further into supercategories. Nor can they be organized as a hierarchy, where one desire builds upon another.

Motives are also the reasons why people are willing to do things on a voluntary basis (Reiss, 2004). This becomes important in the context of IT development, since knowing what motivates people to use a product or service becomes central, especially when the product or service is aimed at private and voluntary use. In our study, we have used Reiss' motivators as a tool for eliciting and analyzing the data gathered in the focus group interviews within the SMART project.

THE SMART PROJECT

Many eGovernment projects are characterized by a technocentric approach with minimal involvement from citizens (Olphert & Damodaran, 2007). The SMART (2006–2007) project was one of many EU projects aimed at increasing citizen involvement in municipality matters through the use of ICTs. This took place in SMART by exploring the concept of "reaction media," which allowed individuals to actively participate in the development of their municipality. More specifically, the project aimed to develop mobile and context-aware services that facilitated the communication between citizens and the municipality. This service was intended to stimulate citizens to give suggestions and opinions for how they wanted the municipality to develop, and to identify risks or dangers in their environment.

The development of these services was carried out in an interactive manner in cooperation between citizens, companies, and official authorities. Since the SMART project was an applied research project aimed to develop new technology, our role as researchers became dual, to some extent. From a practical point of view, our role in the project was to elicit citizens' needs related to communication with local authorities and translate these into system requirements. From a research point of view, our role was to reflect on how a theoretical framework could support this process. We focus on the latter process in this paper.

To facilitate a participatory approach, the project was set in a Living Lab context. The foundation of Living Labs is the involvement of four different stakeholders (government, companies, researchers, and end-user representatives) in innovation processes. The aims involve close cooperation among involved stakeholders in facilitating innovation, and developing products and services that users really need and that are designed to fit their life patterns and preferences. During this development process, the products and services are also tested by end users in their real-world environments. Since the Living Lab activities can go on 24/7, users can test a product or service in their private, real usage situations and from the perspectives of the various roles they shift between during a day: citizen, parent, sport fan, patient, student, or employee. Hence the users gain a deeper and more practical understanding of the function of a new product or service and how it fits into their usage contexts (Mulder et al., 2007; Ståhlbröst, 2006). With this approach, the innovation system becomes human-centric, in contrast to technology-centric.

The Living Lab milieu used in our study is an open Living Lab, called Botnia Living Lab, in which anyone with an interest in the development of IT-related products and services can cooperate. The basic idea of Botnia is to engage interested individuals, ultimate end users, and stakeholder organizations in an interactive and iterative process from needs identification and idea generation through concept development and prototype testing to market validation. Because Botnia is open to all kinds of IT stakeholders in the value chain, the process aims to help these stakeholders manage their development processes with a user-centered approach.

Over the years, Botnia has built up a community of end users with whom it easily and frequently communicates. Thus, this community comprises approximately 7,000 accessible and volunteer "test pilots." Generally, the test pilots represent the diversity found among citizens when it comes to age, gender, living conditions, education, carriers, and so on. These volunteers, however, are motivated by and share a common interest in innovation and technology, are curious to try out new technical artifacts, and seek the opportunity to influence them (Ståhlbröst, 2008).

RESEARCH APPROACH

In order to illuminate the issues discussed above, a qualitative approach was deemed most appropriate, since it enables researchers to capture the richness and the detail of the citizens' experiences. While qualitative research methods were used, the epistemological underpinnings were more broadly interpretive (Orlikowski & Barudi, 1991; Walsham, 1995), focusing on social constructions such as language and shared meanings. Interpretive studies generally attempt to understand phenomena through the meanings that people assign to them through human sensemaking activities. Given that the focus of the research project is to increase citizen involvement in local government, it is crucial that we gain an understanding of the potential users and their needs within the context in which they operate. In order to help achieve this, we used scenario-based focus group interviews, since this method helps stimulate the creation of interactive communication among newly constituted groups that share characteristics of interest (Bloor, Frankland, Thomas, & Robson, 2001; Wibeck, 2000). Focus groups can generate a broader scale of ideas and views compared to traditional one-on-one interviews (Wibeck, 2000), and create a situation in which participants can validate and discuss each other's perspectives and experiences. These interviews aimed to gather the opinion and discussion of the group, not to follow individuals' statements.

In this study, we planned and carried out five focus groups with Living Lab community participants. Arguably, this may skew the results since the community consists of self-selected participants who are interested in technology development. However, we were able to approach a cross section of the Living Lab participants, allowing to emerge a heterogeneous group covering a diversity of citizens, based on residential location, gender, age, and occupation (see Table 2). Initially, around 200 people were approached to participate in the project and—as is typical—approximately 10% responded positively, resulting in 23 participants (13 male and 10 female respondents, with an age varying between 18 and 50 years). The participants were divided into five focus groups, each consisting of between four and six respondents. To account for geographic variation and experiences in different municipalities, three of the surroundings

Table 2. Focus Groups and Their Composition.

Focus group interviews	Composition of the focus groups
(FG1) Carried out with six people from the larger city area	Female; age 38; single; student but works part time in theatre and dance; lives in the city Female; age 30; single; student; lives in the suburb Male; age 52; family; works as an engineer; lives in a rural area Female; age 48;family; works as a nursing assistant; lives in the city Female; age 24; partner; student; lives in the city
(FG2) Carried out with four people from the larger city area	Male; age 35; single; student; unemployed; lives in the suburb Female; age 28; partner; student; lives in the suburb Female; age 22; single; student; lives in the suburb Male; age 36; family; works as a journalist; lives in the suburb
(FG3) Carried out with four people from the larger city area	Female; age 41;family; unemployed; lives in a rural area Male; age 24; single; student; lives in the city Female; age 32; partner; works in an office; lives in the suburb Male; age 26; single, student; lives in the suburb
(FG4) Carried out with four people from one of the smaller city areas	Female; age 41;family; works as a university administrator; lives in the suburb Male; age 38; family; works as a sales engineer; lives in the city Male; age 25; partner; student; lives in the city Male; age 40; family; works as a quality control manager; lives in a rural area
(FG5) Carried out with six people from one of the smaller city areas	Male; age 55; family; works as an IT-consultant; lives in the suburb Male; age 32; partner; works at a newspaper, lives in the city Male; age 37; family; works as a teacher; lives in the suburb Female; age 24; partner; works as a social worker; lives in the suburb Male; age 27; partner; student; lives in the city Male; age 34; family; works as a social worker; lives in the suburb

(about 75,000 inhabitants) and two groups (FG4 and FG5) were carried out with citizens drawn from smaller cities and their surroundings (about 25,000 inhabitants) and rural locations. The focus groups with citizens from the larger city were held on the city's university premises, while the other two took place at the city hall, a central location with easy access, in two of the smaller cities.

The focus groups were formed in order to generate discussion and gain an appreciation of citizens' opinions and experiences in relation to communication with municipalities and governments. An open-ended, structured interview format facilitated the discussions and ensured that the main topics had been covered in each of the focus groups. However, the primary aim was to encourage the citizens to talk as much as possible with each other, rather than respond to the questions posed by the researchers.

In order to encourage this, various scenarios were used (Bødker, 2000; Bødker, Kensing, & Simonsen, 2004; Carroll, 2000) as stimuli. Scenarios can be used in two different ways: to help get the discussion process started or, when asked from users, to elicit concrete experiences or intended points. In the fieldwork, both approaches were adopted and included (a) a typical day in their life, (b) their relationship with the municipality and the process of communication, with illustrations, (c) communication of alarms and potential hazards (e.g., notifying authorities regarding a hole in the road) and their experiences of this contact, (d) suggestions as to how they would like things to operate in the future and how their needs could be accommodated, and (e) how ICTs could be used to support their future needs and aid their communication with the municipality. Once the scenarios had kick-started the group

discussion, we allowed the discussion to flow naturally until that particular area of concern had been exhausted, at which point we introduced a new theme or question. These discussions, which lasted for 1-2 hours, took place in Swedish in order to allow all the respondents to speak their native language. All of the focus groups were audio recorded. We transcribed the interviews verbatim in Swedish to facilitate the analysis process and then translated the selected expressions, reported in this paper, into English.

The method of analysis was based on an ongoing iterative process of reflection and discussion among the research team to help identify concepts, themes, and issues. The "interpretive generalizations" (Walsham, 1995) that emerged from the findings are intended to be insightful and assist scholars and practitioners in deepening their understanding of the use of ICTs by everyday citizens in their encounters with local municipalities.

TRANSLATING USER EXPRESSIONS INTO REQUIREMENTS

We start this section by giving a brief overview of the main analysis and translation processes, followed by an in-depth description of the translation process with illustrative examples. The analysis process consisted of two steps. The first step was an open analysis aimed at identifying patterns and then structuring the data into overarching themes. The second step focused on clustering user expressions into subcategories within the overarching themes. After the analysis, the translation process, consisting of three steps, formally began. The first step translated user expression into general needs and motivators. The second step translated the general needs and motivators into design-oriented and operational needs, that is, needs that aim to guide the design process. By merging user expressions with general needs, we could construct user needs related to the particular system to be designed. The third step translated the design-oriented needs into system requirements.

The first step of the analysis process began with an open analysis of the transcribed focus group interviews, which were read as a whole with a focus on identifying patterns and overarching trends in the users' expressions. In this process, 15 overarching themes were elicited based on what the users had expressed. These themes were Gaining Access, Information, Feedback, Efficiency, Competence, Freedom, Mobility, Respect, Reward, Influence, Security, Interaction, Functionality, Availability, and General Issues. To guide the process of gathering users' expressions into themes, we decided that each theme should have at least three user expressions related to it to count as a theme. Expressions that were not related to any of these themes were gathered into the theme called General Issues. This criterion of a minimum number of expressions was set to make sure that a theme represented the perspective of more than one respondent. We gathered into each theme all of the expressions related to it. For instance, related to the theme Feedback were user expressions such as, "*I do not want any auto-generated feedback. If they give feedback, it needs to be personal*" (FG4, male, 25), and "*I want to see some kind of feedback from the authorities such as, 'We have received your suggestion and this is what we have done with it'; something like that is all I need*" (FG3, female, 32).

The second step of the analysis was to cluster the users' expressions into subcategories within these themes. For example, in the Gaining Access theme, we extracted three

subcategories: people, information, and contact information. Here, all the expressions related to people gaining access to information were gathered into one category, and so forth.

The first step of our translation process aimed to get a thorough and scientifically based understanding of the underpinning needs and motivators for the users' expressions related to the subcategories, hence Reiss' (2004) theoretical framework was applied. By means of this framework, the users' expressions were analyzed with the intention to understand and clarify their expressions, but also to generate new and innovative ways of interpreting them. By applying the theoretical framework, it became possible to discern if an expression was more strongly related to another theme, if new themes needed to be added, or if a theme could be taken away. In this process two new themes were identified (Alarm and Technical Solutions/Characteristics); two themes, Respect and Competence, were combined into one; and, four themes (Security, Availability, Freedom, and Mobility) were integrated into other existing themes. Due to this, the initial 15 overarching themes were modified and reduced to 12 themes: Gaining Access, Information, Feedback, Efficiency, Respect/Competence, Reward, Influence, Alarm, Interaction, Functionality, and Technical Solutions/Characteristics, and General Issues.

In the second step of the translation, we focused on constructing design-oriented user needs related to the SMART system based on the expressions and general needs (Ståhlbröst & Bergvall-Kåreborn, 2008). During this process we also discerned two different types of design-oriented needs. The first type focused on what motivated people to use the SMART service and therefore related strongly to the main purpose of the service. The most frequently occurring needs here were: Idealism, Power, Status, Acceptance, Curiosity, and Tranquility. The second type of needs described or explained how these motivational needs could be operationalized, and what motivated people once they were using the system. As such these needs were related to the specific form and function of the system and in the SMART project they focused on Saving, Order, and Independence.

In the third step of the translation, the design-oriented and operational needs were translated into systems requirements. In this work, we strived to develop a number of alternative system requirements based on each design-oriented need in order to highlight the fact that the requirements are means for fulfilling the needs and, as such, there are many possible way this can be done.

As in any interpretation and translation process, individuals will see, select, and value the same expressions more or less differently, depending on their worldview (Checkland, 1999). This is true as well for the process described in this paper. However, in order to help validate the findings, we members of the research team carried out analyses individually before comparing and discussing our results. This revealed quite similar interpretations, even though some minor differences existed. Some of these differences are illustrated in the three expressions below, where we indicated more than one possible interpretation. These differences were not seen as problems, or as a deficiency in the process; rather, we viewed them as a strength of the processes, since they enriched the expressions and elevated our understanding of them. In relation to the transformation processes, we also want to clarify that the use of a theoretical framework in order to clarify user expressions in no way hinders a feedback loop between the researchers and the users. However, before such a feedback loop can take place, the data need to be analyzed and clustered in order to identify the points that need clarification.

In the following subsections, we will illustrate our process by means of three separate user expressions that were translated into requirements. These expressions were selected

because they illustrate some of the diversity of interpretation found in the users' stories, varying among general needs, design-oriented needs, processes, activities, problems, situations, and solutions. What is important to keep in mind here, however, is the specific aim of this paper: We do not intend to present representative and general users' needs related to the government derived from the data, but rather we focus solely on the translation process from identified user expressions into system requirements. The first expression illustrates a general need, the second a condition for use, and the third a preferred workflow.

Expression 1

An emerging discussion theme among the citizens in the focus groups concerned their desire to feel involved and have influence and control over their lives; the users' expressions related to these discussions rendered the theme Influence. The illustration of this theme stems from a discussion within FG2 that centered on how citizens viewed the opportunity for active involvement by communicating suggestions and alarms to authorities. One citizen commented, "*You need to feel that you are* involved *and have the* power *of your own life. That is important*" (FG2, male, 36).

This comment represents a clearly defined need statement expressing possible motives or underlying rationales that would stimulate and enthuse this citizen to use the service. Focusing on the key word *power* in the sentence, we at first related this to the need for power. However, in analyzing the text against Reiss' (2004) framework, we quickly realized that since the citizen talked about power related to the possibility of having influence over his own life, rather than having influence over other people and their lives, the end motive was independence, not power. This made us shift our classification of the text from the need of power to the need for independence, which included the desire to be autonomous and the intrinsic feeling of freedom.

Besides these basic human needs, the users also expressed needs that were more design-oriented and operational. These expressions took the forms of freedom to select communication channels, media, and structures when expressing a suggestion or alarm; freedom to judge the importance of the suggestion or alarm; and freedom to communicate a suggestion or alarm independent of place and time. However, on a more fundamental level, these needs do not address the basic need of independence and autonomy related to the citizens' own lives. Rather, they are limited to creating a feeling of freedom when using the system.

These design-oriented needs where then translated into requirements. Some of these requirements state that (a) the system should be able to receive data from the phone, mobile technologies, and the Internet; (b) the service should allow the user the opportunity to indicate the importance of her/his input; and (c) the response should be a mobile solution.

The meaning of the user's statement "you need to feel that you are involved" was harder to interpret since we easily could relate it to many different needs. Some of these were status and the desire for social standing and attention, social contact and a desire for peer companionship, and idealism and the desire to improve society.

When we analyzed this first part of the sentence from the perspective of these different needs, we realized that different interpretations lead to quite different design-oriented needs and requirements and sometimes even different functions within the service. Interpreting the expression as a need for status resulted in design-oriented needs, such as making people and

their contribution visible to the community, translated into the requirement of displaying the name of the person giving the suggestion.

Interpreting it as a need for idealism brought forth the design-oriented need of displaying information about whether or not citizen suggestions resulted in actual implementation of the suggestions or, if not, the reasons for this. This translated into the requirement of a service where citizens could follow their suggestions through the decision process of the governmental organization; from initial suggestion to final decision and/or implementation of the suggestion. Table 3 summarizes the process of translating the user expression "You need to feel that you are involved and have the power of your own life. That is important" (FG2, male, 36) into system requirements.

Table 3. Clarification of the Translation Process from General Needs to Requirements.

User Expression	General User Need/Motivator	Design-oriented needs	System Requirement
"You need to feel that you are *involved* and have the *power* of your own life. That is important."	Independence	Create a feeling of freedom when using the system	Support mobile solutions
			Handle data from multiple communication channels
			Visualize the importance of the users' input
	Status	Make people visible to the community	Display contributors name
			Visualize the importance of the users' input
	Idealism	Provide information regarding the suggestion	Indicate and display the process for the suggestion

Expression 2

Related to the theme Efficiency, the focus group interviews revealed clear differences among the citizens in their expressed levels of required effort. While some of the users were keen to participate in and contribute to municipality issues, others were less inclined to do so; for this latter group, participation rested on minimal effort. To illustrate one perspective on efficiency, we have selected a participant's expression from a discussion about reporting suggestions for improvement. This citizen said,

> *If I am to pick up the phone and give a suggestion for improvement in society, I cannot be hindered by whether I have money on my cash card or not. If there are no hindrances, then I would make the call.* (FG5, Male, 37)

This comment does not express a direct user need but rather a condition that the service should fulfill for this person to report suggestions for improvement to the municipality. Further, even though the condition posed by the citizen on the service is quite clear (it cannot require money on cash cards), it was hard for us to relate the expression to a need. The need that we started to elaborate with was *saving,* with its value of frugality, since one possible interpretation of the underlying rational behind the expression "money on cash card" could be an unwillingness to pay for the call.

We also saw a link between the need for saving and the expression, "*If there are no hindrances, then I would make the call.*" However, the expression here was not related to monetary aspects, but rather to saving time through a smooth and easy process. In this instance, we found a lack in Reiss' (2004) framework, since the need for a smooth process—or, more generally expressed, the feeling of efficiency—is not present within the motivator saving.

In our discussions around the above expression, by shifting our focus between the context of the expression, the expression as a whole, and separate clauses and words in the expression, it became clear that just because users expressed design-oriented needs related to a service, this does not mean that they have an actual need of that service. On one hand, this indicates an efficiency demand that the service needs to fulfill for the citizen to use it. On the other hand, "no hindrances" also indicates that the citizen sees little use for the service, since he is only willing to make the efforts to communicate a suggestion when it is effortless to do so.

Based on this expression and our interpretation of its underlying rational, we suggested the requirement that the service should be free of charge, since such a requirement would increase the likelihood of a smooth and easy process as well as address the economic issue. In the end, however, the project team agreed on a Web-based interface for the service that was free of charge since designing a mobile-based service with no cost lay outside the scope of the project. In Table 4, the translation of Expression 2 into a system requirement is summarized.

Table 4. Clarification of Translation Process for a Condition for Use.

User Expression	General User Need/Motivator	Design-oriented needs	System Requirement
"If I am to pick up the phone and give a suggestion for improvement in society, I cannot be hindered by whether I have money on my cash card or not. If there are no hindrances, then I would make the call."		Assure a smooth and easy process Support ease of use	Be free of charge to the user

Expression 3

For many of the citizens in this study, their level of engagement was related to the extent of the ease of use in the communication process; many expressed the desire for interaction that was both straightforward and quick. In relation to the theme Functionality of a future solution for citizen involvement, one of the citizens remarked, "*I just want to pick up my phone, make a short video recording, add a voice message, and then just send it away*" (FG1, female, 30).

This expression also does not directly express a general need, but rather a preferred process or work flow. It also gives a clear indication of desired requirements that the system should fulfill. Based on this expression, we added the requirement that the final system should support the use of different types of data, such as video recordings, voice messages, and pictures.

Further, when we used Reiss' (2004) framework to analyze the expression stated by the citizen, we saw two possible interpretations. Firstly, from a savings perspective, a smooth process is desired since it is related to frugal use of time. Secondly, from the perspective of order, a smooth and clearly defined process is desired since it is linked to a feeling of

stability. However, in analyzing the text from both perspectives, we realized that the word *just* had key importance and was the determining factor for why we choose to set the expression as an expression for saving rather than order. Hence, in this way, one need (order) became the means for achieving another need (savings).

In traditional requirements engineering, an expression that clearly expresses a requirement is usually not elaborated further. Hence, the above expression would result in requirements that support mobile video recording and voice message. Relating the expression to the framework, however, made us reflect further on its meaning and this resulted in design-oriented needs related to time efficiency through ease of use, which in turn were translated to system requirements. For example, the log-on procedure became focused on creating as few steps as possible and, on an overarching level, the focus on saving made us prioritize ease of use and speed over aesthetics in the interface. As in the two previous expressions, a summary is given of the translation from user expression to system requirement, see Table 5.

Table 5. Clarification of the Translations Process for a Preferred Workflow.

User Expression	General User Need/Motivator	Design-oriented needs	System Requirement
"I just want to pick up my phone, make a short video recording, add a voice message and then just send it away".	Saving (ends)	Support ease of use	Have easy log-on procedure
	Order (means)	Assure a smooth and well defined process	Handle different input data automatically

DISCUSSION: DIFFERENT CLASSIFICATIONS OF USER NEEDS IN RELATION TO DESIGN

When we translated users' expressions into needs and then into requirements, we noticed that user needs could be associated with two distinct levels of abstraction. The first level described or explained what might motivate a user to buy and/or use a product or service, while the second level described or explained how these motivational needs could be operationalized. The motivational needs for a service were often expressed quite generally and could be related almost directly to one of Reiss' general motivators (see Expression 1). The operational needs, on the other hand, were seldom expressed as needs but rather as goals, conditions, activities, and processes. Here, the importance and influence of the interpretation and translation process became clear. To be of value for the development process and the programmers, these expressions (see Expression 2 for illustration) needed to be translated into design-oriented needs. For example, the need for a communication channel between the citizen and the receiving organization must be easily accessed and require as few preconditions from the citizens as possible.

While Reiss (2004) helped us avoid a translation and categorization process driven solely or primarily by our preconceptions, his framework did not help us to understand the two different levels found within our data. For this we turned to authors within design and

development disciplines who have translated the basic and general human needs from psychology into more prescriptive definitions.

Patnaik (2004), for example, presented four categories of individual and collective needs that originate from several design and strategy investigations, interviews, and observations: qualifier needs, activity needs, context needs, and common needs. Qualifier needs result from problems with existing systems and solutions and exist for all of those who use a particular solution in a similar way. Activity needs are the results of specific activities that persons perform or want to perform. These needs are the same for all people who want to perform the same activity. Context needs reflect the situations where people live, work, or operate: Similar needs will exist for people operating within the same industry, profession, region, culture, and so on. The common needs are the most fundamental and universal needs of all and relate to needs such as socialization, feeling loved, being comfortable, and so on.

According to Patnaik (2004), developers usually end up with a list of mostly qualifier needs, useful in that such a list leads to incremental improvements of current solutions, but not radical innovations. Context needs and common needs are often left unexplored, leading to a loss of opportunity for companies to create valuable, profitable, and strategically powerful solutions for their customers. For each category, Patnaik also suggested various solution types, for example, a qualifier need is related to new features of an existing solution while context needs are related to new families of offerings.

The categorization by Patnaik (2004) is more prescriptive than those of Maslow (1954) and Reiss (2004), and provided a mental model for understanding needs in design situations. More precisely, it helps designers understand the origin of needs and design wisely, as well as to relate needs to different aspects of a design. However, the framework also has some weaknesses. The most significant are the lack of theoretical underpinning of this work and the lack of methodological description of the research process. Also, Patnaik's categories are somewhat inconsistently described and need to be further developed.

A second example of categorizations of needs, developed from a design perspective, is Kankainen's (2003) two types of needs: motivation-level needs and action-level needs. Motivational-level needs answer the question of *why* a person is doing what s/he is doing. The action-level needs are more cognitive and relate to behavior, since they are related to a mental model of *how* to conduct an action. Hence, the motivational-level needs explain the underlying rational for carrying out an activity while the action-level needs explain the nature and process of the activity. In our view this categorization misses an important category, namely the category of *what* (i.e., what a person is doing).

Oulasvirta (2005) extended the categories presented by Kankainen (2003) by dividing the motivational needs into two subcategories: basic needs and quasi needs. While basic needs relate to general physiological, psychological, social needs, and so on, quasi needs are more ephemeral and situationally induced needs. They are not full-blown needs in the same sense as basic needs but they still affect how we think, feel and act. Oulasvirta illustrates quasi needs as the need or desire for an umbrella when standing in the rain, or the need for money when shopping in a store.

We see many similarities between Oulasvirta's (2005) basic motivation-level needs and Patnaik's (2004) common needs. As such, motivational needs provide a promising starting point for discovering design opportunities. The quasi need, on the other hand, is described as a solution rather than a need. For example, an umbrella does not represent a need, as is

argued by Oulasvirta's (2005). When it is raining, we feel the need to keep dry. This can be managed with different solutions, where an umbrella is one solution and a raincoat is another. Moreover, Oulasvirta's (2005) does not clarify how these various needs influenced or directed the different studies described in his paper.

To fully harvest the potential of these more design-oriented classifications of needs, these needs should be related to the design process as such. It is the design-oriented needs that offer the best potential for helping designers understand what needs to focus on in relation to different phases of development and to reflect on how needs and expressions of needs change form as the design process moves on.

Our classification of needs into two hierarchical levels, motivational needs and design-oriented needs, is one such example of how this can be accomplished. It helped us to identify and shift focus between needs that will motivated a user to buy and/or use a product or service and needs that will motivate the user to keep using the product and service. To further clarify the difference between the two levels of needs, as well as their place and function in the design process, we name the motivational needs as needs *of* the service, and the design-oriented needs as needs *in* the service.

FINAL REMARKS AND REFLECTIONS ON THE FINDINGS

Based on the trends and weaknesses found in the present literature related to user needs, this paper aimed to contribute to the field by presenting an approach for translating user expressions into needs and, later, into requirements. This process was illustrated using a case study focused on increasing citizens' involvement in municipality matters.

One of the most important benefits in using a framework for analyzing user expressions and translating them into requirements was the discussion and reflection it generated. Through these discussions and reflections, the importance of separating needs into two hierarchical levels or categories crystallized. The first is related to needs *of* the service, meaning what motivates a user to buy and/or use a product or service. Based on our interpretation, user needs of the service gave an indication of what the citizens considered important in their lives and what motivated them to interact with public authorities. The second is related to needs *in* the service, that is, when using a service, what needs are important for the users. In our study, typical needs of the service were Idealism, Power, Status, Acceptance, Curiosity and Tranquility, while typical needs in the service, those influencing the design of the implemented system most, were Saving, Order, and Independence.

The translation process from user expressions into requirements generated an interesting debate on what constitutes a need and what the meaning of an expression might be. It also illustrated that users do not always clearly express stated needs. Rather, their contributions include a mix of needs, suggestions, conditions, and problems. Due to this, the analysis and interpretation of user expressions becomes very important. Here, the framework helps to avoid a translation and categorization process driven only by the preconceptions of the researcher by providing scientifically sound theories on user needs. Documenting the translation process also provided a clear pattern of traceability between expressions, needs, and requirements.

Further, if we are to harvest the potential benefits of a needfinding approach, it is crucial that we are able to identify the needs and translate them into relevant requirements and solutions. In this process, the applied framework made it possible for us to see needs hidden in general expressions and to reformulate these accordingly. However, the weakness in this framework applies to Reiss' framework and generally to other frameworks as well: That is, in using a framework to support the analysis of needs, a risk always exists that the researcher may force a need into a predetermined box. Since this might hinder the development of new types of needs, the analyst needs to be attentive and open to this.

The analysis also confirmed that expressions of motivators are situated; that is, they are unique and arise within the situated reality in which the individual takes part—a certain context at a certain point of time. Hence, from a design perspective, the situated needs and motives give the direction or design implication, not the motivators as such. Further, the analyses demonstrated that interpreting the expressions from different motivators generated different requirements and, as such, resulted in different services. Finally, the analysis has generated interesting ideas for new possible requirements or functions of the developed product or service.

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Authors' Note

All correspondence should be addressed to
Birgitta Bergvall-Kåreborn
Social Informatics
Luleå University of Technology
SE-971 87 LULEÅ
SWEDEN
Birgitta.Bergvall-Kareborn@ltu.se