A value-centric model to ground norms and requirements for ePartners of children*

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Abstract. Children as they grow up start to discover their neighborhood and surrounding areas and get increasingly involved in social interaction. We aim to support this process through a system of so-called electronic partners (ePartners) that function as teammates to their users. These ePartners should adapt their behavior to norms that govern the social contexts (e.g., the family or school) in which they are functioning. We argue that the envisaged normative framework for ePartners for children should be based on an understanding of the target domain that is grounded in user studies. It is the aim of this paper to provide such understanding, in particular answering the following questions: *1) what are the main elements that make up the social context of the target domain (family life), and how are they related?*, and *2) what are the relationships between these elements of the social context and the normative framework in which we envision the ePartners to operate?* To answer these questions we conducted focus groups sessions and a cultural probe study with parents and children. The transcripts from these sessions were analyzed using grounded theory, which has resulted in a grounded model that shows that 1) activities, concerns, and limitations related to family life are the main elements of the social context of this user group, and that all three elements are connected through the central concept of user *values*, and 2) norms can support these values by promoting activities, alleviating concerns and overcoming limitations. In this way the model provides the foundation for developing a normative framework to govern the behavior of ePartners for children, identifying user values as the starting point.

1 Introduction

Children as they grow up start to discover their neighborhood and surrounding areas (and more so unsupervised the older they are), and get increasingly involved in social interaction (e.g. at school or sports clubs). It is our aim to support this process with intelligent technology to enable children to feel more

* This publication was supported by the national Dutch program COMMIT.

socially connected, safe, and secure. We call this *socio-geographical support*. Such support can for example concern a child's safety as he/she is learning to explore its surroundings or learning to cycle to school, as well as the organization of children events in the community, birthday parties, and assistance in arranging play dates. We focus on *elementary school children* (between 6 and 12 years old) as our target group, as well as important people in their social environment such as their parents and teachers. We choose this target group as this is the age where they begin to explore their social and geographical environment on their own.

Our proposed solution for providing socio-geographical support is to create a system of so-called *electronic partners* (ePartners), that function as teammates to their human users as they navigate through their socio-geographical environment. ePartners in this setting may take the form of an application on a smartphone or another hand-held device. ePartners have already been investigated in various domains, e.g., within control systems [3], robots [18], and applications that promote positive lifestyle changes [17].

Existing work on ePartners focuses on the bilateral relation between a single human and his/her ePartner. We propose that for our target domain it is also important to take into account the *social context* in which ePartners are functioning to enable them to adapt their support accordingly. For example, if a family normally allows a child to wander around the neighbourhood alone, the ePartner of the child might only notify the parents in case the child has left the area considered familiar or secure. On the other hand, if a family lives in an unsafe area they might not allow the child to do this, in which case the ePartner of the child could send a warning to the parents if the distance between child and parents has crossed a certain limit. We propose to model these different requirements for the behavior of the ePartner as *norms* [2] that govern the respective social contexts. New norms may arise at run-time due to changing circumstances and social contexts. The idea is that the ePartner will be able to adapt its behavior accordingly to provide tailored support.

It is our view that development of interactive, human-centred automation such as ePartners for socio-geographical support should be built on empirical research to ensure that the provided support aligns with the context of use (see also [26,13]). Thus we argue that the development of the ePartner for socio-geographical support and the normative framework on which it is based should be *grounded in user studies* that provide an understanding of the target domain and the ePartner's supportive role in it in a systematic way. To achieve such understanding, in this paper we answer the following questions: *1) what are the main elements that make up the social context of the target domain (family life) in relation to socio-geographical support, and how are they related?*, and *2) what are the relationships between these elements of the social context and the normative framework in which we envision the ePartners to operate?* We aim for a grounded model that concisely describes these elements and their relations. This model is the main scientific contribution of this paper, and is anticipated to help guide future development of normative models suited for

specifying behavioral requirements of an ePartner for socio-geographical support within a family life context.

To answer our research questions we applied a situated cognitive engineering methodology [25] (described in Section 3). In particular, we conducted focus group sessions [22] and a cultural probe study [15] with parents and children (Section 4). Transcripts from these sessions were analyzed using grounded theory [31] (Section 5). The resulting grounded model (Section 6) identifies the main elements and their relations in the social context of family life concerning socio-geographical support, and it shows how these are related to norms for the ePartner. In this way our model provides the foundation for developing a normative framework to govern the behavior of ePartners for children. We discuss related work that forms the background of our research in Section 2 and conclude the paper in Section 7. To the best of our knowledge, this is the first time that situated cognitive engineering has been used in normative systems research.

2 Background

In this section we give more background on important elements of our research, namely ePartners (Section 2.1) and normative and organisational frameworks (Section 2.2).

2.1 ePartners

ePartners are defined as computerized entities that partner with a human (development of a relationship) and share tasks, activities, and experiences [10]. In that sense, as automation becomes sophisticated, ePartners will function less like tools and more like teammates [7]. They follow a paradigm shift from automation extending human capabilities to automation partnering with a human [10]. Examples of ePartners can be seen in various domains: critical domains such as space missions [34], naval command and control [3], and virtual reality exposure therapy (VRET) [27], as well as other, less critical domains such as socio-cognitive robotics [18], and personal digital assistants [24,17].

The notion of ePartner fits very well with the role that we envisage intelligent technology to play in socio-geographical support, namely as an intelligent entity able to partner with people. ePartners can form individual agreements ("contracts") with their users and can take the initiative to act in specific situations. ePartners have not yet been investigated in the context of socio-geographical support nor with the emphasis on the social role that they are playing and the ensuing need for adaptation to norms in their social contexts.

2.2 Normative and organizational frameworks

In recent years, an increasing amount of research has proposed to assign an organization or a set of norms to a multi-agent system (MAS) with the aim of organizing and regulating it (see, e.g., [11,21,36,32,35] and the overview in [2]),

similar to the way social norms and conventions organize and regulate people's behavior in society [36]. This should make agents more effective in attaining their purpose, or prevent undesired behavior from occurring. Organizational frameworks often incorporate norms as an element of the specification of an organization (see [20,11]). Research in this area has yielded a wide range of frameworks and languages for expressing organizations and norms.

We aim to build on this work by using norms to allow people to define requirements of social contexts in which ePartners should function. To ensure that the normative framework allows to express those aspects that are important for people in the context of socio-geographical support of children, we perform user studies to obtain an understanding of this social context and the role that norms could play in governing the ePartner's functioning.

The use of normative systems as the basis for supporting collaboration between humans and artificial teammates has been investigated only to a limited extent. KAoS [32], which is a framework that allows to specify policies for human-agent/robot teamwork, takes steps in this direction. To the best of our knowledge, the requirements for their policy framework are however not elicited based on user studies to understand the context in which these agents or robots should function, but rather on a general analysis of aspects of human-agent teamwork. The work in [1] proposes that software adaptation be achieved through allowing users to modify the system at runtime through feedback, though the work does not propose the use of norms.

3 Methodology

In this section we describe the methodology we are using to develop ePartners as socially supportive applications that understand and adapt to user's social contexts. In Section 3.1 we introduce *situated Cognitive Engineering* (sCE), the general framework we will use for development, and in Section 3.2, we describe the methods we used for data collection and analysis within the sCE framework.

3.1 Situated cognitive engineering

As a principle stance in the development of ePartner that can adapt to its social context, we reject the notion of a generic, context independent normative model, suitable for any social context. Instead we argue for the need of normative models specifically tailored for their social context, in our case family life. Situational dependency is also core to the situated cognition theory [8] which posits that cognition can not be separated from its context. Therefore, this study uses *situated Cognitive Engineering* (sCE) as the general framework for development [25]. sCE describes an iterative process based on *Cognitive Engineering* (CE) approaches [19] whereby practical theories and methods are developed that are *situated* in the domain. Using a situated approach allows for better addressing of the human factors (i.e. human characteristics that influence their behavior in a certain environment), which in turn leads to a better human-machine collaboration design. sCE is composed of three main phases:

1. *Foundation:* understanding the domain, human factors, and technology involved;
2. *Specification:* the specification of the requirements and the corresponding use cases (the steps that define the interaction between a user and a system) and claims (what the developer proposes the system to be capable of doing).
3. *Evaluation:* validating these claims through development of a prototype application that is tested in the field.

We use this methodology for the development of ePartners for socio-geographical support by instantiating the three phases in the following way (Figure 1):

1. *Foundation:* understanding our users' social context;
2. *Specification:* developing an expressive normative framework tailored to the target domain of socio-geographical support, to allow users to communicate their social requirements to the ePartner;
3. *Evaluation:* creation of a prototype ePartner for socio-geographical support according to the specification and iteratively evaluating it in the field.

In this paper we address the first phase (understanding social context). That is, we leave development of a normative framework and a prototype application for future work.

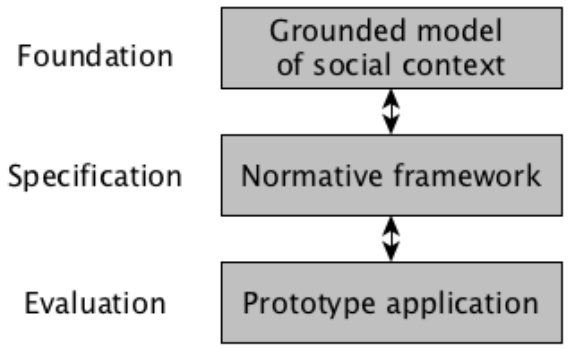

Fig. 1. The three phases of sCE and how they align with the phases of our research

3.2 Research methods

As explained in the previous subsection, we aim in the first phase to get an understanding of the important elements in the social contexts in which the ePartner will function. Therefore we need to collect data that describes the attributes, properties, and characteristics of the content of these social contexts. That type

of *descriptive* data is usually obtained using *qualitative* methods (as opposed to quantitative methods, that start with a pre-assumed concept or model of a phenomena, and set out to collect specific, often quantified data to study this concept or model).

Two established types of user studies can be used to collect such descriptive data from the target environment: the first type is *cultural probing* (CP), a methodology initiated by Gaver [15]. It consists of providing users with packages of postcards, maps, disposable cameras, post-it notes, and other material for them to use to record spontaneous data related to their lives. No explicit usage instructions on exactly how to use the material are provided. Users collect data over a period of several days or weeks (for examples on works involving cultural probes, see [29,6,5]). The aim of CP is not to reach a comprehensive view of the user's requirements, but rather to use the collected material to inspire design. The second type of user studies we have used is *focus groups*, which can be defined as "carefully planned series of discussions designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment" [22]. In a setting like focus groups, a small group (usually 5-10 participants) is gathered in one place, and then a discussion session is led by a moderator. The moderator proceeds to ask open ended questions, stimulating conversations between the participants relating to the subject of research.

We aim to obtain an understanding of the elements of the social context and the relationships among these elements, building a theoretical model on top of the collected data, or "grounded" in the data. This motivated the choice of *grounded theory* as our data analysis method: grounded theory is a bottom-up approach whereby theory is derived from data, systematically gathered and analyzed throughout the research process. Researchers do not begin the project with a preconceived theory in mind, but rather, the researcher begins with an area of study and allows the theory to emerge from the data [31].

In grounded theory, analysis comprises of four distinct steps [9]:

1. *Open coding*[1] where data is examined line by line in case of pieces of text (or object by object for other types of data), and portions of text and other media are "coded" under various codes that represent key points in the data.
2. *Axial coding* or the creation of categories, whereby similar codes are grouped together to highlight the presence (or emergence) of a theme or a concept.
3. *Selective coding* (or to further refine the existing set of codes), to identify themes central to the research questions and aims, and several iterations of coding and re-coding of the data may take place until a satisfactory level is reached.
4. *Theory building* or the discussion and linking of emergent themes, and visual portrayal of connections that build up themes into a theoretical model.

[1] Here, codes bear the meaning closer to tags in modern social applications. To code a piece of text is to tag it with a number of words or short phrases that relate to the content of that piece.

In future work we will use the model that results from step 4 to identify requirements for a normative framework to support ePartner functioning in socio-geographical support (sCE's specification phase), which we will in turn use to build a first prototype (sCE's evaluation phase).

Grounded theory, as any qualitative analysis methods, is inherent subjective in nature and therefore vulnerable to validity threats such as researcher bias, interpretation bias, or respondent bias. This study therefore followed two strategies as proposed in the grounded theory literature [31] to minimize these intrusions. The first strategy applied was comparative thinking, i.e. comparing findings with reports in the literature, and with other data sets. In this study, we therefore collected data through both focus groups and cultural probes, noting the presence of similar themes in the analysis of both sets. Secondly, we applied a re-evaluation strategy [23], whereby an independent researcher was invited to re-evaluate the analysis of samples of the text, in order to investigate the degree of understandability, correctness, and completeness of the coding schema (details in 5.2).

4 User studies

In this section we describe the user studies that we have performed to get an understanding of the contexts in which ePartners for socio-geographical support are expected to function.

We have conducted three focus group sessions and one cultural probe study to investigate user requirements. The participants in these studies were parents and (some of) their children in a town of approximately 30.000 inhabitants, located in the South-West of The Netherlands. Through a small 'snowball sample' [4] we requested a group of 6 parents and another group of 6 children to participate in the studies. "In snowball sampling you locate one or more key individuals and ask them to name others who would be likely candidates for your research" [4]. Our snowball sample started with a contact who participates in the school board, a youth centre and in a website for the local community.

The first focus group session included the six parents only. We introduced to them our project, research, and explained the aim of our user studies. To stimulate discussion, we displayed a few ePartner usage scenarios (created beforehand) and design claims (i.e. claims about a few positive and negative effects of the ePartner features within our scenarios)then asked the participants (individually) to rate to what extent they agree with our claims. After a short general discussion, we provided the parents with cultural probing kits (each kit contains a map, an instant camera, post it notes, post cards, pens, and some glue). The session ended with a brief explanation on the typical usage of the kit material.

The second session (three weeks later) included the same group as the first session. The parents brought back the material they (along with their children) collected during that period, and then proceeded (individually) to describe the data (e.g., pictures, map highlights, etc.) they collected with their kits. This

process stimulated the discussion for a further 45 minutes in which many of the parents' and their children's life issues, values, and concerns were raised.

The third session included the six children only. The ages of the children ranged between six and eight years old. That session was led by an experienced elementary school teacher, and consisted of a discussion where the teacher asked the children a number of open ended questions related to their knowledge and usage of current technology, what activities they are allowed to do, how they connect with other children at school, sport clubs, and other places. All sessions were audio-taped.

5 Data analysis and evaluation

We transcribed the audio recordings from all three focus group sessions and imported these transcriptions and the scanned probe kit material into QSR NVivo[2] to perform qualitative analysis.

First, thorough reading of the transcriptions allowed us to derive the preliminary coding schema from the data material. In the second round of analysis, each passage of text was annotated with the appropriate codes, and the relevant codes were grouped together which resulted in a tree of codes. Afterwards, the tree of codes was further refined (e.g., codes with similar or close meaning were merged, codes under the same topic were grouped, infrequent codes were removed, etc.). Coding was then re-done according to the new tree, and portions of it were rated by another researcher.

5.1 Tree of codes

In this section we describe the tree of codes that has resulted from our data analysis.

The tree can be seen in Figure 2. The leaves of the tree represent the set of codes used in the analysis to mark relevant pieces of text in the transcriptions. Groups of codes represents the main "themes" or "elements" of the social context within our user group that we have identified in the data, created through grouping together codes that are similar or related. Two groups (limitations and concerns) were split into sub-groups (in italic) for further clarification.

Second level nodes represent groupings of codes that together represent a theme within the participants' social context. *Activities* includes codes relevant to activities participants engage in, such as playing with friends, church, or sports. *Concerns* represent issues raised by parents (and children) that are present in their current life or are a cause for a certain worry, such as "contact with strangers" and "misuse" of technology. *Limitations* covers a rather broad theme that consists of both *imposed* (overprotection, privacy) or *natural* (spatial, age) issues that present a specific barrier towards the performance of an action (whether related to technology or not). *Perceptions* include mental models

[2] http://www.qsrinternational.com/products_nvivo.aspx

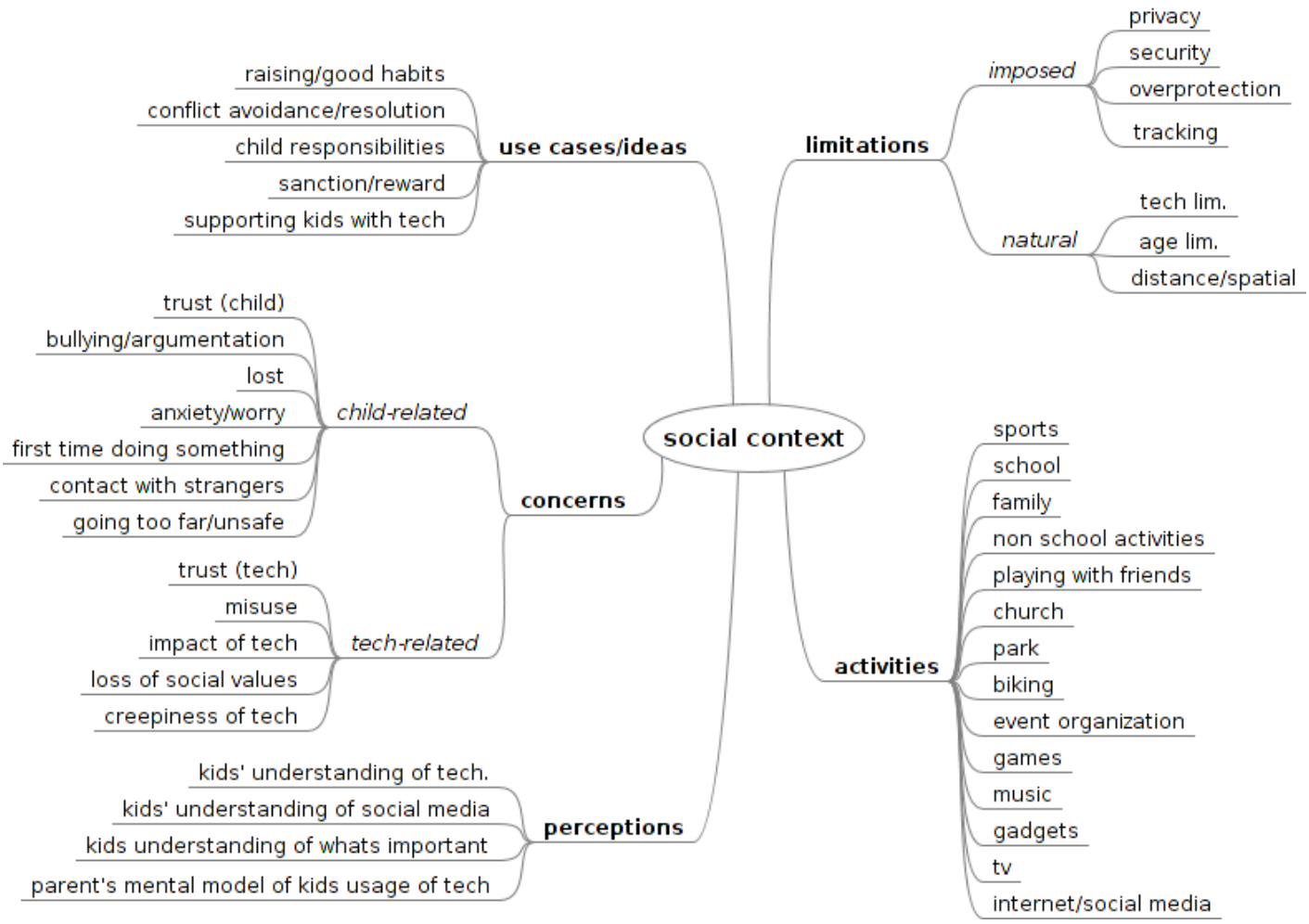

Fig. 2. Final tree of codes

formed by an individual or a group (parents or children) of their understanding of certain concepts such as technology or social media, and *use-cases/ideas* represent suggestions that were given directly by focus group participants about ePartner features they believe to be be useful.

To explain in more detail, a few passages and their related codes taken from the data are shown below [3]:

- A: I think safety & security is important, also for the family, how do you handle this? If they can hack such an "ePartner" system, they will know everything about your child: Where they go, where they play their sports, how the routes are, and that's a lot of data. When I drew these data for the probe kit, I realized: You now know how my kid goes to the football field. Security is extremely important.

Coded under (a) limitations:imposed:security, (b) limitations:imposed:privacy, and (c) activities:internet/social media

- B: You know everything about it, and I don't feel like it, to be on something like Facebook, but I am forced to do this to follow the developments.
- C: We were wondering this week, do we have to make a Facebook account for ourselves to be prepared for when cC wants to have such an account?

Coded under (a) concerns:anxiety/worry, (b) concerns:trust:(child), (c) activities: internet/social-media, and (d) perceptions:parents' mental model of kids understanding of technology.

- cC: (about her smartphone)... and that is something on which you can play all sorts of games, and you can also chat and listen to music.

Coded under (a) activities:gadgets, (b) activities:music, (c) activities:internet/social media, and (d) perceptions:kids' understanding of technology.

5.2 Coding evaluation

As motivated in Section 3.2, randomly selected portions of the data (containing around 20% of the codes) were evaluated by a second researcher who has not been exposed to the data before. Evaluation consisted of (a) rating the codes present in the passages with "OK", "questionable" or "reject", and (b) answering a set of open-ended questions regarding the terminology used, consistency, completeness, placement and grouping of the codes.

[3] Names of participants are anonymized. Adults are referred to with one capital letter (for example, A or B), and children are referred to with a small c before one capital letter (for example, cA means the child of adult participant A).

The result of part (a) was that roughly 60% of the codes received an OK, 20% were rated as questionable and 20% were rejected. Out of the rejected 20%, we agree with the rejection in approximately half of the cases, for example:

- Coding "D: Maybe you can say: They will do things on Facebook etc., but you could let them get used to this in a controlled way".

was classified under "misuse" (which falls under the theme concerns:tech-related), but we agree with the evaluator that this text is not related directly to misuse of technology. For these cases we have adapted our codings.

We disagree with the rejection in the rest of the cases, for example:

- Coding "So, where do you have to interfere? Maybe, do you have to give children their own responsibility not to do these kind of things?"

was coded under "overprotection" (which falls under the theme limitations:imposed), because the idea of overprotection is being discussed, especially considering the overall context of that part of the discussion.

The answers to the questions in part (b) were:

- The current coding schema represents the data fairly well.
- Adding codes such as "future plans" and "playing outside" was suggested, seen to be useful in the third session with the children in specific.
- A few changes to current codes were suggested, for example splitting "bullying/argumentation" into two separate codes, changing "trust (ePartner)" into the more specific "trust (social media)", and renaming "distance/spatial limitations" to become more specific.
- No changes were suggested for the grouping (themes) of the codes.

These suggestions were taken into account to the extent that they had implications for the final tree, though not strong enough to produce prominent changes to the hierarchy and placement of codes within the tree. This suggests that the tree of codes resulting from the analysis has a good level of comprehensibility. Analyzing the evaluation as well as applying many of the suggested modifications to the codes and the tree contributed to a joint-view tree of codes in the final form.

6 Grounded model

With no more refining of the themes and codes in the tree to be done, the fourth and last step in grounded theory is theory building (the discussion and linking of emergent themes, and visual portrayal of connections that build up themes into a theoretical model, as discussed in Section 3.2).

6.1 Values as a central element

We queried the data material with various combinations of codes within the different themes in the tree of codes, especially codes with a high density in the text. We found that many of the passages of text that were returned as a result of queries of this type were statements from parents and children regarding certain elements that they believe to be "good" or "bad", "preferred to" or "not preferred to" a certain familial or societal issue they encounter.

Before we elaborate further on the possible significance of these types of statements, we need to briefly introduce the notion of "values" as discussed in across various academic domains. According to Cambridge Dictionary, a value is defined as "the importance or worth of something to someone".

[30], shows that values can be represented as phrases containing a subject matter, and a claim of "good/better/best" or "bad/worse/worst", relating the subject matter to someone or something, or in general. Examples of that can be "too much cholesterol is bad for your health", "my new can opener is better than my old one" and "pleasure is good". Though the word "value" in itself seldom appears in a sentence of this form, the existence of the varieties of "good" and "bad" in the sentence signify how the value of the subject matter is seen. In his 1973 book [28], social-psychologist Milton Rokeach published a list of values (based on a survey he conducted) that has become popular and widely used. The list included 18 terminal values (end results, or what one seek to accomplish such as happiness, freedom, and a comfortable life) and 18 instrumental values (ways of seeking and accomplishing terminal values, such as ambition, self-control and honesty).

The statements of the the "good/bad" and "preferred to /not preferred to" form, which were returned as results of the queries discussed earlier, may then provide clues to the values of the person providing such statements. Often, the values they refer to align with some of the values in Rokeach's value survey.

To illustrate, querying the data for passages containing both the tree codes of "internet/social media" and "safety", would return several results, one of which is:

- "E: Often I get why-questions from children, and on the Internet you can get really strange things if you Google some words. Can you have a child-friendly Internet, that is safe and enclosed?"

Transforming this passage into the "good/bad" form returns the following value statement:

- "It is good to protect your children from the Internet's unsafe side".

Within Rokeach's value survey, we can arguably link the previous sentence to the value of "family security".

- "C: cC would really be happy if she could see that her best friend is available to play, but then I think they can already phone eachother, but such a feature would be nice for children: to see eachother's availability"

Transforming this passage into the "good/bad" form returns the following value statement:

– "It's good if children are able to use technology for coordinating their activities".

Within Rokeach's value survey, we may link the previous sentence to the values of "independence" and "social recognition".

We found that several of values in Rokeach's survey are important for this type of user groups, including family security, independence, inner harmony, true friendship and social recognition.

6.2 Relationship between social context and values

Highlighting values as a central concept in the user data brought forth the idea for a unifying link that can be established among three of the five themes in the social context through the values of our user group: Activities are driven by their values, concerns pose a threat to their values, and limitations obstruct fulfillment of their values (or in the case of imposed limitations, pose a threat to their values). This relationship is depicted in Figure 3.

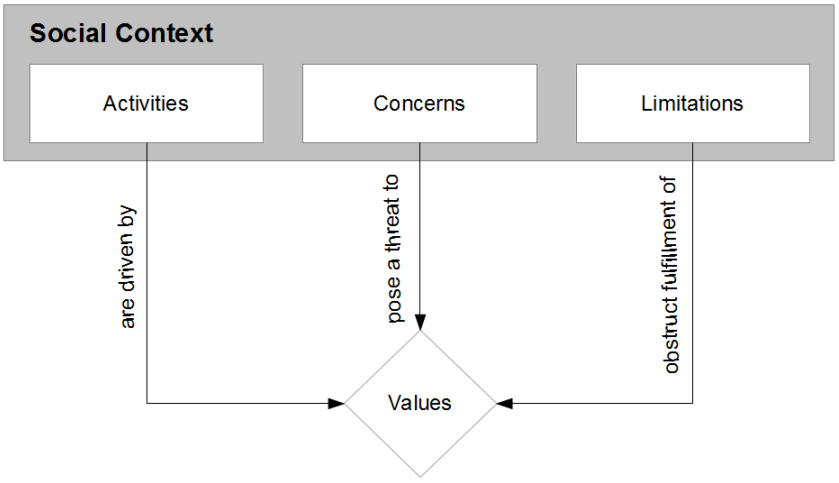

Fig. 3. Relationship between social context and values

6.3 Relationship between values and norms

The second question we posed in the introduction highlighted the need to understand the relationship between the normative framework in which we envision the ePartner to operate, and the elements of the social context. Having seen how the elements of the social context are interconnected through user values, we proceeded by investigating the relationship between these values and norms. This relationship has been established in literature. For example, in [16] it is investigated to what extent norms (obligations, permissions, and prohibitions) can be expressed in terms of value predicates (good, bad, better, etc.). In [12], a method is proposed to identify conflicts between the values of an agent, and the norms to which it subscribes. In [33] norms represent the middle layer in a 3-layer hierarchy (Figure 4) which shows how design requirements can be elicited from values. Social norms (as an intermediary step in this model), can thus be derived from (or to be more specific, created to support) values.

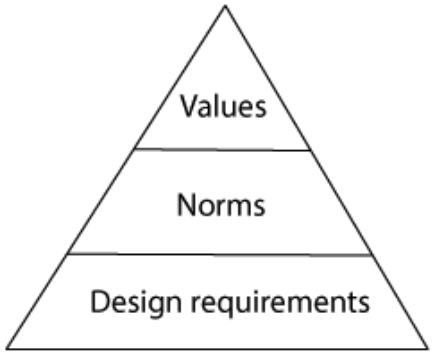

Fig. 4. A model that shows how to move from values to design requirements [33]

Based on the previous literature examples, we propose that norms that influence the behavior of an ePartner can be created to support the values of our user group. Consider our last example of a sentence expressing a value:

– "It is good to protect your children from the Internet's unsafe side".

This means that the user believes a specific concern (misuse of technology) poses a threat to one of their values (family security).

We identify ePartner norms can support this value, for example:

– ePartner is obliged to block websites that are considered unsafe, or
– ePartner is obliged to inform parent if child is accessing unsafe websites.

By adhering to either of these norms, the ePartner alleviates this instance of the concern "misuse of technology", thereby averting its possible threat to the value "family security".

To generalize from that example, the elements of the social context (activities, concerns, limitations) affect user values positively or negatively, and though adhering to norms, ePartners can enforce a positive effect or diminish a negative one.

6.4 Relationship between social context, values, and norms

We have seen how the elements of the social context are related to the values of our user group, and that ePartner norms can be created to support these values. We can now "close the loop" and see how norms for the ePartner can support the elements of that social context. The resulting grounded model (Figure 5) shows the relationship between social context, values, and norms, answering the two research questions that we posed in the introduction (Section 1):

1. *Activities* that families engage in, *concerns* about and *limitations* on family life form the main elements of the social context of this user group, and these three elements are connected through the central concept of user *values* (namely, activities are driven by values, concerns pose a threat to values, and limitations obstruct fulfilment of values).
2. *Norms* can support these values by promoting activities, alleviating concerns and overcoming limitations.

In this way the model provides the foundation for developing a normative framework to govern the behavior of ePartners for children. It shows that to develop a normative framework for ePartners for socio-geographic support, user values should form the starting point. It also provides guidance on the type of prototype application and corresponding norms to be developed in the next phases of sCE, since these should be aimed at promoting activities, alleviating concerns and overcoming limitations.

7 Conclusion and discussion

Our contribution in this paper is a grounded model that shows the main elements of the social context of this user group, namely the 1) activities, concerns, and limitations related to family life, and that these three elements are connected through the central concept of user *values*, and that 2) norms can support these values. In this way the model provides the foundation for developing a normative

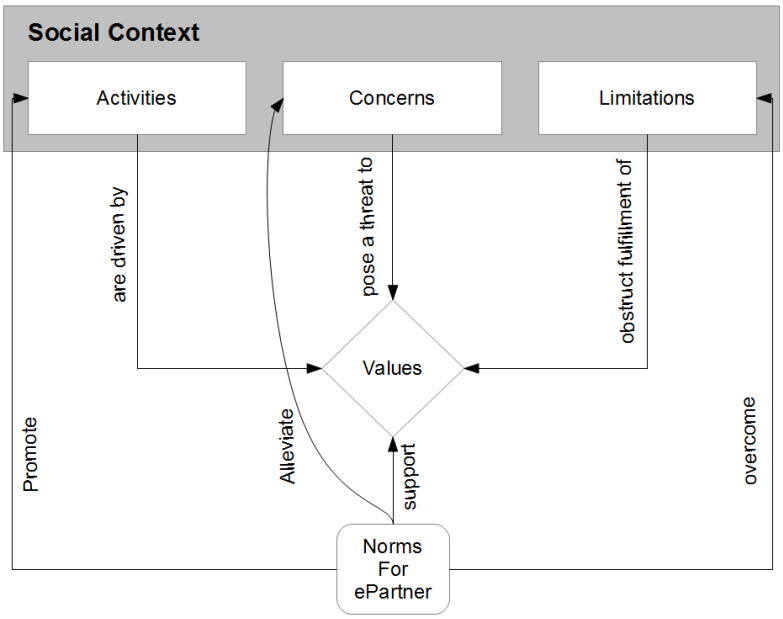

Fig. 5. A grounded model that shows the relationship between social context, values, and norms.

framework to govern the behavior of ePartners for children, identifying user values as the starting point.

The model we presented is grounded, meaning that it was constructed on the basis of user studies and corresponding data analysis, and it provides a coherent and concise specification. We believe that taking users into account is crucial for developing this type of interactive technology, and having done so in this paper, the ePartner's support taken from this model onwards will align with this target group's context of use. This paper also forms an example of how one can use empirical methods as the basis for developing a normative framework.

In future research, we will continue with the next phase of the sCE framework, building on the findings we presented in this model. Relevant research at this stage is Value-Sensitive Design (VSD) [14], which is an approach that seeks to design technology that accounts for human values in a principled and comprehensive manner, and investigate how values are supported or diminished by particular technological designs.

Following the development of a normative framework for socio-geographic support we will create and evaluate a first prototype on top of a mobile phone sensing platform. The prototype should allow users to express express their requirements on ePartners' behavior, supported by a normative specification

language. We will evaluate the prototype through user studies situated in the environment of the target group.

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