

# Substantiating Quality Goals with Field Data for Socially-Oriented Requirements Engineering (Extended Abstract)

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## ABSTRACT

We propose a method for using ethnographic field data to substantiate agent-based models for socially-oriented systems. We investigate in-situ use of domestic technologies created to encourage fun between grandparents and grandchildren separated by distance. The field data added an understanding of what *intergenerational fun* means when imbued with concrete activities. Our contribution is twofold. First, we extend the understanding of agent-oriented concepts by applying them to household interactions. Second, we establish a new method for informing quality goals with field data to enable development of novel applications in the domestic domain.

## Categories and Subject Descriptors

I.2.11 [Artificial Intelligence]: Distributed Artificial Intelligence – multiagent systems.

## General Terms

Design, Human Factors.

## Keywords

Socially-oriented requirements, ethnography, quality goals.

## 1. SOCIAL REQUIREMENTS

Technology can facilitate interpersonal contact in social situations, but that technology is only valuable if it addresses and fulfils the felt needs of people acting in their social environments. Domestic and social goals do not fit well with traditional software engineering methods and processes. Social needs typically include many that are high-level, cognitive, emotional, and hard to measure, such as playfulness, the act of engaging in an activity or expressing feelings. Such socially-oriented requirements are difficult to quantify and measure, and as such, engineering systems to fulfil them is a non-trivial task. Our method is defined to substantiate these high-level *quality goals* [2] with more meaningful attributes that are obtained from ethnographic data. Ethnographic data can be used to inform system models and to help define socially-oriented requirements [3]. However, ethnographic data does not translate directly into requirements

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[1]. Themes extracted from ethnographic data are not limited to functionality; that is, it is not what users actually want. Therefore a problem occurs when we want to inform models with rich field data: the ethnographic data is a bottom-up view of the domain, while system models are typically derived top-down (albeit iteratively). Development tools typically deal best with clearly defined, hierarchical goals that endure over time while the field researchers' focus is on the current and complex lives of people. Consequently there are gaps and disconnections that have to be made up in the design process. Our work defines a method for closing the gap between ethnographic data and agent-oriented models via the use of quality goals. Agent-oriented models are suitable for modelling the social domain because they represent the goals and motivations of individuals using everyday language.

## 2. QUALITY GOALS

Technologies for strengthening bonds within separated families must fulfil hard-to-define and complex quality goals. In our requirements elicitation process, we seek complexity reduction without losing the richness of the social concepts themselves while generating models that can be implemented into technologies. High-level quality goals can be used as such a descriptive complexity reduction mechanism.

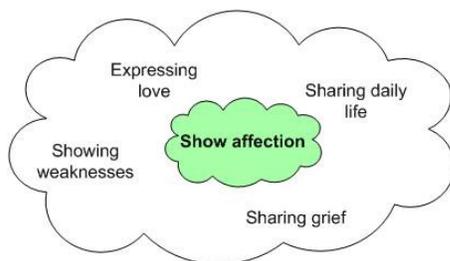
High-level goals associated with activities can act as a point of reference for discussing the usefulness of design alternatives to achieve these goals instead of a decomposition into single requirements. To this end, we suggest that quality goals are a necessary part of the abstraction process because they can be used to represent a set of goals comprising the kinds of complex social concepts that are present in field data. Our research builds on the work of Sterling and Taveter [2]. Their motivation models contain goals and quality goals that can be connected using arcs, which indicate relationships between them. Here we look more closely into quality goals describing the essence of intergenerational activities. The motivation model for intergenerational fun contains the goals *play*, *gift*, *show & tell*, *look & listen* and the quality goals *show presence*, *share fun* and *show affection*.

### 2.1 Substantiating quality goals via field data

The success of a design in achieving its goals can really only be investigated after implementation. Therefore we started with building a set of “lightweight” technologies that focus on certain goals of the model such as gifting. For example the “electronic Magic Box” allowed the sending of a treasure box that could be

filled with photographs and messages. The box was hidden in a forest and a maze had to be solved by the recipient in order to open the box. The applications were installed in three family homes between three and six weeks over a period of four months. The technology probe data collected for example with the Electronic magic box application included 102 boxes (electronic letters and photographs), time stamps for all messages and seven interviews about the application use.

The data was analysed focusing on the quality goals as overarching themes. We investigated and evaluated the activities and interactions and not the technology per se. On the goal model level we do not prescribe how to use specific technologies and independent of one concrete implementation. This procedure enabled us to find sub-themes for all of the quality goals and therefore to learn more about each goal in the light of typical activities between grandparents and grandchildren. This analytic procedure helped us to keep the focus on the human needs with the technology as mediator tying them back to the motivation model. We avoid the risk of focusing on the technology as our aim is not to create a finalised technology, but implementations that support us in further investigating the social requirements themselves. Even further this approach evaluated our existing understanding in looking for examples for “this was fun” or “this was not fun”. The sub-themes that emerged from our data analysis were organised into quality clouds, as shown in Figure 1 for the quality goal *show affection*. The quality clouds consist of one quality goal with associated qualities factored around. The quality clouds can be seen as an abstract representation of field data into which we are able to zoom into the associated quality goal more closely. Each sub-quality of a main quality goal is briefly described and directly linked to the respective quotations in the interview data. Certain value sets we discovered have so far been marginalised such as disclosing weaknesses and laughing about them or the demonstration of grief and openly sharing it with a loved one. In one instance the grandmother does not try to brush the child’s grief about the loss of the loved dog away with some happy comment, but she honestly acknowledges that this is indeed sad.



**Figure 1. Quality cloud for the quality goal *show affection*.**

We also permitted new main quality goals to emerge, and hence allow changes to our overall goal model. For example qualities emerging that we could not group with our existing quality goals were themes surrounding the technology use itself - still explicitly described as fun. The new quality goal that emerge is *build up confidence* with sub-themes such as *mastering the technology* and *showing off*.

## 2.2 From quality goals to design requirements

The quality representations of the field data helped to formulate high-level requirements for a design of a more complex and

refined technology concept for grandparents-grandchildren interactions that we are currently building. For example requirements are influenced by the new quality goal. Building confidence is part of the intergenerational interaction and it has implications on how the technology should be designed: not put everything in an application at once, because it scares the grandparents away. We now maintain simple screen views and a layered application instead of one packed with functionality.

Another important insight was discovering “the other side of fun”. According to our results, the dealing with these kinds of emotions is just as important for a strong tie relationship as demonstrating love, play together and laugh about a joke. It is no contradiction that technologies for intergenerational fun also allow and even aim for activities that deal with aspects we would normally avoid to show openly.

## 3. BENEFITS OF OUR APPROACH

We experienced many practical benefits of this interleaved process and information exchange between the field data and the agent-oriented models. The standard software engineering process is a top down process. We used the high-level structured view – the quality goals – as a lens to analyse the bottom-up field data in a top-down manner. We changed the model as we found new qualities and learnt about existing quality goals. We matched the two different perspectives of top-down and bottom-up. The two processes overlap and inform each other and demonstrate to what extent the gap was closed appropriately and where we still have to achieve a better match.

Quality goals allow a focus on understanding the reasons why people do things or the essence of a relationship rather than describing a physical action. With the quality clouds, we were creating a set of new testing artefacts for lightweight evaluation. They were useful in the process to validate associations between activities and high-level goals and evaluate the degree of the match between the two. The proposed method helped us to substantiate quality goals for social interactions for the development of meaningful domestic technologies, helping us to bridge the gap between the agent-oriented models, and the ethnographic data. The main features of our approach are:

- Use of agent-oriented models with a focus on quality goals.
- The implementation of lean, but focused technologies.
- Iterative exploration and discussion of social requirements.
- Lightweight evaluation of quality goals in ethnographic studies.
- Analysis of quality goals and creation of quality clouds.
- Refining user needs and eliciting socially-oriented requirements.

## 4. ACKNOWLEDGMENTS

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