

# OPENPHONE USER ENGAGEMENT AND REQUIREMENTS SOLICITATION IN LOW LITERACY USERS

**Abstract:** The OpenPhone project aims to design an Interactive Voice Response (IVR) health information system that enables people who are caregivers for HIV/AIDS infected children to access relevant information by using a telephone in their native language of Setswana in Botswana. The system lowers accessibility barriers since it is accessible to illiterate users and the community of the blind. The design utilizes usability engineering methodology in order to ascertain that the end product is usable, efficient, effective and satisfactory to the targeted users who are predominantly females, ranging from semi-literate to illiterate adults but nevertheless numerically literate. The paper describes the methodologies that were used to obtain information from the target user population. The contribution that was made by staff members of the clinic where the caregivers normally get information services is also discussed. This stakeholder information has design implications on the OpenPhone system. Based on the information gathered, we are now able to begin the initial design of the OpenPhone system.

**Keywords:** Usability engineering, User Requirements, Participatory Design, OpenPhone, Botswana-Baylor Children's Clinical Centre of Excellence

## 1. Introduction

Usability is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use (ISO 9241-11 1998). Usability engineering is a methodology for designing technology products/services such that they meet usability objectives. In other words, usability engineering is a set of activities that need to be taken so as to ensure usability in an ICT product/service design/development. The various activities in usability engineering are presented in Figure 1. This paper focuses on the pre-design stage of usability engineering life cycle, which entails knowing the user and their environment, their present means of coping with their information needs, and the tasks that they would use the product/service for.

A major cause for deficiency in information systems development methods is the intricacy of anticipating the system's use in its actual applied work environment (Robinson 1993). In order to develop a system that meets the users' anticipation of the system the developers have to depend on the information that is provided by the users or anticipated users of the system (Lynch and Gregor 2004). It has long been established that user-developer common understanding and user participation are two of the most important factors in the successful development and implementation of systems (DeBrabander and Edstrom 1977, Dickson and Simmons 1970, Lucas 1973, Powers and Dickson, 1973).

In this paper the development of collaboration between the researchers, who are also the system designers, and the anticipated target users is presented together with initial information about anticipated users, their environment, and what they presently do in order to get care-giving information. User information gathering is carried out in order to fulfil a stage in the first phase of the usability engineering lifecycle as shown by the shaded area in Figure 1. User requirements and information are then analysed in order to inform the next stage in the usability engineering as specification of the requirements. Both the requirements gathering and the requirements specification processes are in the pre-design phase in the product lifecycle and are represented by 'understand and specify the context of use', and 'specify the user and organizational requirements' stages, consecutively, in Figure 1.

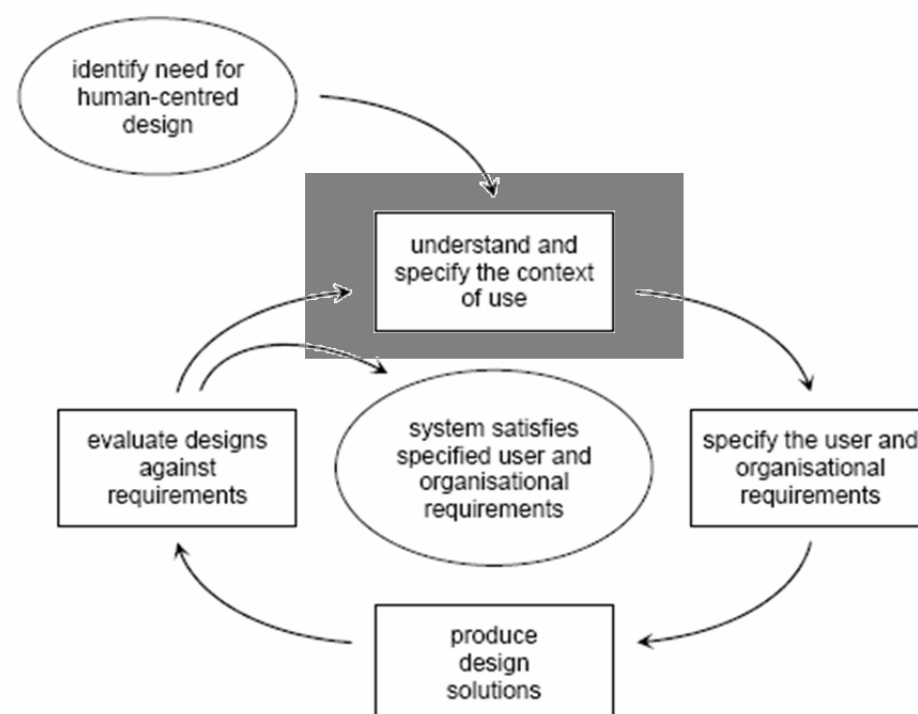


Figure 1. Activities of Usability Engineering Lifecycle (Adapted from Jokela et al. 2003)

The shaded area in Figure 1 represents a phase of knowing the user and their environment, their present means of coping with their information needs, and the tasks that they would use the OpenPhone product for. It is a vital stage in the development of the system because establishing user requirements is well recognized as a critical step in the development of useful and usable systems (Curtis et al. 1988). This is due to the fact that the hard part of building systems is not building them, it is knowing what to build—it's in acquiring the necessary knowledge (Armour 2000).

Potential users were requested and encouraged to participate in the design process as a strategy to ensure that the product designed meets their needs and is usable to them. The design methodology of engaging users in design is known as participatory design and this approach is used throughout the OpenPhone project in combination with the usability engineering methodology as the two methods complement each other. One of the main reasons in utilizing these two methods in concert is to encourage Hawthorne effect, whereby user participants show “an increase in worker productivity produced by the psychological stimulus of being singled out and made to feel important” (Franke and Kaul 1978). User engagement is particularly important for this targeted user group because of a cultural aspect, “where a questioner invariably gets positive answers as a matter of politeness even if these are not actually true! Criticism is seen as a sign of disrespect” (Blake and Tucker 2006). By engaging the targeted user participants in participatory design we anticipate that the participants will collaborate more genuinely whereby the users will take ownership of both the development process and the resulting system with the knowledge that the system under development will eventually be used by them for their own benefit.

The process of requirements development and specification is complex even when designing a ‘simple’ single user system because users often cannot properly articulate their needs (Pekkola et al. 2006). This complexity is amplified when designing applications that are to be used by a group of people since the number of unknown factors is in direct proportion to the number users. Within the OpenPhone project the complexity of requirements development is fuelled by fact that the OpenPhone is fundamentally a new system to the target users who are mostly technology challenged. Maunder et al. explain this phenomenon as follows:

*Developing ICT software that is useful and usable in a rural context poses many problems. One of the major difficulties is understanding the real needs of the end users and the constraints imposed by the rural environment. Many techniques exist in the field of Human Computer Interaction (HCI) that attempt to understand the needs of the end users but many are not useful in a rural context, or at least not when applied in a standard way (Maunder et al. 2006).*

The initial meetings that are discussed in this paper with the various stakeholders can be viewed as a primary induction since further collaborative meetings are planned for the future as the development of the system progresses because user involvement should be continuous throughout the project lifecycle (Gulliksen et al. 1999, Lynch and Gregor 2004). The user requirements information gathering and participatory user engagement process were conducted through focus groups and interviews that were held at the customer premises, the Botswana-Baylor Children's Clinical Centre of Excellence (BBCCCoE) in Botswana over a 3 different gatherings on 3 successive days.

The first focus group meeting was between the research team and the staff members of the BBCCCoE whilst the second and third involved the research team and the caregivers. It is important for the OpenPhone project to acquire different opinions from different stakeholders of the system because, “in participatory design, the “real problem” as well as the system requirements are best determined through merging the different viewpoints of the stakeholders involved” (Winschiers 2001).

## **2. Present coping mechanisms**

Presently, caregivers attend lectures which are given every morning at the BBCCCoE, and each caregiver attends at least one lecture which is given during their first visit to the BBCCCoE for consultation and registration with the centre. The lectures are presently the only way that they learn about giving care to HIV/AIDS infected children. The BBCCCoE reported that subsequent lecture attendance is very low amongst the caregivers after the initial lecture session. Most caregivers attend repeat lectures only when they happen to be at the BBCCCoE for collection of medication and/or consultancy, but rarely do they ever attend lectures for the sake of reminding themselves and refreshing their knowledge on care-giving issues.

The lectures normally take about 90 minutes and the caregivers are allowed to ask questions at the end of the lecture. The lecturing BBCCCoE staff members have observed that the caregivers get to be passive learners during the lectures with some caregivers even falling asleep during the lecture. This observation was supported by an observation made by the research team during a preamble visit to the BBCCCoE. During the interviews with caregivers, it was found out that some caregivers travel about 70 km from their homesteads in order to get to the BBCCCoE. Their homesteads are primarily in rural areas of Botswana and travelling is normally done by combination of public transport and walking. The monotony of a lecturer speaking continuously for more than an hour and the exhausting travelling done by the caregivers before getting to BBCCCoE partially explain the passiveness that subsequently results in the low follow-up lecture attendance amongst the caregivers. The effect of this mode of learning is that the content that was taught to the caregivers is easily forgotten. The staff members are very much aware that

the present lecturing system is not an effective and efficient way of distributing the information that is relevant to the caregivers.

### **3. Identification and recruitment of the participants**

The staff members from BBCCCoE were informed and asked for their participation in the focus group 2 months before the meeting. They were asked to notify the research team on the best time to conduct the focus group and therefore the dates for the visits to BBCCCoE were determined and set by the BBCCCoE. They also informed the research team that the target user participants, the caregivers, for the planned focus groups would be easy to get as they are the people who visit the BBCCCoE for consultations and lectures on a daily basis. They informed the research group that they would ask target users to attend the focus group immediately after the usual lectures that are normally given to the caregivers every morning by the BBCCCoE staff members on HIV/AIDS care-giving issues. There was no prior communication between the researchers and the target user participants, as they were randomly recruited from the pool of caregivers that go for consultations and attend lectures at the BBCCCoE. The participants are characterized as homogenous strangers since they have something in common, which is the need for care-giving information, and yet they do not necessarily know each other.

### **4. BBCCCoE staff focus group meeting**

The staff focus group was held at the Baylor conference centre with BBCCCoE staff members composed of a doctor and 5 nurses. The objective of the focus group was to get the staff members at BBCCCoE to acquaint themselves with the proposed content for the system and review the content such that it is aligned with their needs. This content is the information that the caregivers will be accessing when using the OpenPhone system. It is essential for the researchers to have the BBCCCoE's consent on the content that is to be on the OpenPhone system as they are the customer and major stakeholder who will be accountable for the information that is accessed by their clients, the caregivers.

The proposed content was prepared prior to the meetings by the research team and constructed from 2 sources. The first of the sources is from a professional HIV/AIDS consultant, Prof. Alta Van Dyk, who is a research psychologist and a professor at the University of South Africa (UNISA), in Pretoria, South Africa on the HIV/AIDS topic. She is also an author of the book entitled, "HIV/AIDS Care and Counselling", which has been extensively used in the proposed content for the OpenPhone system under investigation. In an interview that had been previously held with her at UNISA, she provided advice on how to conduct focus groups with care-givers and important factors to be on the look out for during the focus group meetings, and she kindly offered the book to the research team. The second source of the proposed content is a document from the BBCCCoE entitled, "Adherence Education and Psychosocial Support Guidelines: *Training Curriculum and Toolkit*". This document is the handbook that is used by the BBCCCoE staff members as a lecture guide when giving lectures to the caregivers.

The focus group meeting took the form of a contextual inquiry in the sense that all the participants had a focus, which was to reach agreement about the content that is to be in the system (Beyer and Holtzblatt 1998). Through the contextual inquiry the researchers got an opportunity to learn the context in which the OpenPhone system is to be used directly from the BBCCCoE, the customer and major stakeholder. This interaction also strengthened the partnership between the customer and the researchers which is envisaged to encourage participatory design between the two parties. The BBCCCoE staff members were given the proposed content, in print, so that they can comment and edit the content as they see fit. They suggested that they would like to take the proposed content home for a thorough review and distribute it to other more appropriate staff members such as social workers and nutritionists within the centre. We agreed that we would convene the following day in order to get their feedback on the reviews that different staff members would do overnight. Some of their heartfelt input was immediate, such as the present escalation of drug abuse problem amongst youth that was presently encountered by the country of Botswana. They immediately suggested that the system should address this problem as it is very crucial for patients who are taking HIV/AIDS treatment to abstain from using any drugs as this has a negative effect on the treatment program. The research team wouldn't have thought of this problem before hand as it was not documented in any of the literature that the team used to formulate the proposed content. This demonstrated the significance and positive effects of conducting the focus group meeting. Since all the staff members are fluent in English, the entire focus group was conducted in English.

The following day some of the reviews were ready and the researchers took notes about what would be changed, added or left out of the proposed content. Some of the staff members wanted to do a more thorough review of the content and they proposed that they would send their comments and reviews later through email as soon as they are finished with the reviews, a promise that they fulfilled later on.

### **5. Caregiver focus groups**

The focus group approach was chosen as the primary methodology for acquiring initial user needs from the intended target users of the OpenPhone system. This methodology is pragmatically appropriate for this particular user group because focus groups:

- *Do not discriminate against people who cannot read or write*

- *Can encourage participation from those who are reluctant to be interviewed on their own (such as those intimidated by the formality and isolation of a one to one interview)*
- *Can encourage contributions from people who feel they have nothing to say (Kritzinger 1995).*

These characteristics about focus groups and the use thereof fit the intended user population well in the milieu of the unique situation and challenges of this user population as discussed in section 1 and in the abstract. There are some guiding rules on the basic composition of a focus group which state that focus group must often:

- *Use homogenous strangers as participants*
- *Rely on relatively structured interview with high moderator involvement*
- *Have 6 to 10 participants per group*
- *Have a total of three to five groups per project (Morgan 1997)*

These rules are only for guidance and are not rigid because, for example, focus groups can consist of as few as five members (Sampson, 1972) and as many as 20 members (Hess 1968).

The caregiver focus group meetings had 3 primary objectives.

- The first was to study the user characteristics in order to compile and develop a user profile. The first stage in the usability process is to study the product's intended users (Nielsen 1992).
- The second was to allow the targeted users to voice their opinions as to what concerns would they like the proposed system to address.
- The third objective was to engage the targeted users to form a coalition in the design of the system through participatory design which intends to involve the targeted users in all phases of the project. This particular focus group engagement was focused on introducing the system to the target user population and gathering opinions, beliefs, and attitudes about issues of interest about the proposed system.

The caregiver focus group was held over two sessions on two different days with two different groups of participants. The participants were recruited randomly from the pool of caregivers that go to the Baylor centre for consultancy and lectures on care-giving for HIV/AIDS patients. These are the ideal target users since the system will be used by them for information access on HIV/AIDS care-giving issues over the phone instead of them having to travel to the BBCCCoe for lectures.

There were 11 participants on the first day and 16 on the second and were all female with only one male participant on the second day. Both sessions started with a welcome speech that also thanked the participants for attending the focus groups. All conversations and interactions with the caregivers were conducted in Setswana with the aid of 2 moderators who are both fluent in English and the local language of Setswana. One of the moderators was a local Botswana citizen and resident which has helped the research team in comprehending the local cultural nuances which would not have been understood by any other means, not even by the other moderator who is fluent in Setswana but not a resident nor a citizen of Botswana.

The system objectives were then introduced to the participants and a familiar application of loading airtime on a cell phone through the use of an interactive voice response (IVR) system was presented so as to demonstrate the conceptual abilities of the system to the participants by using a familiar application of loading cell phone airtime.

The moderators made it clear to the participants that the research needs to learn from them as to what was needed to be addressed by the proposed system. The moderators informed the participants that the system to be built would only succeed if the participants, who will be the users of the system, collaborated and partnered with the research team in building the system and that the team was respectfully asking for their cooperation. The research team is fully aware of the limitations of how much the participants can contribute to the design of the system, but nevertheless, the research team regards the participants, who are future end-users of the system, as experts developing and defining tools for their own use within their own environment (Schuler and Namioka 1993). A demonstration of a health IVR system for immunization of children was presented so that the participants could see the use and the interaction that is involved with using an IVR system for the purpose of health information access. The immunization programme was previously built by the researchers for demonstration purposes. Participants were offered snacks and fruit juice.

The participants were asked to complete consent forms about the focus group and the discussions that were to proceed. Participants who were unable to complete the consent forms themselves due to inability to read or write were helped by the research group members. The consent form also requested the participants to furnish demographic information such as age, level of education, gender, and others. This information allows the researchers to know the targeted population better in order to build a user profile and inform design decisions more accurately. The back page of the consent form which contains research team contact information was detached and given to each participant. The contact information was furnished so that the participants can have a communication channel for further input or comment at anytime after the meeting. The participants were notified that all the discussion would be recorded and that the participants had the right to stop participation at any time that they feel so. On the second day one of the participants decided that she did not want to participate any further and then the

number of participants was reduced from 16 to 15. The researchers didn't ask any reasons as to why she had decided to quit. This demonstrated the participants' practice of the right to autonomy, including their right to abandon the meeting and the participation at any time for any reason.

The participants then enthusiastically engaged in the discussion and brainstorming of concerns that they felt the OpenPhone system should address. The discussion was again conducted by the 2 moderators and 2 observers were taking notes of the discussion. Both focus group sessions were recorded on a computer with a microphone connected to it. Their enthusiasm was evidenced by the fact that they would chat amongst each other and discuss amongst themselves what they think is necessary to be available on the proposed system before giving their views to the moderators. Naturally some participants were more talkative than others but the moderators encouraged those who were less talkative by engaging them in the discussion and asking them what they consider important and should be made available in the proposed system. The focus groups took an average of 105 minutes each and at the end of the focus groups the participants were then thanked for their participation. Prior to the focus group meetings the research team generated a strategy on how the focus groups with the users would be conducted and this is discussed in the next subsection followed by a summary of findings and benefits of the meetings.

### 5.1 Questions generation strategy

The strategy for the focus group interviews was to initiate the discussion in the form of a semi-structured interview whereby the moderators generally had a framework of broad themes to be explored, and then relax the discussion into an unstructured form whereby the participants can converse freely around the theme at hand. This open discussion would then be gradually guided to converge towards a more specific issue by the moderators. To be effective, focus group questions need to be open-ended and move from the general to the specific (Dreachslin 1999). Figure 2 represents a graphical representation of the strategy that was used to conduct the focus groups. As an example, a broad theme of hygiene and cleanliness would be introduced by the moderators and then the participants would be allowed to discuss issues and concerns around that theme within the context of care-giving. The moderators would then direct the dialogue towards a more focused subject of bodily fluids and infected waste through asking further questions and probing such as, "what would you like to know about hygiene and cleanliness...why?" When the participants give answers to that the moderators would then probe more by asking questions such as, "what sort of bodily fluids are usually of concern?" This would then lead the participants to an even more specific question such as how to clean infected spilled blood properly.

Information charts were used to collate the information that the participants were giving in the form of specific questions that they would like the system to address under each theme. The participants were then asked to prioritize the issues, through consensus, under each theme which then produced a list of specific issues in their descending order of importance under each theme as viewed by the participants.

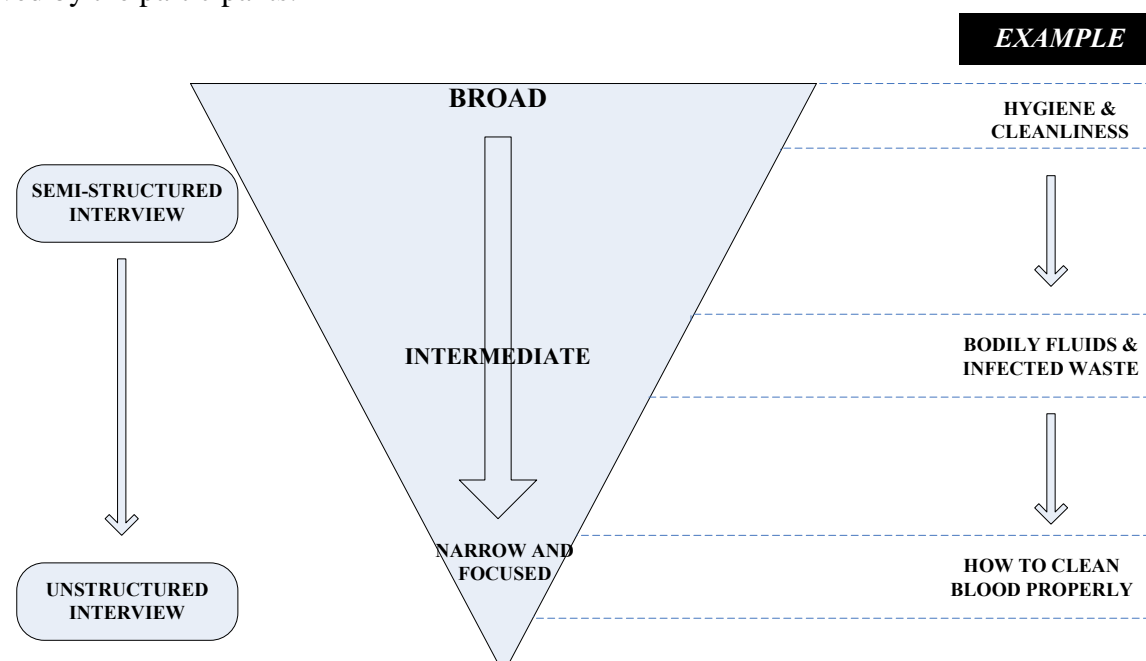


Figure 2. Questions generation strategy

The research team convened after each focus group meeting to:

- Discuss the proceedings. These discussions would go over all the experiences that had been gathered during each focus group and allow the team to highlight any extraordinary elements of the meetings
- Summarize each meeting
- Analyse the summaries and write a report

### 5.2 Summary of findings

Unexpected issues on social services such as government grants were brought up by the participants but unfortunately these issues cannot be addressed directly by the system. Issues that were contemplated by the designers as of high importance such as caregiver psychological support were perceived as of low priority by the participants. When the participants were probed about this issue they stated that they get psychological support through strong immediate and

extended family support. This support can also be communal which is typical of the Tswana culture whereby family and close community members are supportive towards other community members especially in the rural areas where those communal values are still maintained.

### **5.3 Benefits of the focus group meetings**

Conducting the meeting and the interviews has had an impact on the designers' beliefs in terms of testing the designers' general assumptions whereby some of the information that the designers imagined as important to the caregivers was not viewed as such by the participants. This supports Robinson's notion of difficulty in anticipating a system's use in its actual applied work environment (Robinson, 1993). The meetings have enabled the designers to gain the targeted users' inputs on what their information requirements are and to eliminate unnecessary elements that the users don't need in the proposed system, which they have other ways to cope with. The meetings have also helped the design team in building a persona which is a model user that the design team creates to help understand the objectives, needs, and behaviours of the target users who will use the system interface. Benefits of creating an OpenPhone persona are:

- Creating a persona has assisted the designers to approach the design more objectively, with their target user in mind, instead of their own views and beliefs. Instead of asking, "How would I use this system?" the designers are now asking, "How would the caregivers use the system?"
- In using the persona as the target character, the designers are more capable of identifying how the caregivers will interact with the design. This enables the designer to gain an insight about the design and system usage that they wouldn't have gained in any other way.
- Puts all the design team members on the same page as far as to who the design is intended.
- It enables designers to put themselves in the shoes of the target users.

In sum the persona helps the researching designers make a smooth transition between user requirements and the design, which will benefit the overall design of the system. The created persona is a primary persona and is expected to evolve as the designers gain more knowledge about the targeted users of the technology.

## **6. Conclusions**

User needs gathering is a way of animating and furnishing influential information into the design process that will have impact in the manner in which the system is designed. In conducting real user observations the researchers' findings get to be based on realities, not preconceptions. Users bring about things that the researchers would erroneously consider unimportant in a focus group. On the other hand users also remark on the things that the researchers thought to be essential but users don't see to be beneficial to them as they have other ways of dealing with such issues beyond the capabilities of the system.

The contacts made with the actual prospective users enable strong relations between the users and the researchers to be formed. These relationships are envisaged to create trust and understanding between the parties in order to devise a bond with common goals of designing a truly usable system.

In a new and modern design the designers may be misled into assuming that there is no need for user studies because the product idea is new and ground-breaking to the target users and therefore there is no useful information that can be provided by the users. On the contrary, it is essential to observe and interview people in order to understand how they cope in doing things the traditional way before bringing in the new way of doing things. Through the interactions with target users the researchers may discover that they are solving the wrong problem, or that they have overlooked some other more important problems that need to be solved. Researchers may also find that there are features of the old way of doing things that work well which need to be reserved and incorporated in the new design. For example, in the OpenPhone system there is a need to use the same language and terminology that is usually used by the lecturing staff during the lectures at the BBCCoE as the users are accustomed to those terms and language and not the scientific terms and language as acquired by researchers from formal literature.

We have found out that although the participants lack knowledge about technical matters on how to build an appropriate IVR system, they are rich in common sense knowledge about their needs and their typical concerns on care-giving issues. Both scientific and common sense knowledge is important in formulating a holistic solution.

The creation of a persona is a powerful tool for helping designers to keep the users in mind. Based on these focus group meetings and the persona that has been created the designers are able to turn the requirements information into functional specifications before beginning the initial design of the system.

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