

Challenges in Requirement Elicitation of Cellular Applications: For Visually Challenged People

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Abstract

Blindness is a loss of sight and there are innumerable causes of blindness due to abnormal functioning of eyes impacting on cognitive development. Different traditional techniques and methods have been used to guide people who are visually challenged. Researchers and developers have come up with multiple innovative ideas to aid Visually challenged people to perform their routine tasks. As visually challenged people do not visualize world properly so requirement engineers face number of challenges while eliciting requirements from them. This paper focuses on the challenges faced during the requirement elicitation process. As challenges are discussed we have proposed a solution to overcome these problems.

Keywords

Visually Challenged, Mobile Computing, Requirements Engineering, Software Engineering, Smartphone

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1. Introduction

Blindness is poor vision perception dealing with wide range of developmental disorders. Blindness is a cognitive disorder of social development, self-concept, and language development, repetitive and restricted interests and self-help [1]. Damage to any portion of the eye, the optic nerve, or the area of the brain responsible for vision can lead to blindness [1].

Being able to see the world makes us feel tremendous. Visual impairment is cause for special attention [2] Visual impairment symptoms are avoiding tasks and activities that require good vision, being slow in reaction to the world around them, face crunching, especially when there is no bright light [3]. These symptoms of visual impairment appear during early 2-3 years of age [3]. Visualizing problem deals with

- Knocking things over,
- Holding things or toys too close,

- Delay when combining words to make his wants known.
- Avoid organizing elements
- Hesitate to explore things,
- Habit of closing one eye,
- Poor development skills

Problems with social development may include:

- Poor eye contact with people,
- Poor participating skill,
- Disinterested to play with peers
- Unable to self-help,
- Sits alone steadily
- No or less friends,
- Lost facial expressions,

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- Disliking being moved around.

Third basic symptom for autism is reacting to world around them. This may include sub-symptoms such as:

- Limited addition of information from environment,
- Self-stimulated problems
- Not motivated to perform actions,
- Not encouraging to explore routine changes,
- Using objects in an unusual way,
- fearing of taking steps and,
- Sensitive to raising to sitting position.

The reason for visual impairment is not a specific, however there are number of reasons for visual impairment. The degree of visual impairment can range from mild to severe [3]

according to American Printing House for Blind 2012 annual report [4] there are 656,100 people suffering of visual impairment. A research shows that visual impairment is common among boys with the ratio of 1 in 100 to 1 in 310 in girls [4].

Visually impaired people apart from social or behavioral problems sometimes the learning background and language development of people with visual impairment are usually lack of visual orientation and it is customary for them to accept less description on objects and events details communication and learning process [5]. User with visual impairment rely more on auditory memory skills and limited visual memory skills. This affects their performance in comparison to sighted user.

The abilities of visually impaired people can be categories as i) cognitive ii) perceptual iii) physical and iv) psychomotor [6].

Parents and teachers use different modes for sensorial learning and dealing with things with an visually impaired person. They also work from the details up to build an understanding of the whole. As hands are the primary tool that is used for information gathering. Child holds the things and explores its dimensions. They support sensorial learning such as listening to birds singing outside, softness of bunny, smell of dinner- Person with visual impairment appears to have difficulties in learning and education so different technologies are used for this purpose.

Rapid development in the field of smart phones i.e. androids and iPhone encourages researchers and developers to help visually challenged people by developing applications to aid them. This paper focuses on the challenges being faced during the elicitation process for developing mobile applications for people suffering from visual impairment. As

the visually impaired people suffer from slightness problems so they cannot explore their routine changes and hesitate to get their jobs done. In this study problems faced by visually impaired people are discussed and a solution is proposed in the end after analysis.

The paper consists of following sections i) introduction ii) literature review iii) challenges iv) proposed solution and v) conclusion.

2. Related Work

For the past two decades lot of effort has been made to improve developing of new systems for visually challenged people. Most these systems focus on adopting technology to estimate the user's position with higher precision [7, 8, 9, 10, 11].

In [12] provide a comparison between the most popularly used use case model as a requirement capture model.

Miguel et.al [13] study the applicability of three Requirement Engineering (RE) techniques (Use Cases [14], Viewpoints [15], and Goal-Oriented [16]) for the specification of collaborative systems and paying special attention to the awareness requirements. In order to carry out their study, they specify some awareness requirements of a real system (Google Docs) [17]

Usha study[18] Issue Based Information System (IBIS), Feature-Oriented Domain Analysis (FODA), Joint Application Design (JAD), Controlled Requirements Expression (CORE) and each of these method emphasize different aspects for capture of requirements.

By examining RE methods and tools in three fundamental ways, schedule time can be reduced as i) schedule time over entire project ii) Joint Application Development (JAD) and iii) Quality Function Deployment (QFD). A subjective analysis method is used to help requirement engineer in making educated decision about the RE methods [19].

The study [20] makes two contributions, framework that extends the discussion within the RE discipline and present a gap in the literature: the lack of acknowledgement of wide audience end-users in elicitation of requirements

The Mobile Scenario Presenter (MSP) is a prototype, a PDA (Personal Digital Assistant)-based tool that supports scenario-based requirements discovery [21]. A mobile scenario tool is developed to discover requirements directly in the user's work context. The results show that MSP support workplace requirements discovery and their documentation, even though RE mobile tools face a lot of challenges.

JaeJoon [22] Presented, strategy for quality requirement elicitation based on scenarios. The basic steps are: i)

selection of quality attributes, ii) making consensus on the quality attributes, iii) development of scenario elicitation forms, iv) decision of the memes for each quality attribute, and v) decision of priority among quality attributes. But [22] selected three quality attributes and the scenarios that elicited were sufficient to evaluate each quality attribute to the reference architectures.

Geisser et.al [23] focus that a requirement elicitation phase is a critical one therefore needs tool support for distributed teams. Traditional methods of requirement engineering support collocated scenarios. The paper presents a cost-effective, adaptable and evaluation concept for requirement engineering in distributed environment. They develop a tool "TraVis" for visualizing and analyzing requirements in distributed settings. The experimented design explains and discusses many aspects of data collection. The data analysis phase covers a statistical analysis of the quantitatively measured data.

3. Challenges in Mobile Business Applications

Today Mobile Application becomes advance and advance it can integrate a number of field of mobile computing. Smart phones give the new market in the field of mobile communication called Mobile Application development. The demand of mobile application business is on the top and its demand is increasing rapidly. Considering the condition today, mobile devices have become a way of life for many people. Computers are now replaced by smartphones that can be inserted into a pocket and can be taken anywhere. Operation practicality of mobile business an application often poses a question, which generally serves more as a status symbol.

The limit between the customer and the developer is quite complicated. Mostly customer and developer think that they understand what they think and what they want.

In the fulfillment of this demand, a perilous path is treading, which begins at the customers' needs and ends at the developers' idea of what they think the customers demand. As with all domains of software development, convergence of these views is the only key to success. While this problem does exist in conventional systems, it gets worse when it comes to mobile development due to the following reasons:

- Applications are the modern trend just to show their status by businesses [24].
- Like most new mobile application, mobile tools are a "new thing" which despite the whole-hearted adoption by the market, do not come with a guarantee of a thorough understanding on the customers' part of the design limitations and possibilities of a mobile phone platform [24].

Currently an exploratory research study that put in to indicate the overall factor related to mobile requirement and targeted the business users. There are number of challenges that the mobile application development community facing. But the main challenges is in their endeavor to certify that the views of both customer and developers intersect included, but not bounded to, the following aspects:

A. Target audience

With the current research study, the target audience is the visually challenged people themselves. It is quite difficult to identify whom to use in your target audience when the application is being developed is for mass-market-driven products. This problem has been relatively made easier for us, however, as we know whom our target audience is. Our main quandary concerns extraction of requisite information from them to enable the development of a best-suited app for them. Visually impairment can be seen as sightness disability. As the requirement engineering is an important element of software design and development. When the developmental process starts, lot of efforts is made to elicit the all possible background information, to closely fulfill the demands of customers. If such measures are employed right from the beginning, less costly alterations will be required later on. This is essential! No doubt, planning for future conflicts is definitely a plus and is always done, as conflicts are bound to occur when you are developing a system which is going to serve a wide range of persons with varying expectations. As the visually challenged people also belongs to different communities like business community, learning community, so their demands differ, so there is need to understand diverse needs of target audience to make each of them feel like this application was designed specifically to fit his/her demands.

B. Unearth Suitable requirements of visually challenged people

It appears quite hard to really suck to try to find the requirement of visually impaired users. Judgment can best be passed on whether a system's goal matches the developer's requirements if the goals and the requirements are clearly identified. Since extraction of complete information is often difficult when it comes to visually impaired users. With this group, it is already a hard job demonstrating the technicalities of the job and they in turn have difficulty articulating their exact needs. Insight the user requirements and development of new product is particularly difficult because the product must present innovative features to attract the attention of visually impaired users.

Timeline is another crucial pressure when developing business application especially of this type [25]. This is only a problem when we are targeting a group not a single, though,

time is of the essence. As the time is of the essence so it is important to brought out product on its specified time. It is important to win the favor of your customer by competing the competitors and by convincing them you have the best to offer compared to the rest.

C. Prioritizing of stakeholders

To insight the user demands ,developers first sit down to understand the proposed requirements for an application, they have to exercise great care to separate those items which may seem redundant and clearly outline the functions of the remaining to present a clear picture. Somehow there has to be a prioritization of stakeholders, which contains – but is not limited to – the company with the idea, the developers and the visually impaired people who will act as the main source of requirements gathering. The interests and demands of each shall vary and affect the system accordingly, which may require negotiations to resolve. This is generally the case with non-functional requirements, where difficult agreements often need to be made among requirements related to flexibility, cost performance etc. It is imperative to effectively resolve all issues in order to satisfy the stakeholders

D. Dealing with conflicts

To sort out conflicts is very much important in the requirement elicitation. It is necessity to avoid conflicts and ambiguities, but it is difficult to do so. There are number of facts that are required to keep in mind while dealing with conflicts like effective communication, sound decision-making and personal flexibility. In an ordinary scenario, if ever there is a falling out pertaining requirements among the stakeholders due to ambiguity within a requirement or conflict amongst them, it is a good practice to have a negotiation with the customer, discuss all the issues and try to sort them out. If conflicts still persist then it is the best option to let the customer have the final say. The same practice cannot be applied in this situation; however, as the demands of visually impaired users vary.

It will be left upon the stakeholders' intuition and perspectives based on their experience with the visually impaired people, to come to final conclusion.

E. Is the requirement fulfilled?

The big day arrives and it is finally time to test the product out. A new dilemma faces the developer, which was actually there right from the beginning: How to ensure that the system works, as it should? Of course, at this point in time we have more or less all the information necessary to build our system. The only thing left to be done is to make sure that the system is either working the way we want it to or not.

4. Proposed Solution

In line with the perplexity frontal by the requirements engineer in eliciting requirements for applications for visually challenged people, we are proposing a solution called Visually Impaired User Requirements Engineering (VIURE).

The agenda of VIURE consists of five points:

- Build understanding of whole, as the visually impaired cannot see the whole, so there is need to build the concept of whole.
- Aggressive recruitment efforts, as the visually impaired are usually not very confident and lack motivation to be a part of such activities.
- Development of written plan , child's parents work together with program professionals to develop a plan of services the child will receive based on his or her demands
- Oral communication is inherently effective in case of visually impaired users so descriptive mode of communication is recommended.
- Mostly the visually impaired children has little difficulty in generalizing the size, in this case little experience with a variety of objects were require to improve their skill and generalization.

The procedure for the VIURE method has its roots in the basic requirements engineering process. The following stages have been designed to meet the agenda of VIURE mentioned above.

Preliminary-Review: This phase is all about ascertained the attributes of the visually impaired participants and the purview of the research. The participants should possess the ability to respond spontaneously and promptly. This will facilitate communication with visually challenged people.it will definitely help to effectively determine needs of participants Filter the participants for required eccentricity, such as "lead user" characteristic [26]

Demands elicitation: Do not shower the participant with burden of queries as visually impaired people often avoid involvement in discussion. Try to reduce working memory demand of visually impaired participants otherwise might get lose their willingness to be the part of the session. Try to gather requirement in a comfortable environment.

Require evaluation phase: Make descriptive cards of all the ideas proposed by the visually impaired participants Then the participants will be confident to examine further potential avenues in feature development using their own proposed ideas and thinking.

Model aggregation phase: Creation of thematic maps using

the themes formulated from the ladder interview statistics. "Value maps" are generated for every theme [27] while categorization is carried out for singular statement in the statistics as characteristics, consequences and criteria items. Organize these value maps to indicate subthemes and collection of characteristics, outcomes and criteria, encompassing the themes.

Model evaluation phase: Make descriptive cards containing a brief themes description. Then ask the visually impaired participants to evaluate the descriptive cards in descending order of importance of each theme.

Recruitment of significant features: In order to accommodate various features that appeal to a user's imagination, encompassing brief description of attributes and their consequences are developed. Each scenario usually comprises of two or more features based on the complexity of descriptive themes.

Give reasons for inclination: For the features determined in the previous phase, inquire the participants about the reasons for the preference, selection and document the feedback. This post-analysis response mechanism will serve as a fruitful evaluation of the analysis phase.

Demonstration phase: Formulate a detailed business report for the client. The document should include an elaborate description of all the features of the most-preferred applications along with the data collected, analysis, and precise user comments related to the application. Furthermore, the report should also contain the consequences the applications address.

Final Validation: This is the last phase of VIURE. It involves scrutinizing all the data, documents and/or presentations generated during the specification sub-phase and ensuring their relevance and validity. This validation should have all the stakeholders involved. Since, the visually impaired are the major stakeholders; the validation should be carried out using descriptive aids.

5. Conclusion and Future Work

Requirement elicitation from visually challenged users is quite expensive and difficult [28]. This paper highlights the challenges faced by the visually impaired community and contains VIURE (Visually Impaired User Requirements Engineering), a methodology for eliciting requirements from visually impaired users. VIURE has three objectives that include, aggressive recruitment, data gathering with the help of descriptive aids, and accommodation to working memory limitations among visually impaired. VIURE in the future can be used for eliciting requirements from different people suffering from different disabilities.

The future work will include testing and verifying the proposed solution for different scenarios with people suffering from mild to severe levels of visual impairment. This technique can be verified using different phases of software development life cycle from design, implementation and testing.

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Biography



Anam Ashraf got her Bachelors' degree in Software Engineering from National University of Modern Languages (NUML), and Islamabad, Pakistan in 2011 and MS in Computer Software Engineering from National University of Sciences & Technology (NUST), Islamabad, Pakistan.

She has an experience of over 1 year in the field of Software Testing also worked in the capacity of Information Security at Ultra Spectra pvt Ltd, Islamabad. Currently she is working as lecturer at Mohi ud Din Islamic University Azad Kashmir. Moreover, she had the experience of Quality Testing and Web Designing while working as a Software Quality Test Engineer at Center for Advanced Research in Engineering Pvt. Ltd. Here research areas encompass usability engineering and requirements engineering.