Usability and User Experience, Vol. 39, 2022, 428–433
https://doi.org/10.54941/ahfe1001738

Smartphone Application is Designed to Support Visually Impaired People and Enhance the User Experience of Entertaining Events in Saudi Arabia

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ABSTRACT

This paper analyzes the behavior of the visually impaired in terms of navigation in entertainment events to determine the difficulties and pain points. The target audience in this paper is those who struggle in public events in Saudi Arabia due to being visually impaired and those who volunteer in public events. The enhancement of user experience for the visually impaired in Saudi Arabia needs to be reconsidered. We accomplished the first design, which was tested with the prospective users. Based on the findings, we finalized their needs through interviews and questionnaires to obtain difficulties related to accessibility and guidance methods used in public events. As a result, we can provide a helpful solution as a smartphone application designed to help visually impaired, and volunteer users meet their needs. This paper follows a specific product life cycle (identify needs, analysis, design, test, and launch); however, the first three stages of the solution will be included in this paper, and the rest of the two stages will be part of future research.

Keywords: Visually impaired, User experience, Move Me app, General entertainment authority

INTRODUCTION

The General Entertainment Authority (GEA) is one of the initiatives that stem from Saudi Arabia's Vision for 2030. The government of Saudi Arabia sponsors various unique events annually, and the (GEA) is in charge of organizing and running the events. These events are local and international, and the kind of an event differs from one city to another, including concerts, parades, winter wonderland park, and safari. With the excellent services provided by (GEA) during the event to visitors, however, visually impaired people need assistance navigating and exploring entertainment places due to extreme lack of accessibility. We aim to create a smartphone application to support visually impaired people in terms of accessibility to fun places with enjoyment and valuable user experience. It is proposed that user empathy may be helpful to offer a solution to the following questions:

- What are the pain points visually impaired users feel when attending entertaining events?

- What are the scientific findings in the following methodologies: desk research, user interview, usability testings?
- How do visually impaired users cope with events in Saudi Arabia in terms of navigation?
- How can a smartphone application help visually impaired people navigate events?

STATE OF THE ART

Challenges, Opportunities, and Difficulties in Terms of Navigation

The visually impaired and the blind individuals are a crucial segment of the community. There is an enhancement in the eye associated with issues and a decrease in the vision of visually impaired individuals, turning out to be a dimension to be cared for. This enhancement in the number of blind individuals will impact the quality of life and develop an imbalance in society (Khan & Khurso, 2020) Moving Object Ontology (MOT) has the objective of developing formalization regarding the movement styles and the trajectories that should be retrieved (Khan & Khurso, 2020). However, the MOD scalability can be termed yet as an open issue. The blind population encounters several issues to access the intelligent interfaces, which are touch screens. For example, gaining access to the textual data, visual surroundings, maps, graphics, 3D (Khan & Khurso, 2020). Communication that blind people have to do with voice is subjected to the inherited problems of ineffective performance, a transformation of ascent, noisy surroundings. Moreover, it increases psychological pressure, and memorizing the instructions through voice might deteriorate users' privacy in relaxed surroundings. Various challenges which blind people face to handle Smartphone apps are mainly while making a call, sending a message, receiving emails, surfing the internet, socializing, reading text, marketing, finding the location, and many more. Effective design of touch-oriented interfaces is yet a challenge, and blind people need to recognize the orientation and dynamics associated with the touch screen interfaces. Several visually impaired people suffer from navigation-oriented actions because of mishaps that prevent them from social communication and activities (Jeamwatthanachai et al. 2019). However, contrary to the outdoors, indoor navigation inside the public regions is there with their different set of difficulties. The reduction of vision of blind people makes them get subjected to difficulties that directly impact the majority of the functions, specifically those activities that require the capability to navigate. Being incapable of getting data regarding their location or the region where to go in public buildings like universities, museums, and hospitals creates difficulty finding procedures. This difficulty reduces the level of confidence in blind people to navigate independently. It is researched and found that approximately 80-90% of the visually impaired people spent their entire life inside the buildings (Jeamwatthanachai et al. 2019). Therefore, traveling indoors for blind people becomes difficult for the adventitious blind, blindfolded and congenital blind population.

The Basic Concepts for Designing Mobile Apps and an Overview of the Museum Experience

The development of touch-oriented mobile apps is crucial for visually impaired people. However, despite the vast struggle of hardware producers to make inclusion regarding the accessibility characteristics in the mobile devices that are touch-based, they are not much effective in supporting visually impaired people (Sierra et al. 2021). It can be stated that Design for Usability is an essential need to attain effective feedback from the users who are visually impaired when utilizing the applications. Launching a low-vision mobile app portal is an important step taken. This portal serves to help visually impaired people by serving them with the availability of an extensive application collection specially designed for blind individuals. The re-invention is required to be done with conventional applications like contacts, calendars, or telephones. It is essential for the effective designing of the GPS and text magnifiers (Sierra et al. 2021). To deliver a practical experience to the users, it is essential to incorporate certain kinds of controls in the applications to make good communication possible with reduced vision. A button kind of system is found to validate blind people. On the usability test, evaluation can be done regarding the capability of the people navigating through varied perceptions, recognizing the controls, and communicating with them. The redesigning of certain conventional apps is done to meet visually impaired people's requirements. These are:

- Phone: "As the user moves around the screen touching numbers, the text to speech feature reads those numbers." (Sierra et al. 2021).
- Contacts: It will permit the user to develop navigation through the entire contact list. Combining voice with unique gestures will make it easier for blind individuals to locate a particular contact in the entire list.

Low vision mobile portals include apps providing facilities to the blind and visually impaired people to gain availability regarding a broad app collection that is mainly developed for them (Sierra et al. 2021). The establishment of an iOS low vision library is being done to allow other users to include the controls in their applications and provide them in the reduced vision portal. However, work needs to be done in the future-oriented with mobile devices and technology to introduce innovative products to guide blind users, making their lives easier. Therefore, the aforementioned basic concepts must be implemented to design mobile applications for blind and visually impaired people. The experience of visiting the museum for blind people is majorly dependent on assistance from their family or friends or the museum personnel. Solutions for supporting an independent and interactive museum experience for blind people include continuous tracking of the location of the user and orientation for seamless interaction among the navigation and art appreciation. The indoor navigation system is one of the potential solutions for increasing the independence of blind people at the museum (Asakawa et al. 2019).

How can Smart Tourism be Enhanced in Terms of User Experience?

The study focuses on enhancing the brilliant tourism experience for blind and visually impaired people by gamified application approach and need analysis. Tourism has been majorly focusing on substance studies for emphasizing social matters like accessible tourism for every individual for resonating with the global call for tourism development under the sustainable note and contributing to the understanding of the aspiration of blind people in terms of exploring the tourism destination in an innovative and potentially enhancing way. This research paper utilized multisensory participant observation and interviewing to empathize with target users and gain insight into the requirement (Huang & Lau, 2020). The study highlights discussing the significance of intelligent tourism for enhancing user experience.

SOLUTION

Our proposed app follows a product development lifecycle that considers user needs. This research heavily depends on the user's needs. Our users, in this case, are the impaired people and the volunteers. Both users are involved in every stage of the design process. The five stages of the development lifecycle are taken from both the human factor and human-centered design lifecycle; identify need, research, design, test, and launch (Hix & Hartson, 1993) (Hartson & Pyla, 2012). All stages are operated iteratively, showing how important the user needs are. We only include the first three stages, which will be discussed in future research papers.

Stage 1: One idea attracted our attention to this valuable and beautiful project; the GEA is interested in helping people with an imperial vision since they present 7.1% of the disabled people in Saudi Arabia. Almost 1,445,723 million people with disabilities, and among those 811,610 are people with vision disabilities (Statistics, 2021). Unfortunately, our knowledge of the pain points for visually impaired people attending events was not helpful. Therefore, we interviewed one of the potential users to walk us through the experience in public events. This step was valuable to establish the interview questionnaire for the following interviews. In addition, the interview supported us in understanding the pain points, behavior, and assistive resources.

Stage 2: Later we interviewed twenty-one users to find out paint points, behavior, and assistive resources. We created the questionnaire based on measuring the user's interest in attending entertainment events, difficulties related to accessibility, and methods of guidance used in public events. An empathy map and user stories are used to explore the user's motivation in terms of what they say, think, act and feel. Also, it helps us address the most critical stories with the design. Based on the insights from the actual user interviews, we conclude that most respondents have activities that they prefer to do outside their homes; however, a primary challenge they face is accessibility. Most users prefer to go out with someone who can help guide them, and they struggle with not having tailored services. The analysis stage enables us to move to the low fidelity design, which contains the basic structure of the screens such as main functions, image place, body text, and action boxes. Figure 1 describes the dashboard for each user.

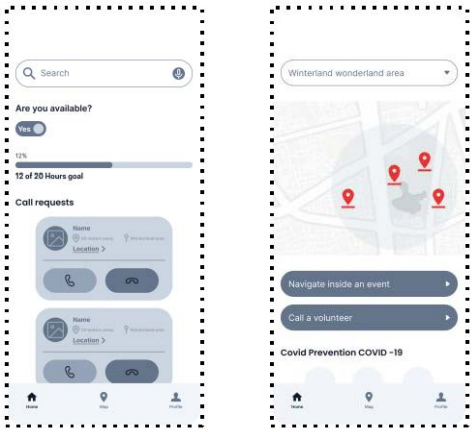

Figure 1: Dashboard.

Table 1. Flow issues and recommendations.

Flow	UX/UI issue	Recommendation
Sign up - Sign in	Lack of information & instructions	Replace terminology with something familiar. Provide onboarding containing enough information about how to use move me
Give location access	Unclickable UI Elements on the map	Place Pin icon on the map to determine location with list of places
Navigation	(low confidence) In terms of user behaviour	Activate maps with high accuracy for directions
Call volunteer	Lack of information about volunteers	Provide a little info about volunteers
Share certificate	Unclickable UI Elements on volunteer dashboard	Provide direct way to reach certificate through home screen

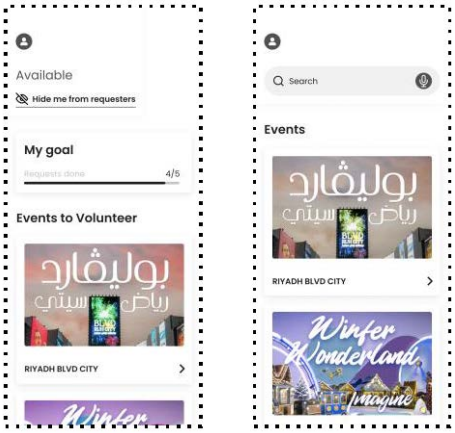

Figure 2: High-Fidelity Dashboard.

Stage 3: We want to gather feedback from the potential users on the design, we add all the necessary visual design elements. One way to learn about the design is to conduct a usability test. We tested the design on a group of volunteers and visually impaired people to determine the usability of the Move Me

app. Ten participants showed a willingness to participate in the study; five volunteers and five were visually impaired. We have identified the factors we will use to determine usability (Reduce cognitive load and limited options). The use cases to be covered in the usability test for visually impaired people were: Sign up, Sign in, Give location access - determine where to go, navigate independently within the app, call volunteers, and share certificates. The table below describes the flow, issues, and recommendations.

CONCLUSION

Enhancing the user experience for valuable people is extremely important to us. Therefore, we will continue testing the app until it reaches maturity. We have completed three different tests: user interview, usability, and desk research. The purpose of doing the tests is to learn about the pain points users may face. Also, the government of Saudi Arabia cares for those people, and it is an excellent opportunity for us to provide a helpful and purposeful solution. This shows the importance of this field to the government and an opportunity for us to provide a helpful solution. We believe that our solution is helping the visually impaired people and volunteers, but it will also reflect on society. Also, as mentioned earlier, this is an ongoing project, and thus, it will be implemented and evaluated soon.

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