

Inclusive Fashion Technology: Designing an Accessible Fashion Styling Application for the Visually Impaired

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ABSTRACT

For visually impaired, selecting clothing and accessories can be challenging without the ability to see colours, patterns, and styles. They often rely on others for help in coordinating outfits, which can limit their independence. One significant issue is colour identification, which makes matching clothing items based on colour coordination difficult. Recognising intricate patterns is a significant challenge affecting the ability to choose aesthetically pleasing outfits. Accessing fashion related information, maintaining their wardrobe and lack of accessible information are few of the many challenges which impacts their confidence and self expression. This paper explores the design and development of an optimal user experience (UX) and user interface (UI) for a fashion styling application tailored to individuals with visual impairments.

The research focuses on creating an intuitive and accessible UI that enhances user experience and promotes independence in clothing selection based on user preferences, current trends and contextual appropriateness. Key elements include a voice-activated navigation system, talk back feature and audio descriptions of clothing items. The study integrates user-centred design principles, involving visually impaired users in iterative testing phases to ensure the interface meets their needs and preferences. After prototyping, the application was tested by 10 visually impaired individuals. Findings indicate that a combination of clear audio cues, simplified and bold navigation structures and customizable user settings significantly improves usability and satisfaction and also promotes greater inclusivity with the fashion industry. This research contributes to the broader field of accessible and inclusive technology design, offering insights into how to effectively cater to the unique requirements of visually impaired users in the context of fashion styling applications.

Keywords: Fashion Styling, Visual Impaired, Accessible interfaces, Technology

INTRODUCTION

For a visually impaired (i.e blind and low vision) person, shopping and matching of clothes are the most challenging everyday tasks that they need to perform Jihyun Lee et. al (2020). They have to face challenges on a daily basis that are often ignored by mainstream society. From selection of an attire that best suits them to maintaining confidence and individuality, their struggles are always never-ending. Unfortunately this makes them reliant on friends and family members. They face difficulties while shopping for clothes offline as the amount of information provided on the product greatly impacts their ability to choose Lee et al.(2020). Navigating inside a shopping mall itself is a challenge especially when stores are poorly organised. A visually impaired person has to rely on spatial memories from past visits and even that could fail if a store changes its layout. Even dressing rooms may also lack accessibility features adding another layer of difficulty. In countries like India, clothing labels rarely offer Braille or tactile tags leaving a blind person clueless about the fabric and colour. This can add to emotional distress as it requires external assistance which diminishes their sense of independence. However, online shopping stores give them a sense of reliability and control which makes them a preferred mode for shopping for visually impaired J'den Williams (2021) as it provides browsing and purchasing of a product within the comforts of their home. These sites do provide additional tools for visually impaired people such as screen readers and voice assistance which further facilitate the process. Screen readers can read descriptions of the product from the website itself eliminating the need for any external assistance making them self-sufficient and ensuring autonomy in decision making. Nevertheless, online shopping platforms do have their own shortfalls. Information provided by screen readers is often confusing and difficult to remember. They can use ambiguous language while describing a product. Most online stores do not adhere to important visually impaired accessibility benchmarks such as bold navigation, simple heading and high contrast images.

Fashion for a visually impaired is a form of self expression. It is not just about appearances, it is about individuality, confidence and comfort. For a blind individual, it transcends physical boundaries as it manifests through different sensory experiences. It reflects their preferences and identity. Although without a visual input, their fashion sense is limited to the practicality of the garment. Interviews conducted in this study reflect the fact that visually impaired people feel that their clothing should not hinder their everyday tasks. They are also sceptical about mismatching clothes. This study aims to bridge the gap between accessibility and self expression by developing a fashion styling software tailored specifically for the visually impaired. The study aims at a visually impaired specific mobile application “*Be Own*” which empowers users with audio description of clothing, curates outfit combinations from existing wardrobe, delivers accessible fashion trends, detects stains and cuts through object detection and even plans outfits based on occasions. The tools already available in the market namely *Whering* and *Lookout* are limited to managing daily tasks for the visually impaired, whereas “*Be Own*” will be a one stop solution for wardrobe management and clothing. The application will adhere to visually impaired specific accessibility criterias as well.

By recognising barriers faced by the visually impaired, concrete steps can be taken to empower visually impaired so that regardless of their disability, they can fully express themselves through their clothing.

LITERATURE REVIEW

Fashion for visually impaired people remains a largely unaddressed issue. Be it purchasing clothes online or offline or selecting a desirable outfit, visually impaired people struggle from inaccuracies and misunderstandings. In this section, we review previous research on two topics: online shopping challenges and styling challenges.

Online shopping challenges

Several studies have been conducted in the past shedding some light on the challenges faced by visually impaired people when purchasing online. While online mode is the preferred mode over offline shopping because it gives visually impaired people a sense of control and trustworthiness *J'den B. Williams (2021)*, it still has its own shortcomings in accessibility. For example, one of the most observed shortfall is table accessibility. Online spaces often use tables as they present information in an efficient manner. Screen readers often read them in a linear manner requiring the user to memorize everything. Complex tables and rows creates a disassociation with the users *Michael Whitney (2020)*. Users have also reported dissent about the cumbersome process to acquire information about the fit, texture and colour of the clothing *J'den B. Williams (2021)*. This makes them reliant on human assistance or they often end up paying for an additional application *Wang et al. (2021)*.

Guanhong et al. (2019) analysed how blind people shop online by conducting interviews with 20 blind people and concluded that visually impaired people are conscious about standing out in mismatched clothes bought online. They are dependent upon others to enrich their knowledge of fashion and to also to seek information to help them decide if clothing items suit their age, personality and style *Michele A Burton et al (2012)*. They are then subjected to the bias of that assistance which inadvertently reduces the visually impaired person's autonomy. *Wang 2021* highlights complex terminologies employed by online spaces with which the visually impaired users might be unfamiliar with for example culture dependent colour names.

Styling Challenges

Most of the information perceived by us is through our sight. In its absence however, touch and hearing becomes the most important source of perception. Fashion industry is mostly visual based where people establish trends of the industry through images and observations. Without the ability to see themselves in the mirror, visually impaired people are generally unable to make clothing combinations that are trendy. They are overdependent on verbal descriptions *Cho, S. et al (2020)*. *Michele A. Burton (2011)*

interviewed 8 visually impaired people with the objective of understanding how blind people perceived fashion. It was observed that the most important factor in what makes a garment appealing was how the garment felt. Clothes with embroidery work added to this appeal since it enhanced touch sensory output. Practically was another factor which furthered a particular garment. The fundamental challenge here is how a visually impaired person feels confident with what he/she is wearing. To bridge this gap, assistive technologies are proliferating. Until now, most research on visual impairments have been on mobility, navigation and object recognition *Bhowmick, A et al* (2017) but with advancements in assistive technologies, the industry is slowly ensuring that style is accessible to all.

METHODOLOGY

The purpose of the study is to understand visually impaired people's behaviour and the challenges they face while shopping clothes online and making clothing choices in the absence of a visual perception. It also seems to explore the kind of assistance they require in clothing and the level of trust they are willing to give to such a system. To achieve these objectives, task observation and standalone interviews were conducted. Task observation is a widely used technique in the field of design where participants perform specific predetermined tasks. This is to understand their behaviour, experiences and the challenges they face in a natural environment. It allows participants to share and recall important details after the task is completed. For this study, participants were asked to match their clothing from their current wardrobe under the pretext of going to a party. They were asked to pick one top and one bottom from their clothing. After task observation, one on one interview followed. Structured interviews are suitable for a deep understanding of the participant's view. Questions asked during the interview were framed according to research requirements and they adhered to spoken language conventions so as to make them easily understandable. They were asked questions about their outfit selection criteria, coordination process, requirements and needs.

Task observation and interview lasted around 40 minutes in total for each participant, 30 minutes for task observation and 10 minutes for interview. Audio recordings of interviews were done with consent of the participants. A total of 10 participants took part in this study. They were students of Punjab University Chandigarh pursuing different streams. Their demographic profile is shown in (Table 1).

Table1: The demographics of the blind user group for primary research

Category	Number	Age	Location	Language	Occupation
Legally Blind	5	20-25	Panjab University, Chandigarh	Hindi and English	Students - currently enrolled in graduation and post graduation programs
Total Blind	2	20-22			
Low Vision	4	24-28			

While conducting observational studies, behaviour patterns were recognised and problems faced by them were identified. For individuals who are totally blind, maintaining a wardrobe presents an even greater challenge as they have to rely on external assistance. All of the participants interviewed in this study lived together under the same roof and the entire group helped each other to perform daily tasks. They were reluctant to go to any social events and were more comfortable around other blind people. Most participants agreed that services provided by online shopping platforms were confusing and here too, they relied on assistance. Few of them were unaware of online shopping platforms providing visually impaired specific tools and relied on friends and family for their shopping needs. Their clothing choices were monotonous and their wardrobes were limited to white or black. Participants were hesitant to try new colours. Almost all of the participants acknowledged their discomfort to ask for assistance on a daily basis and how it affected their sense of self (Figure 1).

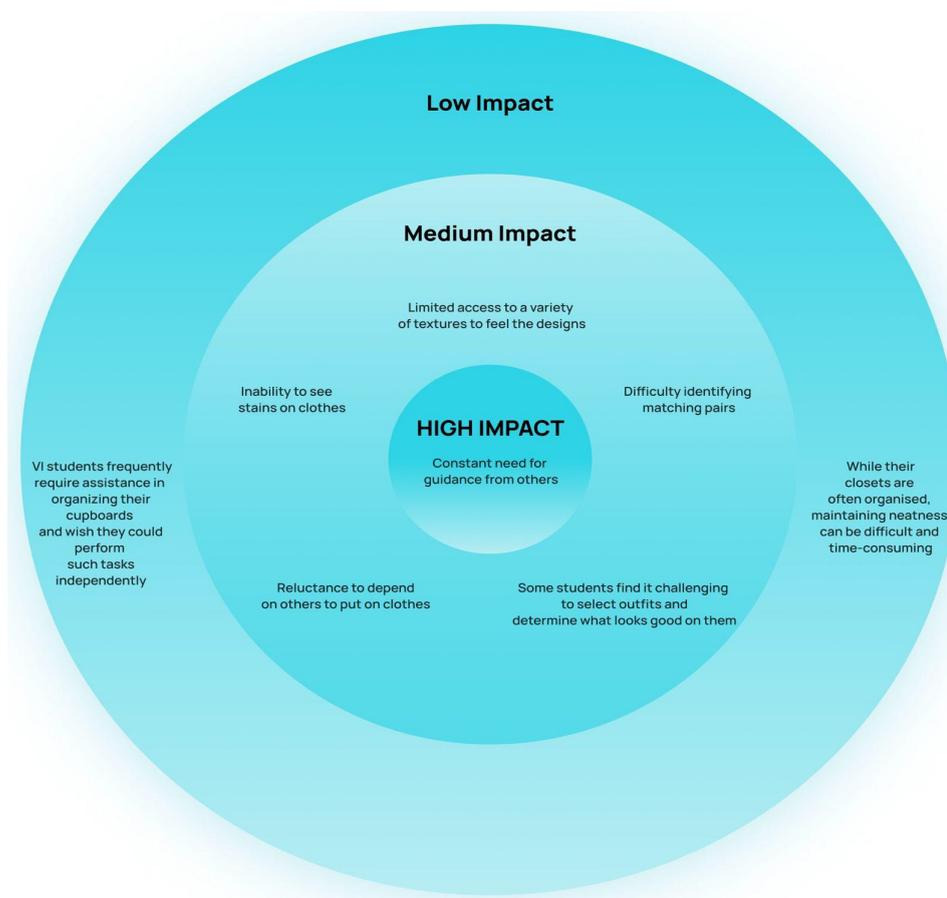


Fig 1: Problem Identification for Blind

The work on the user interface and user experience was done simultaneously. The primary purpose of the application will be to help visually impaired people make more independent decisions so that they can express themselves via their clothing. The application will integrate accessibility, usability and functionality with user satisfaction.

RESULTS AND DISCUSSIONS

“*Be Own*” application will represent a step forward by enhancing independence and confidence of visually impaired individuals by addressing challenges faced in wardrobe management and clothing selection, helping and empowering them to express themselves through clothing. The application will be based on Luciole font, though the user will have the option to choose from other fonts like Verdana, Tahoma and Ariel. The Luciole font has been developed by Centre Technique Régional pour la Déficience Visuelle, France involved in the field of visually impaired. The font has been designed using a specific set of criterias that help visually impaired to read more comfortably (Anna Rita Galiano, 2023). The application will also feature voice guided outfit suggestions, AI driven colour identification, stain detection (Figure 2) and tools like Voice Over. It will also have simple templates and straightforward navigation with clear voice prompts which will provide immediate auditory feedback of every action performed so as to make users feel in control all the time. The user will have the option to increase or decrease font size, change colour contrast and magnification (Figure 3). One of the issues that was observed both during task observation and interviews was that of language. Most of the participants were from rural backgrounds and their mastery over English language was rudimentary. To bridge this gap, the application will have the option of choosing local languages like Hindi, Punjabi, Bengali, Tamil and Kannada. The application aims to avoid clutter and unnecessary features that could be overwhelming for the user (Figure 4). Since availability of high speed internet in India is still sketchy, certain offline features shall be incorporated so as to have basic functionality even without an internet connection.

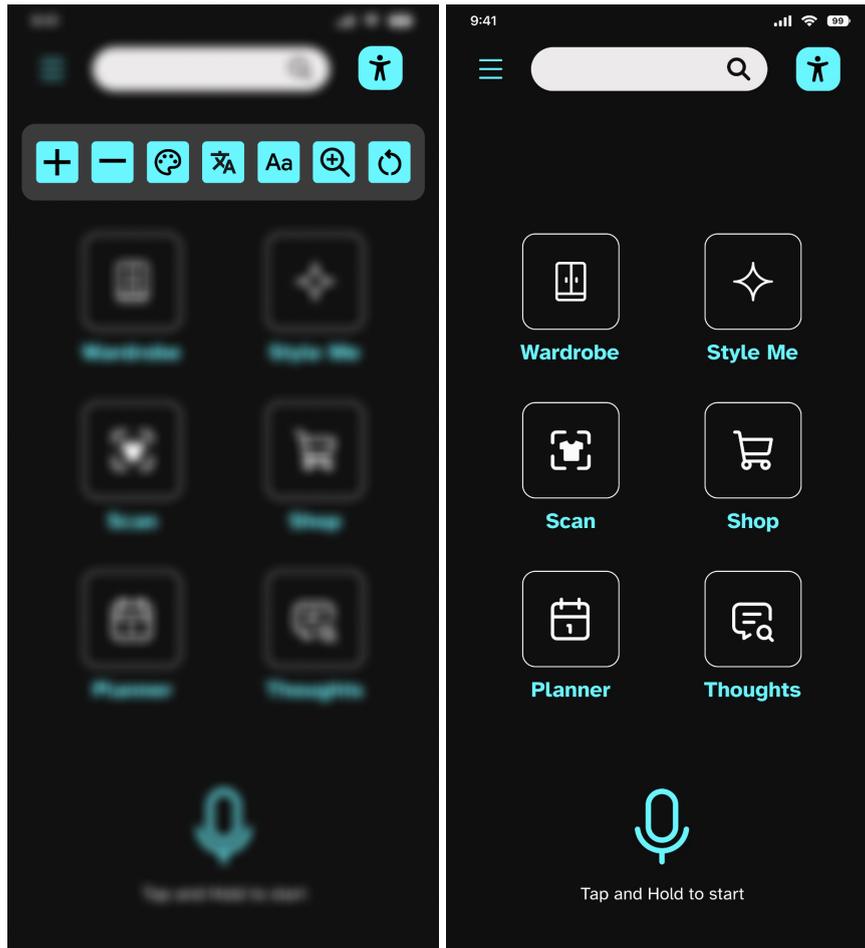


Fig 2&3: Application Interface

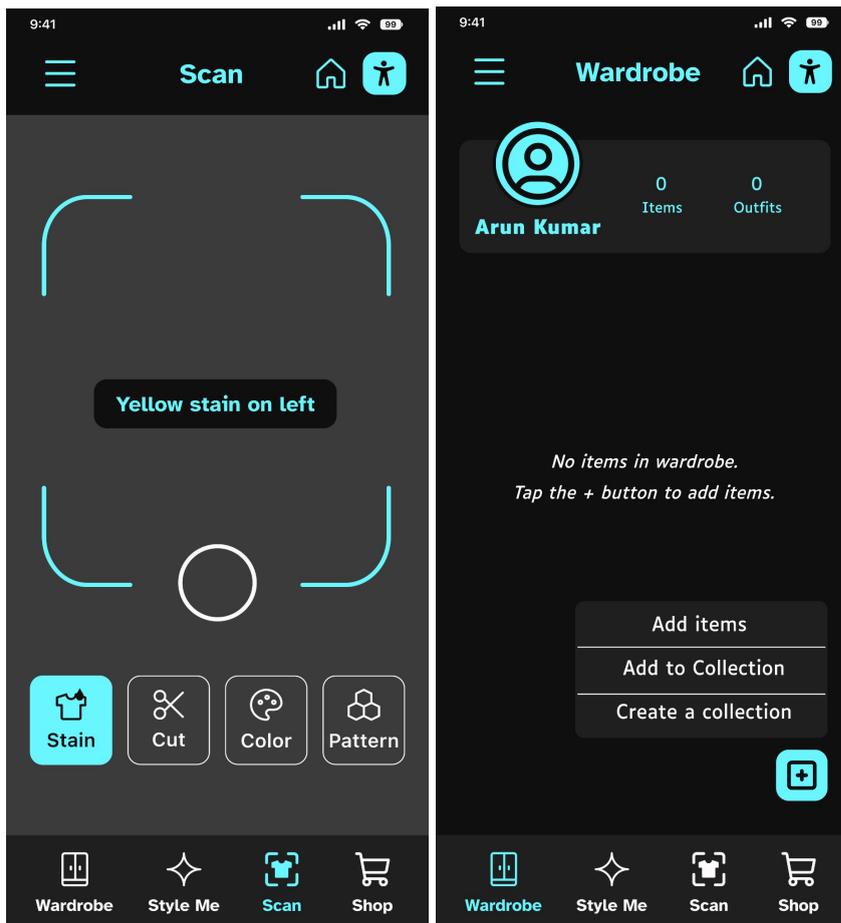


Fig 4&5: Application Interface

CONCLUSION

In this study, a complementary approach of interviews and observations were done with a purpose to obtain insights into the challenges of the visually impaired. The study revealed several interesting fashion related problems and the scope of automation systems that might be helpful for a visually impaired person to be more independent. "Be Own" application is designed to assist blind individuals to be more expressive through their fashion sense. However there is a scope for further development as the application will be limited by functionality. Developments into emotional AI and its integration with wearables to detect moods and thereby giving outfit suggestions is one example.

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