

Adaptive and Inclusive Apparel for the Visually Challenged

A CSR Initiative for Impulse India Pvt. Ltd., Delhi

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ABSTRACT

World Health Organization (WHO) revealed that around 285 million people of all ages worldwide are estimated to have some form of disability. Visually Challenged alone account for 39 million where two-thirds of its population are women and girls. Visually Challenged find different levels of difficulty in doing their daily chores. Clothing plays a major role at social front as they feel it connects them to the world. This paper presents a part of CSR initiative undertaken for Impulse India Pvt. Ltd., Manufacturer of Women's, Men's and kid's Apparel planning to explore feasibility of introducing fashion lines that are inclusive, attractive and usable for anyone and everyone, regardless of disabilities.

An in-depth survey was undertaken at the Blind Relief Association, Delhi, which included officials and vocational trainers followed by boys and girls of classes 5th to 12th who are completely or partially blind. The primary objective of this study was to know what Fashion means to them, their concerns, needs and preferences of clothing. Lack of independence in choosing what to wear, non-availability of specific clothing options in the market that self-communicate, being prone to thefts and accidents, are few major concerns. Use of walking sticks and wearing luminous jackets on the other hand make them feel conscious in being recognized as blind in the crowd.

The study was aimed at satisfying the basic intuition of the blind to be treated as a normal people who are independent, confident and self-reliant in doing day-to-day activities. Giving due consideration to the drawbacks identified in the existing supplies, *adaptive* features like incorporation of sensors for S.O.S. signalling and obstruction detection, braille labels and addition of functional aspect to aesthetics are proposed as scope for further design and development of smart clothing. Product development subsequent to prototyping and performance assessment would enhance the scope for the visually challenged in coping up with several such challenges.

Key words: Adaptive Apparel, Braille, Inclusive Clothing, Sensors, Visually Impaired

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Abstract —Visually challenged find different levels of difficulty in doing their daily chores. Clothing plays a major role at the social front as they feel it connects them to the world. This paper presents a part of CSR initiative undertaken for Impulse India Pvt. Ltd., a liaison of women's, men's and kid's apparel planning to explore the feasibility of introducing fashion lines that are inclusive, attractive and usable for anyone and everyone, regardless of disabilities. Giving due consideration to the drawbacks identified in the existing supplies, adaptive features like the incorporation of sensors for S.O.S. and obstruction detection, braille labels and addition of functional aspects to aesthetics are proposed as scope for further design and development of smart clothing.

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I INTRODUCTION

The World Health Organization (WHO) revealed that around 285 million people of all ages worldwide are estimated to have some form of visual disability. Visually Challenged alone accounts for 39 million where two-thirds of its population are women and girls. Visually impaired individuals must be concerned about learning the details of everything they encounter in their daily life, particularly when they are making decisions as consumers. They are subjected

to confusion and are often unable to make their choices regarding the selection of clothing.

The primary objective of this study was to know what Fashion means to them, their concerns, needs, and preferences of clothing. Lack of independence in choosing what to wear, non-availability of specific clothing options in the market that self-communicate are some of the major concerns other than being prone to thefts and accidents. Hence new and effective inclusive designs are needed for individuals who are visually impaired in the modern world.

II PROBLEM STATEMENT

Limited availability of apparel products those are inclusive, attractive and usable for anyone and everyone, regardless of disabilities is the major concern in today's world, which is consumer centric. The fashion industry should identify an acceptable way of making this happen. The study is aimed at satisfying the basic intuition of the blind to be treated as normal people who are independent, confident and self-reliant in doing day-to-day activities.

III REVIEW OF LITERATURE

As per the Global Estimates of Visual Impairment – 2010, globally the number of people of all ages visually impaired is

estimated to be 285 million, of whom 39 million are blind. Visual impairment or low vision is a severe reduction in vision that cannot be corrected with standard glasses or contact lenses and reduces a person's ability to function at certain or all tasks. (International Eye Foundation, 2011)[1]

A. For Mobility:

Wayfinding while traveling is one of the most widely recognized errands where the visually impaired face the greatest amount of difficulty. One of the most common aids used by them is the walking cane. There have been a lot of developments in the design and functionality of the walking cane with the incorporation of sensors. With the advancement of technology, many devices that provide technological Assistance for mobility are available which include GPS devices with voice commands, haptic feedback based devices like Glove/ footwear, etc.

B. For Reading:

Braille is a tactile system of writing for the blind that uses characters made up of raised dots. It is named after its creator, Frenchman Louis Braille who was left visually impaired after an accident in his childhood. Technological advancements have been made for people in braille as well for example; various assistive devices like screen readers, refreshable braille displays for typing in Braille are available.

C. For Daily Chores:

For simple activities like identifying notes, shopping, cooking etc., the visually impaired face a number of problems. Therefore, there is a need for specialized products to help get through with ease. Currently, blind people use braille based talking equipment such as watches, clocks, scales, and calculators[2] [Figure 1]. Adaptations of coins and banknotes are also available in a few countries that help the blind determine the value of the currency by touch. According to research by Michele Burton and Professor Callie Neylan, it was derived that the sense of touch is the most dominant means of interpretation. It said "Having tactile features on products add to the appeal since touch takes the place of visually interesting aspects." [3]



Fig. 1 Braille based watch

D. For Shopping:

A few companies like thinkskin [4] have started incorporating braille labelling in their products for ease of identification. N.Walmiki, L., &Vastrad, J. have stated that "clothing selection is all the more difficult if the consumer is visually impaired" in their paper titled 'Clothing purchases among visually impaired adolescents'[5].

Visually impaired children face problems viz., putting on the garment, matching of upper and lower garment, handling fasteners, identification of different garments, colour and pattern selection and identification front/back and right/wrong side of the garment. Apps like Be my Eyes, Color ID, Tap Tap See and LookTel [6] are some new apps that are developed to help them in this process but are still not user friendly to the completely blind. Burton, M., &Neylan C. have quoted that "The emphasis on clothing having certain colours was interesting, given that most of the participants could not see colour" which said different people associated colours in a certain way e.g, red for fire and pink for girls. The paper also said "Certain patterns they like simply because they liked a certain object such as flowers or butterflies. This then leads to buying clothing with those prints." [7]

E. Use of sensors and IoT:

The Internet of Things (IoT) [8] is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Hence, such technologies can be incorporated in garments which would then be functional by helping in navigation and obstruction detection alerts.

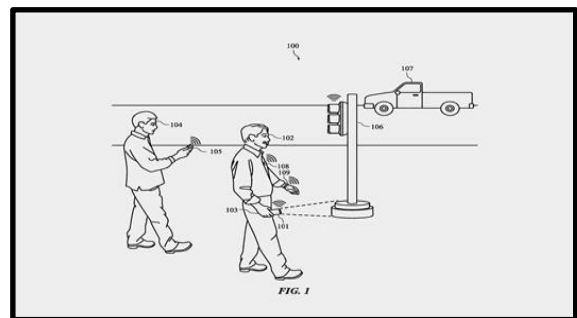


Fig. 2.Apple wearable patent

Figure 2 shows an upcoming wearable clothing design that was patented by Apple Inc. According to that patent [9], the device would map the environment with sensor data and

provide feedback. For the blind, the device could sync with an iPhone to provide spoken feedback to the blind.

IV METHODOLOGY

The methodology was aimed at design and development of prototype based on the primary and secondary research. The contemporary inclusive design was analysed to contextualize the project and to collect critical data through interview schedule, which was focused on user-centred approach, which allows understanding of information underlying people’s experiences, behaviours, motivations and needs, rather than just statistics. Braille questionnaires were also used in order to collect relevant data and ease their understanding. The results of the primary research were recorded into a subject’s profile for further tracing. The findings from secondary research (including Market survey) and primary research were translated into design rationales and then design specifications were generated for development of prototype, which include design activities such as hand sketches, rough mock-up etc., before the final prototype was conceptualised.

1) Sampling and Data Collection

A survey was undertaken as a part of exploratory research to investigate the needs and issues of the visually impaired with reference to their clothing. The study was undertaken in collaboration with the Blind Relief Association, Delhi as the primary goal of the study was towards minimizing the issues faced by the visually impaired with regards to clothing.

As all the students of the Blind Relief Association considered as population for the study have a common characteristic of visual impairment. Hence, homogeneous purposive sampling was applied in selection of sample group. The primary data was collected through interviews as well as Braille questionnaire methods. A sample of 15 students (aged between 21-25 years) undergoing vocational Training was selected based on their readiness for interactions and were interviewed on one to one basis. Braille questionnaires were administered to other students of 11th- 12th standards (aged between 16-20) in different classes for ease of communication and to ascertain uniformity in gathering information.

Young adults were mainly targeted for applied research since they are soon going to face the outer professional world having to meet various needs and demands in completing their daily chores. They were also considered for being in a phase of fashion consciousness, their diligence and sensibleness towards the approach of research. The officials working in the association and vocational trainees were also involved in interactive discussions with an intention to

observe the validity and reliability of the data collected from students pertaining to the struggle that they face in tackling day to day activities. The sample statistics are as given in the table 1 below.

TABLE 1
Demographics of the Survey & Sample statistics

| Demographic profile | Characteristics of Sample |
|---|---|
| Educational status of Respondents / population Nursery to 12 th Standard (College going) at BRA* & Vocational Trainers | 15 Vocational Trainers (For Interview) & 15 College going (11 th and 12 th Standard) for Questionnaire method Are selected as sample for the study |
| Visual Impairment | Complete as well as Partial Visual Impairment |
| Gender of Respondents (Male and Female) | 73.33% of the respondents are Male |
| Age range of the Respondents (16-25) | Average age of the Respondents: 19.5 years |
| Use of tools/ Systems to assist while shopping | 86.66% do not use any techniques, systems or software to assist them while shopping |
| Awareness of products with Brailletags /labels | None of the respondents (0%) have come across any labels or tags with product information in braille in the market. |
| Spending Pattern on Clothing | 46.66% spend in the range of 2000-3000 INR seasonally for clothing whereas around 6.66% spend above 5000 INR. |

*BRA-Blind Relief Association

V RESULTS AND DISCUSSION

The key inputs/ findings from the survey are as listed below.

- Fashion is crucial for the visually challenged as per the survey as it boosts and uplifts their confidence.
- While shopping, they usually take someone along with them for assistance. From Figure 3, it can be seen that 76.6% of the subjects preferred shopping with family or friends. They choose the garment on their own by touching and then ask others about its colour.
- The study highlighted their preference of garments having embossed or elevated designs / tactile quality.
- It was evident that only traditional methods are followed for identifying clothes and coordinates.

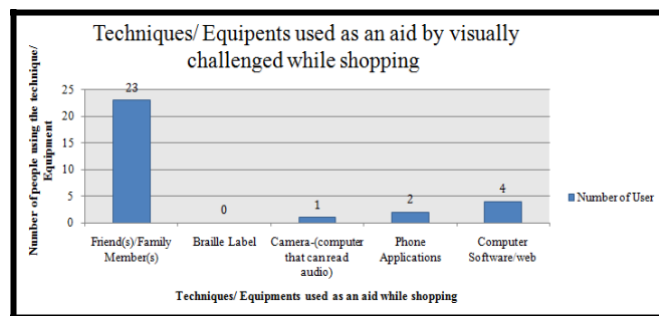


Fig. 3 Response of the Visually Challenged on using shopping assistance techniques

- The survey revealed the appropriateness of positioning of pockets at the top of the garments for the visually challenged.
- The respondents felt the need for size, colour and pattern information (chequered/ casual/ black etc.) provided through some elements in the garments.
- The visually challenged do not want to get highlighted in the crowd by using or wearing any device, equipment or bright colours.
- They were eager to know how the incorporation of sensors for S.O.S. signalling and obstruction detection could be done inside a wearable/ through invisible option.

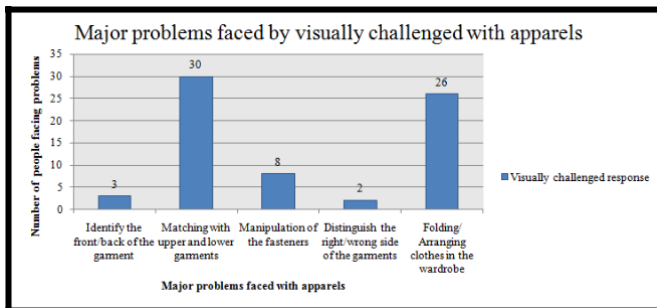


Fig. 4 Major problems faced by visually challenged in apparel front

- Completely blind people are unaware of the colour. Providing such tactile design colour help them get a sense of their clothing. There were different perceptions of colours by the completely blind. Some identified white as a symbol of happiness whereas for some blue was perceived as a symbol of power and strength, this shows that even if they can't see colours, they have associated with them in their own way.
- Although there are a lot of applications available for them that describes an object but using it in their day to day life is quite impractical.
- Also various equipment available as an aid are either expensive or their use/handling in everyday chores are not that efficient.
- After the fabric experience/ Feel test, it was seen that majority of the subjects preferred cotton over any other fabric. (Figure 5)

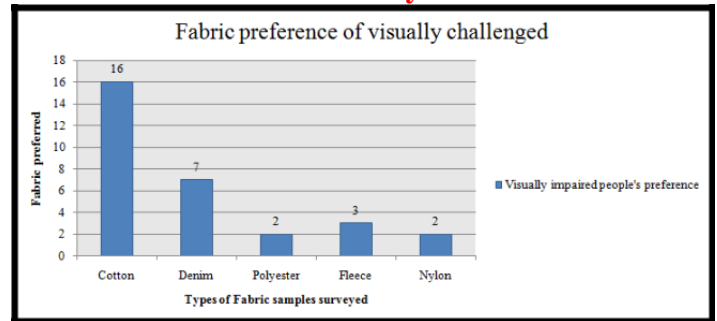


Fig. 5 Fabric preference of visually challenged

VI INTERVENTIONS PROPOSED FOR THE DESIGN AND DEVELOPMENT OF PROTOTYPE

With reference to the data analysis and interpretation subsequent to primary and secondary research, a prototype of the garment was designed as shown in the line sketches of figure 8 and 9, indicating the following specifications / product features.

- Incorporation of the functional aesthetics at the back of the garment that is having an embroidery or surface ornamentation in which braille language is incorporated. For example, embroidery of a pomegranate with seeds in it as braille message in it. This solves the purpose of a functional aspect for them without highlighting them in the crowd.
- A horizontal pocket with a zipper near the chest in order to keep money and cards for safety aspect.
- Two patch pockets with buttoned flap and a cord inside it, which can be attached to the object like a wallet to prevent burglary.
- Luminous piping / use of fluorescent tape in the front and back side of the jacket to prevent accidents in the night.
- Insertion of a detachable S.O.S sensor: This can send an S.O.S message with their location in it to the guardians in case of any emergency. The working of the sensor is shown in figure 6.

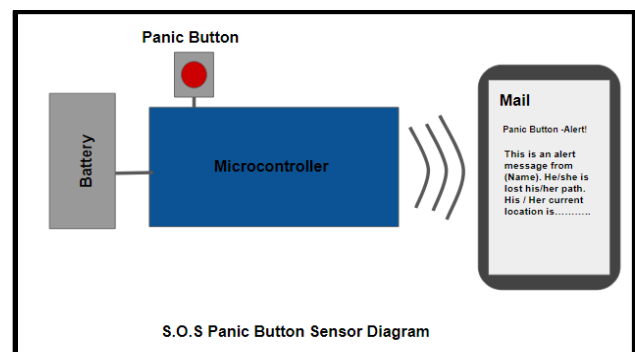


Fig. 6 Diagram of panic button S.O.S sensor

- Also three object detection sensors can be installed one at the center back below the yoke and other two at the outer edge of the sleeves which would help them to detect any obstruction like walls, tables etc. can be detected in their path while walking. The diagram of the working of the sensor is given in figure 7.

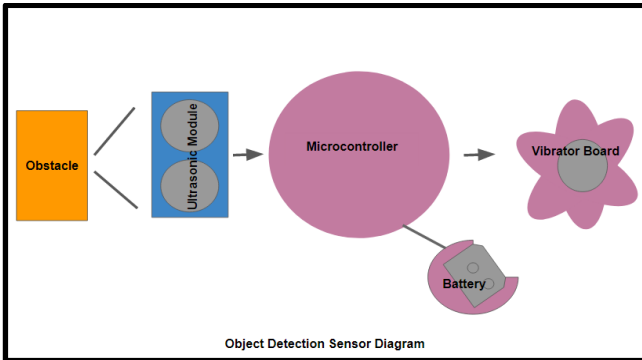


Fig. 7 Diagram of object detection sensor

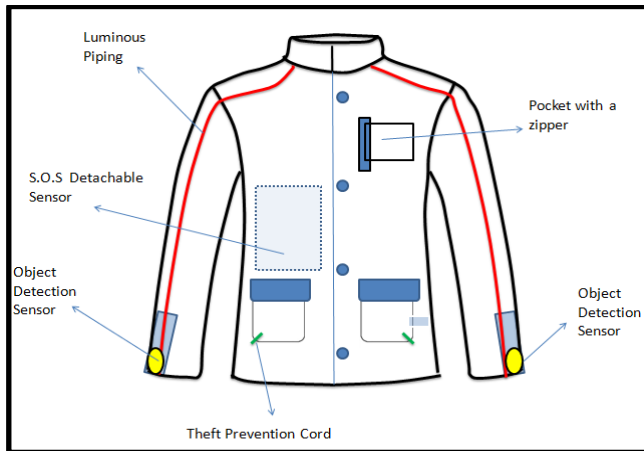


Fig. 8 Front view of the jacket

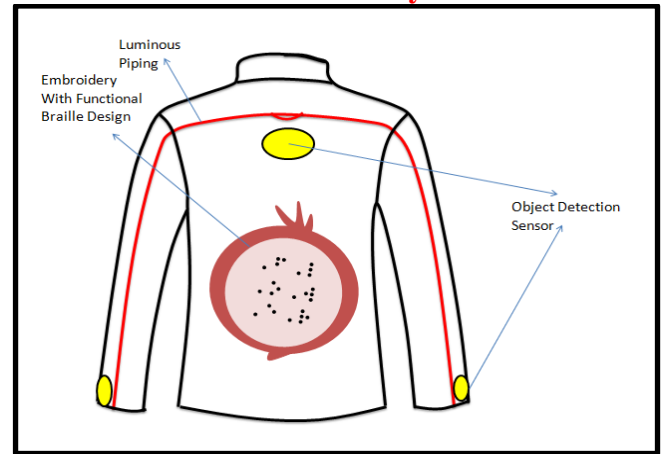


Fig. 9 Back View of the jacket
CONCLUSION

The basic need of a visually impaired is to be treated as a normal human being. Besides, they also want to become independent, confident and self-reliant to do day-to-day activities. All the new devices/ applications which are available as custom made in the present market to help the visually challenged are found to have major drawbacks like high cost, difficult to handle/wear and are also quite noticeable in public. There are certain other difficulties that blind people face in their day to day lives unlike others which include getting robbed easily and being prone to accidents at night. So, incorporation of the sensors, such as, S.O.S, emergency signal and obstruction detection signal, combined with Braille and functional designs can solve the above problems if used in a wearable. These inclusive and adaptive clothing would help them to cope up with challenges mentioned, boost their confidence and share the sense of fashion with them.

Giving due consideration to the drawbacks identified in the existing supplies, *adaptive* features like the incorporation of sensors for S.O.S. signalling and obstruction detection, Braille labels and addition of functional aspects to aesthetics are proposed as scope for further design and development of smart clothing. Product development subsequent to prototyping and performance assessment would enhance the scope for the visually challenged in coping up with several such challenges.

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