

Kitchenware Development: Strategizing blind user-designer experience design activities

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Abstract

Concept Development from research, the blind relies heavily on sensory references like touch to make a spatial judgment – the lack of such often results in accidents. Thus, the solutions physicalize tactile cues, which they can rely on for the next step in the cooking process. Existing solutions in the market are often function-focused, with little attention paid to usability. Product utility is foreign and unnatural to the blind as it contrasts with their prior memory of performing a task. Therefore, this research study is to strategize the Blind User-Designer experience through design activities.

Keywords: Blind-User; Kitchenware, User Experience; Design Activities

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1.0 Introduction

Rapid growth in today's kitchenware product design stresses research and development activities concerning the utilitarian and the practical, epistemic and hedonic requirements (Norman, 2004). Interest has developed in a 'sensory design activity' that considers human senses (Holbrook & Hirschman, 1982). It is difficult to find product research and development activities that involve 'blind users as respondents, thus creating a scientific discipline problem concerning developing 'good design' for the blind. There is a missing association regarding how designers and blind users perceive information through their senses and experience. To further study, researchers strive to uphold knowledge as an academician to dig deeper into blind user society in understanding the 'grey area' which is fundamental to the blind user, however, invisible to the designer. Therefore, this research attempts to promote the basic theory that will associate designers' thoughts when developing ideas for blind users. Alas, it creates an awareness of the model in design thinking.

Throughout the study, the research objectives are:

- Construct a procedural framework through theoretical research study and participatory research activity concerning blind user touch related to product appearance.
- To conduct an empirical experiment of design activity by associating the designer with the blind user's state of condition in product performance and evaluation.
- To provide data to support New Product Development (NPD) rationalization. An analysis can contribute to holistic understanding by associating blind user-designer experiences with the designed activities.

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1.1 Kitchenware Product for the Blind-User

Cooking is difficult enough when you have eyesight, but it's far more difficult when you don't. Preparing meals becomes more difficult for the blind as they learn to deal with the possibility of spills or injuries such as knife cuts or burns. As a result, it is astonishing to see 2012 Master, third season, Chef Christine Ha, who is blind, handling the stove and knife like a seasoned pro (Aaron Parsley; Liza Hamm, 2012). Her biography on that show explained that she could only achieve all her skill through years of training and practice. However, this procedure takes time and might be discouraging in the beginning. The critical part is to instill confidence in people to overcome physical and emotional hurdles to appreciate and try cooking. FOLKS kitchenware leverages natural, sensory feedback and tactile cues to prepare food safely with confidence and dignity through a steep learning curve. A design study by Kevin Chiam (2018) described that cooking is challenging for the blind due to the lack of sensory references. He, the winner of the James Dyson Award in 2018, discovers that existing industry approaches are frequently function-driven, with little regard for usability. Because it contradicts their prior memory of how a task is completed, product utility seems strange and unnatural to the blind. They unintentionally create social stigmas by relying on obnoxious sensory feedback (such as a loud beep) to convey a specific function or change. This could also lower the user's self-esteem, which is something that the blind is not comfortable. On the other hand, Folks cookware offers traditional analog instruments that are easy to use. This significantly reduces the learning curve. Tactile cues also give the user the assurance and confidence they need during the preparation and cooking. Folks aid the workflow and improve the culinary experience when used as a system. They are also less expensive, self-sufficient, and require less maintenance than their battery-operated counterparts.

1.2 Research Motivation

The novel theory of this research underlines the missing link between designer and the blind user in questing for lifestyle improvement affected through a consistent, tangible product developed. This study allows the researcher to gather information on what contributes to what information in the form of haptic and experience of a blind person. In return, a design procedure can be developed to take users' feedback of product information for the designer to reflect by experiencing them from the condition blind state. As mentioned by Bruce Hanington & Bella Martin (2012), the transfer of knowledge about work structure happens more frequently when people discuss how they work while they do it. As a result, research data are more reliable. The experiment's results widen the design research horizon through a multi-disciplinary approach. Hence, it generates the User-Designer consensus within the respondent's awareness, invisible to the product designer. It enables researchers to look into gaps and articulate product performance according to the blind user perspective.

Despite the consistent design pattern findings, the researcher develops a general descriptive model from the experimental phase to help the researcher structure contextual theory. It is crucial that designers establish a user-centered model approach to haptics product design for the BVI by offering more thorough, meaningful, and practical assessment activities for this population. Understanding the population of people who are visually impaired and their sensitivity to touch may help reveal opportunities for improving reasoning across a variety of design disciplines and categories to produce new design ideas or developments specifically for this target group (Vermol et al., 2015). Figure 1 conceptualizing how Blind User perceive a designed product's physical attributes validates its philosophical impact. Knowledge of the capabilities and constraints of general human touch, the technical possibilities of designing for touch, and how the resulting designs affect haptic interaction and the overall use are all necessary to produce high-quality final products.

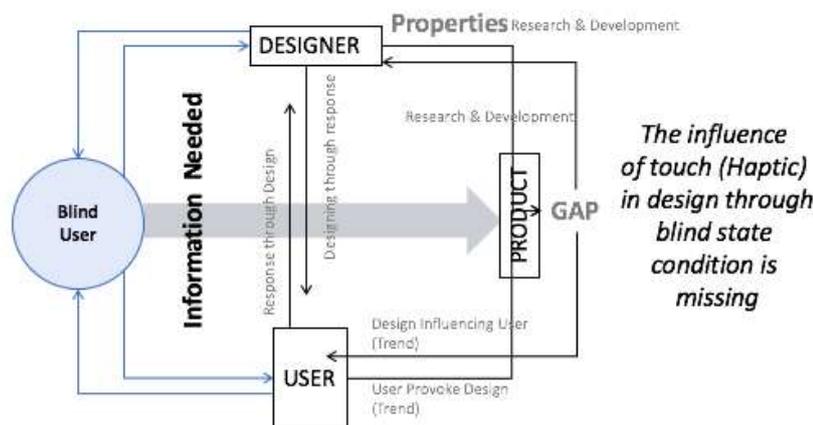


Fig. 1: Conceptual framework design representing the influence that differs between Blind User and sighted User (Vermol et al., 2015)

Globally, 39 million people are blind and 253 million have some vision impairment. In Malaysia, approximately 1.2% of the population experiences blindness. Life during the pandemic has highlighted issues of independence and isolation, especially for people who rely on touch to communicate their needs and access information. People with disabilities could face a higher risk of infection due to a lack of access to guidelines and precautions. She also added, up to 95% of blind children do not attend school. This is primarily due to the lack of skilled teachers and limited Braille materials or equipment access. Braille skills dramatically increase opportunities for entrepreneurship and employment for adults, but employers are often unaware of the need for basics such as Braille paper or keyboards. Technology should be complementary to Braille; it plays an essential role in amplifying human ability. However, we must remember it is not a substitute for Braille, enabling and empowering policies, or purposeful vision, action, and inclusion.

The fundamental goal of this study is to gather as much data of blind users' feedback on kitchenware product performance while in use. In return, this data can be the key for designers to provide an affordable and low-tech kitchenware tool that is practical for every household, institution, or business. This study's development also aligns with the UN's Sustainable Development Goals (SDGs) to achieve a more fantastic and sustainable future for all. The difficulty to implement this maxim is adequately recognized and can be signified through 3 SDG which:

SDG 3: Good Health and Well-being

SDG 3 aims to ensure healthy lives and at the same time promote wellbeing for all ages. The significance is underpinned by the right to enjoy the highest attainable standard of health services, information and health education without facing disability discrimination, according to CRPD Article 25.

SDG 4: Quality Education

SDG 4 focuses on ensuring inclusivity, equal and quality education for all, without leaving anyone behind. This goal promotes lifelong learning opportunities for all. The researcher firmly believes that the visually disabled, although categorized as the PWDs, also deserve the same value of education as other non-disabled citizens.

SDG 9: Industry, Innovation and Infrastructure

This goal focuses on building resilient infrastructure and promoting inclusive and sustainable industrialization. SDG 9 also ought to implement the UN Convention on the Rights of Persons with Disabilities (CRPD) by ensuring that person with disabilities will be offered personal mobility with the most significant possible independence as mentioned in article 20 of the CRPD and having freedom in independently accessing the information on an equal basis with others through all forms of communication.

2.0 Literature Review

Bjelland (2008) described touch as a central way of interacting with products and offers unique interaction qualities. Further study showed haptic technology enables rich tactile or force-feedback output, especially on computerized products development. However, the sense of touch relating to product interaction has received relatively little attention in product design and human factors research of blind users' haptic interaction.

On their theoretical analysis, Ericsson and Simon (1993) debated that the thinking and verbal reports most substantial connection is found when subjects verbalize thoughts generated during task completion. Before this matter, subjects will be vocalizing their "inner speech," which would have otherwise remained inaudible if they didn't correspond to think aloud. Dagman (2010), in her study approach investigating the 'haptic aspects of verbalized product experiences,' concluded that users' could verbalize their haptic product experiences through adjectives. She also explained that in advance of guiding to product design work, there is a need for more systematic studies to be carried out to identify the actual effects of basic product properties such as weight or size on people's haptic product experiences, as well as any interaction effects between different product properties.

In another study by Klatzky & Lederman (2002), haptic perception extracts properties of objects and surfaces that lead to recognition of things. It provides the fundamental approach to humans exploring products and haptics contribution in sensing object properties such as their size, shape, texture and hardness. However, existing research does not address product experiences from the designer's way of knowing. The comprehensive investigation of haptics only focuses mainly on touch and texture. Schifferstein and Cleiren, in 2005, present an experiment result on several product details perceived and communicated by the participants. In 2006 again, Schifferstein explained that the relative importance of different senses depends upon the product type. However, the research does not explain the character of the experiences consumed.

Sonneveld (2007) explains a framework study of five domains on users' descriptions of pleasant and unpleasant tactual experiences. It describes the haptic product experiences through movements, tactual properties, physical sensations, affective behavior and 'gut feelings. This research displays an essential connection of human emotion and bringing meaning to the human touch sense.

A language was said to be lacking. Schifferstein and Hekkert (2008) later concluded that although haptic experiences are part of everyday life, people do not talk about these experiences and seem to lack the vocabulary to do so. Jessica Dagman *, MariAnne Karlsson, and Li Wikström (2010) added that the method of the verbal description can explain and describe user haptic product experiences precisely and how they relate to visual product experiences. From a quantitative perspective, adjectives were used to describe participants' haptic experiences in the experiment. However, the research was never subjected for the Blind User to be studied on the experiments. The touch is rarely used alone and involves complex multimodal relations with the other senses.

3.0 Methodology

This research aims to study Blind User (BU) verbal experiences through product haptic aspects, reasoning their verbalized haptic properties and implications. The research objective is to understand how BU evaluates haptic senses driven by implicit values, intellects, and emotions and how they are supported. It is essential that studying BU verbal responses through their touches experience may assist the designer in tackling the problem in designing assistive design for the BU. This result will contribute new novel knowledge on "Structuring Systematic User-Centered Design Analysis" in determining the critical Haptic Product Properties to consider in the process of Formgiving for the BU (Vermol et al., 2018). In order to develop a successful design outcome, it is essential to decide an approach that fits the goal,

ambitions, and resources to determine the necessary activities without compromising the allocated resources and limitations of the study. The quest begins by introducing the research models used by the researcher in staging the design activity of this study. Explanations of the design activities will be mapped down to visualize a more precise flow and steps taken for this research and to manage the expectations and preparation. This will also consider the data collection procedures, explaining the type of research that was carried out. Finally, the methods of collecting and analyzing data will also be rationalized.

The mixed method is the best strategy to respond to the research questions because it enables findings to be understood in numerical sense as well as through an understanding of the life experiences of two subjects — the blind and the sighted people surrounding them — as this research aims to address a practical research problem involving the association of the blind and the sighted. Other than the fact that there aren't many previous research or literatures that concentrate on topics related to the blind or people with disabilities in general, there are certain limitations to this study. The study is only conducted in the Brickfields neighbourhood of Kuala Lumpur because, according to the CEO of the Malaysian Foundation for the Blind, Kuala Lumpur is a popular place for blind people to live and work due to the city's infrastructure that enables them to travel independently or using only their white cane.

3.1 Mix Method

In designing this research, the researcher refers to Creswell (2009), who defined research design as the study plans and procedures that take decisions from broad assumptions to comprehensive data collection and analysis methods. Creswell (2009) further mentioned that selecting a research design often depends on the complexity of the research question or issue being discussed, the researcher's knowledge, and the research audience. There are three (3) types of research, according to Creswell (2009); qualitative research, quantitative research and the infamous mixed-method research. In the early 1990s, researchers have started integrating quantitative and qualitative data into mixed methods since certain biases can result from applying only a type of research.

This research utilized a mixed-method design approach; quantitative and qualitative data are collected sequentially.

Tashakkori & Teddlie (1998), as quoted by Creswell (2009), recognized that the results from a technique might assist in identifying participants for the study or questions to be asked from the other method. Alternatively, the data are merged into an extensive database and used side by side to serve a bigger purpose, especially when advocating for marginalized groups; women, racial minorities, under-privileged people, and people with disabilities (Mertens, 2003; Creswell, 2009). The researcher thought neither quantitative nor qualitative approach is adequate to grasp the research problem. Hence, as supported by Creswell's (2009) statements, a mixed-method design is preferred.

This study starts with a broad survey to generalize findings to a population before focusing on qualitative, open-ended interviews to collect detailed opinions from the informers. In designing the study using a mixed-method design, four factors contribute to this study's procedures – timing, weight, mixing and theorizing. The researcher has chosen the Sequential Explanatory Design to quickly communicate the procedures for this mixed-method study, as adapted from Morse (1991), Tashakkori and Teddlie (1998), Creswell and Plano Clark (2007) and summarized by Creswell et al. (2003).

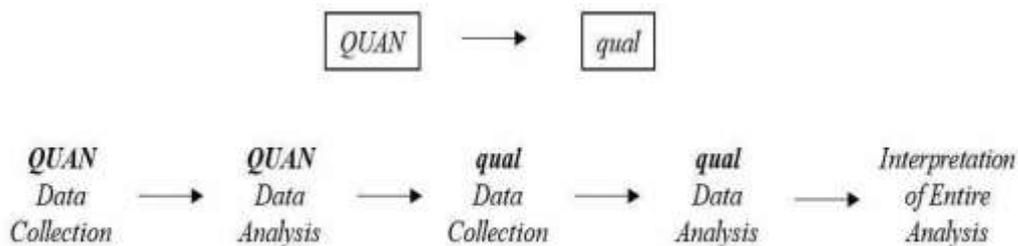


Fig. 2: The Explanatory sequential mixed method design (This figure was inspired by Creswell's (2015) the explanatory sequential mixed method design)

Therefore, the Sequential Explanatory Design strategy, as shown (see Fig.1: Sequential Explanatory Design strategy), will be the starting point on the activity of preliminary data collection and analysis through quantitative approach during the first phase of the research and followed by the collection and analysis of qualitative data which was build based on the results from the first quantitative study. Typically collected feedback data will be analyzed through the quantitative approach, determining the variables for the qualitative phase. To summarize the whole research plan, a research flowchart is illustrated.

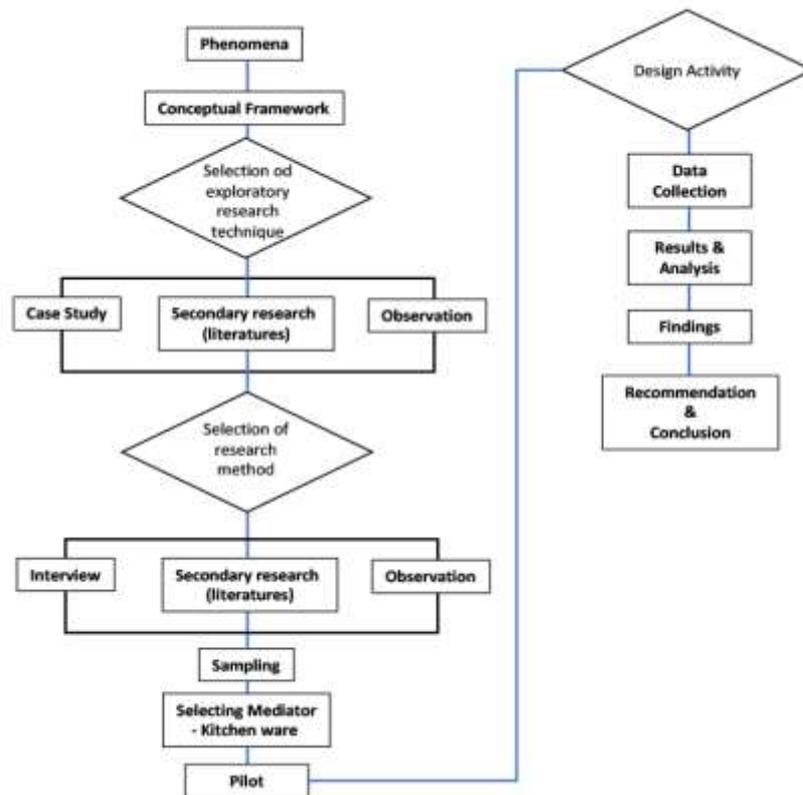


Fig. 3: The process flow of design activity planned out for data collection

3.2 Research Sampling

Referring to Banerjee & Chaudhury (2010), a sample is a part of the defined population. Each sample is adequately chosen, with the inclusion and exclusion criteria well defined. For a blind individual to be chosen in this sample, they need to first register with the Department of Social Welfare Malaysia and own an OKU card. This characteristic is vital to ensure that their blindness is well acknowledged and given proper education, technical skills, and social assistance from the government. The research sample selection will be subjected to the blind user who can read Braille, under the B4 group (Total Blindness) and 20 – 57. (average age 39.7). The participants had to be 30, but no more than 60 years old; the reason is that the skin's sensitivity decreases as one grows older (Harding, 2004).

B4 - 20/200 to 20/400	Considered severe visual impairment or severe low vision
B3 - 20/500 to 20/1,000	Considered profound visual impairment or profound low vision
B2 - More Than 20/1,000	Considered near-total visual impairment, or near-total blindness
B1 - No Light Perception	Considered total visual impairment, or total blindness

3.3 Data Collection

Qualitative Data

Primary data is collected by using three methods in this study: there are two sources of data collection applied; primary sources and secondary sources. Primary sources include the responses from the research sample, as will be stated below. The later secondary sources consist of the literature reviews from scholarly articles, publications and others.

(i) Questionnaire

Questionnaires are one of the forms of primary data collection method, which allows the collection of data directly from the samples. In this study, a survey was given through an online form, considering the limitations that may be faced for the blind respondents to respond on physical papers. Before constructing the questionnaire, researchers identified the blind respondents' medium of preference to access

the questionnaire. It is found that with the proper knowledge in web browsing via mobile phone, it is much more convenient for them to use Google Form when answering the survey.

(ii) Observation & Interview

The other half of the data collection phase will be conducted through observation and interview within the modality of Verbal Protocol Analysis, reflecting the work of Vermol et al. (2017) in collective observation of concurrent and retrospective respondent experience through verbatim information. An interview will be conducted based on the key results from the earlier survey. It seeks to validate the acknowledgment of a phenomenon from the opinion of respondents. Observation of qualitative data will identify a shared pattern of human behavior over time among the populations by engaging in their on-site experience feedback through collective kitchenware tools as key mediators (i.e., knife; cooking pots; cups; plates. Through this study, the researcher may have the opportunity to highlight a potential issue and solution in the context of this study.

Quantitative Data

For the quantitative part of the study, the sampling method uses a non-random sampling of (n=30) from a population of blind individuals from the Malaysian Foundation for the Blind. Every individual in the population has an equal opportunity of being included, but the first 30 who volunteered were taken as samples. A snowball sample is used in the qualitative study, where one case identifies others of his kind.

Data Analysis

As mixed method design is applied in this study, qualitative and quantitative data are analyzed differently. For the quantitative data, the researcher utilizes the usage of Statistical Package for the Social Sciences (SPSS) software to process and analyze the results from the questionnaire. The percentage is used for most of the variables from the collected data. From the data percentage, analyzation process will be performed; interpretation will be e constructed and use for further proceeding activity that is being structured. The program's ability to handle many variables allows mass data to be collected and statistically analyzed. The data will be analyzed for the qualitative collection of data by identifying the common patterns within the responses. The patterns will then be analyzed in a way that is in line with the research objectives. Observation will be conducted and sequentially analyzed on-site. Data will be collected through video recording.

4.0 Findings & Discussion

The implication from the research introduces the fundamental nature of blind users' haptic imagery to products and its critical knowledge gathered from design activity. Data collected from this activity serve as design factors data that is critical to help designers to understand the actual product feedback from the blind users' experience of using them. Nevertheless, cuts short designers' design process and strategically focusing on what is working and what is not, what is there and what is not there. The findings of this study were obtained from various analyses. 30 blind users as participants were observed in conjunction with the activities sets. From there, data from the questionnaire is analyzed with SPSS to gain a deeper understanding of the problems and demands created by the activities. In conclusion, the research's findings will clarify the design and functional aspects that the researcher must take into account when using the instrument in question.

Table 1. An example of a table

No		Frequency	Rank
1	Most products in the market does not have inclusive design for person with disability.	4.0000	Agree
2	It is difficult to identify a product without any tactile feature when using them.	4.1000	Agree
4	It is difficult to differentiate 2 products with similar shape/form	4.4667	Agree
5	It is difficult to determine a product without the help of someone else to assist in reading the label.	4.1000	Agree
6	A tactile feature or labelling helps a blind person to identify an object.	4.1333	Agree
7	By having Braille-labelled household product, especially kitchenware, it helps blind people to live more independently	4.0000	Agree
8	Most Braille labelling tool in the market are expensive and unaffordable.	3.5667	Neutral
9	It is difficult to find a Braille labelling tool in Malaysia.	3.9667	Neutral
10	Being able to own a Braille labelling tool to label own household products brings more convenience in a blind person's life.	4.1333	Agree

Table 1 shows the analysis of responses from Section 1 in the questionnaire. In this section, questions were asked in Likert Scale form, where respondents have to choose among 'Strongly Disagree', 'Disagree', 'Neutral', 'Agree' and 'Strongly Agree'. These variables are ranked with score from 5 to 1 respectively, and then is analysed to find the Mean in SPSS software.

Eighty percent (80%) of the statements made were agreed upon by the respondents. The mean derived from Section 1 questions, where respondents had to rank their agreement with each claim about Braille labels, is shown in Table 1. The majority of items on the market do not have inclusive design for the disabled, according to a score of 4.000. The market's offerings fail to provide blind consumers

with the information they need, according to a high mean score of 4.467. They find it challenging to recognize an object without a tactile element as a result. The majority of respondents (4.467) agreed that it is challenging to distinguish between two identical products with the same design and characteristic. 4.100 respondents on average agree that it can be challenging to identify a product without assistance from a companion who can read the label. This is related to their mean average of 4.133, who acknowledge that tactile labelling aids in object identification for blind people. In addition, a mean average of 4.000 indicates that respondents believe that having household items labelled in Braille helps blind people live more independently, and at 4.133, they agreed that having a Braille labelling tool to name one's own household items adds to a blind person's convenience.

In today's global market of a mainstream product, designers are involved in the increasingly diverse users, cultures and environments. These challenges the designers' working environment and activities either in the systematically and wickedly complex environment and sometimes, the task involved in aligning all requirements can seem impossible. By understanding both stakeholder requirements of 'what?', 'why?' and 'how?' do designs preferences and attributes being interpreted gives an answer to what is out there that can be improvised and implement in how the knowledge in design activity flow as per explained through the activity of (Crilly, N 2005). Thus, in this research study, the association between blind users and designers synergizes through the researcher's activities. Mediated through product components and attributes factored from the activities feedback performed by blind users.

5.0 Conclusion & Recommendations

To sum up the findings, the informants stated that there was always a difference between their daily lives and those of sighted individuals. The findings from the research and observation, supported by earlier research investigations, may aid in our comprehension and shaping of consumer needs. It's likely that the results were influenced by the dearth of goods accessible in Malaysia's market for blind customers. The results of this observation point to the necessity for a labelling tool for the blind in order to lessen their difficulties when using kitchen equipment. Additionally, it is discovered that some evidence is required to support the conceptual premise that Braille labelling is needed in kitchenware design in order to foster successful design engagement between users and products.

The research study is grounded by literature reviews on existing approaches and an ethnography overview. To better understand the blind users' pain points through mediated kitchenware as mediating component. This study provides first-hand information that focuses on blind user experience mapping to highlight design opportunities. Looking deeper through collaborative analysis of design with empathy, (Kouprie and Visser, 2009) discuss the framework as an insight towards three key elements, which are motivation, 'stepping into and out of users' life,' and the time that should plan for the empathetic relationship (Kouprie & Visser, 2009). From this proposed framework, researchers can reflect on blind users' difficulties. How do blind users portray their touch foundation in determining the reality of haptic imagery and the meaning behind design invisible to humans with sight? Designers may portray hindrance to product use through assumption; however, by putting themselves to the same state of condition as the blind users, they may find something worthwhile and inspiring to initiate product improvement further. From the experiments conducted and the topic structured, the researcher discovers that the associations of Blind Users-Designers' procedural method approaches provide a successful 'user experience design' in centering user-centered design.

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