Digital Communication Through Design: Indonesian Workers' Experiences with Voice Assistants

Chindy Elsanna Revadi*[1], Khairullah Zikri[2] , Akbar Gading[3], Monica R. A. Simanjuntak[4]

1234Departemen Teknik Industri, Universitas Sumatera Utara, Medan, 20155, Indonesia
*Corresponding Author: chindy@usu.ac.id

ABSTRACT

Voice assistants have transformed how people communicate with smart devices, enhancing productivity through AI. This study examined the usability and satisfaction of Indonesian workers when using Google Voice Assistants in Bahasa and English, incorporating industrial design principles. All participants, of working age, regularly used these voice assistants in both languages. Using the System Usability Scale system, they performed practical tasks in real-world conditions. A statistical analysis revealed significant differences in usability and satisfaction between the languages. The findings highlight notable distinctions in the communication experience between Bahasa and English. This research underscores the role of industrial design in refining AI voice assistant interfaces to better facilitate diverse linguistic interactions and optimize user productivity.

Keyword: Voice Assistant, design, communication.

ABSTRAK

Asisten suara telah mengubah cara orang berkomunikasi dengan gawai pintar, meningkatkan produktivitas melalui AI. Studi ini meneliti kegunaan dan kepuasan pekerja Indonesia saat menggunakan *Google Voice Assistant* dalam Bahasa Indonesia dan Bahasa Inggris, dengan menggabungkan prinsip-prinsip desain industri. Semua partisipan penelitian, yang berusia produktif, secara rutin menggunakan asisten suara ini dengan kedua bahasa tersebut. Dengan menerapkan *System Usability Scale*, partisipan melakukan tugas-tugas praktis dalam kondisi nyata. Analisis statistik menyajikan perbedaan yang signifikan dalam kegunaan dan kepuasan antara kedua bahasa tersebut. Hasil penelitian ini menunjukkan perbedaan yang menonjol dalam pengalaman komunikasi antara Bahasa Indonesia dan Bahasa Inggris. Penelitian ini menekankan peran desain industri dalam memperbaiki antarmuka asisten suara AI untuk lebih memfasilitasi interaksi linguistik yang beragam dan mengoptimalkan produktivitas pengguna dalam berkomunikasi dengan gawainya.

Kata kunci: Asisten Suara, desain, komunikasi.

1. Introduction

Technological advancements have revolutionized communication devices, transforming them into advanced digital tools that enhance productivity and user interaction (Morana et al., 2020). These AI-powered voice assistants leverage natural language processing and machine learning to interpret and respond to users in real-time, assisting with complex tasks (Ahanin et al., 2022). As part of the field of Human-Computer Interaction, the design and development of voice assistants play a crucial role in facilitating seamless and intuitive digital communication between humans and their devices (Clark et al., 2019).

Research has highlighted the importance of industrial design standards in enhancing interface consistency and usability of voice assistants, which can significantly impact user satisfaction and the overall quality of interaction, particularly for those using the technology in their native languages (Pal et al., 2019; Pyae et al., 2020). Studies have also examined the use of voice assistants in native languages to measure usability and user satisfaction, providing insights into the role of digital communication through device design and Human-Computer Interaction (Zwakman et al., 2021).

This research aims to examine the user experiences and responses of working individuals when using virtual voice assistants, incorporating an industrial design perspective. Data collection involves distributing usability questionnaires to assess how these users experience and interact with virtual voice technology used.

2. Literature
A. Human-Computer Interaction (HCI)
Human-computer interaction examines how humans and computers interact to complete tasks and create interactive system (Shao & Chang, 2020). The scope of human-computer interaction (HCI) is as follows:
a. Human
    Includes ergonomics, psychology, anthropology, and others.
b. Computer
    Includes software, hardware, information systems, and others.
c. Interaction
    The interaction between humans and computers is related to the user interface.
d. Activities
    Shows activity performed by users
e. Work Environment
    The environment in which human-computer interaction takes place

The principle of human-computer interaction is based on the philosophy of human-centered design, which focuses on developing new technologies tailored to user needs and considering user requirements throughout the technology development process (Forlizzi, 2018).

B. Usability
Usability is a crucial characteristic in human-computer interaction that assesses the ease with which users can interact with an interface to accomplish tasks in a clear, transparent, responsive, and advantageous manner (Queiroz et al., 2017). According to the ISO 9241-11 standard, usability is defined as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use."

One important discussion in the scientific field of human-computer interaction is user experience which is a response to the use of systems controlled by users to achieve and carry out the functions of a system. Successful user experience includes ensuring customer request satisfaction without harassing and boring users; providing simple and elegant products so that customers can use them pleasantly and happily; and surprising the users (Hellweger & Wang, 2015).

C. Voice Assistant
Voice assistants are a form of digital communication that facilitate interaction between humans and their devices (Feng et al., 2018). These software-based assistants, exemplified by Siri, Google Voice, and others, have emerged as a technological development in the contemporary era, enabling users to control devices through voice commands.

Interestingly, the social perceptions and dynamics that characterize human-to-human interactions also manifest in the way people engage with voice assistants (Morana et al., 2020). These assistants can have a social facilitation effect, potentially enhancing the productivity of workers in their daily activities. Additionally, voice assistants are often perceived as more competent and trustworthy when handling sensitive information (Seymour & Kleek, 2021).

The growing popularity of voice assistants can be attributed to the public's reluctance to download and use individual applications for resolving various issues (Voorveld & Araujo, 2020). The use of these assistants can also serve as a means for individuals to fill their free time through virtual conversations. A key factor contributing to the appeal of intelligent assistants is their ability to search and retrieve relevant content. Furthermore, the utilization of voice assistants is influenced by users' language proficiency (Jiang, 2021).

D. System Usability Scale (SUS)

System Usability Scale (SUS) is a standardized questionnaire containing 10 points and has been widely used by usability professionals worldwide. Table I shows the SUS questionnaire (Zwakman et al., 2021). Odd numbers questions are positively formatted, while even numbers questions are negatively formatted to minimize responses. After interacting with the product, the user evaluations give a rating on a type of Likert 5-point scale, where 1 (no agreement) and 5 (no agreement). If a participant does not respond to an item, the center rating of the scale, i.e. 3 is assigned to that particular item. The total SUS score is in the range of 0 to 100 an increase of 2.5 points. A higher rating is an indication of better user-friendliness.

3. Method

This study recruited Indonesian workers aged 25-35 who regularly use Google Voice Assistant in Bahasa Indonesia and English. Participants were excluded if they were unwilling or unable to participate in remote testing or had self-reported cognitive impairments (Khotimah et al., 2020). To find the participants, the research team utilized online advertisements on social media platforms and personal referrals. The ads clearly outlined the eligibility criteria, and interested individuals contacted the researcher via the messaging app.

The final sample consisted of 15 participants, 10 females, and 5 males, with an average age of 30.7 years. All participants were employed by any sector of national companies, with three working in customer service and the remainder in administrative roles. They were all native Bahasa speakers who used the language daily and held graduate degrees. Interestingly, all participants used English as the language setting on their smartphones as smart devices.

The user experience was investigated through a two-phase approach. The first phase focused on participants' perspectives and used a survey instrument based on the System Usability Scale (SUS) (Masina et al., 2020; Zwakman et al., 2021). This questionnaire served two purposes:

Gather user feedback: Participants provided their opinions on usability, usage patterns, and effectiveness of Google Voice Assistant in both languages (Bahasa and English) (Klein et al., 2020; Khotimah et al., 2020). Inform the second phase: The survey results helped define practical tasks for the usability testing phase in their smart devices (Pal et al., 2019).

In the second phase, participants engaged in real-life scenarios using Google Voice Assistant in Bahasa and English. These tasks were derived from the ten SUS scale points outlined in Table 1. This approach allowed us to assess usability through observation and user feedback in a simulated work environment.

Table 1. SUS Task Description

Task Number	Task
1	Use the Google VA for checking the current weather
2	Ask the Google VA to get directions to commute between two places
3	Use the Google VA to check daily news headlines
4	Use the Google VA to play songs
5	Use the Google VA to set up an alarm for a specific time
6	Ask the Google VA about a famous personality
7	Ask the Google VA to adjust its volume
8	Ask the Google VA to tell some jokes
9	Using the Google VA to read audiobook
10	Using the Google VA to read audiobook

By examining user experience across two languages and in a work context, this study aims to inform the industrial design of voice assistant interfaces (Zwakman et al., 2021). The participant has done all the SUS tasks in two sections. The first section will done in Bahasa and then in English. They're not allowed to use any translator during the task. The findings will help identify areas for improvement to ensure these interfaces match the specific needs of Indonesian workers, ultimately enhancing their work productivity and satisfaction

4. Result

The results from the System Usability Scale questionnaire identified the most frequently performed tasks by participants, which were detailed in Table 3. These tasks formed the basis for the usability evaluation conducted in the latter part of the experiment. After completing each task, participants were prompted to fill

out a digital form that encompassed the ten items of the SUS scale (Zwakman et al., 2020). The SUS scores, originally rated on a 5-point scale where 5 denotes 'strongly agree' and 1 means 'strongly disagree', were subsequently transformed into an adjective rating scale, aligning with previous studies on the semantic interpretation of SUS scores. Figure 1 illustrates the distribution of SUS scores across these tasks.

To explore potential disparities in usability between native and non-native speakers, this research conducted a paired-sample t-test on verbal assessments using Google Voice Assistant (Zwakman et al., 2020). Participants were divided into two groups based on their use of Bahasa Indonesia and English while executing each task on their smart devices. The detailed findings are as follows:

- Task 1: Checking today's weather
  Mean difference = 0.6, Standard Deviation = 1.40, p = 0.12
  No statistically significant difference was observed in usability between Bahasa and English. Participants noted no major issues but reported occasional misinterpretation of regional terms in Bahasa.
- Task 5: Setting alarms
  Mean difference = 0.33, Standard Deviation = 1.29, p = 0.334
  No significant usability differences were found. Feedback indicated that both language settings performed equally well, though some users preferred English for its brevity in command structure.
- Task 7: Adjusting smart device volume
  Mean difference = 0.67, Standard Deviation = 1.98, p = 0.215
  No statistically significant difference. Users highlighted that commands like "Keraskan volume" in Bahasa were less consistent in execution compared to their English counterparts.

Significant differences were observed in the following tasks:

- Task 2: Getting directions
  Mean difference = 1.9, Standard Deviation = 1.62, p < 0.001
  Participants found English commands more precise for navigation. One user stated, "The differences of words in Bahasa Indonesia often confuses street names spelling"
- Task 3: Checking daily news headlines
  Mean difference = 1.93, Standard Deviation = 1.38, p < 0.001
  English responses were quicker and more accurate. Users noted that the Bahasa Indonesia version sometimes failed to retrieve news tailored to their interests.
- Task 4: Playing music
  Mean difference = 1.4, Standard Deviation = 1.59, p = 0.004
  Participants expressed frustration with the Bahasa Indonesia version, as it struggled to recognize song titles or artists.
- Task 6: Setting reminders
  Mean difference = 2.26, Standard Deviation = 1.27, p < 0.001
  English outperformed Bahasa Indonesia, with feedback highlighting issues in recognizing specific phrases like "Ingatkan saya untuk minum vitamin jam delapan pagi."
- Task 8: Asking for jokes
  Mean difference = 1.46, Standard Deviation = 1.22, p < 0.001
  Participants commented on the limited humor and cultural relevance of jokes in English that recognized in their smart devices.
- Task 9: Reading audiobooks
  Mean difference = 1.73, Standard Deviation = 1.22, p = 0.004
  The English version provided smoother playback and better compatibility with audiobook formats. Bahasa Indonesia users experienced frequent pauses and mispronunciations.
- Task 10: Controlling smart home devices
  Mean difference = 1.8, Standard Deviation = 1.14, p < 0.001
  Users reported better command recognition and faster responses in English, with one participant stating, *"The Bahasa version struggles with device-specific terminologies like 'nyalakan lampu'"
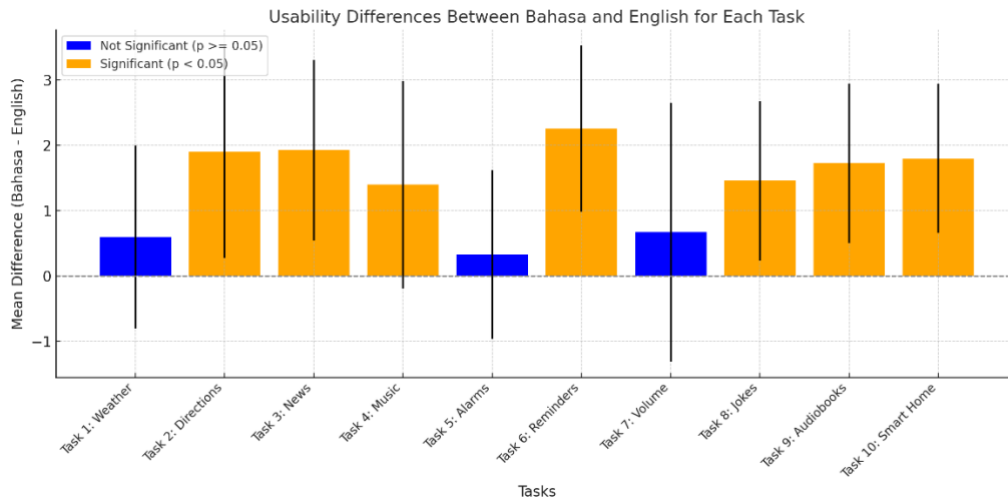 .

Figure1. SUS Result

Additionally, participants' qualitative feedback highlighted several usability challenges. Common issues included difficulties with natural language recognition in Bahasa Indonesia, inconsistent responses to idiomatic expressions, and a perceived delay in processing commands. In contrast, the English version was often described as more accurate and responsive by the smart devices. Specific feedback included statements such as:

"The voice assistant often misinterprets my Bahasa Indonesia commands, especially with colloquial phrases."
"English commands seem to work faster, but I struggle with technical terms in English."
These insights reveal the specific challenges users face in each language, offering valuable direction for future interface design improvements.

These findings underscore significant variations in user experience between the two languages, highlighting the critical role of industrial design in optimizing AI voice assistant interfaces to meet the diverse linguistic needs and enhance the productivity of Indonesian workers during their productive years.

4. Conclusions

This study investigates the usability aspects and user satisfaction among Indonesian workers in their interactions with digital voice assistants, specifically comparing their experiences using Bahasa and English with Google Voice Assistant through SUS tasks. The paired sample t-test analysis reveals noteworthy differences in usability between the two languages, aligning with existing research on the efficacy of voice recognition within digital voice assistant systems (Pal et al., 2019; Masina et al., 2020). This underscores the need for digital voice assistants like Google VA to adeptly interpret speech across various languages, considering the diversity in daily dialects and accents among users (Jang et al., 2019). Further exploration is warranted on how participants' daily activities, work contexts, and language preferences shape their interactions with Google VA during their productive years (Ahanin et al., 2022).

To enhance usability across languages, insights from industrial design are crucial (Pal et al., 2019). Design principles such as an intuitive interface layout, culturally sensitive voice command recognition, and adaptive language processing algorithms are essential. Incorporating culturally specific contexts, idiomatic expressions, and regional dialects into the digital voice assistants' smart device responses can significantly boost user engagement, satisfaction, and overall productivity.

Moreover, leveraging user-centered design methodologies can ensure that digital voice assistant interfaces are not only functional but also empathetic and responsive to the unique needs, preferences, and work-related requirements of Indonesian users (Zwakman et al., 2021). By integrating these insights, future iterations of digital voice assistant technology can better cater to diverse linguistic environments and work contexts, optimizing user productivity, satisfaction, and overall pride as workers.

5. References

Ahanin, E., Sade, A B., & Tat, H H. (2022). Applications of Artificial Intelligence and Voice Assistant in Healthcare. , 12(12).

Clark, L., Doyle, P., Garaialde, D., Gilmartin, E., Schlögl, S., Edlund, J., Aylett, M P., Cabral, J P., Munteanu, C., Edwards, J., & Cowan, B R. (2019). The State of Speech in HCI: Trends, Themes and Challenges. Oxford University Press, 31(4), 349-371.

Feng, G., Yu, C., & Xie, J. (2018). Study on Design Principles of Voice Interaction Design for Smart Mobile Devices. Springer Science Business Media, 398-411.

Forlizzi, J. (2018). Moving beyond user-centered design. Association for Computing Machinery, 25(5), 22-23.

Hellweger, S., & Wang, X. (2015). What is User Experience Really: towards a UX Conceptual Framework. Cornell University.

Jang, S., Jang, S., Lee, J., & Lee, J. (2019). User Experience Research on Intimacy and Usability When an AI Voice-Activated Personal Assistant Uses a Dialect. Korean Society of Design Science, 32(4), 71-83.

Jiang, R. (2021). Language Interaction and Gender Discrimination in Conversational AI. Advances in Social Science, Education and Humanities Research, 558, 112-119

Khotimah, K., Santoso, A., Ma'arif, M., Azhiimah, A N., Suprianto, B., Sumbawati, M S., & Rijanto, T. (2020). Validation of Voice Recognition in Various Google Voice Languages using Voice Recognition Module V3 Based on Microcontroller. Third International Conference on Vocational Education and Electrical Engineering (ICVEE), pp. 1-6.

Klein, A M., Hinderks, A., Schrepp, M., & Thomaschewski, J. (2020). Measuring User Experience Quality of Voice Assistants. 15th Iberian Conference on Information Systems and Technologies (CISTI), pp. 1-4

Masina, F., Orso, V., Pluchino, P., Dainese, G., Volpato, S., Nelini, C., Mapelli, D., Spagnolli, A., & Gamberini, L. (2020). Investigating the Accessibility of Voice Assistants With Impaired Users: Mixed Methods Study. JMIR Publications, 22(9), e18431-e18431.

Morana, S., Pfeiffer, J., & Adam, M T P. (2020). User Assistance for Intelligent Systems. Springer Nature, 62(3), 189-192.

Pal, D., Arpnikanondt, C., Funilkul, S., & Varadarajan, V. (2019). User Experience with Smart Voice Assistants: The Accent Perspective. 10th International Conference on Computing, Communication and Networking Technologies (ICCCNT), pp. 1-6.

Pyae, A., Hlaing, S Z., Aung, N T T., Kham, N M M., Khant, M M., & Kyaw, M K. (2020). Understanding Non-native English Speakers' Perceptions of Voice User Interfaces with and without a Visual Display: A Usability Study. International Conference on Advanced Information Technologies (ICAIT), pp. 70-75.

Queiroz, F., Silva, R., Miller, J., Brockhauser, S., & Fangohr, H. (2017). Good Usability Practices in Scientific Software Development. Cornell University.

Seymour, W., & Kleek, M V. (2021). Exploring Interactions Between Trust, Anthropomorphism, and Relationship Development in Voice Assistants. Association for Computing Machinery, 5(CSCW2), 1-16.

Shao, S., & Chang, W. (2020). Research on Computer Wireless Network Assisted Industrial Design in Human-Computer Interaction. Research Square (United States).

Voorveld, H A M., & Araujo, T. (2020). How Social Cues in Virtual Assistants Influence Concerns and Persuasion: The Role of Voice and a Human Name. Mary Ann Liebert, Inc., 23(10), 689-696.

Zwakman, D S., Pal, D., & Arpnikanondt, C. (2021). Usability Evaluation of Artificial Intelligence-Based Voice Assistants: The Case of Amazon Alexa. Springer Nature, 2(1).

Zwakman, D S., Pal, D., Triyason, T., & Arpnikanondt, C. (2020). Voice Usability Scale: Measuring the User Experience with Voice Assistants. IEEE International Symposium on Smart Electronic Systems (iSES) (Formerly iNiS), pp. 308-311.

Zwakman, D S., Pal, D., Triyason, T., & Vanijja, V. (2020). Usability of Voice-based Intelligent Personal Assistants. *International Conference on Information and Communication Technology Convergence (ICTC)*, pp. 652-657.