

Evaluating the Usability and Effectiveness of Desktop Voice Assistants on Windows Operating Systems

Pritam Pal¹, Harsh Panchal^{2,*}, Kinjal Doshi³

Abstract

This paper presents an in-depth empirical study of usability and effectiveness regarding using desktop voice assistants (DVA) within the Windows operating system platform. While much research has been done on mobile-based assistants like Siri and Google Assistant, or smart speaker platforms like Amazon Alexa, desktop-based assistants remain comparatively underexplored. A total of 176 participants were surveyed to analyze their experiences with DVA in usability, multitasking, accuracy, accessibility, and overall satisfaction. To provide a balanced analysis of users' perceptions and behavioral trends, the study used a structured quantitative survey that included closed and open-ended questions. The research then tried to explore how demographic factors like age and occupation influence satisfaction levels through statistical correlation and frequency analysis. The evaluation also included practical scenarios of usage, like launching applications, navigating files, and web search, to assess real-world effectiveness. Results indicated that though DVA provides accessibility and convenience, the user satisfaction levels remain moderate, having a mean of 3.03/5 due to persistent challenges in contextual understanding and multitasking. Based on previous literature, this paper provides empirical evidence and sheds light on design recommendations for improving the effectiveness of DVA in professional and academic contexts.

Keywords: Accessibility, contextual intelligence, desktop voice assistants, human-computer interaction, multitasking, Windows OS

INTRODUCTION

Voice assistants have affected the way we interact with computers. They have enabled the use of computers without the necessity of seeing them. With the development of AI, voice assistants have been incorporated into smartphones, speakers, cars, and desktops. Personal voice assistants in smartphones, such as Siri, Google Assistant, and Bixby, top the list. Smart speakers, including Amazon Alexa, were at the top of the list. However, desktop voice assistants (DVA), such as Microsoft Cortana, have received less attention.

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The last decade has witnessed the progress and transformation of intelligent virtual assistants from command assistants to those capable of conversing and contextual understanding. Cortana, an innovation by Microsoft, was one of the major initiatives taken to introduce voice assistants to the world's desks. The limited knowledge base and features compared to those found in mobile assistants prevented Cortana's expansion. The emergence of AI technology tools, such as Windows Copilot and ChatGPT plugins, has reignited innovation.

To increase the usability of DVA, there is a growing trend in recent AI implementations to focus on conversational abilities. The virtual assistant must be more than a simple command executor; it must understand the user's context and intent. This shift in assistance, from reactive to proactive, leads to new research domains in the realms of personalization, learning, and task prediction. Microsoft Copilot and ChatGPT plugins demonstrate this by including logic and context in desktop interfaces. However, the lack of clarity on the reliability of these DVA, particularly when dealing with more complex tasks, indicates that, although significantly advanced in technology, the focus on user-friendly design and usability has not kept pace.

Another contributing element is the differing set of user expectations found on mobile platforms, which vary greatly from those on desktop platforms. Users of mobile assistants expect them to perform rudimentary functions, such as setting reminders, providing quick answers, or engaging in calls. Desktop computer assistants, on the other hand, require greater integration with software such as Microsoft Office, file manager functionality, web browsers, or educational databases. They require seamless functionality, where voice control can interact with different software applications simultaneously. This emphasis underlines the importance of a digital virtual desktop access (VDA) transition beyond the limitations of pattern recognition, thereby identifying a set of functionalities related to productivity systems on either platform.

In addition, accessibility and inclusivity are crucial for DVA use on desktops. Voice interaction may significantly improve computer use for individuals with motor impairments or repetitive strain injuries. In educational settings, where switching between applications is common, DVA can help simplify these tasks. However, without adaptive learning models and robust natural language processing (NLP) frameworks, a DVA may present more of a cognitive burden than a useful tool. This places a strong requirement on research to establish whether existing assistants meet user needs or whether they actually need redesigns and AI improvements to function well during everyday use on the desktop.

The desktop remains the principal working platform where most deep work occurs, such as programming, research, and document creation in professional and academic environments. DVA has the potential to bridge the gap between natural language interaction and classic workflows that occur on computers. Their success depends on how well they meet user expectations, the responsiveness of the interface, and how accurately they understand the context.

DVA is becoming indispensable in workplaces and educational institutions, where multitasking is the norm. While this integration of voice interaction in a desktop environment is supposed to enhance productivity, reduce mental effort, and promote accessibility for physically disabled users, its usability and effectiveness remain an issue owing to serious problems with context interpretation, system reliability, and limitations in multitasking.

It also focuses on establishing how well DVA works within the Windows operating systems to determine the overall satisfaction of users with DVA [1]. Tanmay et al. [2] analyzes the consequences of using it on multitasking, and finally, Malar et al. [3] identify demographic elements that influence their adoption. This study presents pragmatic knowledge on the strengths and weaknesses of digital adoption (DA), thus supporting recommendations for improvements based on a survey of 176 respondents.

The remainder of this paper is structured as follows: Section 2 presents a review of the related studies that will be presented. Section 3 explains the approach to the survey and the procedures followed in the analysis of the data. Section 4 illustrates the findings using graphs and statistics. In Section 5, the conclusions are derived in light of the findings and related studies. In the last section, the conclusions and possible directions for further research are discussed in more detail.

LITERATURE REVIEW

Studies on DVA and various related technologies have mainly focused on privacy, accessibility, multimodal fusion, NLP, and performance trade-offs [4–7]. However, studies targeting empirical evaluations of DVA in real-world desktop settings are scarce [8, 9].

To address trust and reliability issues, an offline-enabled voice assistant was designed and proposed [1]. This study validated that offline processing adds value to user trust, especially in official environments where confidential information is normally processed [6, 10]. Likewise, the emphasized the use of multitasking, which employs both voice and graphical interfaces to minimize errors and improve usability [2,11].

Developed lightweight desktop assistants with reduced resource consumption [3]. Their results revealed that resource efficiency enhances the potential for adoption in low-specification devices [12, 13]. especially focused on adaptability and personalization, clarifying the effectiveness of preference-oriented learning personal assistants over other types of assistants [14]. At the same time [15], the focus was on accessible devices. They proved the effectiveness of the DVA on visually impaired persons for the independent execution of tasks [16].

NLP remains one of the most significant challenges in DVA development [17]. claimed that most of the currently available NLPs are poor in terms of contextual continuity; the failure of assistants to handle multi-turn conversations forces users to repeat instructions, which reduces efficiency [18]. examined domain-specific educational assistants, which is a tailoring that enhances the relevance of tasks [19]. investigated cross-platform support and found that maintaining uniform performance across multiple operating systems poses a major challenge [20]. addressed the design trade-offs between the response speed and accuracy. Their findings confirmed that designs that provide better response speed often compromise accuracy and vice versa, resulting in specific usability limitations [21]. focused on error resilience and examined strategies to handle ambiguous or incomplete user inputs. Their results showed that ambiguity resolution mechanisms remarkably improve user trust and adoption.

Several researchers have underscored the importance of user experience design principles in increasing the acceptance of intelligent assistants [22]. reasoned that the success of a voice assistant lies not only in the correctness of understanding of NLP but also in how intuitively it fits into existing software ecosystems. The results indicated that assistants designed with task flow awareness and contextual learning capabilities tended to demonstrate higher usability scores than generic command-based systems. This indeed speaks to the need for the development of DVA from simple static command executors to adaptive digital collaborators able to learn from user behavior over time.

Recent advancements in on-device processing and privacy-aware AI models have enabled new capabilities for desktop-based assistants [23]. mentioned that cloud dependency reduces the responsiveness of the system and heightens privacy concerns, especially in professional usage involving sensitive information. The authors proposed hybrid models in which lightweight computation is executed locally, whereas NLP tasks of higher complexity are sent as encrypted requests to the cloud. However, such architectures are still in the early stages of development for Windows-based DVA, indicating a gap in research on their practical implementation.

Another trend in literature is the development of human trust or AI acceptance frameworks [24]. Applied technology acceptance model (TAM) to assess users' willingness to adopt desktop assistants. They reported that perceived usefulness influences the ability to adopt a technology more than ease of use [4, 5]. In other words, even if people find DVA easy to use, they will not readily adopt it unless they perceive a clear productivity advantage in doing so [6]. This view is particularly appropriate in academic and corporate settings, where efficiency and accuracy are crucial [78]. However, no prior research has explicitly investigated this trust-utility relationship in the context of Windows desktop usage, indicating a substantial research gap that the current study aims to fill [9].

Finally, whereas most of the reviewed literature tends to focus on performance measures and efficiency, very few studies have empirically explored perceptions of real-world usage through empirical research. These tend to have been drawn from prototypes and/or laboratory research and not practical usage conditions. Thus, there is a divide in the effectiveness of DVA, given their theoretical abilities and usage realities. In a bid to overcome these limitations and provide a more practical perspective on the effectiveness of DVA, the current research tends to have collected empirical perceptions from a pool of 176 respondents.

Collectively, these studies suggest that although DVA provides benefits for accessibility and personalization, there are ongoing concerns regarding contextual intelligence, multitasking, and inter-platform use. This study draws upon these findings by investigating DVA in Windows operating environments with a set of 176 participants.

SYSTEM ARCHITECTURE

The proposed DVA design ensures seamless interaction between the user and Windows through voice commands. This system has a modular pipeline that comprises capturing the speech input, recognizing and processing it, interpreting the command, executing the task, and generating feedback. Each stage in this pipeline is designed to guarantee the accuracy of the response, error handling, and to keep the user informed during all stages.

The user's voice input was first captured using a microphone. The audio is then passed through a dual speech recognition layer, where the Google Speech API serves as the main recognition engine, and the Vosk offline model works as a backup when the network is unavailable. The recognized text is fed into the Command Processing Module. Here, this module extracts keywords and maps intents using a previously defined dictionary of commands and corresponding actions.

After the execution of the command is confirmed, it proceeds with the System Task Executor. This system works with Windows processing calls, file path directions, or internet services, depending on the user input. The Feedback and Logging Module enables real-time updates of the graphical interface. It displays action execution, recognition logging, and the status of microphone activity. The system enables trust between the user and their response through a feedback mechanism.

System Architecture

A lightweight flow of execution is modularly extensible. This makes it possible to integrate future components, such as gesture triggers, AI-based command prediction, or adaptive layers of personalization. A block diagram is useful for representing the system architecture at the conceptual level, making it possible to understand the implementation.

RESEARCH METHODOLOGY

This study applied a quantitative survey technique to analyze the user experience of DVA. The survey included demographic and perception-related questions.

Demographic questions included age and gender classification. Perceptions were measured based on general satisfaction, usability, benefits related to multitasking, and accuracy using a 5-point Likert scale. Respondents were also required to answer open-ended questions related to their experience with DVA. The survey consisted of 18 questions spread across three themes: demographics, frequency of use, and perceived performance. Each usability criterion, such as accuracy, reaction rate, and understanding capacity, was measured using a 5-point Likert scale ranging "very poor" to "excellent".

The online survey utilized Google Forms, and the data was processed using Microsoft Excel and Python libraries, such as Pandas and Matplotlib, for descriptive and correlation analyses. Internal consistency was measured using Cronbach's alpha, where the value for the Likert scales was 0.82.

The survey reached students, working professionals, and regular computer users, and 176 valid responses were returned. This sample had a diverse demographic profile, representing experiences from younger to older users, and was balanced between genders. Descriptive statistics, boxplots for comparing demographic differences, and correlation analysis were performed on the dataset to explore the satisfaction, multitasking, and other usability factors. Besides the basic frequency distribution, data normalization and cleaning were performed to eliminate incomplete or duplicate entries. The statistical analysis focused on central tendencies, dispersion, and distribution patterns, which helped gain an in-depth understanding of user behavior. Cross-tabulation techniques were also employed to explore how demographic factors affect satisfaction and adoption.

RESEARCH QUESTIONS

This study is guided by the following research questions:

1. How do users perceive the usability and reliability of DVA on Windows?
2. What are the primary use cases and limitations of voice assistants in the Windows desktop environment?
3. To what extent do DVA improve user productivity and accessibility?

FIGURES AND RESULTS

Analysis of the 176 responses produced the following insights: • Age distribution revealed that most of the respondents ($\approx 70\%$) were aged 18–25, as shown in Figure 1.

- Gender distribution was balanced, with participation from both male and female respondents.
- The average satisfaction score was 3.03/5 (SD = 1.31), suggesting moderate usability.
- Weak correlations were observed between satisfaction and multitasking, suggesting that productivity alone cannot explain satisfaction.

From the distribution of gender in Figure 2, there was an equal distribution of participants in the study, with both genders contributing almost equally to the study. This will go a long way to making the data reliable, as there will be no bias toward the perceptions of either gender. It also shows that using the desktop voice assistant is not biased toward gender.

What can be inferred from the graph is that the age category of 18–25 years represents most of the participants, which clearly suggests that the younger generation is more receptive to experimenting with DVA. Although the other category, which consists of people between 25 and 35 years, is small, it is still quite actively involved, which suggests that professionals in the sector are gaining interest. However, the 35+ category was very small, which might indicate less awareness of AI technology among the older generation.

Most respondents scored their satisfaction between Figures 3 and 4, thus having a moderate usability and acceptance level with DVA. Few people scored their satisfaction between 1 and 5, implying that the majority were not extremely satisfied or extremely dissatisfied with DVA and may not express either dissatisfaction or complete satisfaction with the system's current capabilities and functionalities. This scenario suggests that while DVA are helpful and useful, there is always room for improvement in terms of their accuracy and precision to further increase user satisfaction ratings. Furthermore, it suggests that while the potential benefits and advantages of DVA are recognized and acknowledged, certain usability and acceptability concerns pertaining to DVA are yet to be eliminated with improved accuracy and precision. Many people may find desktop assistants helpful and useful for simple tasks, such as opening applications and searching through them, but certain complex commands may decrease their satisfaction ratings on DVA.

There is an increased satisfaction level in the 18–25 to 25–35 age groups, with their ratings being more concentrated around the median values of 3 and 4. This analysis shows that the younger generation finds the DVA relatively helpful and is more willing to adjust their workflows to accommodate voice-centric communication. On the other hand, the 35-year-old and above age group showed varied

satisfaction levels, with evidence of decreased ratings. This may imply that the older generation faces more usability issues, or their standards may be higher for the correctness and reliability of the task.

Male and female participants indicated a similar trend in their level of satisfaction in a general manner, having median values of approximately 3, thereby registering a moderate level of acceptability for DVA, as shown in Figure 5. Although their level of acceptability for the DVA registered a moderate value, a slight range variation in the way women responded to this technology might indicate their diverse levels of interaction experience with this system. Males appear to indicate a more consistent level of satisfaction with this system than females. Overall, the evidence fails to indicate any disparity in their level of acceptability for this system, suggesting that gender is a less significant determinant within this technological system than age and familiarity with AI-powered systems. This consistency in their level of acceptability for this system implies that gender does not have a significant effect on the level of usability for this system in a manner that is more desirable from an adoptability perspective for this technology. A slight discrepancy in their responses might indicate their differing levels of interaction expectations in this regard, wherein they might seek more refined levels of conversation and interaction.

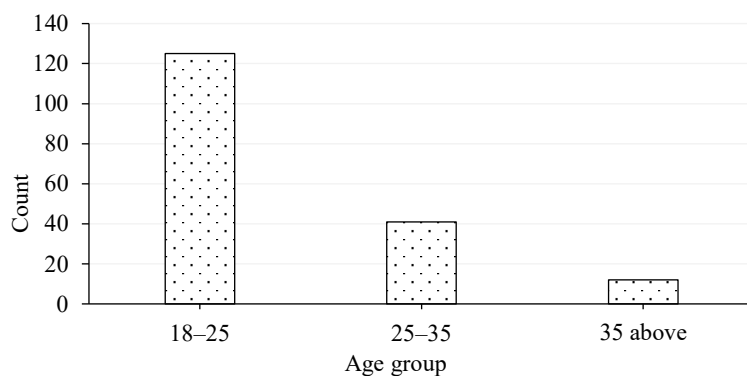


Figure 1. Age distribution of respondents.

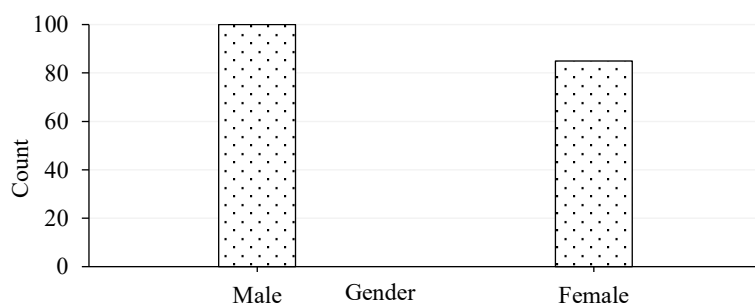


Figure 2. Gender distribution of respondents.

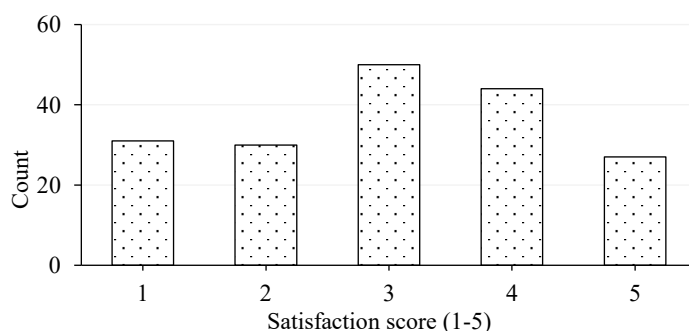


Figure 3. Distribution of satisfaction scores.

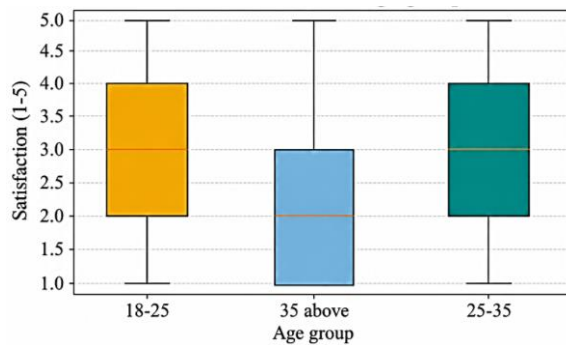


Figure 4. Satisfaction levels across age groups.

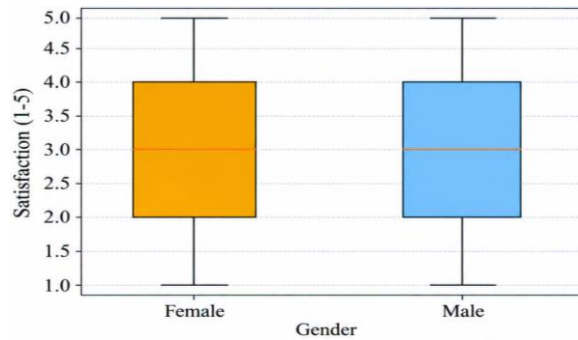


Figure 5. Satisfaction levels across gender groups.

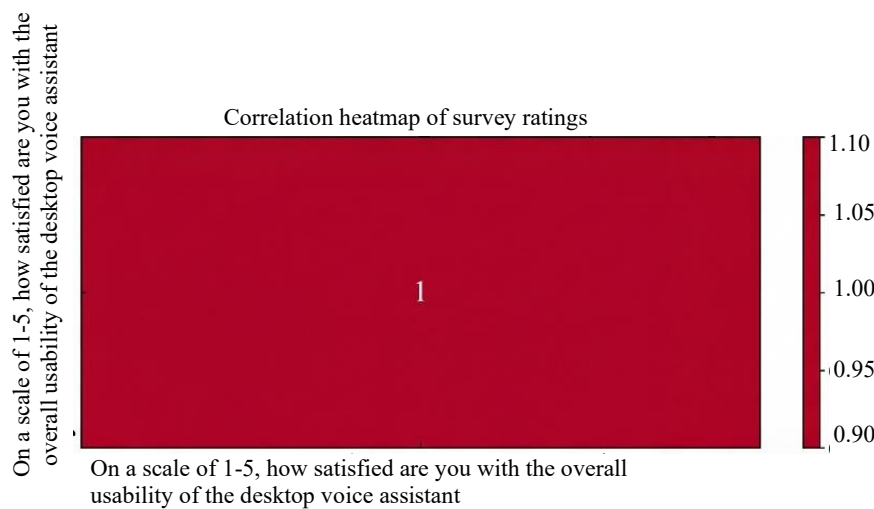


Figure 6. Correlation heatmap of usability metrics.

Further examination of the correlation information revealed that while satisfaction was moderately correlated with accuracy perception ($r = 0.46$), the link between satisfaction and multitasking was relatively weak ($r = 0.21$). This confirms that accuracy is more valued than multitasking support abilities, as shown in Figure 6. Conversely, it also shows that satisfied study or creative task-heavy users tend to frequently resort to the assistant, suggesting a more suggestible adaptation to its inadequacies.

Notably, open-ended feedback revealed that users appreciated the innovative nature of hands-free control but were disappointed with some inconsistent control actuation and interpretation of commands. Users suggested that improvements should include increased language flexibility, independence from internet connectivity, and integration with other applications like MS Office and browsers.

Figure 7 shows the interface of the desktop application created using CustomTkinter. This interface provides a more modern appearance and is more user-friendly than the command-line interface. It displays a panel for showing real-time command logs, allowing users to visualize the commands as well as typed inputs with system responses to enhance transparency and debugging. The Start and Stop control buttons allow smooth handling of the speech recognition engine to ensure that manually starting or stopping voice interaction is possible without closing an application. There is also a toggle option for the text-to-speech (TTS) feature that allows users to enable or mute the spoken feedback based on their preferences. This adds flexibility when it needs to be used in quiet environments, such as classrooms or workplaces.

Demonstration of the effective execution of a voice command related to opening the file explorer, highlighting the operational process of the designed desktop assistant Figure 8. Once the desktop assistant receives a voice command such as “open file explorer,” the command is processed by the recognition of the speech algorithm, which initiates an automated system-level task with the help of the AppOpener and subprocess modules. This process is demonstrated in the snapshot, where the file explorer window is opened dynamically with the logging of the command in the assistant’s logging panel.

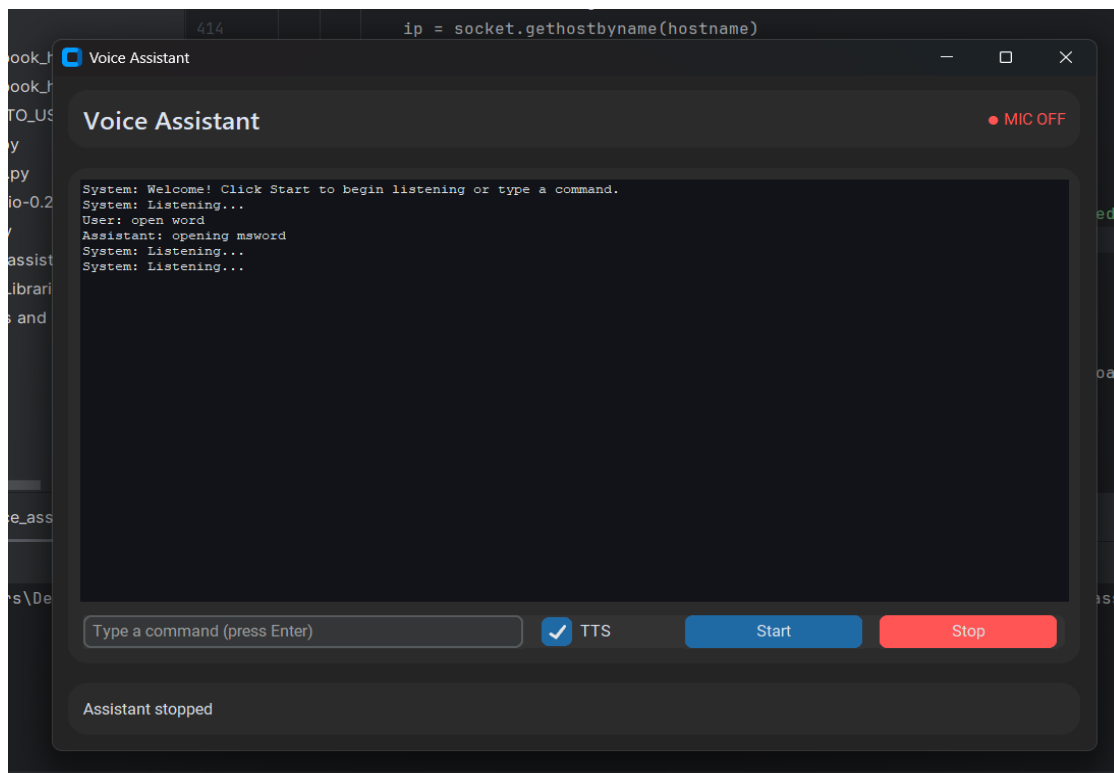
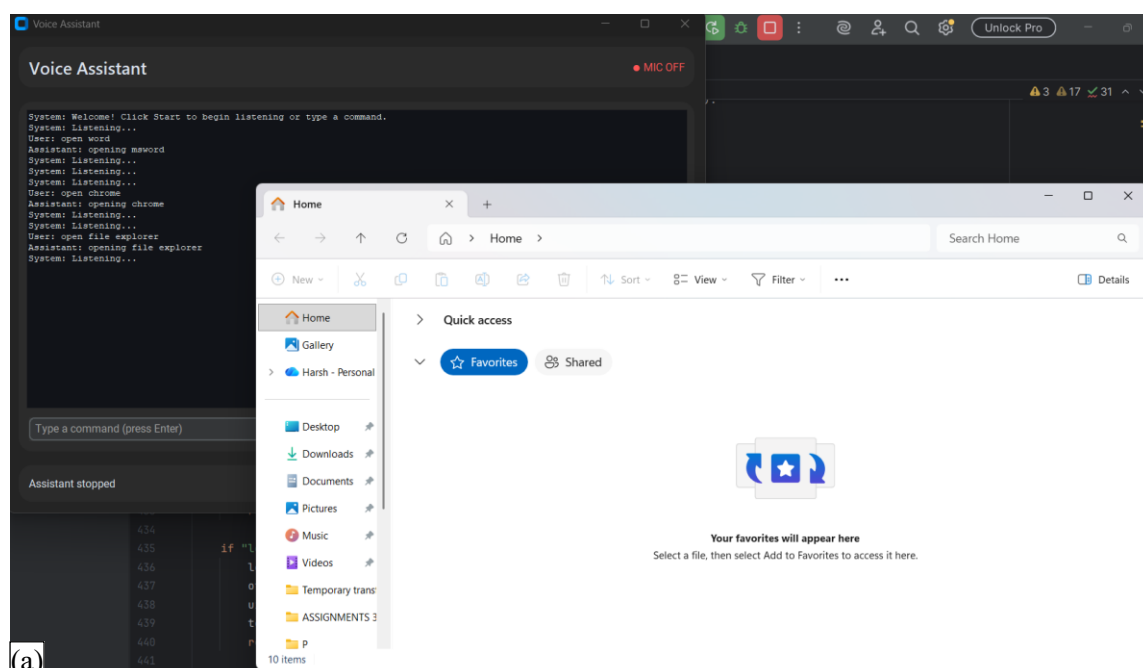
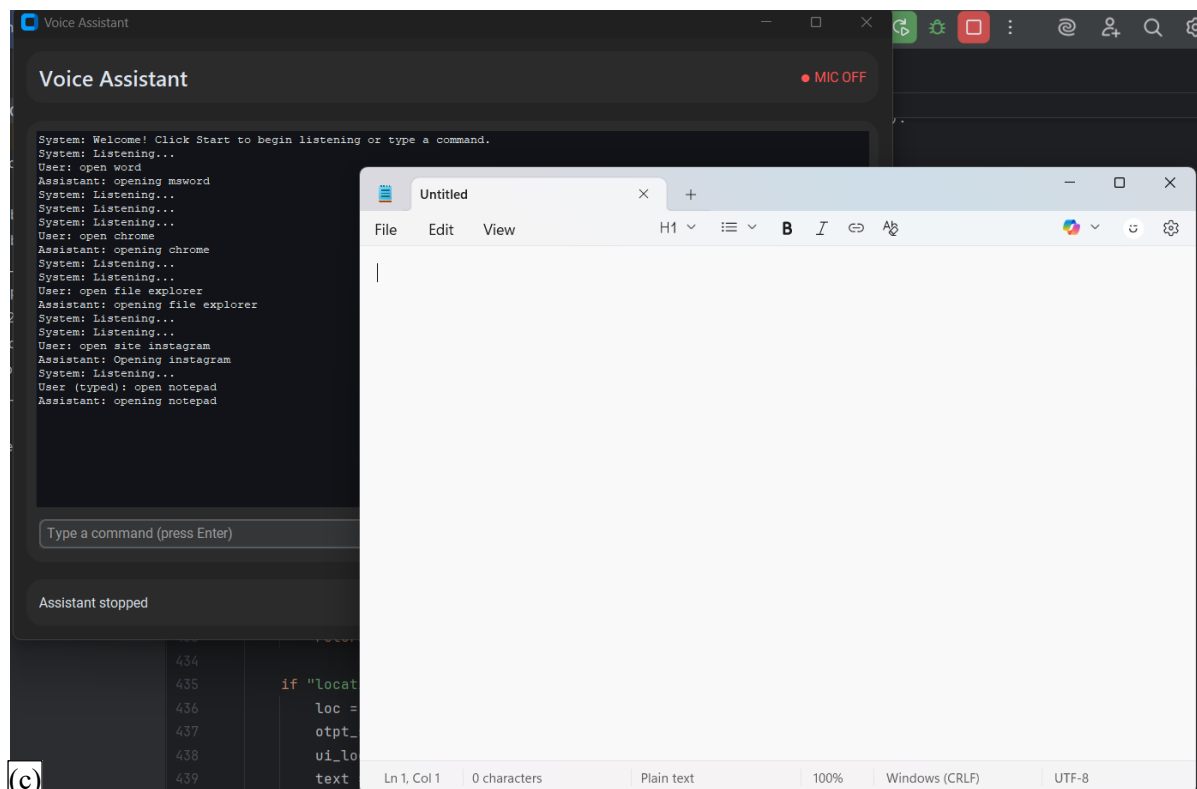
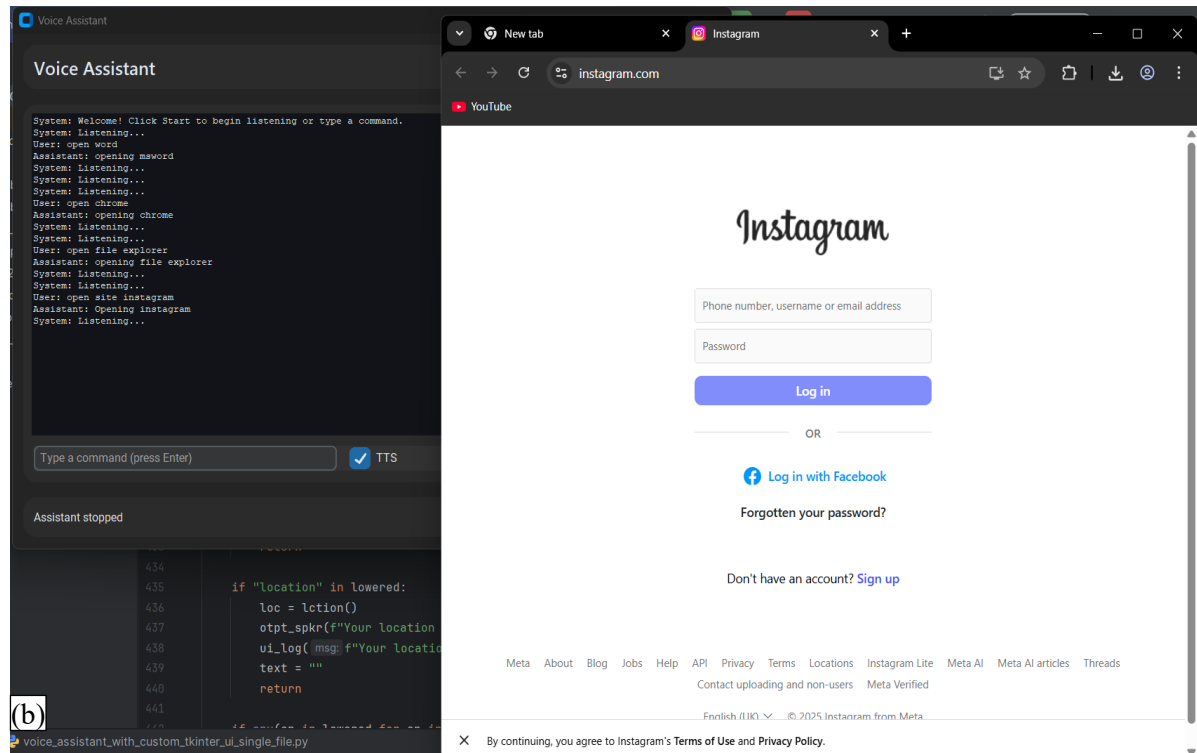


Figure 7. Project App.



Web interaction ability of the voice assistants, in which the voice command, “open Instagram,” automatically initiates the launch of the web browser and lands the user directly on the target website. From the snapshot, the login page of the Instagram website is opened, thereby ascertaining the ability of the voice assistants to carry out tasks related to the internet, rather than being restricted to the offline functions on the desktop platforms.



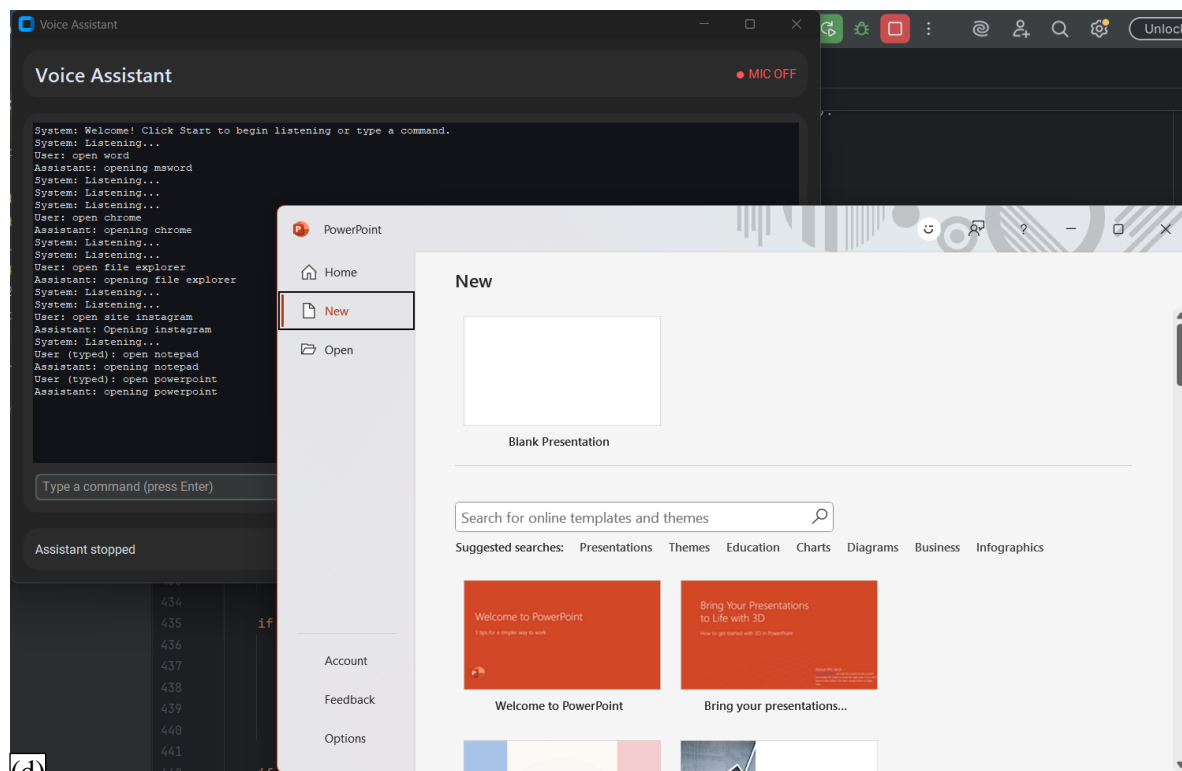


Figure 8. (a)–(d) Working module.

Furthermore, the execution report in the voice assistant interface confirmed the accurate interpretation of the user command and the correct execution of the target function. This module indicates the expanded ability of voice assistants to increase the efficiency associated with internet operations, particularly in the case of frequent access to online platforms.

Automation of desktop productivity tools involves the assistant's successful execution through the opening of a text editor application, such as Notepad, via the voice command "open Notepad". The log from the interface confirmed that the utterance was correctly recognized and interpreted, further demonstrating how this system can convert natural language directly into system-level actions. This is useful in pretty handy during academic and professional settings where a user would like to quickly jot down something, prepare a draft of something, or copy some temporary information without having to disrupt their usual workflow. An assistant saves time by eliminating manual navigation via menus or search bars and reflects the potential for serving as a hands-free Windows-based productivity facilitator.

The capability of the assistant to handle productivity-oriented software, whereby the voice command "open PowerPoint" triggers the automatic start of Microsoft PowerPoint without requiring any human intervention on the system. The log appearing on the assistant's interface proves the successful execution of the voice command, facilitating the confirmation of the effectiveness of communication between the voice recognition and task execution components. This component is evidence of the system's functionality in handling academic-related activities and presentation processes, facilitating the fast execution of activities such as the generation of presentations or the retrieval of existing slides using voice commands, which plays a significant role in enhancing efficiency in operating systems, thus proving the functionality of the assistant as a useful desktop automation tool.

DISCUSSION

These results show that DVA satisfaction and usability fall into moderate ranges, which agrees with the results of previous studies concerning limitations to contextual intelligence [17, 22, 7]. The majority

in the dataset were users who were younger, which may suggest that younger or early adopter users are more likely to try using DVA, while older demographics may not be as ready to adopt it [23, 8]. The rather equal gender distributions point to inclusiveness, but the satisfaction scores have shown that there are still some usability challenges [24, 18]. The weak association between satisfaction and multitasking may suggest that benefits in productivity are not a major factor affecting the adoption [25, 9]. Instead, users appreciate convenience, hands-free interactions, and accessibility more [15, 15, 25]. These findings agree with the results of Jain and Jason's investigation into the accessibility of devices [15], while also mirroring those regarding contextual challenges [18, 5, 20, 10]. The implementation trade-offs are reflected through user reviews citing accuracy problems. Like the former consideration [21, 11] identified error robustness. This concern should be noted, as users are frustrated about the mistaken understanding of their commands. These points identify the developing attitude of users toward intelligent assistants, prioritizing convenience over complete context understanding [6, 12]. Furthermore, the satisfaction ratings further justify users' perceptions of DVA being auxiliary tools rather than productivity tools at their core [7,]. users are not exposed to the adaptive element of the DVA on Windows assistants, as found to be crucial for engagement [13].

Another important observation is regarding how those errors should be: a few misinterpretations are tolerated, but repeated or contextually incoherent errors quickly lead to a loss of trust. This corresponds to our observation [21, 11], emphasizing the need for robust error-recovery systems [6]. In the design of future DVA, incremental learning and user feedback loops can refine the understanding of commands dynamically to attain better user retention [10, 12].

One of the key observations in this study is that users' expectations are shifting from merely executing simple commands to intelligent, context-aware assistance [17, 8]. The lack of any adaptive learning and memory-based interaction resulted in the issuance of repetitive commands, hence reducing engagement, contrary to the emphasis [13] on personalization as a driver of long-term usage [16]. While isolated misinterpretations are tolerated, repeated errors result in a loss of trust, with better contextual continuity and smarter error-recovery mechanisms being desirable [11,12].

In general, improvements in NLP, error handling, and performance optimization are necessary for the widespread acceptance of DVA [17, 4, 5, 14, 19].

CONCLUSION

This research is one of the first empirical studies undertaken solely in the realm of DVA, integrated within the Windows operating system. Based on the lessons learned from 176 respondents, the results show that while the value of accessibility is highly appreciated in DVIs, their usability capabilities remain challenged. The average user satisfaction level was average, showing that technology has yet to integrate with what the user would like in their desktop environment.

These results indicate that although DVA has a positive impact on accessibility and task automation, its capabilities in dealing with more complex multitasking scenarios are still inefficient. This is because users view them not as a part of the intelligent system, but rather as accessories that need to be used alongside them. Some of the challenges involved in the development of DVA are the lack of flexibility, inability to understand the context properly, and integration with office software.

Empirical data also underscores the importance of improvements in the realm of NLP, understanding context, and dynamic learning processes to improve usability and overall effectiveness. The complementary forces of AI reasoning and personalization can revolutionize the use of DVA from mere command executors to active digital partners that can potentially comprehend the dynamics of user activity and intentions. Furthermore, offline reliability and latency should be considered imperative for fostering long-term user interactions.

In summary, the potential of DVA to improve human-computer interaction in the Windows environment is considerable, but the existing state of usability implies a phase of transition in the

developmental process. Removing the gap between the technical possibility and the practical expectations of users through continuing research and development in the realms of human-centric design, NLP optimization, and adaptive intelligence is necessary in the developing domain of DVA and will contribute to the uncharted territory in the realms of research in information and communication technologies.

FUTURE WORK

Although this study delivers significant information regarding the usability and efficacy of DVA in Windows operating systems, some areas are yet to be explored in relation to further research and development in this sector. Technical aspects and some user-oriented factors should be covered to improve intelligence, adaptability, and trust in the DVA. The following are some recommendations.

1. *Enhancement of NLP and contextual understanding:* Future DVA should use state-of-the-art NLP engines, including transformer models such as bidirectional encoder representations from transformers (BERT), Whisper, or GPT models, which would ensure enhanced context understanding and support multi-turn dialogues with more consistent commands and fewer repetitions.
2. *Integration of adaptive learning and personalization:* The implementation of adaptive learning capabilities would allow the DVA to analyze the behavior and preferences of users and their commands to have more personalized interactions with them. The capabilities of these systems would allow them to adapt to and predict the needs of the user.
3. *Multimodal interaction and interface fusion:* The integration of voice commands with other input options, such as gesture control, eye tracking, or keyboard shortcuts, would help improve accuracy. The integration of multimodal interfaces would make the DVA functional in both quiet and multitasking environments.
4. *Expansion of cross-platform compatibility:* Future work should generalize these evaluations of DVA to cover not only Windows platforms but also Linux and macOS platforms. Such comparisons across platforms will enable designers to develop more versatile personal assistants.
5. *Domain-specific implementation and evaluation:* The DVA must be custom-developed to suit professional sectors, such as medical, educational, software development, or administrative. The knowledge gained regarding professional domain requirements can help optimize system performance to suit those areas.
6. *Longitudinal user studies and behavioral analysis:* Long-term evaluation of the impact of regular usage and updates on user satisfaction and trust will be possible with these projects, which will provide valuable information on real-world usage patterns.
7. *Privacy, security, and offline processing:* Next-generation systems must utilize improved encryption techniques, local processing, and open privacy practices to protect confidential user information. Local capabilities involving sophisticated models can improve the reliability of regions with poor connectivity.
8. *Integration with AI-driven copilots and cloud ecosystems:* Utilization of advanced AI copilots and cloud-based services (such as Microsoft Copilot or ChatGPT-based plugins) would allow intelligent DVA with the potential for critical thinking, contextual memory, and task management across multiple applications.

Considering these requirements, future versions of desktop voice interfaces can be developed into smart, context-savvy, and adaptable interfaces. These improvements will enable effortless incorporation into academic, corporate, and home settings to enhance productivity and usability.

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