Exploring Voice Assistants and Their Impact on Student Productivity

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ABSTRACT

The goal of this paper was to determine and document the impact that voice assistants (VAs) have on students at the Rochester Institute of Technology (RIT). Specifically, do VAs improve the academic productivity of RIT students? Our research entailed screening potential interviewees, using an online survey, followed by semi-formal interviews with eight ideal student subjects. Our results concluded that students do not necessarily utilize VAs to improve their academic productivity, and instead use them for straightforward tasks that may assist in their academic lives. Additionally, our results indicated several deficiencies that persist with VAs, specifically for non-native English speakers.

Author Keywords

Artificial Intelligence, Voice Assistant Technology, Academic Productivity

INTRODUCTION

Artificial intelligence (AI), once considered a far-away sci-fi concept, has quickly entered the forefront of innovation and technology. Since 2010, when Apple first revealed to the world the intelligent and accessible voice assistant, 'Siri,' AI has spread across a myriad of industries and platforms, with ever-advancing functionality. Today, nearly all new technology relies or utilizes AI to deliver faster, more robust performances and information for users [2].

For the average person, AI is most commonly seen and used in the form of voice assistants (VAs). VAs exist on nearly all major smartphones, tablets, and computers, and are becoming more ubiquitous across other devices, like appliances and cars. Moreover, VAs are developing increasingly more advanced capabilities, offering users fast and reliable features that integrate with their most used applications. It is fair to say that AI VAs will become smarter and more useful as time progresses [2].

Given these trends, our research team believes it is both relevant and prudent to investigate these technologies in the field. More specifically, in this paper we will attempt to answer the following question: Do voice assistants improve the academic productivity of RIT students?

To do this, we will conduct several semi-formal interviews with pre-screened students, and record their genuine feedback about VAs and the role it has on their student life. The interviews will include both broad and specific questions, relating to user experience, accessibility, and usability, with each question encouraging open-ended responses. Preferably, we would like our interviews to produce personal stories, insights, and critiques by students, to gauge whether VAs make a difference in their academic productivity.

Ultimately, our goal is to better understand how students are utilizing VAs, and whether they are helpful for students, or whether they require improvements.

METHODS

First and foremost, our stakeholders for this study were students at the Rochester Institute of Technology (RIT). From the inception of this study, our primary goal was to investigate voice assistants and how they were going to affect the lives of students at RIT. The aspects of the study, which we believed to be critical, were accessibility, usability, and user experience of voice assistants. From this point, we wanted to define a clear sample of participants that would produce relevant and meaningful responses. For this aspect of the study we came up with a list of screener questions, which would provide us feedback for RIT student users that use VAs [3].

The screener questions were:

1. Do you own a mobile device with a voice assistant (Siri, Google now, Robin, Dragon, Skyvi, Assistant for Android)?
2. To what degree do you use your phone's voice assistant?

   - Never, Sometimes, Often
3. If you use voice assistant, which aspects do you use it for?

   - Academic, getting organized, entertainment, communication, homekit, others
4. If you do not use a mobile voice assistant, why not?

This screener was sent electronically to 25 RIT students, all of whom came from various backgrounds, ages, class status (undergraduate/ graduate), etc. We tried to limit our study to only Siri and Google Assistant users, as they are the most common VAs on the market, and the most likely to be used by students. Based on the replies from the screening, we moved forward with interviewees whom we felt could provide genuine and useful responses.

Out of 23 people who responded to the survey, 15 said that they use VAs. Before starting the interview process, our research group developed an interview script, which included questions, notes, and queues the interviewer should follow; this was intended to remind the interviewer to maintain a level of informality with the interviewee, in the hopes of being provided with optimal and honest responses. Our interview questions that we derived into three sub topics:

User Experience
In this category, users were asked questions which were centered around their experiences with their VA interfaces. This included both positive and negative responses, as well as suggestions for improvements.

1. Can you please describe your experience with voice assistants?

- This can range from general use, to interesting/funny stories, or the accuracy and time delay of recognition, etc.

2. Do you think voice assistants play an important role in your academic life? How?

- Save time, increase efficiencies, etc.

3. Is there anything that you would like your voice assistant to better develop to improve your experience?

- Recognition time
- Accuracy
- App integration (camera, calendar, etc…)

Accessibility
In this category, users were asked questions about their VAs ease-of-use, and whether the interface was navigable, accessible, and if there were any pain-points while using the interface. We also asked for input on how they felt accessibility could be improved.

1. Overall, is your voice assistant easy to use?

- Easy to access/navigate
- Easy to control/edit
- Easy to integrate into your school routine

2. How do you prefer to activate your voice assistant? What are some factors affect your preference?

- Manually (i.e. using your fingers or swiping)
- Voice (saying a phrase)

3. Is there any pain-point you experience when you are using your phone's voice assistant?

4. Is there anything that you would like your voice assistant to better develop to improve accessibility?

- Easier access
- Different forms of access

Usability
In this category, users were asked how usable and useful the software was, and whether there were areas in which it could be improved.

1. What tasks do you typically utilize your VA for?

- Scheduling/Time
- Calculations
- Google Searches
- Checking Emails

2. Overall, do you think your voice assistant is useful? Does it work well with daily student life?

3. Is there anything that you would like your voice assistant to better develop to improve usability?

The interviews were semi-formal, and all information was recorded, along with any additional and relevant information that was received from the participants [3].

RESULTS
Our research scope included 23 individuals who responded to our screener survey, 15 of which (65%) had stated that they used their mobile devices' voice assistants (VAs) (*indexed P1-P15*). Out of those fifteen, only one stated that they use their VA "often", while the other fourteen stated they "sometimes" use their VAs. Out of those 15 VA users, 8 stated that they use their phone for academic purposes, with the rest not making any distinction about their usage [3].

User Experience
Respondents had many different uses and experiences with their VAs. They can be categorized as "functional" tasks and "planning" tasks. Functional tasks are executed with the intent of solving a problem in the present moment, while planning tasks are executed with the intent of meeting a future goal. The number of functional tasks (8) were double that of planning tasks (4). The two common functional tasks involved Hands-Free usage and Language translation, while the greatest use of planning tasks was reminders and alarms.

While respondents said they had many uses for VAs, the majority did not feel as though they were particularly important in their academic work process. The common thought was that VAs are "not indispensable and irreplaceable", and that they have a limited task set of calculations and searching for keywords provided by the user. Respondents considered alerts and reminders to be the only important role VAs played in their academic process.

Respondents focused on the limited number of functions a VA can complete as something that needed to be improved upon. This, along with more adoption and integration by third-party application developers, would be required before any respondents would consider VAs important or essential to their academic tasks, "...if RIT's mycourses was integrated with google assistant, information about my courses, deadlines, events, etc. would be available to me easily and quickly without even opening a browser" (P7).

Respondents also felt that improvements were needed in recognition of accents and dialects, "...especially, like 15 minutes, it will be 50 minutes (instead)...maybe because

English (is) my second language, so my pronunciation is not perfect..." (P1).

Accessibility and Usability

All respondents came to the consensus that their VAs were easy to activate and use, while also experiencing occasional errors. Method of activation was split between manual (with fingers or swiping) and voice activation. Voice activation was found to be much easier to activate, but ease can lead to accidental activation. Manual activation was consistent yet had no programmability. Our respondents largest complaint is not with voice activation, but with the stigma of using voice activation in a public setting: "I think they are easy to use, but in terms of integrating into my life, that is still to be desired. I'm the kind of person who will not speak out loud, in public, to set reminders; I don't want people to know those kind of things" (P6).

DISCUSSION

According to the interview responses, mobile voice assistants (VAs) appear to not be as much of a factor in the academic productivity of RIT students, contrary to what our research group anticipated. There is no denying that VAs are easy to use as a whole, and offer some support and assistance in RIT students' academic work process. However, when talking about how VAs work in the academic domain, our interviewees had difficulty extending into this topic. This ultimately boiled down to VAs' limited capabilities, and a lack of range when attempting to complete a task. Additionally, user experience is dynamic, as it varies from person to person, with no standard of determining whether VAs improve academic productivity. Due to the usability, accessibility, and user experience structure of our study, the results show that there are three distinct factors that affect the usage of voice assistants for academic productivity for RIT students: language, user personality, and interactive design.

Language

After reviewing our results, it was clear that different native-language speakers developed distinctly different user experiences when utilizing VAs. The focus group of our research involved both native English-speaking students, and international students that currently attend RIT. The international students, who are non-native English speakers, reflected a desire to use VAs for language translation more so than other tasks. Most of them prefered to interact with VAs in English, due to the embedded language preferences of VAs, like Siri and Google. Although VAs' demonstrated the potential to recognize English words, which could help facilitate international students' improved academic productivity, the accuracy of recognition with non-native dialects and accents did not translate well for many users. As one participant mentioned, "I feel that the voice recognition of accents and dialects is something that needs to be improved..." (P8). Getting stuck in the English word recognition process often annoyed our respondents, which limited their use and often led some to stop using VAs.

When it came to the native English speakers, most of them had not mentioned such an issue.

Users' Personality

When analyzing the VA preferences of our subject group, we found that users' personalities often influenced their attitudes towards VA technologies, ultimately affecting their usage frequency and habits. For our focus group, it can be broken down into positive users and negative users. The positive users were typically ready to try something new, thus having a natural inclination to test innovations like VAs; this allows them to learn about what voice assistants are capable of, and how to use voice assistants efficiently. For example, one of the participants said, "when I got a new mobile phone, I always try to explore all the new functions. Siri is one of them. Being the first one to test new technologies makes me excited" (P4). They are willing to continue using their mobile VAs, although they do not consider VAs an "indispensable and irreplaceable" tool for their academic lives. Conversely, the negative users tended to stay in regular routines, using their VAs less frequently, but continually doing simple and reliable tasks. Another participant told us that "I am used to typing to search and swipe on my phone, which is already an easy way to use. Siri probably seems not much easier" (P1). As a result, our participants indicated that they are more likely to quit a task if the VAs cannot understand their requests.

Interaction Design

Based on the analysis of the voice assistant mobile usage, we concluded two limitations for the design of voice assistant interactions as follows.

Accidental activation

According to our research results, both voice activation users and manual activation users are regularly troubled with accidental activation. It results from voice recognition accuracy, and a lack of user programmability, with the former affecting user preference. Specifically, VAs are often mis-activated when users need to be hands-free or eyes-free, resulting in a mistrust by users, with them often losing interest in further VA use. Additionally, VAs can be activated at inappropriate occasions, such as meetings and in classes. As an interviewee told us, "I often feel nervous if I use voice to start Siri because I am afraid that I don't know which of my words could call Siri incorrectly when I am having class or meeting" (P5). These accidental activations come about from a different person altogether. One participant indicated "I'm not convinced that activating Siri by 'Hey Siri' will be safe. I mean, if I turn on 'Hey Siri', it can be activated by anyone's 'Hey Siri', not just mine. Also, when I say 'Hey, seriously?,' Siri will be activated accidentally. What's worse, it will be activated and then begin executing anyone's words" (P4). These instances can cause serious concerns with users, which frequently result in users turning off VAs. Understandably, these accidental activations can spur a few users to choose manual activation with fingers or swiping. However, accidental activation problems still exists within this

medium: "when using Siri, I would accidentally long press the 'Home' button when attempting to unlock their phone with the fingerprint reader, or accidently double press the 'Home' button to use Apple Pay, resulting in a false-positive result" (P5).

Limited Environment-Usage

Our research also revealed that environments may limit the usage of VAs for academic productivity. Generally, academic environments include classes, group meetings, and other places that are not conducive for VA's inherent voice and response functionality. This can significantly narrow the scope and frequency of use of VAs for students. Beyond the setting of a university, this limitation persists to many areas of work and leisure; whether it is an office building or a grocery store, many users may be embarrassed or self-conscious of using VAs in public (P6). Therefore, we believe that the design of this interactive mode of VAs results in a limited amount of environments.

Limitations of the Research

Our qualitative research of the factors that affect usage preference of voice assistant for academic productivity in the RIT student group is based on our online screener survey of 23 participants, as well as face-to-face interviews with 8 interviewees. The results of which do not necessarily represent the usage preferences of all RIT students, or students in general. The limitations of the study include the number of our sample size, the ethnographic composition of interviewees which varies with ages, genders, majors, personalities, etc., the voice assistants that users' mobile phones offered, the phones' performances and so on. Altogether, our research can be defined as non-definitive. We will continue to explore and expand our research in future work.

CONCLUSION

Based on the responses from our interviewed student VA users, we have come to the conclusion that we cannot definitively confirm whether VAs improve RIT student's academic productivity. Due to the technological limitations of mobile artificial intelligence, as well as the limited available functionality for academic applications, VAs cannot yet eclipse the traditional modes that students use to stay productive at school. Although our initial impetus for this research bared insubstantial results, this work has provided a general view of the factors that affect the usage of voice assistants with regards to academic productivity. From this work we would like refocus our topic, and explore the limitations of VAs for international and non-native English speaking students. With the responses from our interviews, and our analyses, it is clear there is a more well-defined population that both struggles and relies on the capabilities of VAs.

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REFERENCES

1. Bo Yi, Xiang Cao, Morten Fjeld, and Shengdong Zhao. 2012. Exploring user motivations for eyes-free interaction on mobile devices. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. ACM, New York, NY, USA, 2789–2792. DOI:http://dx.doi.org/10.1145/2207676.2208678

2. Jonathan Lazar, Jinjuan Heid Feng, and Harry Hochheiser. 2017. Research Methods In Human-Computer Interaction, Cambridge, MA: Morgan Kaufmann Publishers, an imprint of Elsevier.

3. Julia Kiseleva, Kyle Williams, Jiepu Jiang, Ahmed Hassan Awadallah, Aidan C. Crook, Imed Zitouni, and Tasos Anastasakos. 2016. Understanding User Satisfaction with Intelligent Assistants. In *Proceedings of the 2016 ACM on Conference on Human Information Interaction and Retrieval (CHIIR '16)*. ACM, New York, NY, USA, 121-130. DOI:https://doi-org.ezproxy.rit.edu/10.1145/2854946.2854961