

An enhanced user's speech recognition data analysis and expectation in intelligent personal assistant**Maen Alrashdan^{a*}**^a*Jadara University, Jordan***CHRONICLE****ABSTRACT***Article history:*

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Intelligent Personal Assistant (IPA) adoption has ushered in a technological revolution in today's society. There are several well-known IPA agents, like Google Assistant and Cortana, which were both created by Microsoft. The benefits of IPAs' speech comprehension capabilities have resulted in an increase in IPA users year after year. The goal of the study is to look at how an IPA's speech comprehension capability could be improved in the future, making it easier for IPA users to handle their everyday routines. This study will employ a survey and an unstructured interview to learn about users' expectations for an IPA's speech comprehension capabilities and how IPA adaptation affects their daily routine management. To fulfill the research's goal, an IPA with a daily routine management system will be suggested using the methodology and project design that have been determined.

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1. Introduction

Technology has become an integral part of daily living in today's world. It has sparked a debate about Intelligent Personal Assistants (IPA) among people from all walks of life. IPA is a “virtual assistant”, or software that may be installed on a computer or a mobile device to help users with activities including information retrieval, task scheduling, health monitoring, appointment reminders, and creating reminders (de Barcelos Silva et al., 2020) These responsibilities are inextricably related to anyone who schedules their daily activities. A daily routine is described as a collection of common and routine tasks that are performed daily. IPA can operate as a knowledgeable secretary to conduct daily tasks without worry of conflict, while there is no direct correlation between social media adoption and corporate performance (Muna et al., 2022).

In this technology-driven world, an individual can manage their daily routine successfully by using IPA. According to GO-research, Gulf's the number of individuals using an IPA will reach 1.8 billion by 2021. As a result, it is true that IPA has the potential to improve a person's everyday routine management. Overall, IPA will become increasingly important to everyone around the world in managing everyday activities in our fast-paced society. Allan et al. (2020) conclude that usability, security, and privacy have a direct impact on a user's willingness to adopt an IPA.

1.1 IPA Background

Since October 4, 2011, Apple Inc. has released Siri, a well-known IPA. The world's first mainstream voice assistant was released by placing it in an iPhone 4S smartphone. This event has had a direct impact on the global rise of IPA. As a result, it is evident that information technology companies are benefiting from a new market development. Since then, developers have continued to release a range of additional IPAs. For example, Microsoft released Cortana, Amazon released Alexa, and Google released Google Now and Google Assistant. The features, operating systems, designs, quality, and innovation of the IPAs

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compete with one other. The study examines the IPAs' comprehension, capacity, and effectiveness when dealing with many queries. According to the graph below, Google Assistant performed exceptionally well among the organization's common IPAs. As a result, all these IPAs have increased productivity and made everyone's life easier and more convenient. Because it has had such a direct impact on modern culture by driving a revolution, IPA adoption will eventually continue to rise. The strategic approach and data content infrastructure had the greatest impact on organizational ambidexterity, followed by integrating consumers and workers (Tariq et al., 2022).

2. Literature Review

Manikonda et al. (2018) did a study in which they emphasized the IPAs' privacy vulnerabilities. The study looked at how well users of IPAs were aware of privacy concerns. By summarizing the internet evaluations and survey, the researchers arrived at five conclusions. To begin with, IPA users are quite optimistic about their use of the app without being excessively concerned about privacy concerns. Second, the IPA's brand had a direct impact on users' knowledge of privacy issues. Third, users are concerned about several major privacy issues, including hacker intrusion, gathering personal information, audio monitoring, audio recording, and so on. Fourth, once users are told about the privacy risks with IPAs, they will become more conscious of them. Fifth, one of the main reasons for IPA users to silence their smart device's microphone was privacy concerns. These findings revealed a clear picture of the link between IPAs and their users, and the researchers demonstrated that IPA design openness is extremely important.

Furthermore, a study found that it is critical to consider that IPAs can operate as an automated caretaker by enhancing IPAs with the adoption of Internet of Things (IoT) technology (Santos et al., 2016a). The researchers have proposed to construct a caretaker IPA for mobile health using a combination of IPA, AMBRO, and the IoT world (m-Health). A smart watch, for example, uses Low Energy Bluetooth to connect with a mobile device and collect statistics on the user's heart rate. The acquired data will then be uploaded to the AMBRO cloud for analysis. Finally, the IPA Caretaker will be guided by the studied data to take the most appropriate action based on the circumstances. Santos et al. (2016b) published another study on IoT-based IPAs. The research aided in the analysis of IoT technologies, the discovery of available technologies and protocols, the discovery of important functions of an IPAs with functionalities adaptation instances, and the explanation of the impacts of combining IPAs with IoT. This study concludes that IoT-based environments are guiding the advancement of IPAs, and cyber security issues are highlighted to explain the risk of IoT deployment on IPAs.

Natural Language Processing (NLP) is one of the most critical links in the learning process of IPAs (Canbek & Mutlu, 2016). The researchers established a link between technology, natural language processing, and the potential of IPAs in the context of human-computer interaction (HCI). Artificial intelligence, natural language processing (NLP), personal digital assistants (PDAs), and intelligent personal assistants (IPAs) have all been discussed to provide a clear understanding of their relationship. By studying dialogue examples from a blog writer and sample inquiries offered on the official website, Apple's Siri, Google Now, and Microsoft Cortana were analyzed. Overall, they proved that Siri's natural language processing is the best of the three IPAs. Also, IPAs and PDAs should be a source of concern because they may play a key role in IPAs' future language development. A study showed that fear of missing out is more impacted by situational variables than personal attributes (Ilyas et al., 2022). Hybrid system aids firms in determining the best sort of ERP system to install to improve their performance (Hadidi et al., 2020).

A research study on IPAs and impaired persons was conducted by Pradhan et al. (2018). The researchers reviewed 346 online reviews of Amazon Echo from disabled people and 16 interviews with visually challenged respondents who had an Amazon Echo or Google Home device. The study investigated how handicapped persons adjust IPAs, the benefits and drawbacks of accessibility recognition, and the possibilities for improving voice recognition interfaces for disabled people. Both studies aided each other in furthering our understanding of how impaired people adjust to IPAs. With an emphasis on technology designers, change managers, and users, some theoretical and practical implications are highlighted (Al-Marroof et al., 2022).

The cause for the low use of speech recognition IPAs was discovered by Zhao et al. (2018). According to the findings, the reasons are poor recognition, faulty cognition, privacy concerns, societal shame, and insufficient assimilation. The researchers analyzed Siri's discussion on Zhihu, a question-and-answer website, to see if their hypotheses were credible. As a result, they discovered that many users only use Siri for basic tasks, that Siri's users are interested in receiving unexpected responses and answers from Siri, that some users may believe that manual operation is better than using Siri, that voice recognition is used privately due to privacy concerns, and that some Siri's new functionalities on remote controlling smart home applications are being used privately.

The researchers conducted a survey as a research method and studied the results to see if there was a link between data privacy, trust difficulties, IPA adoption, and users versus non-users. Furthermore, the IPAs examined are divided into two categories: Phone IPA and Home IPA. Phone IPA may be accessed via a smartphone, whilst Home IPA is used to control smart home applications. The study's findings revealed that most IPAs' suppliers are trusted by IPAs' users, with the existence of a social contract as well as privacy and security concerns that may be raised again in the coming year when IoT is integrated.

The possibility of combining IPAs with IoT, IPAs' privacy concerns, and how IPAs connect to various sorts of users are all discussed extensively in the research (Zhao et al., 2018). This is because IPAs are gradually becoming integrated into people's daily lives, and they may usher in a new technological revolution that directly affects people's quality of life. As an example,

IPA adoption may continue to rise as more smart devices are integrated with the Internet of Things, allowing them to communicate with one another. As a result, it is true that IPA and IoT have an impact on the technological revolution.

3. Problem Statement

Even though the existence of IPAs has brought a slew of appealing benefits, there are several concerns that researchers and users should be aware about. Speech recognition is still imperfect, even though it is improving over time (Yi, 2021). For example, IPA users may need to repeat themselves if their voice is indistinct or if noises are present for the IPA to find the correct instruction. All IPAs have a difficult job in converting natural language into a comprehensible computer command with 100 percent correctness. In other words, an IPA's ability to correctly answer questions and comprehend commands will decide how clever it is. As a result, it is apparent that IPA's connected speech comprehension capabilities is a problem that researchers and developers should be concerned about.

4. Hypothesis Development

This research aims to present an IPA that will provide the user with the best speech recognition IPA that is both entertaining and practical to use in real life to improve their users' experience with using an IPA to manage their daily routine efficiently and effectively. The study's goals are to examine the impacts of IPA adaptation on users and non-users, to determine the three best IPAs' speech comprehension capability, and to build the suggested system by combining the strengths of the current IPAs. Based on the research scope, the consideration of the following hypothesis will be studied:

H₁: *There is a considerable relationship between effective management of daily user's routine and IPA adaptation.*

H₂: *There is an important relationship between effective management of daily users' routine and building a hybrid system combining the best features of current IPA systems.*

H₃: *There is a considerable relationship between effective management of daily user's routine and efficient speech recognition system.*

5. Methodology

The Kanban approach has been chosen as the methodology for software development. The project has been motivated by the Kanban principles and has opted to use this methodology in this study. Kanban is a Japanese word that means "signboard.". According to Junior and Godinho Filho (2010), the first principle will be "start with what you're doing now", which means that Kanban methodology can be directly implemented to the workflow without any changes to current processes (Junior & Godinho Filho, 2010). Secondly, in the Kanban approach, "commit to seek incremental, evolutionary change" is used as a guideline to minimize obstruction and accept changes that offer benefits. The third premise of this technique is to "respect the present process, roles, and duties." This methodology adapts step-by-step change to avoid change opposition from the allocated process, roles, and responsibilities. The final concept is to "promote acts of leadership at all levels," which means that each team member's work is recognized in order to motivate everyone to keep developing. The researcher's steps will be discussed in more detail below.

The first stage entails visualizing the workflow in order to implement Kanban (Senapathi & Drury-Grogan, 2021). The next step is to categorize all of the tasks into those four categories. Then, because jobs like IPAs requirement collection, IPAs functionality implementation, IPAs user acceptance testing, and any other tasks are organized in an optimal flow, all tasks can be prioritized effectively. The project will then be managed by limiting the amount of work in progress (WIP) by setting a stringent limit for the ongoing segment. For example, if the implementation is focused on developing IPA's functions such as speech recognition and routine management, it should not move on to the next step until two of the functionalities have been effectively implemented. The third step is to make the process policies explicit by establishing a number of shared goals and reserving some capacity for interruptions in order to improve efficiency and productivity. Finally, the Kanban methodology employs continual improvement. It encourages Kanban users to improve their workflow rather than completely overhaul it.

6. Project Design

The project used quota sampling, which is one of the sample methods from non-probability sampling, to collect requirements from IPA users and non-users. Random selection is not used in non-probability sampling. Non-probability sampling, on the other hand, is more suited to qualitative research because the samples chosen are based on the researcher's personal judgment. The following sections will go over why quota sampling was chosen, as well as the steps involved in conducting a quota sampling. Decision support systems are used in organizations where decision-making is crucial to the success, continuation, or failure of the company.

Quota sampling is efficient and cost-effective. This is due to the fact that the sampling method gets right to the point in its sample operation, lowering the execution cost (Iliyasu & Etikan, 2021). It also captures important data and speeds up the sampling process by acquiring additional data from remote groups. As a result, the various groups within the population can

be accurately and fairly represented. As a result, quota sampling has prevented over-representation in the sample process because the sampling is driven by predetermined quotas.

Throughout the sample process, quota sampling can provide a high level of precision (Iliyasu & Etikan, 2021). Because quota sampling, as a non-probability sampling approach, has a well-structured process. For example, in order to complete the sampling properly, the sampling will simply follow the established procedures of quota sampling. As a result, the sample procedure can prevent mistakes in the vast majority of circumstances, as any existing errors will have a direct impact on the sampling method's precision.

Furthermore, quota sampling entails three primary steps: dividing the sample population into subgroups, calculating a quota for each segment, and conducting surveys based on the predetermined quotas. The project's first stage is to explore the distinctions between IPA users and non-users, with the type of users chosen as the categorization standard. Second, the project's sample size has been set at one hundred users, with seventy IPA users and thirty non-IPA users dispersed among them.

The survey will be done utilizing a variety of data collection methods, including interviews and questionnaires, until the participants reach the predetermined quota. Overall, the arguments for utilizing quota sampling and the methods involved are outlined above. It is evident that quota sampling has aided in the comparison of data collected from the various sample groups.

The discussion will go on to a description of the proposed IPA. Task reminders, appointments, task organization based on importance, and task visualization in many views are the major features. Making appointments is a feature that allows users to add events or reminders to their calendar by specifying a start and finish time. If numerous tasks are due within the same time limit, the IPA will prioritize them. Finally, the IPA can generate a few other types of views. The daily tasks, for example, can be displayed in a list view, a calendar view, a time remaining view, or a sticky notes view. (Chuen et al., 2019) Allow users to easily remember their passwords in order to aid in the creation of more meaningful passwords, as well as the creation of stronger passwords and the ease of remembering them.

7. Results

Cronbach's alpha was used to measure the study's validity and reliability. Cronbach alpha, which determines how strongly a group of items is related, is used to determine internal consistency. Exploratory component analysis is one way for determining dimensionality. In other words, Cronbach's alpha is a reliability or dependability coefficient rather than a statistical test. Cronbach alpha can also be determined based on the total number of test items and their average inter-correlation. For real-world working settings, the maximum Cronbach alpha value was 0.92.

The greatest dependability score for efficiency of the efficient speech recognition system was 0.86, and the alpha value for the adaptation of IPA was 0.89, indicating that reliability was accepted. As indicated in Table 1, the Mean and Standard Deviation (S.D.) were both high, with the Mean values ranging from 3.77 to 3.92. In addition, this study looked at the average variance extracted (AVE) and found that all AVE values were more than the recommended threshold of 0.50, indicating that convergent validity was met, as shown in Table 1.

Table 1
Reliability and Mean and Descriptive Statistics (S.D) and Average Variance Extracted (AVE)

Variable	Cronbach's alpha	Mean	S.D	AVE
IPA adaptation	0.89	3.77	0.76	0.678
Proposed hybrid System	0.91	3.90	0.82	0.729
Efficient speech recognition system	0.86	3.92	0.89	0.714

The Durbin-Watson test was also used to confirm the relationship between the independent variables and their impact on the effective management of daily user's routine. Table 2 shows the results.

Table 2
(Durbin-Watson) test of Independent Variables

Variable	Durbin-Watson
IPA adaptation	1.796
Proposed hybrid System	1.856
Efficient speech recognition system	1.843

Table 2 reveals that all Durbin-Watson values for the independent variables are less than 3; these values are acceptable and suggest that there is no self-correlation problem in any of the study's independent variables.

Multiple Regression analyses were utilized to investigate the relationship between the roles of system real working circumstances in increasing overall adapting the proposed hybrid IPA system in the effective management of daily user's routine. As a result, Table 3 shows:

Table 3

Multiple Regressions Analysis on the Relationship between the of adapting IPA, proposing hybrid system and efficient speech recognition system in in the effective management of daily user's routine.

Variable	"t" value	"t" sig	β	Result
IPA adaptation	6.722	0.001	0.219	Accepted
Proposed hybrid System	6.629	0.002	0.221	Accepted
Efficient speech recognition system	7.996	0.000	0.213	Accepted

$R = 0.935$ $R^2 = 0.9103$ $F\text{-Value} = 407.65$ ($\text{Sig.} = 0.016$)

Table 3 shows that the impact of the hybrid IPA system with efficient speech recognition system in strengthening system of daily routine. In this situation, the F-value was 407.65, which was statistically significant at 0.01; the R value was 0.935, and the R2 value was 0.9103. With a "t" value of 7.996, efficient speech recognition system also appears to have a larger role in effective management. The t value for IPA adaptation was 6.722, while the t value for hybrid IPA system was 6.629. As a result, all objectives were met.

8. Discussion

Several obstacles were encountered during the project design when designing the IPA, and the system constraints of the proposed IPA were revealed. This is because the acquired data is analyzed through the idea evaluation process. As a result, a personal reflection is conducted to better understand the issues and system constraints. The importance of the system, problems, and system constraints in creating an IPA for daily routine management will be discussed below.

The use of IPA technology for daily routine management might be a valuable application that helps IPA users manage their tasks more efficiently using the given functionality. With the help of the IPA, users may manage their daily schedules more efficiently in our chaotic world, allowing them to spend their time wisely on each activity.

The initial problem is to coach and onboard the suggested IPA into a real-world setting while ensuring quality. For example, an IPA user can utilize the proposed IPA to successfully manage their daily routines and responsibilities by utilizing its functionalities. It is critical that the suggested IPA's selling feature be interaction, so that IPA users are drawn to it and eager to include it into their daily routine management. Because an IPA will need to go through a developer's training, training and onboarding are directly tied to cost and time. The training is aimed at teaching the IPA how to integrate itself with the allocated processes in order to manage daily tasks. As a result, the IPA will be able to detect interactions between the allocated processes and the user. Coaching has undeniably played a significant impact prior to the IPA's official onboarding.

Another difficulty will be that an IPA must be highly precise and allow for specific customization. The proposed IPA's primary use is everyday routine management. Because it will be interacting with people from various walks of life whenever any of its users utilize it, the IPA's processes are typically related to precision and tailored personalization. For example, based on his or her daily schedule, the user may request a check or a change from the IPA. In this situation, the IPA will need to remind all relevant tasks that were recorded with the set time frame in a timely manner for the day, as well as adjust any schedule changes that were requested. As a result, the IPA user is worried about precision and personalized customization. If there are any errors in the scheduling, it will have a direct impact on the user experience, and the user will be hesitant to adopt an IPA instead of manually writing down their daily chores in a list.

Data security, on the other hand, will be one of the constraints (Rampton, 2020). This is because the proposed IPA does not consider voice command encryption. Users of the IPA software may have concerns about data security and privacy. When storing data from the IPA in the cloud, it should be encrypted so that it cannot be viewed by an unauthorized user. Furthermore, the proposed IPA's second restriction is that it is an unproven design, which makes it less competitive in the market. Developers have created a variety of IPAs, including Google Assistant, Amazon Echo, Cortana, and others. As a result, the suggested IPA will have difficulty overcoming user reluctance and enticing them to incorporate it into their daily routine management. Because the competitors' brands are well-known, competing with them is challenging.

9. Conclusion

This research is looking at an IPA that has a daily routine management system that can help the user manage their activities and time wisely because that IPA adaptation is currently leading a revolution in modern society. One of the most well-known IPAs in the world is Google Assistant, which is defined as a person's personal Google that is ready to assist anytime needed. The ability of an IPA to interpret speech has been highlighted as a concern in this study since it is directly tied to the IPA's convenience and dependability. The goal of this study is to present an IPA that will provide the user with high-quality speech recognition capabilities, allowing them to handle their everyday routines more efficiently. Furthermore, the project will be managed utilizing the Kanban Methodology, which is an agile methodology. To determine the population involved in the requirement gathering stage, quota sampling was chosen. The survey and unstructured interview have been used to gather requirements. Furthermore, the challenges include coaching and onboarding an IPA, as well as designing an IPA with high precision and specific personalization for the user.

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