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An Analysis Of Adoption Of Digital Intelligent Assistant In Reference Of Unified Theory Of Acceptance And Use Of Technology

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Abstract

Digital Intelligent Assistants (DIAs) have emerged as ubiquitous technologies reshaping human-computer interaction paradigms. Understanding the factors influencing their adoption is crucial for both researchers and practitioners. This paper investigates the adoption of DIAs through the lenses of the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT provides a theoretical framework to explore how performance expectancy, effort expectancy, social influence, and facilitating conditions influence users' behavioral intentions and actual usage. By synthesizing insights from UTAUT, this study aims to provide a comprehensive understanding of the adoption dynamics surrounding DIAs. The findings contribute to theoretical advancements by refining UTAUT in the context of DIAs in shaping user attitudes and behaviors. Additionally, practical implications are discussed, offering recommendations for stakeholders to optimize DIA adoption strategies and enhance user experiences. Overall, this research contributes to advancing knowledge in the field of technology adoption, paving the way for more effective design, implementation, and utilization of DIAs in diverse settings.

Keywords: Digital intelligent assistant, internet of things, artificial intelligence

Introduction

In the past decade, the proliferation of digital intelligent assistants (DIAs) and digital voice assistants (DVA) has transformed the landscape of human-computer interaction, offering users a seamless and intuitive interface to interact with technology. From Siri to Alexa, these intelligent systems have become ubiquitous in our daily lives, permeating various domains such as smart homes, healthcare, education, and business (Shoot L., 2018; Huang & Rust, 2018). In future, more information regarding these devices will come (Kumar et al., 2016). From virtual assistants like Siri and Google Assistant to smart speakers such as Amazon Echo and Google Home, these AI-powered systems have permeated various aspects of modern society, from personal productivity to home automation. Digital intelligent assistant are the machine which act, think and respond (Bowen & Morosan, 2018). India had been experiencing a significant increase in the adoption of digital intelligent assistants (DIAs) due to the growing availability of affordable smartphones and internet connectivity. Here's an approximation based on information available up to that point: According to a report by Statista, as of 2021, India was estimated to have over 200 million active users of digital voice assistants, with projections indicating continued growth in the coming years. Additionally, a study conducted by Deloitte India suggested that the adoption of DIAs in India was accelerating, driven by factors such as increasing smartphone penetration, rising internet usage, and the growing popularity of smart home devices. Furthermore, companies like Amazon and Google, which offer popular digital voice assistants like Alexa and Google Assistant, have been expanding their presence in the Indian market, indicating the significance of India in their global strategies. Understanding the factors influencing user acceptance of DVAs is crucial for developers, marketers, and policymakers alike, as it not only shapes consumer behavior but also informs the design and implementation of future technologies. While existing theories, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), have provided valuable insights into technology adoption, they may lack the specificity needed to fully capture the unique attributes and challenges associated with DIAs. Thus, this research paper seeks to refine and extend the UTAUT framework to better elucidate the factors driving user acceptance of DIAs. Such insights are not only pertinent for academics seeking to advance theoretical knowledge but also for practitioners striving to enhance the design, implementation, and adoption of digital voice assistants in diverse contexts. Despite their widespread adoption, understanding the factors that influence user acceptance of DVAs remains a critical area of inquiry. Existing theoretical frameworks, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), have provided valuable insights into technology adoption behavior. However, these models may not fully capture the unique characteristics and challenges posed by DIAs. Therefore, this research paper seeks to refine and extend the UTAUT framework to better elucidate the drivers of user acceptance of DIAs. By synthesizing existing literature, integrating recent advancements in technology adoption theories, and conducting empirical investigations, this study aims to provide a comprehensive understanding of the nuanced relationship between individual characteristics, perceived usefulness, ease of use, social influence, facilitating

conditions, and behavioral intentions towards DIAs. The findings of this research are expected to contribute not only to academic discourse but also to inform practitioners in designing and implementing DIAs that align with user preferences and expectations, ultimately fostering greater acceptance and adoption of these transformative technologies.

Research Methodology

This research will employ a quantitative approach to investigate the adoption of digital voice assistants within the framework of the Unified Theory of Acceptance and Use of Technology (UTAUT). A survey will be conducted among individuals with experience using digital voice assistants, employing Likert-type scales to measure constructs such as performance expectancy, effort expectancy, social influence, facilitating conditions, and behavioral intention. The questionnaire will undergo pilot testing to ensure clarity and reliability before being administered to a diverse sample using online or in-person methods. Total 309 data were collected through questionnaire. New Delhi is a place under study. Data analysis will include descriptive and inferential statistics to explore relationships between UTAUT constructs and adoption behavior. Smart PLS4 utilized for assessing the relationship among constructs. Ethical considerations will be prioritized, including informed consent and participant privacy. While limitations such as sample bias and self-reporting biases may exist, this study aims to provide valuable insights into the factors shaping the adoption of digital voice assistants and inform strategies for their successful integration into daily life.

Literature Review

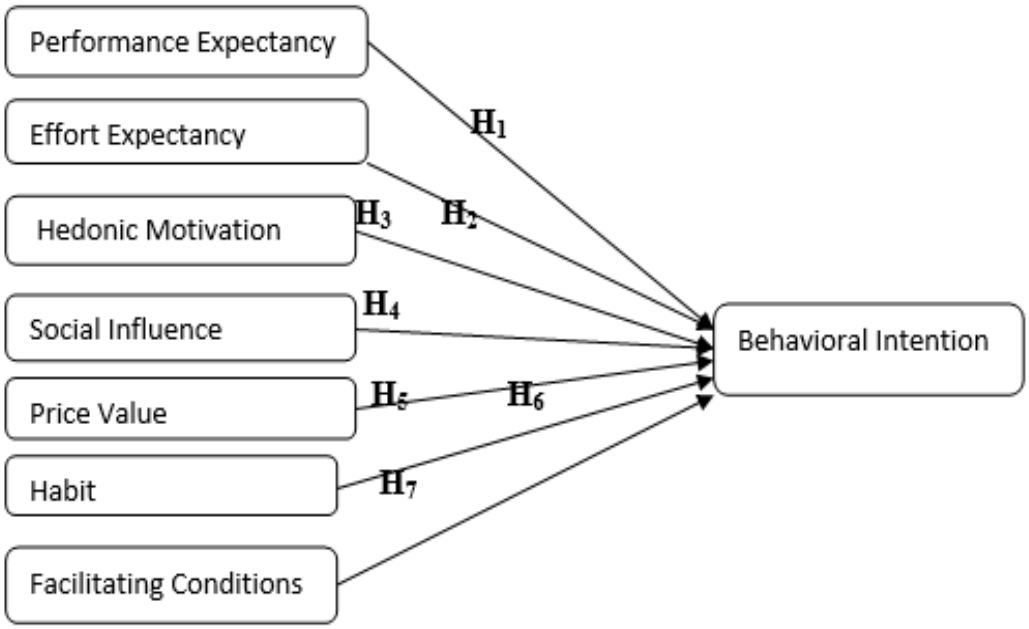
Digital Voice Assistants (DIAs) have emerged as pervasive and transformative technologies in recent years, reshaping the landscape of human-computer interaction across various domains. Understanding the factors driving user acceptance of DIAs is crucial for researchers, practitioners, and policymakers alike. While existing theoretical frameworks, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), have provided valuable insights into technology adoption, they may require revision to fully capture the unique attributes and challenges posed by DIAs.

Theoretical Foundations

The UTAUT framework, proposed by Venkatesh et al. (2003), synthesizes elements from eight prominent theories of technology adoption to explain user acceptance and usage behavior. The model identifies four key constructs influencing behavioral intention and actual use: performance expectancy, effort expectancy, social influence, and facilitating conditions. While UTAUT has been widely applied and validated across various technological contexts, its applicability to DIAs may be limited due to their unique characteristics, such as natural language processing, voice recognition, and context-awareness. Extensive research has been conducted on the adoption of technology across various domains, including artificial intelligence (Hah, 2010), smart devices (Kim and Shin, 2015), mobile IT systems (Koc et al., 2016), and the internet of things (Shin and Jin Park, 2017). Additionally, research was conducted on the acceptance of technology in the travel and tourism industry, including the utilization of IT system technology [No and Kim 2014; Trakulmaykee et al. (2018), and social media technology in conjunction with upscale hotels on the Internet. (Dieck, Tom, et al., 2017). Extant research has identified several factors influencing user acceptance of DIAs, which extend beyond the constructs of the original UTAUT framework. Performance expectancy, a key construct in the Unified Theory of Acceptance and Use of Technology (UTAUT), holds significant relevance in the context of digital voice assistants (DIAs). Performance expectancy refers to the degree to which an individual believes that using a particular technology will help them to accomplish tasks more effectively and efficiently (Venkatesh, V., Thong, J., & Xu, X. (2012). In the realm of DIAs, performance expectancy encompasses users' perceptions of the extent to which these assistants can accurately understand and respond to their queries, execute commands promptly, and provide relevant and helpful information or services. As DIAs become more proficient at understanding complex queries, executing tasks across multiple domains, and adapting to users' preferences and contexts, users are increasingly inclined to rely on them as indispensable tools in their daily lives. Effort expectancy, a key construct within the Unified Theory of Acceptance and Use of Technology (UTAUT), plays a significant role in understanding user acceptance of digital voice assistants (DIAs). In the context of DIAs, effort expectancy refers to users' perceptions of the ease and convenience of interacting with these systems. Research has shown that users are more likely to accept and adopt DIAs if they perceive them to be easy to use and require minimal cognitive effort (McLean and Osei-Frimpong, 2019). Therefore, efforts to enhance the usability and user experience of DIAs, such as improving speech recognition accuracy, refining natural language processing algorithms, and designing intuitive interfaces, are essential for fostering user acceptance and maximizing the potential benefits of these technologies. This perspective is supported by studies such as those conducted by Venkatesh and Bala (2008) and Venkatesh et al. (2003), which have highlighted the importance of effort expectancy in shaping users' attitudes and behaviors towards technology adoption. Hedonic motivation: In the context of digital voice assistants (DIAs), hedonic motivation plays a significant role in influencing user acceptance and

adoption. Users are often driven by the pleasure and enjoyment derived from interacting with DIAs, such as experiencing the novelty of voice commands, engaging in entertaining conversations, or enjoying the convenience of hands-free operation (Venkatesh, V., Thong, J., & Xu, X. (2012). Research by Zhou et al. (2020) highlights the importance of hedonic motivation in shaping users' attitudes and intentions toward DIAs, emphasizing the role of enjoyment and emotional satisfaction as key determinants of usage behavior. Price value is another critical factor influencing user acceptance of DIAs, particularly in terms of the perceived value proposition offered by these devices relative to their cost (Venkatesh, V., Thong, J., & Xu, X. (2012). Research by Han et al. (2019) underscores the significance of price value perception in shaping consumers' purchase intentions and willingness to invest in DIAs, highlighting the need for manufacturers and service providers to offer competitive pricing strategies and value-added features to attract and retain users. Social influence also plays a pivotal role in driving user acceptance and adoption of DIAs, as individuals are influenced by the attitudes, opinions, and behaviors of their peers, family members, and social networks. Research by Li et al. (2021) emphasizes the impact of social norms, subjective norms, and social identity on users' perceptions (Venkatesh, V., Thong, J., & Xu, X. (2012) and usage behavior regarding DIAs, highlighting the role of social interactions and recommendations in shaping adoption decisions. Positive word-of-mouth, social endorsements, and testimonials from trusted sources can enhance users' trust and confidence in DIAs, leading to increased adoption rates and sustained usage over time. Habitual use can facilitate the integration of these technologies into daily routines, leading to sustained adoption over time. Research by Venkatesh, Thong, and Xu (2012) found that habit positively influences technology adoption and mediates the relationship between prior experience and intention to use. Similarly, a study by Li and Karahanna (2015) revealed that habit plays a crucial role in the continued use of technology beyond initial adoption. Facilitating conditions, as a crucial construct within the Unified Theory of Acceptance and Use of Technology (UTAUT), play a pivotal role in shaping user acceptance (Venkatesh, V., Thong, J., & Xu, X. (2012) and utilization behavior towards digital intelligent assistants (DIAs). In the context of DIAs, facilitating conditions encompass a range of factors that ease the adoption and usage of these technologies, including technical support, infrastructure availability, compatibility with existing systems, and privacy concerns. Research by Venkatesh et al. (2003; 2008) highlights the significance of facilitating conditions as determinants of technology acceptance, emphasizing their role in reducing perceived barriers and enhancing users' confidence in adopting and integrating new technologies into their routines.

Figure1: Research Framework for Adoption of Digital Intelligent Assistant



Data Analysis

Sample statistics provide valuable insights into the characteristics of a dataset and are crucial for making inferences about a population based on a sample. These statistics summarize key aspects of the data, such as central tendency, variability, and distribution.

Table 1 Sample Statistics

Characteristics (N=309)	Indicators	Frequency	Percentage
Gender	Female	159	51.4
	Male	150	48.5
Age	Below 18	9	2.9
	18-30	100	32.3
	30-45	150	48.5
	Above 45	50	16.1
Qualification	Higher secondary	50	16.1
	Graduate	100	32.3
	Post Graduate	150	48.5
	Other	9	2.9
Marital Status	Single	159	51.4
	Married	150	48.5

Smart PLS (Partial Least Squares) is a powerful statistical technique used for structural equation modeling in research. By employing a latent variable approach, Smart PLS allows researchers to examine both measurement and structural models simultaneously, providing robust insights into the underlying relationships among variables. In Smart PLS 4, convergent validity, Average Variance Extracted (AVE), and discriminant validity are essential concepts in assessing the quality of measurement models. Convergent validity refers to the extent to which items measuring the same construct are correlated with each other (Hair et al., 2017). A high level of convergent validity indicates that items are effectively capturing the underlying construct. AVE is a measure used to assess convergent validity, representing the average amount of variance shared among the items measuring a particular construct. In Smart PLS 4, AVE values above 0.5 are typically considered satisfactory. Discriminant validity, on the other hand, examines whether constructs are distinct from each other. It ensures that a construct is more strongly correlated with its own items than with items from other constructs ((Joe F Hair, Jeffrey Joe Risher, Marko Sarstedt and Christian M Ringle, 2019). These concepts are fundamental for ensuring the reliability and validity of measurement models in Smart PLS 4 analyses (refer Table 2)

Table 2 Convergent Validity

Construct	Items	Outer Loadings	Composite reliability (rho_c)	AVE
Performance expectancy	PE1	0.886	0.836	0.707
	PE2	0.749		
	PE3	0.882		
Effort expectancy	EE1	0.866	0.830	0.741
	EE2	0.849		
	EE3	0.867		
Social influence	SI1	0.868	0.762	0.628
	SI2	0.780		
	SI3	0.718		
Hedonic motivation	HM1	0.720	0.725	0.628
	HM2	0.833		
	HM3	0.843		
Price Value	PV1	0.795	0.805	0.672
	PV2	0.890		
	PV3	0.769		
Habit	H1	0.843	0.821	0.723
	H2	0.863		
	H3	0.846		
facilitating conditions	FC1	0.714	0.785	0.664
	FC2	0.854		
	FC3	0.868		
Behavioral Intention	BI1	0.810	0.757	0.664
	BI2	0.856		
	BI3	0.776		

Table 3 Discriminant Validity

	BI	EE	FC	H	HM	PE	PV	SI
Behaviroul Intention								
Effort Expectancy	0.453							
Facilitating Conditions	0.473	0.16						
Habit	0.626	0.13	0.26					
Hedonic Motivation	0.6	0.31	0.7	0				
Performance Expectancy	0.48	0.28	0.72	0	0.629			
Prive Value	0.384	0.23	0.51	0	0.473	0.408		
Social Influence	0.352	0.27	0.32	0	0.217	0.212	0.328	

In Smart PLS 4, hypothesis testing plays a critical role in evaluating the structural model. The structural model examines the relationships between latent constructs in the research model. Hypothesis testing in Smart PLS 4 involves assessing the significance and directionality of path coefficients, which represent the strength and direction of relationships between constructs. Researchers formulate hypotheses based on theoretical expectations and prior research findings, specifying the expected direction of relationships between constructs. Smart PLS 4 utilizes bootstrapping techniques to estimate the standard errors and significance levels of path coefficients. Through bootstrapping, thousands of resamples are generated from the original data, allowing for the calculation of robust standard errors and confidence intervals. Path coefficients are deemed significant if their p-values are below a predetermined threshold (e.g., 0.05), indicating that the observed relationships are unlikely to have occurred by chance. By testing hypotheses in Smart PLS 4, researchers can assess the validity of their theoretical propositions and gain insights into the relationships among constructs in their research model (refer Table 3).

Figure 1: Adoption of Digital Voice Assistant

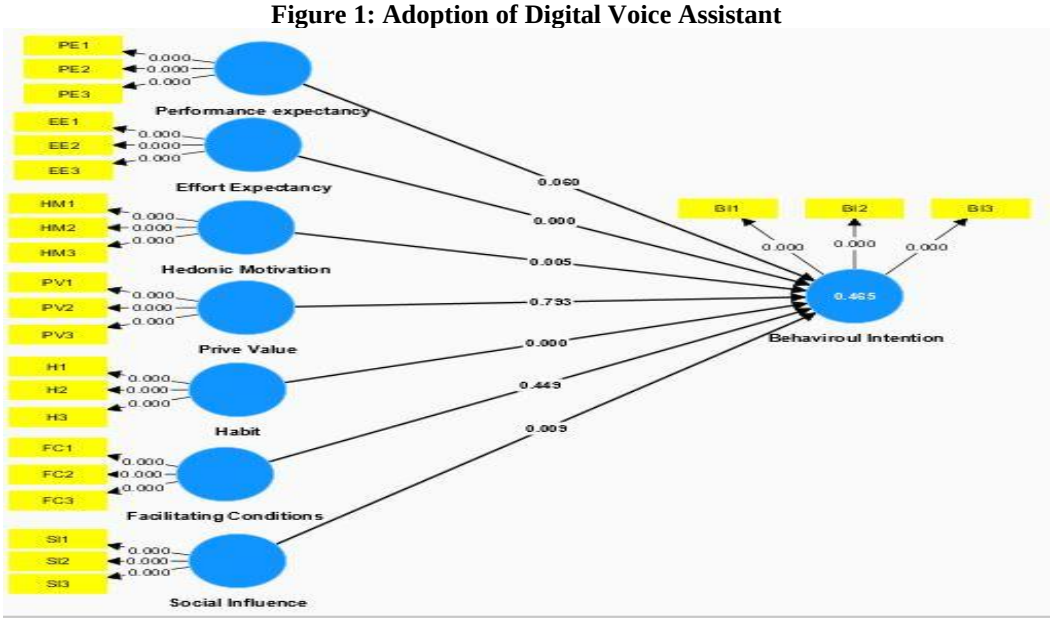


Table 4: Result

Hypothesis	Path	Path coefficient (Beta value)	t-value (>2.58)	p-value (<0.05)	Decision
H_1	PE -> BI	0.121	1.881	0.060	Not Supported
H_2	EE -> BI	0.209	4.294	0.000	Supported
H_3	HM -> BI	0.164	2.826	0.005	Supported
H_4	PV -> BI	0.014	0.262	0.793	Not Supported
H_5	H-> BI	0.405	7.883	0.000	Supported
H_6	FC -> BI	0.046	0.757	0.449	Not Supported
H_7	SI -> BI	0.121	2.621	0.009	Supported

As per the result, H_2, H_3, H_5 and H_7 are significant in nature and H_1, H_4 and H_7 are insignificant. This model has R^2 is 0.454 and R^2 adjusted is 0.441.

Managerial Implication

The adoption of digital intelligent assistants (DIAs) holds significant managerial implications for organizations seeking to leverage these technologies to enhance productivity, efficiency, and customer experiences. Drawings on the Unified Theory of Acceptance and Use of Technology (UTAUT), there are several managerial implications can be derived to facilitate the successful adoption of DIAs. Organizations should focus on demonstrating the practical benefits and value proposition of DIAs to users. This involves integrating DIAs into existing workflows and processes to streamline tasks, automate routine activities, and improve decision-making. Providing training and resources to help users understand the capabilities and potential applications of DIAs can enhance their perceived usefulness, encouraging adoption and utilization. Managers should prioritize the design and usability of DIAs to ensure they are intuitive, accessible, and user-friendly. This includes simplifying interaction processes, providing clear instructions and prompts, and minimizing cognitive load for users. Investing in user interface design, voice recognition technology, and natural language processing capabilities can enhance the ease of use of DIAs, reducing barriers to adoption and increasing user satisfaction. Organizations can leverage social influence mechanisms to promote the adoption of DIAs among employees and customers. This involves highlighting positive experiences and success stories, fostering a culture of innovation and experimentation, and encouraging peer-to-peer recommendations and endorsements. Additionally, involving influential stakeholders and opinion leaders in DIA implementation and advocacy efforts can enhance social acceptance and legitimacy. Managers should ensure the availability of facilitating conditions to support the adoption and usage of DIAs within the organization. This includes providing technical support, infrastructure resources, and compatibility with existing systems and devices. Additionally, addressing privacy and security concerns, complying with regulatory requirements, and establishing governance frameworks can create a conducive environment for DIA adoption and usage. Continuous monitoring and evaluation of DIA usage patterns, user feedback, and performance metrics are essential for optimizing adoption efforts and maximizing return on investment. Managers should track key adoption indicators, such as user engagement, satisfaction levels, and productivity gains, and use insights derived from data analytics to identify areas for improvement and refinement. By incorporating these managerial implications derived from UTAUT, organizations can effectively navigate the complexities of DIA adoption and implementation, capitalize on the benefits of these technologies, and drive digital transformation initiatives to achieve strategic objectives and competitive advantage.

Conclusion

In conclusion, user acceptance of DIAs represents a multifaceted phenomenon influenced by a myriad of individual, social, and contextual factors. While the UTAUT framework provides a valuable foundation for understanding technology adoption, its applicability to DIAs may require refinement and extension. By integrating insights from existing literature and proposing enhancements to UTAUT, this paper contributes to advancing theoretical understanding and empirical research on user acceptance of DIAs, thereby informing the design, implementation, and adoption of these transformative technologies in diverse contexts. While UTAUT provides a comprehensive framework for understanding technology adoption, its application to DIAs may encounter several challenges. Firstly, DIAs introduces unique interaction modalities, such as voice commands and conversational interfaces, which may not be adequately addressed by UTAUT's focus on traditional user interfaces. Secondly, the context-aware nature of DIAs, including their ability to adapt to users' preferences and environments, necessitates the consideration of additional constructs beyond those proposed by UTAUT. Moreover, the rapid pace of technological advancements and evolving user expectations in the DIA domain may render static models like UTAUT insufficient for capturing dynamic user behaviors and preferences. Moreover, organizations and service providers need to invest in user education and training initiatives to enhance users' technical competencies and alleviate any apprehensions or uncertainties surrounding DIA adoption. By addressing these facilitating conditions comprehensively, stakeholders can create an enabling environment that encourages widespread acceptance and usage of DIAs, thereby realizing their full potential in enhancing productivity, convenience, and user experiences across diverse domains.

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