Artificial intelligence and augmented reality glasses

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Abstract
AR has unique benefits compared to other digital technologies. These include creating blended learning experiences that combine digital and physical materials and embodiments of abstract concepts. In addition, other payoffs include providing educational content from a 3D perspective, encouraging students to be present, present, understanding, and invisible. Studies in various fields such as business, medicine, entertainment, and education have shown that the use of AR brings many advantages and benefits to users. This present study evaluates the previous studies in terms of usage, acceptance, adoption, etc. then some of the models like UTAT and TAM are also being observed. The limit of the study was for the period of 2010 to 2023.
Keywords: Artificial Intelligence, ARGS, Usage, Adoption.

Introduction
In the last few years, researchers and developers from the field of optical have shown a great interest in all types of wearable smart devices and the related technologies. The domain of such research is expected to cover the field of human health, routine well-being, education and even sales/marketing. This is partly because they can offer users a different type of human-computer interaction compared to mobile devices, but on the other hand, this interest may be left behind by the rapid development of the Internet of Things, which also includes smartphone glasses. These glasses were launched in 2013 with the launch of Google Glass **Klein et al. (2020)**, so the first details were about this device. For example, Lewis et al. Recently, the contents of smart glasses have focused on the ability to interact with the device, with many applications, and to have a virtual or reality experience.

One type of smart glasses is Augmented Reality Smart Glasses (ARSG), defined as a device that can be used with one or two screens, able to combine virtual information with real information according to the user's perspective. ARSG is different from other mobile devices (e.g. smartphones, tablets) due to its capabilities (e.g. combination of real and virtual objects, personal and self-awareness, hands-free operation and first-person view). The business size of ARSG is growing rapidly. According to **Statista (2022)**, ARSG sold a total of 170,000 units in 2019 and this figure is expected to increase to 3.9 million units by 2024. Considering the increasing demand for 7G usage, it is important to evaluate the areas they have. Those that have been used so far and those that affect their usage and acceptance by potential customers in the firm, those who are participating, colleges and schools. Previous research in the field of information technology and innovation has shown that examining the acceptance of new technologies at an early stage of their development can contribute to their future integration. Understanding these factors at an early stage can provide companies with an advantage and increase efficiency when implementing ARSG. For example, in education, teacher'sattitudes, beliefs, and opinions play an important role in the adoption of new technologies in teaching by **Choi et al. (2023)**. According to the model, certain recognition and concepts such as Technology Adoption and Use Analysis (UTAUT), Technology Acceptance Model (TAM) and their extensions. Therefore, this literature review aims to review existing research on the factors that are important in accepting ARSG for users in different environments, identify inconsistencies in the research, and make recommendations for future research. Previous literature reviews have focused on the general acceptance of smart wearable technologies

or a specific category such as wearable tracking devices. Therefore, a review was needed that included studies specifically focusing on acceptance by the workgroup. The fact that smart glasses are a new technology, just like other new technologies such as fully autonomous cars, creates many uncertainties about how users will accept them. Previous research on ARSG acceptance findings (e.g., enrollment, history, approach, acceptance decision) can be used to inform their adoption by different ARSG users (e.g., students, teachers, professionals, customers) in everyday life, thus encouraging future research in different areas with rigorous procedures. In addition, understanding the factors that influence ARSG acceptance can help researchers, technologists, and policy makers in organizations, institutions (e.g., schools and colleges), and informal learning spaces (e.g., museums and halls) to develop professional, educational development plans. Support. and adoption of this technology among staff, students, and visitors. Researchers, technologists, and policy makers are working on new and innovative technologies in a variety of areas, including analytics, medical information, and smart electrical technology. Additionally, new ARSGs with various payment methods are now available, such as the Microsoft HoloLens 2 and Magic Leap 2 **Palumbo (2022)**. Therefore, we believe that identifying different factors related to the acceptance of ARSG can help future researchers develop new acceptance models for next-generation smart glasses, thereby helping designers improve their capabilities, functionality, usability, and effectiveness.

Augmented Reality and Smart Glasses

The way we view and experience the world will be changed by augmented reality. Azuma defined augmented reality as modifying the user's real environment by superimposing it with virtual elements, i. e. , images, video, text, 3D objects, and sound. The fact that real and virtual worlds coexist in real-time was included in the definitions.,**Rauschnabel et al. (2022)** defined AR as

 "A *hybrid experience consisting of context-specific virtual content that is merged into a user's real-time perception of the physical environment through computing devices*".

AR has unique benefits compared to other digital technologies. These include creating blended learning experiences that combine digital and physical materials and embodiments of abstract concepts. In addition, other payoffs include providing educational content from a 3D perspective, encouraging students to be present, present, understanding, and invisible. Studies in various fields such as business, medicine, entertainment, and education have shown that the use of AR brings many advantages and benefits to users **Vizcarra et al. (2023)**. For example, AR in education has been shown to promote better learning outcomes, increase student motivation and engagement **SÂrakaya (2022)**, improve business skills (e.g. visual perception, assembly) Chang et al. (2023), and improve computational thinking. In the field of medical education, research shows that AR provides an overview of content, location, reality and simulated learning. In patient education, AR has a positive effect on knowledge retention and patient satisfaction. In terms of entertainment, AR games are used to promote positive emotions such as happiness, fun and curiosity, to improve student behavior, satisfaction and success, and also to help young people build strong interpersonal relationships and develop thinking. In recent years, especially thanks to innovations in telecommunications (such as 5G) and technological devices such as smartphones and tablets, the use of AR has become widespread among users. However, viewing AR on the screens of these mobile devices has a limited interaction experience. ARSG is a practical device that includes devices or projects that present digital information to the user's view of the real world **Semmann (2023).** They use sensors and cameras to track the user's movements and surroundings and present information, images or virtual objects on the user's watch face.Compared to mobile devices, these glasses provide a greater immersive experience, which is related to two categories ofstimuli:

 (a) sensory (i.e., visual displays, auditorymodalities, haptic interfaces, and movement tracking) and

(b) perpetual(i.e., interactivity, representation fidelity, imagination, haptic imagery,perceived sense of self-location, media richness, and perceived usability).

Additionally, research on payments for wearable devices (e.g. Google Glass and Oculus Fit) identified 14 revenues. These include Freehand and Shantanu (2023). Many researchers in the fields of information and social psychology have proposed and developed models and theories to explain and predict people's thoughts and behaviors regarding using and adopting technology. Below is a brief introduction to the main forms of the current literature review. TRA proposes that attitudes and attitudes toward behavior are important determinants of an individual's intention to engage in a particular behavior. Attitudes are defined as the good or bad feelings that a "person" has toward performing a behavior, while norms are defined as the majority of people's opinions that a behavior should or should not be performed, which are important to "him". The behavior in question was expanded to the TPB to include the behavioral control (PBC) variable. Criticisms that the TAM was too simplistic led to the continuation and development of the Technology Acceptance Model 2 (TAM 2) and Technology Acceptance Model 3 (TAM 3), which show the relationship. In TAM 2, PEOU and emotions are "influenced by social influence processes (norms, voluntariness, and image) and cognitive processes (interference with performance, product quality, and perceived ease of use) personal computer use, visual control. externalities, computer stress, computer games, perceived

enjoyment, and objective validity. **Singh et al (2022)**. More specifically, in this new model, behavior is influenced by the relationship between PU and PEOU of TAM and **Rogers (1995)** innovation. The latter is defined as - the extent to which the innovation meets the values, needs, and experiences of potential customers. Learning styles are influenced by peers and positive attitudes. Behavioral control is also influenced by self-efficacy, that is, the user's confidence in the technology, and supporting factors (e.g., the primary purpose in the environment that can help the consumer). Another theory, Church Acceptance and Use of Technology (UTAUT), borrows changes from eight theories and models. There are four direct measures of intention to use this technology and four moderators of the above variables (e.g. gender, age, knowledge, voluntary use).Performance expectancy is defined as

"The degree to which an individual believes that using the system will help him or her to attain gains in the job"

Shamali (2020)

According to UTAUT, the use of behavior is influenced by the motivation and motivation for the behavior. Behavioral goals are in turn influenced by performance expectations, effort expectations, and social influences. For caregivers, gender influences performance, expected effort, and social influence. Performance is related to age, job opportunities, social influence, and assistance. Knowledge is related to hope, social influence, and assistance. Finally, voluntariness of use is defined as the use of an innovation is viewed as voluntary or free of charges, and hedonic motivation is related to the satisfaction or fulfillment of the technology use, behavior. Price describes the amount of money the customer must have to purchase the device. According to this theory, age, gender, and experience affect hedonic motivations, attitudes, performance, expectations, and social influences on behavior patterns. Age and gender moderate the effect on the value of emotional behavior and the effect on the ease of behavior. For example, in education, these reviews focus on the impact of educational tools, methods, and theoretical methods used by researchers, the topics on which wearable materials are used, and the type of materials used **Chu et al. (2022)**. There is also an analysis focusing on how wearable devices and devices can be used in healthcare to improve the quality of life of people with disabilities or conditions such as dementia and Parkinson's, and to collect patient information from health. Clinical case Santos et al. There are also reviews of specific products, smart glasses, devices, processes, sensors, and data visualization, processing, and transmission with smart glasses in general. There are three reviews related to its claim. **Shin et al. (2021)** examined data from 463 studies on clothing. This topic focuses on the audience's work experience (analysis), healthcare (patient care and environmental health), consumption behavior health (behavior change), personal data collection (important personal data), security, and health concerns. However, this review focuses on a specific device. **Niknejad et al. (2020)** provides a comprehensive review of wearable devices, including ARSG. There are no studies that examine the acceptability of ARSG. Given that the purpose of this study is to examine the validity of ARSG, this subsection focuses on the last two analyses. in his article but did not mention the process he followed while examining the data. Its purpose is to collect acceptance patterns or opinions received by researchers and to identify factors influencing the acceptance of technologies including ARSG.

(1) perceived benefits,
(2) technological characteristics,
(3) individual characteristics,
(4) social factors, and
(5) perceived risks.

However, he said that it is important to remember that the conditions listed do not apply to all wearable devices. This happens for two reasons. First, wearable devices are different from each other, and second, consumers perceive them differently. For example, smart glasses and smart clothes will be seen by consumers as fashion rather than technology. Therefore, consumers have different perceptions of different products, and there are many factors that affect their acceptance. **Shawn (2020)** reviewed 244 studies on the use of smart wearable devices from 2010 to 2019 in their literature review and found that 58 of them were related to the intention to adopt or use this technology. The researchers highlighted 38 factors that influence the acceptance or use of smart wearable devices.Among them, thefollowing four factors that affect the intention are mentioned as the bestpredictors of the acceptance of smart wearable technologies:

(1)perceived usefulness,
(2) attitude towards technology,
(3) social influence, and
(4) privacy concern.

The best determinants also include perceived usefulness (affecting behavior) and perceived ease of use (affecting perceived usefulness). The above characteristics are measured within the framework of accepted models and theories such as Technology Acceptance Model (TAM), Diffusion of Innovations Theory (DOI). Whether the above-mentioned acceptance criteria or assumptions have been proven to be reliable in achieving the research objectives

stated in this review, respectively, as **Niknejad et al(2020)**, the assessment of user acceptance and opinion as smart Wearable devices should be done in a unified and accepted method. First, the factors affecting the adoption or use of smart devices do not necessarily affect the adoption or use of ARSGs. Second, there is no specific model or theory to explain the willingness or acceptance of using smart glasses. Therefore, the information regarding the factors affecting the acceptance or use of ARSG should be filled in independently. This information is considered important as it will provide the necessary information for researchers to develop a recognition model specific to ARSG in different fields.

Objective of study

The main objective of study is evaluate factors influencing the acceptance of ARGS and application of artificial intelligence in the same.

Process of Study

This present study is based on the assessment of acceptance for ARSGs and the impact of Artificial Intelligence on the same. The time line of the study is 2010 to 2023. For this the researcher has followed a trail of research papers and writeups available on various online and offline database related to the point in question. The initial inception of Smart glasses has taken place in 2010 in USA and first pair released in 2013 for open market (google glasses) and from that point of time many changes and developments have taken place, considering this as base line researcher has touched the literature available till 2023.

The basic keywords used in the present study were:
- Acceptance model
- Augmented reality smart glasses (ARSG)
- Google Glass
- AR Glass
- Artificial Intelligence and many other related components.

It is a well-known fact the research is mostly limited in the area of ARGS, hence the reference is taken from journals of national and international repute, conference & seminar papers and even some of the book chapter published in this regard. Researcher observed that some of the pervious researchers have also adopted the same methodology to reach adjacent findings, like **Till et al (2022); Wou et al (2023)** and many others. Then the researcher has imposed some of the basic restrictions on the selection of papers, book chapters, etc. some of such restrictions are:
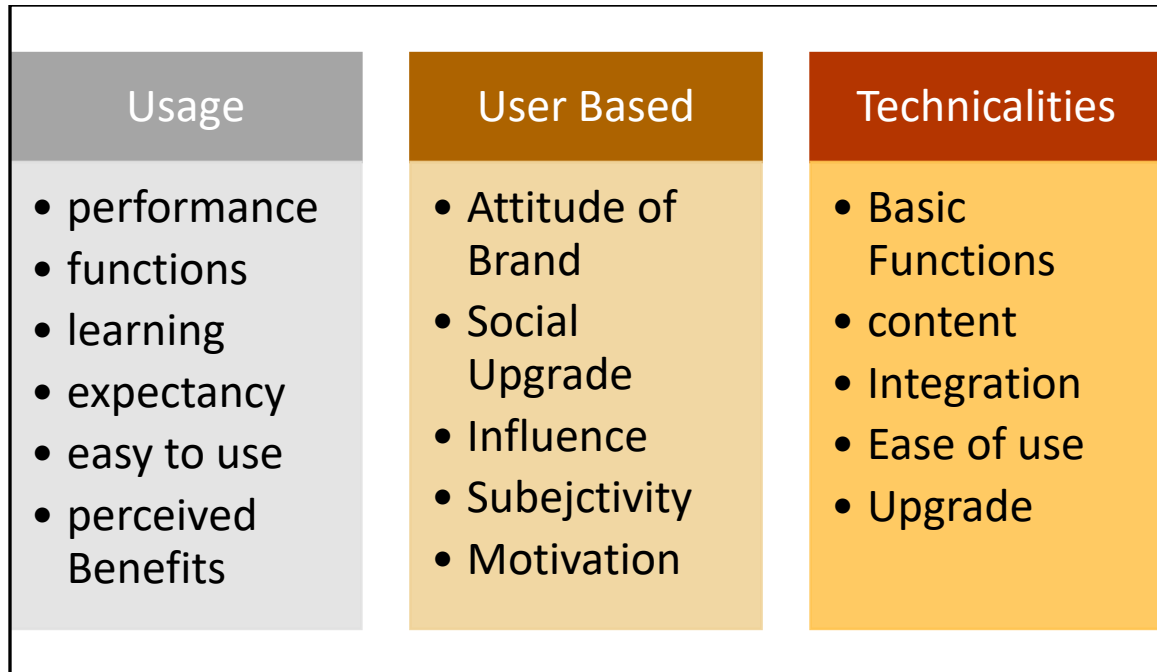- Minimum assessment should be regarding ARGS and evolution of the same.
- Minimum time period assessed should be around 10 years, Specifically 2010 to 2020
- The article should be in English
- It should contain some empirical data and assessment of the same
- Summary, abstracts, same author, etc. were not considered for the assessment.

Total 43 articles, research papers and book chapters were included in the study, at the initial level the number of such papers was around 72, but after detailed screening some of them were excluded from the list and remaining were assessed on the basis of their merit. The researcher has coded the articles on the basis of keywords, date of publication, country of origin, and relevance to the point in question.

For some of the cases, researcher has considered the out of bound papers as well i.e. papers related to early inception of ARGS, background of study based on military application and even some of the student papers based that are based on current developments, but still the authentication of the same has been checked.

Broad outputs of the study

1. On the basis of studies evaluated from 2015 to 2022 it was found that there are four basic fields of application and usage of ARGS, the same are explained below:
a. The first usage was found for the users of ARGS and it was established that these users are using the glasses for surfing internet, playing games and even shooting videos.
b. Then the second category contained the educational application of ARGS, where many school, colleges, higher education institutions are using the ARGS for educational purposes i.e. for subjects like mathematics, physics, electronics, etc.
c. Then for the medical education and practical application of the same in referencing and contemplating the complexities of the medical procedures.
d. Then on other hand fourth category included the differentiated usage of ARGS, like sports, tourism, museums, historical places, etc.

Usage	User Based	Technicalities
• performance • functions • learning • expectancy • easy to use • perceived Benefits	• Attitude of Brand • Social Upgrade • Influence • Subejctivity • Motivation	• Basic Functions • content • Integration • Ease of use • Upgrade

Figure 1: Factors Responsible for Acceptance of ARGS

2. Then on the other hand it was also found that the researchers in the past have focused on the assessment of various theories, models, modifications and even the current modulations. These models are based on the acceptance, adoption, usage, etc. for the ARGS. This is not an old concept; the development time lag is somewhere between 2010 to 2023 (first pair of Google glasses hit the market in 2013) and there is a vast scope of development in this area. The only shortcoming that the researcher observed is that the quotient of research is not much, although the scope is very vast for future research. TAM and UTAT models were found to be most common in many of the studies, and most of the studies were from the field of marketing and tourism. Some of the studies were focused on the areas of education and higher education.

3. Then working on the commercial use of smart glasses was also observed, in many of the studies the researcher have considered the sample from the education institutions, universities, schools, etc. then in some of the cases the samples were considered from the sample units of students and teacher (separately and combined). It was found in the process that the companies are using all the avenues to sell the glasses like malls, virtual meetings, etc. in some of the cases the researcher also got involved and observed the procedure very closely.

4. Then in some of the consumer/user-based studies it was found that most of the researcher have conducted quantitative studies and some of them carried out qualitative studies as well. The outcomes of the studies were positive enough to provide a green light to the usage, adoption and acceptance of ARGS for the common users in the market. Also it was found in the process that the observed benefits of ARGS were more than the stated limitation.

Artificial Intelligence and ARGS

Artificial Intelligence (AI) and Augmented Reality (AR) are two technologies that have the potential to improve human-machine interaction in the Metaverse. Together, these technologies create meaningful and interactive experiences for users, allowing them to interact with virtual objects and characters in a natural and emotional way. AI and AR can improve human-computer interaction by using language design and speech recognition.**Parket al (2021)**This allows users to communicate with virtual characters and objects using voice commands or questions. For example, users can ask the virtual assistant to help them find a specific place in the virtual world or perform a specific task, and the assistant uses language processing to understand the user's speech request and complete it using existing knowledge of the virtual world.**Wang et al (2021)** To improve human-computer interaction using machine learning algorithms, the virtual environment can be modified to provide users with a personalized experience.

For example, AI systems can use machine learning algorithms to analyze user behavior and then customize the virtual environment to provide a more personalized experience. Information that guides users in a virtual environment.**Bouachir(2022); Ananya et al (2022)** For example, AR-enabled devices can display a map of the

virtual world or virtual objects and landmarks, making it easier for users to find their way. With the ability of AI and reality to create a better understanding and engagement with the virtual experience in the virtual world, users will be able to interact well and intuitively with characters and equipment. More research is needed to fulfill the promise of these technologies and overcome the many challenges and limitations they currently face.

Conclusion

This present study tried to go back in the recent past and collect information about the characteristics, features, usage, adoption and acceptance of ARGS and impact of Ai implementation in the same. The study shows that the history of ARGS is not very old i.e. the first model of ARGS was introduced in 2010 and launched in the market in 2013. As a limitation only a few studies are available on the origin and development of ARGS and even less are available on quantitative and qualitative aspects of consumers and final users. ARSGs are an emerging trend that represents a dynamic and rapidly changing field. This review is timely as new ARSG devices are expected to appear on the market and their sales will increase. The main contribution of this review is that it fills an existing gap in research on the adoption of ARSGs, as it is one of the first to address their adoption or use. It provides a comprehensive overview of ARSG adoption by highlighting key research topics in the field. Academic researchers could benefit from the findings and implications of this review as there are existing limitations and gaps.

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