Impact of Augmented Reality on Consumers' Behavioral Intention to Use Mobile Apps in Retail

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ABSTRACT

Augmented reality (AR) represents a ground breaking and momentous technological advancement within the retail sector, with the potential to expand the assortment of purchasing choices accessible to clientele. The impact that augmented reality applications might exert on the perceptions of users is a subject that continues to generate debate. Based on the technological acceptability paradigm, the current investigation seeks to assess the influence of mobile augmented reality applications on consumers' intentions to acquire and employ associated technologies. In all, 160 client contributions were received. In order to analyse the route links, PLS-SEM, or partial least squares structural equation modelling, was implemented. The study participants' viewpoints and experiences were assessed through an examination of the direct and indirect consequences of utilising the augmented reality mobile application. The outcomes demonstrate that augmented reality improves both the perception of usability and enjoyment. The relationship between augmented reality and behavioural objectives is mediated by positive effect, whereas the relationship between augmented reality and perceived convenience of use is not mediated by negative effect.

KEYWORDS- Augmented Reality, Consumer behavior, Retail, Mobile Apps.

INTRODUCTION

Augmented reality is the use of computer-generated visual overlays, such as images and videos, to represent virtual objects. This technical advancement is more recent. One can perceive the actual world through the application of highly sophisticated technological devices, including computers, smartphones, tablets, projectors, smart glasses, and 3D, 4D, and 5D displays [1, 2, 3]. As a consequence, individuals exhibit a greater propensity to engage with virtual objects in physical environments [4, 5]. Numerous organisations across various sectors—including education and healthcare, marketing, retail, oil and gas, and education—are actively endorsing and incorporating augmented reality into their existing product lines [6, 7]. Augmented reality empowers users to interact directly with virtual objects that are situated in the physical environment, thereby enriching their sensory encounters [8]. Venture capitalists and software developers have been prompted to prioritise augmented reality due to the proliferation of smartphones and other electronic devices [9]. [3] Assert that augmented reality is rapidly transitioning from experimental settings to the broader consumer market. Furthermore, it was acknowledged by the retail industry that the integration of augmented reality could augment consumers' in-store purchasing experiences, leading to heightened levels of product engagement and revenue. Prominent e-commerce sites including Burberry, Timberland, Ray-Ban, Sephora, Panasonic, and Topshop have set an industry standard through the implementation of augmented reality mobile modules. Customers' purchasing intentions are dynamically altered by augmented reality, according to research [1, 2] [10, 11]. [12] Assert that augmented reality is critical to the future expansion of the retail sector. However, a scarcity of scholarly investigations persists regarding the effects of augmented reality applications on users' behavioural intentions. Limited theoretical research has been devoted to assessing the commercial implications and variables of augmented reality. For the direction of technological research projects, the model of technology adoption, which is regarded as "the most influential and widely applied theory of information systems," was selected. [13]. Using the technological acceptability model, this study investigates the factors that influence prospective consumer acceptance of augmented reality. The primary objective of this research is to determine whether perceived enjoyment and simplicity of use mediate the relationship between customer behaviour and intentions to utilise augmented reality smartphone applications. Due to the scarcity of academic literature pertaining to this particular study context, a cross-sectional study is conducted utilising individual data acquisition from retail consumers in India. This study endeavours to address the knowledge voids arising from the introduction of augmented reality mobile applications in Indian retail marketplaces through the implementation of an acceptability analysis. The

current research suggests that the integration of augmented reality applications into conventional approaches for obtaining product knowledge, collecting user data, and enhancing customer experience is revolutionised through the utilisation of a real-time virtual representation of the brand outlet. The introduction of the research paper presents a comprehensive examination of the technical acceptance model, along with a synopsis of the philosophical and theoretical underpinnings of augmented reality. In the second segment, a conceptual framework for analysing the impact of augmented reality on the behavioural intentions of consumers is presented. Third, the methodology discusses the methods and tools used in analysis. The fourth portion deals with study results. The conclusion, theoretical and applied ramifications, constraints, and suggestions for further study are all included in the last part.

Theoretical background and Hypothesis Development

Augmented reality

A special set of interactive technology developments known as augmented reality integrates virtual items into the physical environment. There is an increasing inclination among users to engage with virtual objects [14]. The computer-generated virtual objects are presented via video, photographs, visual overlays, and textual information utilising augmented reality. Users are able to view, listen to, and read content in a physical environment. People are able to simultaneously experience "the real and virtual worlds" by utilising electronic devices such as headgear, tablets, smartphones, projectors, and immovable interactive displays [10]. Three characteristics define augmented reality, according to [15] [16]: first, It serves to merge the physical and digital realms; second, it provides users with a dynamic "novel experience" that aids in decision-making; and third, it provides a dynamic "novel experience." Second, augmented reality provides an engaging experience because it is "interactive" in real-time. Moreover, subsequent to augmented reality is a three-dimensional simulation that provides a "vivid visual" experience. The augmented reality technology is not novel. Morton Heilig introduced the term "Sensorama" to the field of cinematography in 1950 [17, 18, 19]. Prior to the recent advancements in software and hardware, the limited capacity for technological innovation in smart devices posed a significant obstacle to the widespread implementation of augmented reality [20]. The initial potential of augmented reality to amalgamate dynamic attributes remained unrealized as a result of insufficient financial support, limited accessibility, and inadequate technology integration [21] [22]. In due course, both organisations and consumers will embrace it in an effort to enhance the user experience [16] [23]. An anomalous technological shift can be discerned by comparing the current era to that of the 1990s, during which augmented reality first emerged [16]. Research has demonstrated that technological innovation yields substantial time and cost savings. The two fundamental components of augmented reality are portability and mobility [22]. Augmented reality may eventually enable users to interact with the digital components of their surroundings [24]. Augmented reality technology has garnered increased support and attention from the manufacturing, services, and retail sectors. This investigation seeks to gain a deeper understanding of two aspects of augmented reality: (a) An advancement in augmented reality that integrates the virtual and physical domains through the use of user-specific data, and (b) The term "vibrant augmented reality" denotes the ability to visualise a virtual object in the real world with precision and depth. A concise examination of vividness and originality is provided in the subsequent sections.

Augmented reality vividness

Vibrantness is defined by [16] [11] is the capacity of technology to generate a multimodal mediated experience. By integrating the visual experience of the virtual object with the physical environment, clients are presented with an accurate representation of the object's appearance [25]. Vivid depictions of physical objects are conveyed through the use of a variety of digital media, including text, videos, images, and visualisations [26]. It influences the behavioural intentions of consumers regarding the physical and experiential attributes of a brand. Excellence in brand virtual display and "aesthetic appeal" are often correlated with vibrancy [11]. From the perspective of technical intervention, vividness is characterised as the ability to enhance and furnish accurate data regarding visual effects [16]. It enhances the visual representation of the digital product. The utilisation of vibration enables users to envision an unparalleled product experience while contemplating the augmented reality engagement method. Customer recall of the product feature would be enhanced [27]. Augmented reality capabilities are utilised to provide customers with a comprehensive, succinct, and

transparent product presentation, thereby facilitating their understanding of the product's features [16]. Furthermore, the way in which virtual products are showcased in physical environments significantly impacts consumers' perceptions of emerging technologies [11], [28].

Augmented reality novelty

Augmented reality (AR) offers consumers a unique visual depiction of virtual objects through the integration of the physical and digital realms [16], [29]. Mobile augmented reality applications offer novel opportunities for engagement, diversity, and expansion [30]. When discussing novelty, the 'newness' of augmented reality components is not addressed in this context. Conversely, novelty refers to information or stimuli that are tailored to the specific needs of each person, while also being distinctive, instantaneous, inventive, and dynamic through Installation of augmented reality technology [11]. An innovation in augmented reality occurs when individuals focus on a novel, distinct, dynamic, and original object or experience, as stated by [18]. According to [29], originality is the synthesis of uncommon and distinct stimuli. Augmented reality technology-based presentations of virtual products via text, images, or videos may be regarded as an innovative approach [10]. Utilising AR devices, users are able to interface with virtual objects in the real world. [31] as well as [3] posit that virtual content provides a compelling synopsis of augmented reality applications, enabling users to perceive the potential appearance of a wearable device on their own person. Thus, the content becomes exceptionally personalised and distinct. Furthermore, augmented reality applications empower users to customise content according to their individual preferences and areas of interest. Augmented reality applications have the capability to replicate in a virtual environment each tangible feature of a product [32]. Customer visual experiences with products are more likely to be enhanced by the distinctive attributes of interactive augmented reality technology, enabling them to accomplish their purchasing objectives more efficiently and expeditiously [3] [11]. The incorporation of a product code scanning or selecting option enhances consumer engagement on Amazon and other augmented reality platforms by furnishing additional details pertaining to virtual merchandise [33]. Additionally, the article examines online evaluations that are tailored to smart devices and permit users to modify the colour and size of the product. This alteration primarily impacts individuals' perception of the user-friendliness of the state-of-the-art technological innovation [34]. To surmount this challenge, the subsequent hypotheses are scrutinised.

H1: One discernible consequence of augmented reality was an increase in individuals' level of enjoyment.

H2: Augmented reality had a substantial influence on the perception of usage.

Technology acceptance model

The technology acceptance model (TAM) generates forecasts regarding the adoption and utilisation patterns of emerging technologies by individuals. A user's desire to utilise a system that doesn't involve any effort is interpreted by TAM. The degree to which businesses adopt and utilise new IT systems is substantially influenced by the perception of their user-friendliness. TAM has been acknowledged as an effective tool for evaluating workplace adoption of the most recent IT solutions. The writers who have used it to anticipate the adoption of new information systems have gotten significant empirical support for it [35, 3, 36, 37, 38]. As to the TAM measurement and validation procedures, a number of authors have expressed scepticism. Furthermore, the extensive application of TAM in management and social scientific research has led to inconsistent, perplexing, and highly divergent results regarding statistical significance, magnitude, and direction [39]. The "most frequently reported limitation" was the utilisation of self-developed assessment instruments in particular [13]. Conversely, a positive correlation has been observed between self-reported consumption and self-reported constructs [35]. The validity and reliability of technical domains are established by absolute measurement procedures [40] [3]. Considerable scholarly investigation has been dedicated to bridging the existing theoretical voids and projecting the correlation between technology adoption management (TAM) structures and technology utilisation [13] [3]. Direct and indirect associations between augmented reality and the propensity to engage in TAM-related conduct are investigated in the present study. The sections that follow provide explanations of TAM constructs.

Perceived enjoyment

Define perceived enjoyment as "the extent to which the act of utilising a computer is considered enjoyable in and of itself, regardless of any potential performance repercussions." In order to predict an individual's inherent proficiency in a novel system or endeavour, their enjoyment threshold is considered. Perceived utility and enjoyment appeared to influence attitudes towards the adoption or utilisation of innovative technologies or systems. The impact of customers' subjective experiences on their perceptions of mobile augmented reality applications is substantial. [41] [11]. Augmented reality applications offer the advantage of facilitating seamless content visualisation on smartphones and delivering realistic purchasing experiences, all while maintaining an intuitive user interface [3] [13]. The ability of customers to interact with virtual products via augmented reality applications was highly appreciated. [11], [13]. It could be entertaining to utilise the most recent augmented reality applications.

H3: The influence of perceived delight on behavioural intention to use is substantial.

Perceived ease of use

According to the paradigm for technology evaluation [35], "Perceived user friendliness" refers to the extent to which a person believes that integrating a specific technological system is an easy and straightforward operation. The anticipation of customers' attitudes towards the adoption of novel technologies or systems is facilitated by the distinctive notion of "perceived ease of use" [35]. "Complexity" and this concept are interchangeable, according to Rogers' "innovation and diffusion theory" (1995). A number of technological advancements have been rejected by consumers due to inadequate user interface design [42]. Consumer-critical attributes of the retailer's augmented reality application include a user-friendly interface featuring transparent navigational structures, a meticulously planned layout, information that is readily updated, streamlined checkout procedures, and an easy-to-use interface [10], [36], [37], [34]. Several factors significantly impact the efficacy of augmented reality applications within the retail sector. These include the entertainment value, the quality of products provided, the navigational simplicity of the website, and the design of the application [2], [16]. The primary objective of this research was to investigate potential correlations between users' evaluations of the efficacy of augmented reality applications and their intentions to employ them [41]. Virtual retailers can more easily model their products using application-based augmented reality to attract consumers, increase sales, and decrease returns [10]. Augmented reality applications have the potential to significantly mitigate the difficulties that arise from the absence of visual inspection, specifically in the context of online purchasing decision-making [43][13].

H4: A noteworthy correlation was identified between the perceived simplicity of use and the intention to use behaviour.

Mediation effect of perceived ease of use and perceived enjoyment between augmented reality and behavioral intention to use

Before examining the potential applications of augmented reality among individuals, [44] considered perceived satisfaction. The integration of user-generated content into a physical environment is made possible by mobile applications capable of augmented reality. Choose a more suitable expression to succinctly summarise the customer's expressed satisfaction. The potential mediating function of perceived enjoyment in the association between behavioural intention to utilise augmented reality and perceived enjoyment was investigated in a study [45]. Academic research has endeavoured to identify the fundamental factors that influence consumers' satisfaction levels with novel technologies or systems in an effort to comprehend consumers' intentions [44, 45, 46, and 47]. The relationship between users' behavioural intention to utilise mobile augmented reality applications and their subjective delight derived from those applications is poorly studied empirically [47]. According to the recommendations, the perceived simplicity of use component of the technological acceptability model is the most significant predictor of customers' intentions to adopt augmented reality [48], [3]. Enhancing augmented reality mobile applications could involve granting users the capability to manipulate nearby objects to access virtual content on their devices and experience it in real time. The enhanced functionality of mobile applications for augmented reality is a result of the increased control that users have over the technology. Moreover, the user's inclination to utilise mobile augmented reality applications may be influenced by the

user's perception of stratification, which could be enhanced through the presentation of visually immersive content that closely resembles the application's physical appearance [49]. Extensive research has been conducted on the technological acceptance paradigm in an effort to ascertain the sentiments of consumers regarding augmented reality mobile applications, as stated by [50]. To determine how retail consumers intend to utilise augmented reality mobile applications, the present study utilised an improved technology adoption model. By implementing the proposed research framework, one can examine the direct and indirect connections that exist among augmented reality, perceived effectiveness, enjoyment, and propensity to utilise technology in a behavioural manner. At present, the existing body of literature lacks comprehensive research on the direct and indirect impacts of augmented reality mobile applications on the intentions of Indian consumers to utilise them in the retail sector. Customers and retailers alike are sceptical regarding the most effective applications of augmented reality due to the fact that it is still in its infancy in the retail sector. In an effort to gain a more comprehensive comprehension of consumer behavioural intention towards utilising augmented reality applications, this research study applied perceived enjoyment and ease of use as mediators between augmented reality and behavioural intention to the TAM model.

H5: The degree of perceived enjoyment mediated the relationship between the desire to utilise augmented reality and the degree of perceived enjoyment.

H6: The ease of use process served as an intermediary between the desired outcome and the genuine intention to utilise augmented reality.

Study framework

By integrating augmented reality research with the technological acceptance model, a framework was established for this inquiry. The development of this model's hypotheses is supported by both theoretical and empirical investigations. In this approach, technological acceptance model structures and augmented reality directly affect consumer behavioral intenion to use.
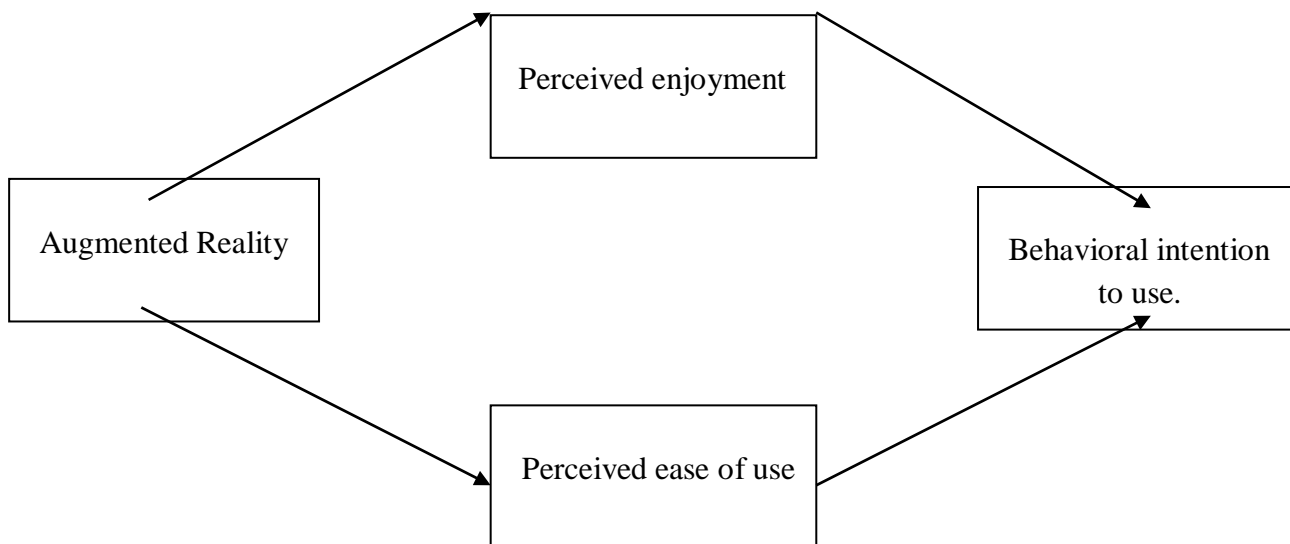
Methodology

Data collection

The information was gathered from Indian clients who had applied augmented reality in the past. An online questionnaire was formed. A Google form was utilized for data collection. Prior to dispatching responses, the investigator verifies that each participant possesses adequate knowledge regarding the novel technology. Aged 18 to 35, the cohort of the study

comprised young adults with an interest in consumer behaviour. In the sample, both masculine and female participants were represented. These individuals were selected for the study due to their advanced computer literacy and ability to understand the significant implications of newly developed system features, including websites and applications. Furthermore, they exhibit a proclivity for embracing or evaluating novel functionalities of technological advancement. The sample for this research comprised 160 individuals from which data were gathered. The table contains information regarding the profile of each participant. The measuring instruments utilised for each construct in this research were those that had been independently validated in prior studies. The participants assessed each component using a five-point Likert scale: five points denoted substantial agreement, while one point indicated substantial disagreement. [11] Delineate that the augmented reality framework is comprised of two fundamental components: novelty and vividness. For enjoyment, [11] Define and elucidate, respectively, the perceived simplicity of use pertaining to three and six items. The behavioural intention to use scale, comprising its five constituent elements, was developed by [individual] [51].

Table 1. Participants profile

Demographic	Frequency	Percent
Gender		
Male	77	48.1
Female	83	51.9
Age (in years)		
18-23	27	16.9
24-29	107	66.9
30-35	26	16.2
Educational Qualification		
Intermediate	-	-
Graduate	66	41.3
Post Graduate	94	58.7

Table 2. Descriptive statistics (n= 160)

Relationship	Sample mean	Standard deviation
AR→PE	0.835	0.071
AR→PEU	0.899	0.050
PE→BI	0.548	0.230
PEU→BI	0.186	0.237
AR→PEU→BI	0.183	0.215
AR→PE→BI	0.457	0.200

Data analysis

In evaluating the data gathered for this inquiry, smart PLS software applications and the partial least squares method of structural equation modelling (PLS-SEM) were utilised. The SEM technique has been widely recognised in various studies for its strong fit and fundamental compatibility with the dataset [52]. Concurrently, two widely recognised methodologies— covariance-based SEM (CB-SEM) and partial least squares (PLS-SEM) are the two principal approaches utilised in SEM. Path confidence is a metric utilised to assess the strength or weakness of a model. In contrast to alternative approaches, Least Potentials Squared Structural Equation Modelling (PLS-SEM) offers a more extensive array of statistical data analysis possibilities to assess the direct and indirect impacts of latent variables [31]. This investigation followed in the footsteps of [52], who established the relative significance of route coefficients, validated theoretical levels, and illustrated the complex interactions between constructs using the PLS-SEM method. The application of PLS SEM ensures and verifies the precision of findings while substantiating hypotheses. Moreover, it is a frequently employed method for forecasting the direct or mediated relationship between elements [52]. The scholars cited in this investigation made extensive use of PLS-SEM to investigate complex or direct relationships between the

variables. Extensive research has been conducted on the effect that technology adoption model components have on the behavioural intention of consumers to utilise technology [48]. PLS can also demonstrate discriminant validity in the absence of sample constraints. Two distinct approaches are utilised by the PLS methodology to estimate the model: an internal measurement model and an external structural model. These techniques illustrate the correlation between latent variables.

Measurement model

This investigation employed four distinct constructs. Behavioural desire to use augmented reality, enjoyment, and simplicity of use are the three determinants. For the purpose of establishing the validity of each of the investigated constructs, a composite reliability (CR) and Cronbach's alpha reliability study was conducted. Utilising the average variance extracted (AVE) method, convergent validity was evaluated. In order to arrive at a final score of 0.946, all factors that exhibited factor loading values exceeding 0.5 were included as components. The AVE value of 0.933 for augmented reality and the Cronbach's alpha value of 0.946 for composite reality are two examples. Upon the loaded value of object AR 3 decreasing to a value below 0.5, it was eliminated from the system. In contrast, the interval encompassing Cronbach's alpha values is 0.875 to 0.940, while the interval corresponding to composite realibility values is 0.924 to 0.953. The loadings for reported enjoyment, behavioural intention to use, and reported convenience of use are all greater than 0.7. Each AVE value surpasses 0.5 as well.

Table 3. Realibility analysis

VARIABLES	ITEMS	FACTOR LOADING	CRONBACH'S ALPHA	COMPOSITE RELIABILITY	AVE
AUGMENTED REALITY (AR)	AR1 AR2 AR4 AR5 AR6 AR7 AR8 AR9 AR10	0.563 0.511 0.815 0.883 0.913 0.905 0.828 0.926 0.896	0.933	0.946	0.669
PERCEIVED EASE OF USE (PEU)	PEU1 PEU2 PEU3 PEU4 PEU5 PEU6	0.779 0.872 0.940 0.874 0.940 0.855	0.940	0.943	0.772
PERCEIVED ENJOYMENT (PE)	PE1 PE2 PE3	0.848 0.917 0.919	0.875	0.924	0.802
BEHAVIORAL INTENTION TO USE (BI)	BI1 BI2 BI3 BI4	0.867 0.879 0.917 0.924	0.919	0.953	0.805

Table 4. Discriminant validity

	AR	BI	PE	PEU
AR	0.818			
BI	0.691	0.897		
PE	0.834	0.773	0.895	
PEU	0.896	0.733	0.880	0.878

Results

Structural model

Following the validation of the measurement model, PLS-SEM was applied to assess the model's prospective applicability to this investigation. The hypothesis are rejected or accepted on the basis of T- value and P- value if the t-value is above 1.96 then we accepted the hypothesis but if t- value is below 1.96 then hypothesis was rejected. The acceptance of a hypothesis is determined by its p-value; if it is less than 0.05, it is considered accepted; otherwise, it is deemed disproven.
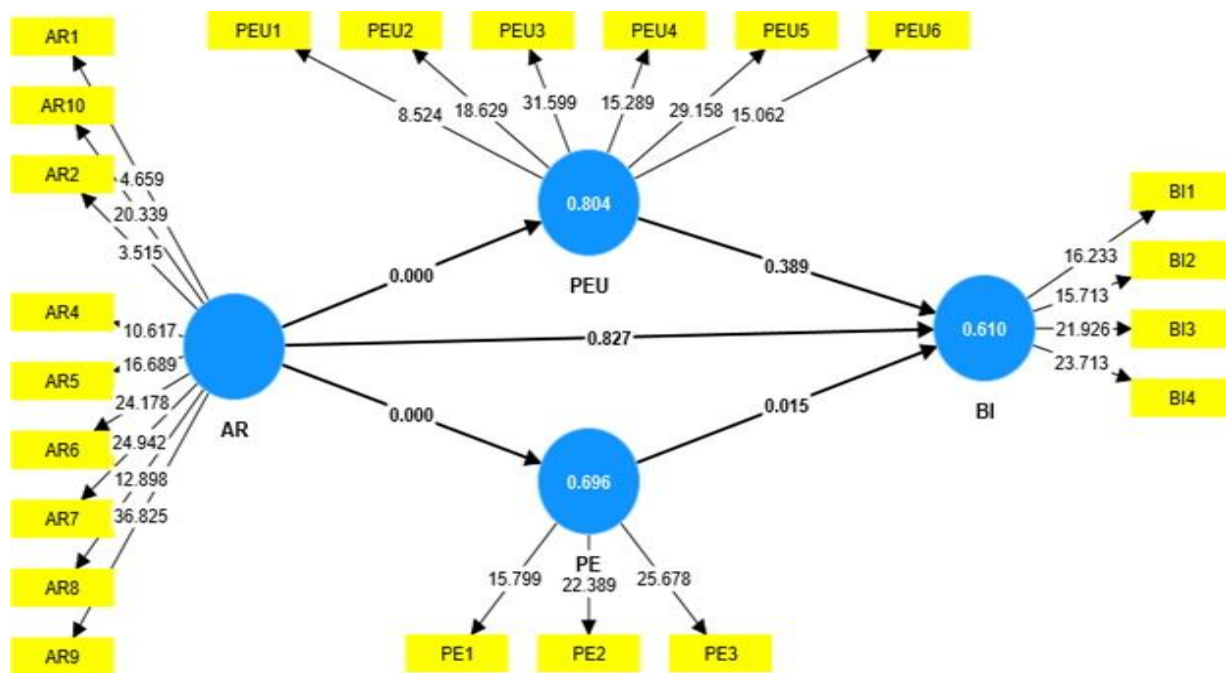
Hypothesis testing

Table 5.

Relationship	T- value	p- value	Results
AR→PE	11.709	0.000	Accepted
AR→PEU	17.878	0.000	Accepted
PE→BI	2.429	0.015	Accepted
PEU→BI	0.862	0.389	Rejected
AR→PEU→BI	0.852	0.394	Rejected
AR→PE→BI	2.332	0.020	Accepted

Findings

The technological acceptability model was utilised in the present study to assess the impact of augmented reality mobile applications on users' intended behaviours. Perceived convenience and enjoyment were employed as mediating variables in order to investigate the correlation between the intention to utilise augmented reality and subsequent behaviour. According to the findings of the research, subjective satisfaction and perceived simplicity of use were both positively correlated with augmented reality. The results of the study align with previous investigations that propose perceived enjoyment as a mediating variable in the propensity to utilise augmented reality [11]. The degree to which individuals

perceive augmented reality to be user-friendly does not substantially influence their inclination to adopt it. The propensity of an individual to utilise mobile applications for augmented reality is contingent upon their perception of the world; this cognitive state influences their actions and their assessment of the applications' utility [54], [55]. The degree to which mobile augmented reality applications are user-friendly is influenced by consumer perceptions regarding functions such as product detail presentation and developer design [11], [54]. [56] Posit that the level of enjoyment experienced may be contingent upon the users' level of understanding and expectations, factors that may differ by region or demographic. The prevalence of product information displayed on augmented reality applications demonstrates that these marketing strategies provide consumers with a wealth of data tailored to their specific preferences and decisions. Nevertheless, such practises are uncommon in the retail sector, especially in developing countries such as India.

Conclusion

In order to provide information about goods and services, augmented reality smart phone applications are being created and put into use. It has a lot of potential to start a new online shopping trend. Retailers, however, find it challenging to stay up with consumers in the online market due to cutting-edge technology advancements. The goal of this study is to offer a fresh viewpoint on how augmented reality mobile apps might increase user desire to use and purchase. The respondents to the survey exhibited a positive disposition towards augmented reality-enabled mobile applications, as well as a behavioural intention and prospective desire to utilise them. To comprehend how customers engage directly with technology, perceived enjoyment has to be further investigated. By utilising either old or new mobile applications to develop augmented reality applications, retailers can highlight the benefits of their products. It will encourage increased sales and trust among consumers. Most essential, businesses need to understand that users find augmented reality technology to be user-friendly. Retailers and app developers want to design a workable procedure so that users may evaluate the usefulness of applications. In a similar vein, this will assist merchants in providing customers with an intuitive smartphone app that offers augmented reality product features.

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