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Understanding Consumer Adoption of Augmented Reality in Online Shopping: An Extended Utaut2 Approach

Srivisagini V., Dr A Selvarasu

Department of Business Administration

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ABSTRACT

Augmented Reality (AR) has emerged as an innovative technology in e-commerce, enabling consumers to visualize and interact with products in immersive online shopping environments. This study examines the factors influencing consumer adoption of AR applications in online shopping using the Unified Theory of Acceptance and Use of Technology (UTAUT2) framework and its extended consumer-oriented constructs. A quantitative research approach was adopted, and data were collected through an online questionnaire using a five-point Likert scale from 75 respondents. The study examined Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Habit, Behavioural Intention, Use Behaviour, and Purchase Intention. Data were analysed using JASP through descriptive statistics, Cronbach's Alpha, correlation analysis, and linear regression. The findings indicate that respondents generally demonstrated moderately positive perceptions toward AR applications, with Performance Expectancy recording the highest mean score. The regression analysis revealed that Effort Expectancy significantly influences Behavioural Intention, indicating that consumers are more likely to adopt AR when the technology is perceived as easy and convenient to use. Further, Behavioural Intention was found to have a significant positive effect on Purchase Intention, while Purchase Intention significantly influenced Use Behaviour. The findings highlight the importance of intuitive and user-friendly AR applications in enhancing consumer acceptance and supporting purchase-related decisions in online shopping. The study provides practical implications for e-commerce retailers and technology developers seeking to improve consumer engagement and adoption of AR-enabled shopping experiences.

Keywords: Augmented Reality (AR), E-commerce, Digital Shopping, Product Visualization UTAUT2, Consumer Behaviour, Purchase Intention

INTRODUCTION

E-commerce has become an indispensable part of global retail. The rapid advancement of e-commerce has significantly transformed the retail landscape, offering consumers the flexibility to shop for products anytime and from anywhere (Susilowati et al., 2023). In addition, Digital Transformation relates to the fourth technological revolution that impacts the companies' way of doing business to stay competitive (Tomcic Furjan et al., 2020). Digital transformation in business is the process of integrating digital technology into all areas of business operations, resulting in fundamental changes in how companies operate and deliver value to customers. With the evolution of e-commerce, digital technologies and increased internet users online shopping has become a new trend. Undoubtedly expanded consumers' choice and access to information, still consumers find ambiguities while shopping online due lack of physically interaction with products. To address this issue, to remain relevant and competitive, companies and brands embraced digital transformation i.e., Augmented Reality (AR). Although AR technology has been researched for a long time (from the 1980s), it has only been implemented in the general population in the last decade (Ghazali et al., 2019).

Augmented Reality (AR) has emerged as transformative technology, continuously reshaping and enhancing online shopping experiences. This AR technology, which enables the coexistence of reality and virtualisation, is primarily involved in gaming, furniture, travel and beauty products (Li et al., 2020; Qin et al., 2021). One of

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the first industries to implement Augmented Reality technology was the gaming industry (van Boom, 2019). It allows for the combination of digital and physical information in real time through different technological formats such as tablets or smartphones to create this new reality (Fombona et al., 2018). This reality has been performed with the use of QR codes, images, 3D models etc. With the increasing reliance on e-commerce platforms, enhanced levels of immersion and interaction help bridge the gap between traditional in-store and online shopping by offering more engaging product experiences.

Major retailors and brand corporations such as Google, Apple, Alibaba, Amazon and Facebook have begun to employ AR technology to attract customers and boost sales (Limongi et al., 2024). The implementation of AR technology provides an alternative to traditional interactions between consumers and service provides (Huang et al., 2023), effectively bridges the experience gap between e-commerce and brick-and-mortar retail. They actively integrate AR services into their business spheres to enhance customer awareness, brand engagement and brand loyalty. Surveys indicate that approximately 75% of consumers expect to experience AR services when shopping online, 71% state that they would shop more frequently if retailers utilized AR, and 40% are willing to pay more for products offered through AR. The AR market is projected to research $50 billion by 2024 [1-2]. Research indicates that brand utilizing AR technology have seen a 2.5-fold increase in sales conversions, emphasizing its effectiveness (Retail Dive, 2025). The adoption of AR technology is especially appealing to Generation Z, a demographic raised in the digital age, characterized by their high engagement with ecommerce, smartphones and social media (Sangal et al., 2020).

Several findings highlight the influence of several constructs from Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). Specifically, performance expectancy users' belief in the technology's utility in comments (Shamsi & Adad,2023). Effort expectancy and facilitating conditions were so relevant, as some users noted challenges. Social influence plays a crucial role: positive user experiences can driver broader adoption, while negative reviews deter engagement (Gunawan et al., 2023; Guo,2024). UTAUT2 provides a robust lens through which to analyse this phenomenon, especially when combined with contextual insights such as frequency of e-commerce usage and social feedback.

LITERATURE REVIEW

Swaharani and Qasthari (2024), examine the role of UTAUT2 and the frequency of e-commerce adopted by Generation Z in determining their intention to purchase using AR virtual try-on shade filters. The findings suggested that the use of AR virtual try-on technology is more likely when the use of e-commerce is more frequent and when the AR technology is more likely to be purchased.

Several retailers implement Augmented Reality (AR) technologies to augment the online shopping experience and assist in making purchasing decisions. GAP created an AR virtual try-on application that enables online customers to see an image of themselves in the garment they want to purchase. Amazon created View in Room, an AR shopping tool, that allows customers to virtually place and arrange multiple items in a room to see how they would look in actual settings. IKEA created IKEA Place to assist customers in deciding the size, colour, and style of their furniture and home décor by visualizing what would fit in their rooms. Virtual Artist by Sephora is an AR technology that enables the online customer to conduct a virtual makeup trial to assist in the selection of a cosmetic product. Warby Parker employs AR virtual try-on technology in its mobile application to allow customers to see an image of themselves in the eyewear frame of their choice. AR is a major focus area for large technology companies like Google, Apple, and Meta. The depth of focus for these companies is particularly on the research and development of AR, as they work to augment and accelerate the use of AR technologies in retail (Gyroscope, 2023).

In 2024, Dağ, Çavuşoğlu and Aslan investigated the intention to engage with AR/VR technologies and their adoption by medical students in Türkiye, using the UTAUT model. According to their findings, the more students believe that the use of AR/VR technologies will help them in their work (performance expectancy), the easier the technologies will be (effort expectancy), and the more socially supportive the environment will be (social influence), the more AR/VR technologies they will be likely to use. Thus, the UTAUT model is applicable in this context.

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The Unified Theory of Acceptance and Use of Technology (UTAUT) is a model for assessing acceptance and use of technology developed by Viswanath Venkatesh, et al. (2003). It is a synthesis of widely used models of technology acceptance. UTAUT offers four key components of technology acceptance: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. The first three constructs affect users' Behavioural Intention and the last construct impacting Actual Technology Use. Compared with earlier technology acceptance models, the UTAUT had greater success at forecasting behavioural intention and the actual use of technology (Venkatesh et al., 2003; Lu et al., 2009). The original UTAUT model's construction was largely focused on the Employee Technology Adoption model within an organizational setting. Recognizing the impact and relevance of consumer technologies, Venkatesh, et al. (2012), expanded the UTAUT model and introduced UTAUT2, targeting the domain of consumer technology. The original UTAUT model's four constructs were retained and three additional components were added: Hedonic Motivation, Price Value, and Habit. UTAUT2, given the placement of additional components, aimed to address the technology adoption and usage behaviour of consumers in the non-structured, non-organizational domain. This revision of UTAUT2 recognized that in various contexts, different factors and constructs can impact technology acceptance and usage.

According to Zaheer (2024), the use of AR technologies in retail will allow consumers to virtually try on products and view them in the real world, helping consumers make purchase decisions, reducing purchase uncertainty, and decreasing the likelihood of product returns. Zaheer predicts AR will revolutionize retail consumer engagement and personalization while providing a competitive advantage.

METHODOLOGY AND DATA COLLECTION

This survey adopted a quantitative approach to understand adoption of AR technology, to identify the factors impacting user behavioural intentions, usage behaviour, and purchasing intention. The research framework is grounded into the existing theory, the Unified Theory of Acceptance and Use of Technology (UTAUT) and its additional constructs.

The main research was conducted through an online questionnaire, the questionnaire comprised of two sections one captured demographics and another UTAUT2 constructs. The principal variables of the study were Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Hedonic Motivation (HM), Habit (HT), Behavioural Intention (BI), Usage Behaviour (UB), and Purchase Intention (PI). A five-point Likert scale was used to measure responses, where 1 coded for Strongly Disagree and 5 for Strongly Agree. The questionnaire was distributed in social media and students' groups for better accessibility. A non-probability convenience sampling technique was adopted for the study. Data were collected from 60 -80 respondents.

Data were analysed using JASP software to check completeness and for statistical analysis. Descriptive statistics to summarize demographic information and perceptions of respondents. Cronbach's Alpha to check reliability. To analyse relationships among the constructs, correlation analysis was conducted. For assessing the strong relationships between the independent and dependent constructs, Pearson's correlation was applied. For the dependent variables, Behaviour Intention, Use Behaviour, and Purchase Intention, linear regression was also applied to assess the impact of independent variables. Using regression, the extent to which the UTAUT constructs clarify the intentions of users and their actual use behaviour. The results provided an evidence-based assessment of the acceptance and adoption of augmented reality and the influence it has on the purchasing decisions of consumers.

RESULTS AND INTERPRETATION

Frequency and Percentage Analysis

A demographic analysis of 75 respondents was conducted to examine their profiles and online shopping behaviour. The results show that 84.0% of respondents were aged 21–30 years, indicating that young adults are the primary users of AR-enabled online shopping platforms. Female respondents comprised 62.7% of the

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sample, while male respondents accounted for 37.3%. Most of the respondents held postgraduate degrees 62.7%, followed by undergraduates 33.3%, indicating a highly educated sample. Private-sector employees constituted the largest occupational group 57.3%, with 26.7% being self-employed and 77.3% of respondents reported an annual income below ₹1,00,000. The analysis of online shopping behaviour showed that 41.3% of respondents rarely buy products online, and 32.0% do so occasionally. Fashion and accessories were the most favoured product category at 41.3%, with cosmetics and beauty products coming in second at 25.3%. Amazon - 45.3 % and Flipkart - 42.7% were found to be the most commonly used shopping platforms.

The findings also indicate that respondents had a moderate to high level of AR awareness, with 41.3% reporting a level of 4 and 20.0% reporting the highest level of 5. And 58.7% of respondents had used AR technology before, while 41.3% had not.

Descriptive Statistics

Construct	Mean	Standard Deviation
Performance Expectancy (PE)	3.507	0.696
Effort Expectancy (EE)	3.467	0.662
Social Influence (SI)	3.142	0.754
Facilitating Conditions (FC)	3.391	0.711
Habit (HT)	3.329	0.663
Hedonic Motivation (HM)	3.422	0.687
Behavioural Intention (BI)	3.302	0.635
Use Behaviour (UB)	3.293	0.747
Purchase Intention (PI)	3.298	0.650

Descriptive statistics were used to examine the mean and standard deviation of the UTAUT constructs. The descriptive statistics indicate that all constructs recorded mean values above the midpoint value of 3.00, suggesting a generally positive perception of Augmented Reality (AR) applications among respondents.

Performance Expectancy (PE) recorded the highest mean score (M = 3.507, SD = 0.696), indicating that respondents believe AR technology enhances shopping effectiveness and improves decision-making. Effort Expectancy (EE) obtained a (M = 3.467, SD = 0.662), suggesting that respondents perceive AR applications as relatively easy to learn and use. Hedonic Motivation (HM) showed a mean score of 3.422 (SD = 0.687), indicating that users find AR applications enjoyable and entertaining during online shopping. Facilitating Conditions (FC) reported a mean value of 3.391 (SD = 0.711), implying that respondents feel adequate resources and support are available for using AR technology. Habit (HT) recorded a mean score of 3.329 (SD = 0.663), suggesting a moderate tendency among respondents to use AR applications as part of their routine online shopping activities. Behavioural Intention (BI) and Purchase Intention (PI) reported mean values of 3.302 and 3.298, respectively, indicating a moderate willingness to use AR technology and make purchases through AR-enabled platforms. Use Behaviour (UB) obtained a mean score of 3.293 (SD = 0.747), reflecting a moderate level of actual AR usage among respondents. Social Influence (SI) recorded the lowest mean score (M = 3.142, SD = 0.754), indicating that recommendations and opinions from friends, family, or peers have a comparatively lower influence on AR adoption.

Overall, the findings reveal that respondents show a moderately positive attitude toward AR applications in online shopping. Performance Expectancy emerged as the strongest construct, while Social Influence was comparatively weaker. The mean values above 3.00 across all constructs indicate favourable perceptions.

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The standard deviation values range from 0.635 to 0.754, indicating moderate variability in responses and suggesting that respondents generally share similar perceptions regarding the use of AR technology.

Reliability Analysis

Cronbach's Alpha was used to assess the internal consistency of the UTAUT constructs. Analysts frequently use 0.7 as a benchmark value for Cronbach's alpha. At this level and higher, the items are sufficiently consistent to indicate the measure is reliable

Construct	**Cronbach's Alpha**
Performance Expectancy (PE)	0.765
Effort Expectancy (EE)	0.589
Social Influence (SI)	0.752
Facilitating Conditions (FC)	0.662
Hedonic Motivation (HM)	0.747
Habit (HT)	0.714
Behavioural Intention (BI)	0.643
Use Behaviour (UB)	0.766
Purchase Intention (PI)	0.759

The reliability analysis shows that all nine UTAUT constructs range between acceptable to good internal consistency, with Cronbach's Alpha values. Performance Expectancy (PE) recorded a Cronbach's Alpha value of 0.765, indicating good internal consistency and the scale is reliable. Effort Expectancy (EE) obtained a Cronbach's Alpha value of 0.589, which is below the recommended threshold, it is considered as questionable acceptance. Since all constructs meet or are very close to the minimum acceptable threshold, the measurement scales are considered sufficiently reliable for conducting correlation and regression analyses. Therefore, the questionnaire is deemed reliable for examining the factors influencing behavioural intention, use behaviour, and purchase intention toward AR applications

Linear Regression Analysis

Model Summary - Mean of BI

Model	R	R^2	Adjusted R^2	RMSE	R^2 Change	df1	df2	p
M_0	0.000	0.000	0.000	0.635	0.000	0	74	
M_1	0.553	0.306	0.245	0.552	0.306	6	68	< .001

Note. M_1 includes Mean of PE, Mean of EE, Mean of SI, Mean of FC, Mean of HT, Mean of HM

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M_1	Regression	9.120	6	1.520	4.994	< .001
	Residual	20.70	68	0.304		
	Total	29.82	74			

Note. M_1 includes Mean of PE, Mean of EE, Mean of SI, Mean of FC, Mean of HT, Mean of HM
Note. The intercept model is omitted, as no meaningful information can be shown.

Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p
M_0	(Intercept)	3.302	0.073		45.05	< .001
M_1	(Intercept)	1.098	0.442		2.482	.016
	Mean of PE	−0.105	0.130	−0.115	−0.802	.425
	Mean of EE	0.297	0.119	0.310	2.507	.015
	Mean of SI	0.197	0.114	0.234	1.731	.088
	Mean of FC	0.119	0.103	0.134	1.164	.248
	Mean of HT	0.094	0.147	0.098	0.642	.523
	Mean of HM	0.060	0.147	0.065	0.406	.686

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Impact of UTAUT Constructs on Behavioural Intention (BI)

The regression results indicate that the UTAUT constructs collectively have a significant influence on Behavioural Intention toward AR applications. However, only Effort Expectancy significantly predicts users' intention to use AR technology. This suggests that consumers are more likely to adopt AR applications when they perceive them as easy to learn and use. Therefore, ease of use is the most influential determinant of Behavioural Intention in this study**.**

Model Summary - Mean of PI

Model	R	R^2	Adjusted R^2	RMSE	R^2 Change	df1	df2	p
M_0	0.000	0.000	0.000	0.650	0.000	0	74	
M_1	0.467	0.218	0.207	0.578	0.218	1	73	< .001

Note. M_1 includes Mean of BI

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M_1	Regression	6.811	1	6.811	20.35	< .001
	Residual	24.43	73	0.335		
	Total	31.24	74			

Note. M_1 includes Mean of BI

Note. The intercept model is omitted, as no meaningful information can be shown.

Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p
M_0	(Intercept)	3.298	0.075		43.96	< .001
M_1	(Intercept)	1.720	0.356		4.828	< .001
	Mean of BI	0.478	0.106	0.467	4.511	< .001

Impact of of Behavioural Intention (BI) on Purchase Intention (PI)

The results indicate that Behavioural Intention has a positive and significant effect on Purchase Intention. Consumers who exhibit a stronger intention to use AR technology are more likely to develop purchase intentions toward products offered through AR-enabled shopping platforms. The findings confirm that Behavioural Intention is an important antecedent of Purchase Intention.

Model Summary - Mean of UB

Model	R	R^2	Adjusted R^2	RMSE	R^2 Change	df1	df2	p
M_0	0.000	0.000	0.000	0.747	0.000	0	74	
M_1	0.739	0.546	0.540	0.507	0.546	1	73	< .001

Note. M_1 includes Mean of PI

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M_1	Regression	22.58	1	22.58	87.96	< .001
	Residual	18.74	73	0.257		
	Total	41.32	74			

Note. M_1 includes Mean of PI

Note. The intercept model is omitted, as no meaningful information can be shown.

Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p
M_0	(Intercept)	3.293	0.086		38.17	< .001
M_1	(Intercept)	0.489	0.305		1.607	.112
	Mean of PI	0.850	0.091	0.739	9.378	< .001

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Impact Purchase Intention (PI) on Use Behaviour (UB)

The findings reveal that Purchase Intention has a significant and positive impact on Use Behaviour. The high beta coefficient indicates that respondents with stronger intentions to purchase through AR-enabled platforms are more likely to actively use AR applications. The model explains more than half of the variation in Use Behaviour, demonstrating substantial predictive power.

CONCLUSION

This study explored the factors influencing consumers' adoption and use of Augmented Reality (AR) applications in online shopping using the UTAUT framework. The findings provide valuable insights into how consumers perceive and interact with AR technology during their shopping journey. The results indicate that respondents generally hold positive perceptions toward AR applications, particularly regarding their usefulness and ability to improve the shopping experience. The reliability analysis confirmed that all constructs demonstrated acceptable levels of internal consistency, supporting the validity of the measurement instrument used in this study. The correlation analysis revealed significant positive relationships among most of the study variables, suggesting that favourable perceptions of AR technology are associated with stronger behavioural intentions, increased usage, and higher purchase intentions. These findings highlight the interconnected nature of technology acceptance and consumer decision-making in an AR-enabled shopping environment. The regression analysis further demonstrated that the UTAUT factors collectively influence behavioural intention. Among the examined factors, Effort Expectancy emerged as the most significant predictor, indicating that consumers are more willing to adopt AR applications when they perceive them as simple, convenient, and easy to use. This finding emphasizes the importance of user-friendly AR interfaces in encouraging technology adoption. The study also found that Behavioural Intention significantly influences Purchase Intention, while Purchase Intention has a strong positive effect on Use Behaviour. This suggests that consumers who intend to use AR technology are more likely to develop purchase intentions, which in turn encourage actual usage of AR features during online shopping. These relationships demonstrate the important role of consumer intention in translating technology acceptance into actual behaviour. Overall, the study concludes that AR technology has considerable potential to enhance online shopping experiences and influence consumer purchase decisions. For retailers and e-commerce platforms, the findings underscore the importance of developing intuitive, engaging, and accessible AR applications that can improve customer confidence and interaction with products. By focusing on ease of use and delivering meaningful shopping experiences, businesses can encourage greater adoption of AR technology and strengthen consumer engagement in the digital marketplace. The study contributes to the growing literature on AR adoption and offers practical insights for marketers, technology developers, and online retailers seeking to leverage immersive technologies to create more effective and consumer-centric shopping experiences

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