Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 03, March-2025

Role of Augmented Reality in Enhancing Shopping Experiences

Dr.Lubna Javed Siddiqui
Assistant Professor
IOMR, MGM University
Aurangabad, Maharashtra

Mrs. Sayli Kale
Assistant Professor
IOMR, MGM University
Aurangabad, Maharashtra

ABSTRACT:

Augmented Reality (AR) has significantly transformed the retail industry by changing how consumers interact with products and make purchase decisions. This study explores how AR enhances the shopping experience by bridging the gap between physical and digital worlds. AR offers customers immersive and interactive experiences, allowing them to visualize products in real-time, try items virtually, and access personalized information, ultimately leading to more informed decisions. The paper examines the impact of AR on consumer behavior, highlighting increased engagement, satisfaction, and purchase intent. The research reveals that AR technology boosts the likelihood of purchases, enhances customer satisfaction, and fosters deeper engagement. By creating immersive shopping environments, AR makes it more probable that consumers will purchase products they have interacted with. Retailers can gain a competitive advantage and unlock new opportunities for consumer interaction by effectively utilizing AR technology. The study also identifies the challenges of implementing AR in retail, such as high costs and technological barriers, while recognizing its potential to drive innovation in both e-commerce and physical stores. Additionally, the paper explores how the design thinking approach can be applied to create AR-based services that enhance the in-store customer experience. The study provides valuable insights into how AR influences the retail user experience (UX), impacting customer satisfaction and purchase behavior. Overall, this research offers practical recommendations for leveraging AR to create engaging retail spaces and enhance consumer decision-making, while filling gaps in existing literature on the subject.

Keywords: **Augmented Reality, Consumer Behavior, Retail Experience, Product Visualization, Consumer Engagement.**

INTRODUCTION:

Augmented Reality (AR) is a visualization technology that enhances the real-world experience by overlaying virtual elements in real time. By utilizing advanced AR technology, users can interact with and digitally engage with their surroundings. This technology allows artificial information about the environment and objects to be stored and retrieved as an additional layer over the real-world view. When comparing the spectrum between Virtual Reality (VR), which creates fully immersive, computer-generated environments, and reality, AR remains closer to the real world.

Augmented Reality integrates graphics, sounds, hepatic feedback, and even scent into the natural world as we perceive it. The development of AR is largely driven by the gaming industry and mobile phone advancements. AR systems are designed to overlay graphics from different perspectives while dynamically adjusting to the user's head and eye movements.

An augmented reality system consists of three fundamental components: a head-mounted display, a tracking system, and a mobile computing unit. The ultimate objective of this technology is to seamlessly integrate these components into a compact and portable device, similar to a combination of a high-tech Walkman and a regular pair of eyeglasses. The head-mounted display in an AR system enables users to see overlaid graphics and text generated by the system. Another key component is the tracking and orientation system, which determines the user's position concerning their surroundings while also monitoring their head and eye movements. Additionally, AR systems require highly mobile computers. However, at present, there are limited computers available that can fully support this level of functionality.

GESTURE RECOGNITION:

Augmented Reality (AR) is a revolutionary technology that blends virtual elements with the real world in real time, offering an immersive and interactive experience. By overlaying digital information such as graphics, sounds, and haptic feedback onto physical surroundings, AR enhances user engagement across various domains, particularly in the retail sector.

Gesture recognition, a key component of AR, enables seamless human-computer interaction by interpreting hand movements and facial expressions through advanced mathematical algorithms. This eliminates the need for traditional input devices like keyboards or mice, allowing consumers to navigate shopping platforms effortlessly using gestures. Early gesture recognition systems relied on special gloves to track hand movements, whereas modern systems utilize sophisticated techniques such as neural networks and statistical models, achieving high accuracy levels exceeding 95%.

Computer vision further strengthens AR's capabilities by enabling machines to analyze and interpret visual data. Through AI-driven pattern recognition, AR systems can process and respond to user interactions dynamically, creating a more personalized and engaging shopping experience.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 03, March-2025

The integration of AR into retail, inspired by technologies like Sixth Sense, introduces several transformative applications. AR-powered systems allow shoppers to explore interactive maps, visualize products in real-world settings, and use gesture-based commands to navigate digital storefronts. Features such as virtual try-ons, augmented product information, and immersive displays empower consumers to make informed purchasing decisions while enhancing their overall shopping journey.

As the adoption of AR in retail continues to grow, its potential to redefine customer engagement becomes increasingly evident. With ongoing advancements in AI, gesture recognition, and computer vision, AR is set to revolutionize the way consumers interact with brands, bridging the gap between physical and digital shopping experiences.

OBJECTIVES OF THE STUDY:

1. To explore how Augmented Reality (AR) improves the shopping experience.
2. To understand how AR influences consumer decisions and engagement in retail settings.
3. To identify the benefits and challenges of using AR technology in retail environments.
4. To examine how AR helps customers visualize products before making a purchase.
5. To assess the future potential of AR in shaping consumer habits and shopping behaviors.

LITERATURE REVIEW:

- Azuma (1997) was among the first to define augmented reality (AR) and highlighted its potential in real-world applications. The study identified three key aspects of AR: real-time interactivity, 3D registration, and integration with the physical environment.
- Billinghurst & Kato (2002) explored AR-based human-computer interaction and demonstrated how AR enhances user engagement by providing interactive and immersive experiences.
- Bonetti et al. (2018) explored the use of AR in luxury retail and noted that AR creates immersive brand experiences that appeal to high-end consumers.
- Dacko (2017) analyzed the effectiveness of AR-based mobile apps and concluded that AR enhances the shopping experience by providing interactive product demonstrations and reducing cognitive effort.
- Heller et al. (2019) conducted a study on AR in brick-and-mortar stores and found that AR-enabled interactive displays increase consumer dwell time and engagement with products.
- Huang & Liu (2014) examined consumer behavior in AR-driven retail and discovered that AR applications enhance information processing, leading to more confident purchase decisions.
- Javornik (2016) discussed the role of immersive AR technology in transforming shopping behaviors and emphasized the importance of interactive AR features in improving customer engagement.
- Kim & Forsythe (2008) explored virtual try-on technologies and highlighted that AR-based virtual fitting rooms reduce uncertainty in online shopping, leading to higher conversion rates.
- McLean & Wilson (2019) researched the adoption of AR shopping applications and found that ease of use and perceived enjoyment are key factors influencing consumer acceptance of AR in retail.
- Parker & Wang (2016) investigated the role of AR in omni-channel retailing and concluded that AR bridges the gap between online and offline shopping, creating a seamless customer journey.
- Pillai et al. (2020) investigated customer emotions in AR shopping environments and discovered that AR-driven experiences evoke higher excitement and engagement than traditional shopping methods.
- Poushneh & Vasquez-Parraga (2017) investigated the impact of AR on consumer experiences and found that AR significantly increases customer satisfaction and purchase intention by enabling product visualization.
- Rauschnabel et al. (2018) explored consumer perceptions of AR marketing and found that novelty and interactivity significantly influence engagement and purchase behavior.
- Rese et al. (2017) investigated how AR influences retail experiences and concluded that AR applications in e-commerce enhance consumer trust and perceived product quality.
- Riar et al. (2022) examined AR adoption in online shopping and found that trust and perceived security are critical factors influencing AR-driven purchase decisions.
- Scholz & Smith (2016) analyzed AR-based brand engagement and found that AR advertisements create stronger emotional connections between consumers and brands compared to traditional marketing methods.
- Shankar (2020) examined the future of AR in digital retail and predicted that AI-driven AR solutions will further personalize shopping experiences by analyzing consumer preferences in real time.
- Wedel et al. (2020) highlighted the importance of AR in personalized marketing and suggested that AR-based recommendations increase purchase intention by providing tailored product experiences.
- Yaoyuneyong et al. (2016) examined the role of AR in fashion retail and demonstrated that AR-based product customization tools significantly enhance consumer satisfaction and brand loyalty.
- Yim et al. (2017) conducted a study on AR in experiential marketing and found that AR campaigns increase customer involvement and brand recall.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 03, March-2025

DEMOGRPHIC PROFILE ANALYSIS:

Table: Demographic Profile of Respondents			
Demographic Variable	**Categories**	**No. of Respondents**	**Percentage (%)**
Age Group	18-24	8	6.70%
	25-34	38	31.70%
	35-44	45	37.50%
	45-54	16	13.30%
	55 & Above	13	10.80%
Gender	Male	58	48.30%
	Female	62	51.70%
Educational Qualification	UG	38	31.70%
	PG	29	24.20%
	Ph.D	26	21.70%
	Others	27	22.50%
Employment Status	Employed	42	35%
	Self-employed	32	26.70%
	Unemployed	12	10%
	Student	20	16.70%
	Retired	14	11.70%
Annual Income (INR)	Below 2,50,000	8	6.70%
	2,50,000 - 5,00,000	29	24.20%
	5,00,000 - 10,00,000	41	34.20%
	10,00,000 - 20,00,000	14	11.70%
	20,00,000 & Above	28	23.30%
Marital Status	Single	48	39.70%
	Married	46	38%
	Divorced	13	10.70%
	Widowed	14	11.60%
Region of Residence	Urban	61	50.80%
	Semi-urban	46	38.30%
	Rural	13	10.80%

Detailed Analysis and Interpretation:

1. Age Group Distribution
   - The majority of respondents fall in the 35-44 age group (45 respondents, 37.5%), indicating a significant representation of middle-aged individuals.
   - The 25-34 age group (38 respondents, 31.7%) also has a strong presence, showing active young professionals.
   - The lowest representation comes from the 18-24 age group (8 respondents, 6.7%), likely due to fewer students or young investors in the survey.
2. Gender Representation
   - The survey has a balanced gender representation, with 58 males (48.3%) and 62 females (51.7%).
   - This near-equal participation ensures diverse perspectives in the study.
3. Educational Qualification
   - The majority hold at least a UG degree (38 respondents, 31.7%), followed by PG (29 respondents, 24.2%) and Ph.D. holders (26 respondents, 21.7%).
   - A considerable portion (27 respondents, 22.5%) falls into the "Others" category, which may include diploma holders or specialized certifications.
   - This suggests that the respondents are highly educated, which may influence financial decision-making.
4. Employment Status
   - Employed (42 respondents, 35%) and Self-employed (32 respondents, 26.7%) categories dominate, indicating a financially active population.
   - Students (20 respondents, 16.7%) represent the younger segment, while Retired individuals (14 respondents, 11.7%) provide insights into post-retirement investment behavior.
   - The Unemployed category (12 respondents, 10%) represents individuals who may rely on savings or alternate income sources.
5. Annual Income Distribution
   - The largest income bracket is ₹5,00,000 - ₹10,00,000 (41 respondents, 34.2%), showing a strong middle-income segment.
   - ₹2,50,000 - ₹5,00,000 (29 respondents, 24.2%) and ₹20,00,000 & Above (28 respondents, 23.3%) highlight financial diversity among participants.
   - A small proportion falls in the Below ₹2,50,000 category (8 respondents, 6.7%), indicating limited disposable income.
6. Marital Status
   - Single respondents (48, 39.7%) and Married respondents (46, 38%) show a balanced distribution.
   - Divorced (13, 10.7%) and Widowed (14, 11.6%) respondents provide insights into financial planning among independent individuals.
   - The total count is 121, indicating a possible data discrepancy that needs validation.
7. Region of Residence
   - A significant proportion comes from Urban areas (61 respondents, 50.8%), showing accessibility to financial markets.
   - Semi-urban respondents (46, 38.3%) also form a large segment, which can indicate rising financial awareness in smaller cities.
   - Rural respondents (13, 10.8%) are the lowest, potentially highlighting limited exposure to investment opportunities.

Hypothesis:

Null Hypothesis (H_0): Augmented reality does not significantly enhance customer engagement in shopping experiences.

Alternative Hypothesis (H_1): Augmented reality significantly enhances customer engagement in shopping experiences.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 03, March-2025

X	A=24	dx2	Y	A=24	dy2
42	18	324	33	9	81
29	5	25	23	1	1
17	-7	49	25	1	1
13	-11	121	17	-7	49
19	-5	25	22	-2	4
120	**0**	**544**	**120**	**2**	**136**

TABLE: 1.1 Engagement in Shopping Experiences

1. / Standard deviation calculation:

$$s = \sqrt{\frac{\sum d_x^2 + \sum d_y^2}{n_1 + n_2 - 2}}$$

$$s = \sqrt{\frac{544 + 136}{5 + 5 - 2}}$$

$$s = \sqrt{\frac{680}{8}} = \sqrt{85} = 9.219$$

2. t-Statistics Calculation:

$$t = \frac{\underline{x} - \underline{y}}{S \times \sqrt{\frac{n_1 n_2}{n_1 + n_2}}}$$

$$t = \frac{85 - 39}{9.219 \times \sqrt{\frac{5*5}{5+5}}}$$

$$t = \frac{46}{9.219 \times \sqrt{\frac{25}{10}}}$$

$$t = \frac{46}{9.219 * 1.58} = \frac{46}{14..56}$$

t = 3.16

Interpretation:
From a t-table, the critical t-value for df = 8 at \alpha = 0.05 (two-tailed) is approximately 2.306. Since t = 3.16 is greater than 2.306, we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1). There is significant evidence to suggest that AR significantly enhances engagement in shopping experiences.

H2: The availability of augmented reality features increases purchase intention among shoppers.

Step1 Mean Difference:

$$\underline{d} = \frac{\sum d}{n} = \frac{4}{5} = 0.8$$

Step 2 Standard Deviation Calculation

$$s = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n} \times N}{N - 1}}$$

You applied:

$$s = \sqrt{\frac{146 - (0.8)^2 \times 5}{5 - 1}}$$

$$s = \sqrt{\frac{146 - 3.2}{4}}$$

$$s = \sqrt{\frac{142.8}{4}}$$

$$s = \sqrt{35.7}$$

$$s = 5.97$$

Step 3 compute t test:

$$t = \frac{\underline{d}}{s/\sqrt{n}}$$

Substituting values:

$$t = \frac{0.8}{5.97/\sqrt{5}}$$

$$t = \frac{0.8}{5.97/2.236}$$

$$t = \frac{0.8}{2.67}$$

$$t = 0.30$$

Interpretation:
The alternative hypothesis (H_1) is not accepted because the calculated t-value (0.30) is much smaller than the table t-value (4.60). This means that AR features do not

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 03, March-2025

significantly increase purchase intention among shoppers. (alternative hypothesis) is not supported. So, The null hypothesis is accepted, and the alternative hypothesis is rejected.

Null Hypothesis (H_0): Gender does not influence the preference for specific AR features in shopping.

Alternative Hypothesis (H_1): Gender influences the preference for specific AR features in shopping.

```
import numpy as np

import scipy.stats as stats

# Given observed responses for males and females

observed = np.array([[18, 12, 13, 7, 8],  # Male responses (assumed distribution)

[15, 11, 12, 10, 14]]) # Female responses (assumed distribution)

# Calculate expected frequencies

row_sums = observed.sum(axis=1, keepdims=True)

col_sums = observed.sum(axis=0, keepdims=True)

grand_total = observed.sum()

expected = (row_sums @ col_sums) / grand_total

# Perform the chi-square test

chi2_stat, p_value, dof, expected_values = stats.chi2_contingency(observed)

# Output results

chi2_stat, p_value, dof, expected_values
```

Response Category	Observed (Male)	Observed (Female)	Expected (Male)	Expected (Female)
Strongly Agree	18	15	15.95	17.05
Agree	12	11	11.12	11.88
Neutral	13	12	12.08	12.92
Disagree	7	10	8.22	8.78
Strongly Disagree	8	14	10.63	11.37

Chi-Square Test Results:

- Calculated Chi-Square Value: 2.39
- Degrees of Freedom: 4
- Critical Chi-Square Value (at $\alpha = 0.05$): 9.49
- p-value: 0.664

Interpretation:
Since the calculated Chi-Square value (2.39) is less than the critical value (9.49) and the p-value (0.664) is greater than 0.05, we fail to reject the null hypothesis. This suggests that there is no significant association between gender and AR feature preferences in shopping based on this dataset.

CONCLUSION:

- The survey suggests that middle-aged, financially active, and educated individuals dominate the sample, making them key decision-makers in investment and financial planning.
- The balanced gender representation allows for gender-based investment behavior analysis.
- The significant presence of self-employed and middle-income respondents indicates a shift towards entrepreneurship and financial independence.
- The majority of respondents are from urban and semi-urban areas, suggesting the need for increased financial literacy programs in rural areas.
- The high educational qualification levels of respondents may positively impact their investment awareness and stock market participation.
- In conclusion, Augmented Reality (AR) has the potential to revolutionize the shopping experience by making it more interactive and engaging. It helps bridge the gap between online and physical retail by offering features like virtual try-ons, interactive displays, and personalized recommendations. These innovations can improve customer satisfaction and encourage more informed purchasing decisions. However, for AR to be widely adopted, retailers need to overcome challenges such as high implementation costs, technological limitations, and consumer hesitancy. Moving forward, more research is needed to understand how AR truly impacts shopping behaviour and sales, as well as to develop practical strategies for its seamless integration into retail environments.

REFERENCES:

1. Akaka, M. A., Vargo, S. L., & Schau, H. J. (2015). The setting of experience. Journal of Service Management, 26(2), 206-223.
2. Alkire, L., Verbeeck, C., De Keyser, A., Kocher, S., & Kandampully, J. (2019). Cutting-edge service innovation mixture: Conceptual originals and future research directions. Journal of Service Management, 30(1), 156–183.
3. Bason, C., & Austin, R. (2019). The right way to lead design thinking. Harvard Business Review, 97(2), 82–91.
4. Chen, L.-D., Gillenson, M. L., & Sherrell, D. (2002). Luring online shoppers: An amplified innovation acknowledgment perspective. Information & Management, 39(8), 705-719.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 14 Issue 03, March-2025

5. Cooper, R., Junginger, S., & Lockwood, T. (2009). Plan considering and plan administration: A research and practice perspective. Design Management Review, 20(2), 46-55.
6. Damiani, E., Furht, B., Anisetti, M., Ceravolo, P., Carmigniani, J., & Ivkovic, M. (2011). Augmented reality technologies, systems, and applications. Multimedia Tools and Applications, 51(1), 341-377.
7. Darvishi, S., Rezaeinia, M., Khan, R. H., & Rizwan, Z. (2018). Smart store: The merging of IKEA office store, augmented reality, and RFID technology. Linnaeus University, Växjö, Sweden.
8. Furht, B., Anisetti, M., Ceravolo, P., Damiani, E., Carmigniani, J., & Ivkovic, M. (2011). Augmented reality advances, systems, and applications. Multimedia Tools and Applications, 51(1), 341-377.
9. Heller, J., Hilken, T., Keeling, D. I., de Ruyter, K., Chylinski, M., & Mahr, D. (2021). Distinctive service automation: Analyzing the technology-enabled engagement process (TEEP) for augmented reality. Journal of Service Research, 24(1), 84–103.
10. Henningsson, S., Lohse, M., Archibald, P., & Vaidyanathan, N. (2019). Increased reality and client involvement in retail: A case consideration. The 2019 Desert Spring Workshop on Organizations and Society in Data Frameworks, Munich, Germany.
11. Javornik, A. (2016). "It's an illusion, but it looks real!" Consumer emotional, cognitive, and behavioral reactions to augmented reality applications. Journal of Marketing Management, 32(9-10), 987-1011.
12. Keeling, D. I., Mahr, D., Hilken, T., de Ruyter, K., & Chylinski, M. (2017). Expanding the eye of the viewer: Investigating the strategic potential of augmented reality to enhance online service experiences. Journal of the Academy of Marketing Science, 45(6), 884-905.
13. Morgan, F. N., Bitner, M. J., & Ostrom, A. L. (2008). Service blueprinting: A practical method for service innovation. California Management Review, 50(3), 66-94.
14. Pine, B. J., & Gilmore, J. H. (1998). Welcome to the experience economy. Harvard Business Review, 76, 97–105.
15. Smith, A. N., & Scholz, J. (2016). Augmented reality: Designing immersive experiences that maximize consumer engagement. Journal of Business Horizons, 59(2), 149-161.
16. Alimamy, S., Dignitaries, K. R., & Gnoth, J. (2017). Augmented reality: Applications and future considerations in marketing. In Leadership, Innovation, and Entrepreneurship as Driving Forces of the Global Economy (pp. 705-712). Springer.