

Augmented Reality Retail Solution for Enhanced Shopping Experiences: Design Intervention for Retail Industry [†]

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Abstract: India's retail industry has grown and seen significant progress over the past few years. However, after the COVID-19 pandemic, there has been a move towards e-commerce convenience, which has changed how people shop, and retailers still need to adapt. The current practices of traditional retail are more retailer-centric and limited to in-store shopping, causing dissatisfaction among customers. Current issues include the absence of personalized suggestions, difficulties related to in-store buying such as product trials, overwhelming product options, limited community involvement, geographical limitations, and other issues. This study addresses retail customers' challenges and highlights the need for a design intervention to enhance the overall retail shopping experience. This study aims to propose an innovative omnichannel retail solution that can be tailored to specific locations and users' needs, leading to overall customer satisfaction. Modern technologies like artificial intelligence (AI) and augmented reality (AR) have a huge role in the proposed solution. The proposed AR Retail solution can potentially affect millions of people, including customers, retailers, influencers, and industry experts. As a result, this will help businesses make more revenue and serve customers by enhancing their retail shopping experiences.

Keywords: traditional retail shopping; AR in retail; e-commerce shopping experience; omnichannel retail solution; Indian retail industry; customer experience; design intervention



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1. Introduction

The McKinsey Global Institute projected that India's buying market would be worth USD 1.5 trillion by 2025, making it bigger than Germany and making it the world's fifth-largest economy (after the US, Japan, China, and the UK) [1]. People around the world have greatly changed how they think about purchasing and act when they buy things since COVID-19 happened. The effect of the COVID-19 pandemic on consumers' behavior and wellbeing is a thought-provoking issue which requires attention from practitioners and academia. As the coronavirus pandemic continued to spread to new areas, people preferred going to shops less often. Even though a significant population still prefers to shop in-store as a leisure activity, for social interaction, or to check the credibility of products physically, the current traditional retail model does not cater to any of these goals and poses many other challenges to the customers [2].

The most important thing for a retail business to focus on when it comes to customer happiness is the customer experience. When it comes to shopping, customers have better experiences when products can be found, purchased, and delivered quickly [3]. The retail business is always changing because of new technologies, changes in customer behavior, and changes in the way the market works. Traditional brick-and-mortar retail, which used to be the main way people shopped, has been facing more and more problems in recent years [4]. Together, the rapid growth of e-commerce and changing customer tastes for ease

and customization have led to a worrying trend of unhappy customers in real stores. This study shows how AR and omnichannel strategies can be used to solve these problems and revitalize the standard retail industry [5]. Customer unhappiness is a common problem that could make it hard for brick-and-mortar stores to stay in business. Shoppers are often unhappy because they cannot customize their experiences, the stores are not interesting, and their shopping trips are not well-planned [6]. The aim of this study was to identify the existing gaps in the traditional retail model leading to customer dissatisfaction and propose a design intervention so that customers have in-store-like experiences in the online store.

2. Literature Review

To achieve the purpose of this study, a review of the existing literature was performed. Keywords used included traditional retail, AR in shopping, omnichannel retail, geographical limitations, etc. Academic databases such as IEEE explore, ScienceDirect, Taylor & Francis, etc. were searched. About 33 research articles were found to be suitable in fulfilling the review process. Forthcoming sections discuss the findings of the literature review.

2.1. Traditional Retail and Impact of COVID-19

The COVID-19 outbreak had a significant effect on the traditional retail sector. In a study conducted by Alvarez et al., it was found that customers were making more online purchases and changing their product tastes [7]. Another study on the European food retail industry showed the importance of being adaptable and creative when dealing with changing market conditions [8]. Another study has also shown a change in customer behavior, leading to more dependence on online shopping and new worries about safety [9].

2.2. Association of Traditional Retail Shopping and Customer Dissatisfaction

Because of the rise in e-commerce, traditional stores now have to deal with a digital gap. Studies also suggest that digitalization has changed traditional retail, and to keep up with changing consumer behaviors, retailers need to digitize [10]. It is difficult for traditional shopping to give customers a good experience. A real-world study has discovered issues with product availability, service quality, and shopping in general [11]. Other issues causing customer dissatisfaction include retailer-centric practices and dissatisfaction [8], limited in-store shopping options [9], the absence of personalized suggestions, in-store buying difficulties [8], limited community involvement, and geographical limitations [9].

2.3. Omnichannel Retailing and Customer Satisfaction

Omnichannel commerce is a move from multi-channel strategies to a seamless and integrated approach to selling in order to make the whole shopping experience better for the customer [12]. The use of multiple channels for shopping has been shown to improve customer happiness. Also, Venkatesan and Hess stress that the effectiveness of omnichannel strategies can be changed by the qualities of the products being sold [13].

2.4. Role of AI in Retail Personalization

Many changes are happening in retail because of AI, especially when it comes to customization. AI-powered algorithms can look at a large amount of consumer data to give people personalized product ideas and shopping experiences [14]. Wang and other authors stress the importance of more research on how AI can improve the omnichannel customer experience. They stress how important this technology is for driving retail innovation [15]. AI has an effect that goes beyond simply offering things to buy. Sundararajan and Gupta say that AI can help retail companies come up with novel concepts, which can lead to more adaptable and quick-moving business structures [16].

2.5. Impact of AR on Consumer Behavior

Mobile AR applications have revolutionized the retail industry by providing immersive and engaging experiences for customers, making them exhibit positive behavioral and

attitudinal transformations [17]. These applications streamline the shopping process, allowing for more convenient access to information and transactions [18]. The retail industry has incorporated smart retailing into its strategic framework, transforming the landscape of smart commerce [19]. AR's unique attributes can enhance customer purchasing, foster engagement, and positively influence brand perception and purchase intentions [20–23]. It elicits emotions like excitement, amusement, and pleasure, offering practical and utilitarian advantages. The innovative product offers reliable and comprehensive information to customers [24,25].

2.6. Enhancing In-Store and Online Retail Convergence through AR

The engaging setting of AR technology enhances the recognition and recall of the brand. It provides users with contextual information and a three-dimensional experience, influenced by their perception of the product's benefits and value. This compensates for lack of knowledge or physical interaction with a product, offering additional information for purchase in both physical stores and on online platforms [26,27].

2.7. Opportunities and Scope of AR in Retail

AR can enhance customer understanding, information acquisition, and analysis, leading to more informed decisions [28]. It can bridge the gap between online and physical buying by combining the benefits of both [27]. AR applications can improve the visual perception of products, foster engagement, and enhance shopping experiences through virtual try-ons and interactive displays. Fun and play elements in user experiences have significant value [26].

2.8. Challenges of AR in Retail

Designers face challenges in integrating AR into retail environments, as it is a complex task requiring careful consideration and successful implementation [24]. Some studies suggest that AR might impede cognitive processes [28], while others suggest that it may facilitate them. AR's usage in social contexts can create novel challenges. Studies show that AR increases the likelihood of impulsive buying decisions, leading to negative emotions like grief and humiliation. Sharing holograms in the virtual realm can foster a sense of ownership, potentially leading to property rights violations. Bullying can also occur due to social aggression, negatively impacting customers and enterprises [29].

2.9. Adoption of AR in Retail by Leading Companies

IKEA Place, Walmart's AR scanning tool, and Amazon's AR View are among the AR services that have been integrated by global retailers into their operations. The COVID-19 pandemic has led to a surge in consumer demand for AR purchasing, which could transform marketing. Millennials prefer experiential pursuits over material possessions, with a 74% increase in purchase likelihood after positive brand experiences. Companies like Amazon, Gucci, Burberry, and Sephora are incorporating AR, virtual reality (VR), and AI into their operations to foster customer loyalty, increase spending, and improve the shopping experience [30].

3. Methodology

This study followed a double-diamond design process, consisting of four phases: research and discovery, defining the problem and user segment, ideation and design, delivery of the prototype, and user testing.

3.1. User Interviews and Questionnaire Survey

An online questionnaire survey consisting of 12 questions was administered to 40 retail shoppers, focusing on issues faced by frequent shoppers. A sample size of 50 was chosen, out of which 40 were considered relevant, including both younger and older adults

and varying educational backgrounds. Data were also collected through 10 one-to-one interviews with 5 females and 5 males aged 18–60 yrs.

3.2. Contextual Inquiry

Gathering in-depth observations and exchanges is a necessary part of contextual research. To understand work styles, behaviors, and mental models, looking at the user group's wants, goals, and frustrations is important. A contextual inquiry flow model, as shown in Figure 1, was made to establish relationships between different participants in the same context.

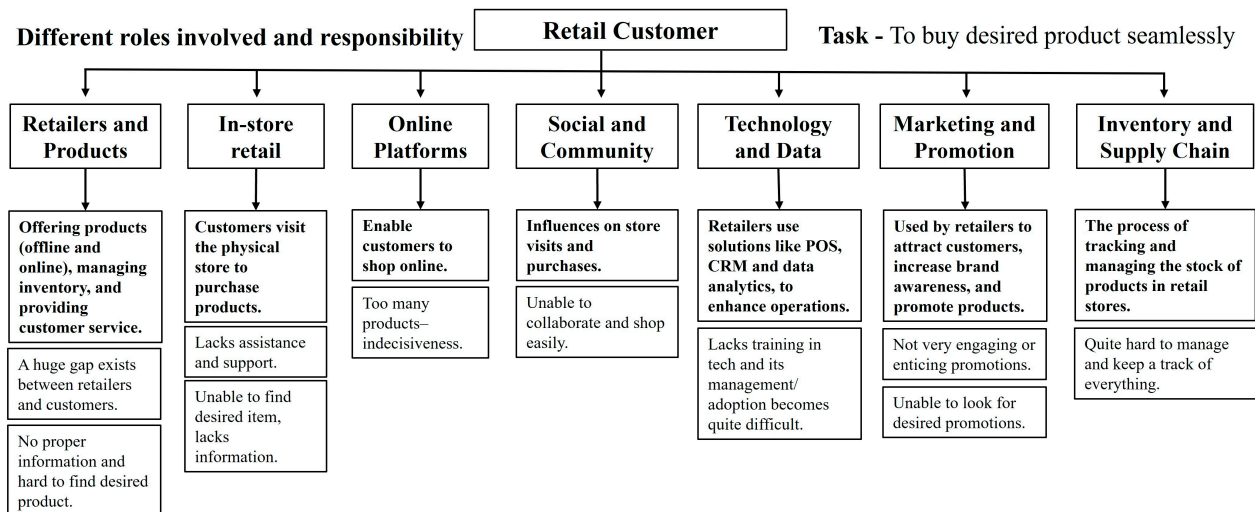


Figure 1. Flow model—relationships between different participants in the same context.

3.3. Defining the Problem

The analysis of the observations from user research helped in defining the problem, which states that traditional retail experiences lead to customer dissatisfaction due to issues like geographical limitations, lack of social interactions, comprehensive product information, and personalized promotions. For better understanding of the problem area, a 5W+H table was created (shown in Table 1).

Table 1. 5W+H analysis of the problem.

What?	Why?	Who?	Where?	When?	How?
Limited interactivity, personalization, and transparency lead to poor customer experience.	Limited product options, generic recommendations, and a lack of relevant information lead to a less engaging experience.	Customers and retailers in the traditional retail industry.	Physical retail stores.	During customers' shopping experiences in traditional retail stores when they seek their desired product.	By leveraging technology like AR, personalized product recommendations and transparent practices through omnichannel retail solution.

3.4. Competitive Analysis

Direct and indirect competitors were identified and benchmarked against the feature list, as outlined in Table 2.

Table 2. Benchmarking of the features of the competitors.

Features	Direct Competitors			Indirect Competitors		
	Ikea Place	Lowe's	Sephora	Amazon AR	Walmart	Etsy
Virtual Product Try-On	✓	✓	✓	✓	✓	✗
AR Product Showcases	✓	✓	✓	✓	✓	✗
Personalized Recommendations	✗	✗	✗	✗	✗	✗
Real-Time Inventory	✗	✗	✗	✗	✓	✗
Online Social Shopping Events	✗	✗	✗	✗	✗	✗
Sustainable Product Highlight	✗	✗	✗	✓	✓	✓
Total Features	2	2	2	3	4	1

3.5. Final Concept Selection

Different concepts were ideated by merging different solution ideas, and 5 users gave ratings on a scale of 1 (low)–5 (high), as shown in Table 3.

Table 3. Concept rating by users.

Concepts	U1	U2	U3	U4	U5	Mean
Virtual Shopping Mall with Interactive Showcases	4	3	5	4	4	4
Try Before You Buy—AR Fitting Rooms	5	4	5	4	5	4.6
Social Shopping Events and AR Influencer Collab	3	4	4	3	4	3.6
Proposed Concept—The AR Retail App	5	5	5	5	5	5

The AR Retail app concept received the highest user rating and turned out to be the most feasible yet novel solution. The AR Retail app is a comprehensive AR-based omnichannel platform that enhances traditional retail shopping experiences for users and bridges the gulf between offline (in-store) and online stores. The app aims to provide a seamless and immersive shopping experience with features like a collaborative cart, location-based and need-specific shopping, personalized experiential marketing, planning in-store shopping features, scanning items to view them in your AR space and obtain product information, 3D view, and virtual try-on.

3.6. Designing and Developing the Concept

A systematic app development process was applied, which included user journey mapping, task flows, micro-interactions, card sorting, navigation diagrams, defining user interface (UI) elements, and style guides. After these steps, low-fidelity and high-fidelity interactive prototypes were made in the Figma tool. A typical use case scenario of the users' interaction is shown in Figure 2.

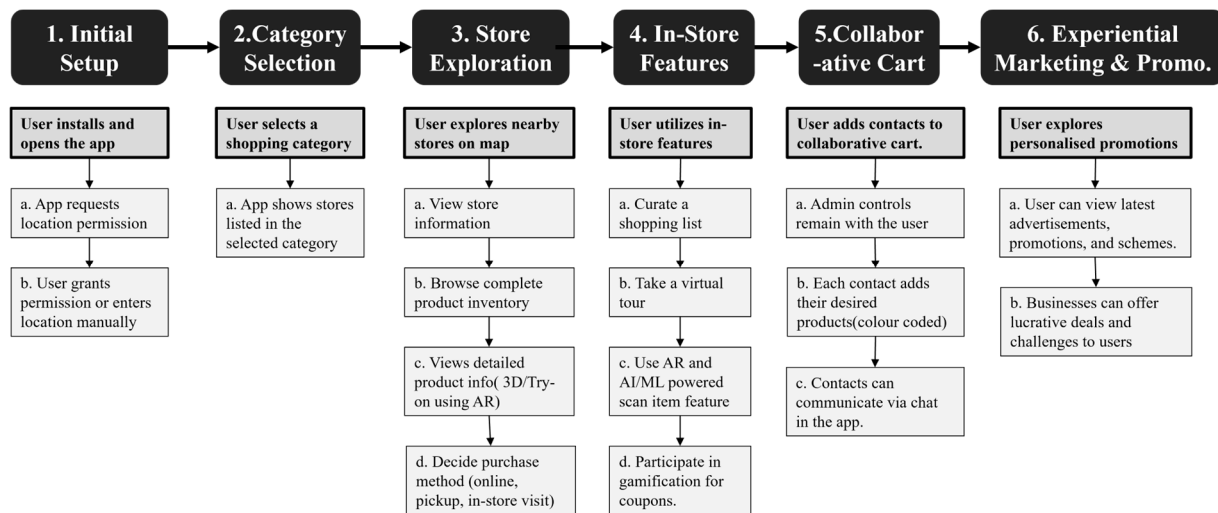


Figure 2. Use case scenario of the proposed solution.

3.7. Usability Testing

The usability testing was performed using retrospective think-aloud protocol along with a system usability scale (SUS) rating questionnaire [31]. Six users were asked to experience the interface by conducting an assessment of the given task or walkthrough. A task brief was given to users with specified steps and instructions.

4. Results

4.1. Insights from Survey and User Interviews

The user questionnaire survey found that about 55% of people find it challenging to find the right store near them to buy the desired product. Around 80% of people find the options and suggestions overwhelming when purchasing online. About 67.5% of people ($n = 27$) find it very frustrating and feel the retail shopping experience needs more social interaction. Half of the people still prefer physical store shopping over online shopping, as they do not trust the product's credibility and feel there needs to be more information. It was observed that 57.5% of people are willing to use an omni-channel retail app solution, while 27.5% favor using modern technologies like AR, virtual try-ons, and 3D views.

The insights from user interviews established that participants generally viewed AR in retail shopping as innovative and exciting. They value personalization, personalized product recommendations, and virtual try-on features. However, some users expressed concerns about technical glitches and the need for a seamless experience. The social aspect of shopping is significant for many, and users desire a balance between traditional retail and e-retail experiences.

4.2. Conceptualization of UI Design

To conceptualize the user interface of the proposed mobile app, static low-fidelity paper prototypes were sketched, and high-fidelity interactive prototypes of UI designs were made using the Figma tool (shown in Figure 3).

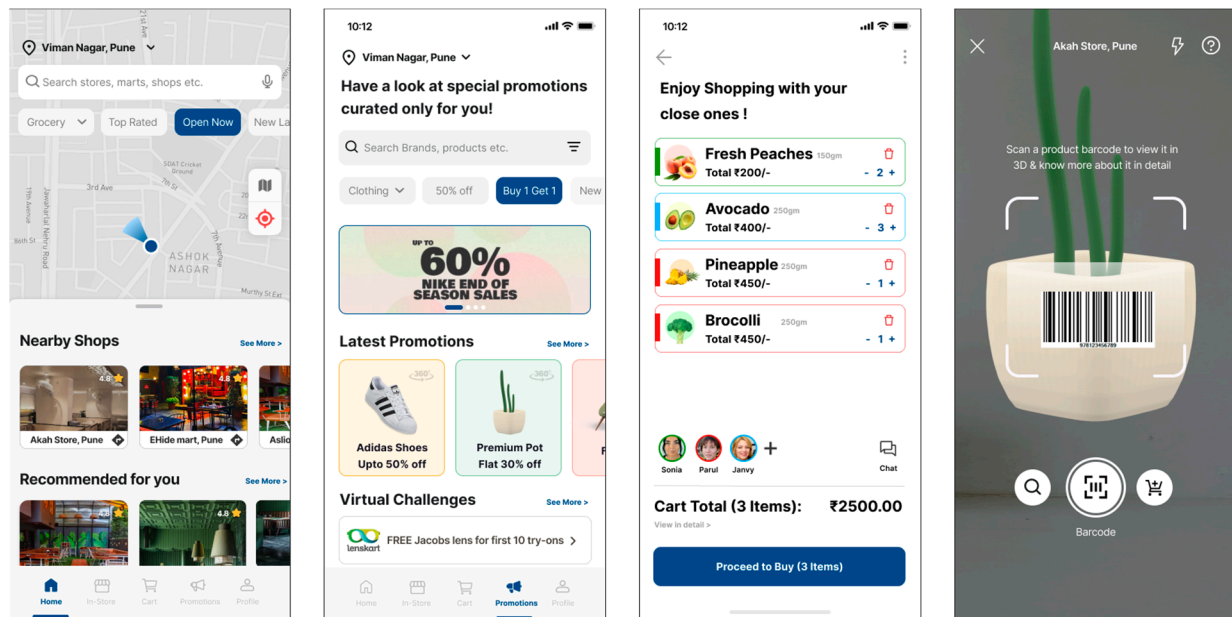


Figure 3. High-fidelity interactive prototype of the application.

4.3. Insights from Usability Testing

The average SUS score (shown in Table 4) was 85.83 (<85.5), implying excellent usability [32]. According to the user's feedback, the app was intuitive and easy to learn, with a clear and organized layout. The majority of users also reported feeling satisfied with the app's overall performance and would recommend it to others.

Table 4. System usability scores of the proposed design.

System Usability Scale Questions	Ratings, n (%), Total n = 6				
	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
I would like to frequently use this application	0 (0)	0 (0)	0 (0)	2 (33.33)	4 (66.66)
The application is unnecessarily complex	4 (66.66)	2 (33.33)	0 (0)	0 (0)	0 (0)
The application was easy to use	0 (0)	0(0)	1 (16.66)	4 (66.66)	1 (16.66)
I would require a technical support to use this application	5 (83.33)	0(0)	0(0)	1 (16.66)	0 (0)
Various functions of this application were well integrated	0(0)	0(0)	1 (16.66)	2 (33.33)	3 (50.00)
The application had too much inconsistency	6 (100)	0 (0)	0 (0)	0 (0)	0 (0)
This application is very quick to learn	0 (0)	0(0)	2 (33.33)	1 (16.66)	3 (50)
The application is very cumbersome in use	5 (83.33)	0 (0)	1 (16.66)	0 (0)	0 (0)
I felt very confident using the application	0 (0)	0 (0)	0 (0)	2 (33.33)	4 (66.66)
A lot of things need to be learnt before using this application	3 (50)	0 (0)	3 (50.00)	0 (0)	0 (0)
Average SUS Score = 85.83					

A few participants reported confusion and frustration with the app's 3D product view feature, as it was new to their mental model. Specifically, some participants expressed difficulty in finding a way to explore products in 3D. They suggested that it could be easier by giving some instructions on the interface itself. Overall, the SUS ratings and

the retrospective think-aloud protocol provided valuable insight into the app's usability esthetics and highlighted areas where improvements could be made.

5. Discussion, Limitations, and Future Scope

The AR Retail system is an innovative solution that could revolutionize the retail industry, offering an interactive shopping experience. By utilizing augmented reality technology, stores can create immersive virtual storefronts and product displays, making shopping more enjoyable and interactive. This, in turn, can lead to increased sales and customer loyalty. The system also offers personalization and ease of use, addressing issues faced by traditional brick-and-mortar stores. This integration also makes it easier for customers to switch between online and offline shopping, demonstrating its adaptability to changing consumer tastes. The proposed solution aims to make shopping more of a social activity, fostering a sense of community among customers who share similar interests, leading to stronger connections and increased sales. There are a few limitations, including potential usability issues for older users, security and privacy concerns, and a lack of AR-supported devices. The shift to e-retailing and other new proposed features may cause frustration and may entail a sharp learning curve. Future advancements in AR and VR are expected to enhance app functionality and the users' experience. A lot of future work may go in the direction of reducing the learnability aspect of the AR in retail. The emphasis will be on building relationships with stores and brands, including incorporating retail stores from other sectors. The AR Retail solution is expected to enhance customer brand connections, drive sales growth, and set new benchmarks.

6. Conclusions

The proposed solution focuses on the implementation of an AR Retail solution with other supporting features like collaborative cart, experiential marketing, location and goal-based shopping, in-store features, etc., aiming at revolutionizing customer engagement with products, brands, and sellers. It emphasizes the importance of user-immersive AR shopping experiences, which can bridge offline and online shopping and have the potential to address all the challenges mentioned in the study. It is expected that the proposed design intervention would be beneficial to other allied retail sectors, where the customer is not able to perform in-person shopping. The proposed design solution demonstrates how the convergence of technology, personalized experiences, and customer engagement can collaboratively enhance customer satisfaction in the retail industry.

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