Project Dissertation Report

DELHI SCHOOL OF MANAGEMENT
DELHI TECHNOLOGICAL UNIVERSITY

MAJOR RESEARCH PROJECT – MGT 44

Factors affecting Use of Augmented Reality in Retail

SUBMITTED TO

Dr. Vikas Gupta

Assistant professor

SUBMITTED BY

Lav Sharma (2K20/DMBA/59)

Section A - M.B.A. (2nd Year)

CERTIFICATE

This is to certify that the work titled **'Factors affecting Use of Augmented Reality in Retail'** as a part of the Final year Major Research Project submitted by Lav Sharma in the 4th Semester of MBA, Delhi School of Management, Delhi Technological University during January-May 2021 is his original work and has not been submitted anywhere else for the award of any credits/degree whatsoever.

The project is submitted to Delhi School of Management. Delhi Technological University in partial fulfilment of the requirement for the Award of the degree of Master of Business Administration.

Dr. Vikas Gupta	Dr. Archana Singh
Faculty Advisor	Head of Department (DSM, DTU)

DECLARATION

I hereby declare that the work titled **'Factors affecting Use of Augmented Reality in Retail'** as part of the final year Major Research Project submitted by me in the 4th Semester of MBA, Delhi School of Management, Delhi Technological University, during January-May 2021 under the guidance **of Dr. Vikas Gupta**, is my original work and has not been submitted anywhere else.

The report has been written by me in my own words and not copied from elsewhere. Anything that appears in this report which is not my original work has been duly and appropriately referred/cited/acknowledged.

Lav Sharma

(Roll No 2K20/DMBA/59)

ACKNOWLEDGEMENT

Before I get into the thick of things, I would like to add a few words of appreciation for people who have been a part of this project right from its inception. This project's writing has been one of the significant academic challenges I have faced. This project would not be completed without the support, patience, and guidance of the people involved. It is my deepest gratitude to them.

It gives me incredible pleasure to present my Major research project report on "Factors affecting Use of Augmented Reality in Retail". It has been my privilege to have such project guides who have assisted us from this project's commencement. This project's success results from sheer hard work and determination put in by me with my project guide. I now take this opportunity to thank Dr. Vikas Gupta, who acted as my mentor despite his many academic and professional commitments. His wisdom and insight inspired and motivated me. Without his understanding and support this project would not have been exciting, and neither would have reached productivity.

I also feel the heartiest sense of accountability to my family members & friends, who helped me collect data & resource material even in processing and drafting the manuscript. This project is devoted to all those people who helped us while doing this project.

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Executive Summary

The goal of this study is to use qualitative research to analyze the perception of augmented reality among Indian consumers, as well as the influence of AR on retail by carrying out a topical analysis on variables explored in current literature. The data collection contains responses from more than 100 respondents, the majority of whom are between the ages of 18 and 26, as well as more than 200 variables investigated in 30 research publications and obtained using explicit search and inclusion measures.

Thematic analysis is used to identify patterns in the data set from existing literature. The topics that emerged from the investigation are organized into a conceptual framework to describe user decision-making. The most dominant variable type in the theme determines the position of the theme in the model, as does using the TAM as the reference paradigm.AR technology should be included into marketers' experience marketing tactics. Organizations should employ current toolkits or partner with technology companies to create their products since integrating and maintaining AR technology needs expertise.

To differentiate the current study from earlier papers focusing on existing literature throughout this subject, the analysis only contains studies that employ analysis measures to examine customer behavior in retail connected to AR. The study adopts a unique technique for identifying patterns in published studies by utilizing theories and concepts as the basis for categorization.

Many groundbreaking projects have shown to the rest of the world that augmented reality has significant market appeal and possible promise for retailers. Large-scale companies have seen the rise of augmented reality and have decided to use it to improve their future ventures. Experts are attempting to transform augmented reality projects into real-time customer apps. According to the Augmented Reality projections, AR technology will begin to evolve and pick up speed in this decade and will continue to break all headlines.

Introduction

Technological advancements have made it possible to showcase items more convincingly by putting a number of instruments at our disposal. Augmented reality (AR) is an interactive technology that has been widely adopted in retailing contexts and is produced in the form of smart device applications. AR is described as "the superposition of virtual items (including computer-generated pictures, texts, and sounds) over the user's real surroundings."

Mobile apps, fixed screen devices, head-mounted displays, and contact lenses have all included AR interactive technology (ARIT). In retail, ARIT is commonly utilized to transmit sensory information through interactive presentations. Customers benefit from visual cues from virtual representations since they provide information about the product's experience features. ARIT's success in retailing stems from its capacity to give customers with fun while experiencing the item, to provide convenience value by saving time, and to transfer information about the product qualities among customers.

With the rapid deployment of augmented reality in retail, researchers have undertaken several studies to better understand the aspects influencing AR acceptability in various scenarios including various types of apps, age groups, product categories, and nations. The primary goal of this research is to investigate the impact of augmented reality on consumer behavior in the retail setting. The study attempts to highlight the limits of existing studies in understanding the influence of AR by critically comparing and evaluating existing material and recommends areas for future research by critically comparing and analyzing existing literature.

Theory and background

The application of augmented reality technology goes back to 1962, when Morton Helig, a cinematographer, created one of the first prototypes of augmented reality, named Sensorama. AR technology has experienced several changes since its conception, and it took decades for it to enter the public. Although journal and conference articles have been published since the technology's inception, Ronald Azuma released the first survey study outlining aspects of AR as well as presenting a thorough description that incorporates essential properties of this technology in 1997.

The use of ARIT in the domains of entertainment, manufacturing, education, retail, healthcare, tourism, defense, and construction, among others, has resulted in significant publications in this study domain in the twenty-first century. In 2014, Philipp Spreer and Katrin Kallweit released the first notable research on the acceptability of augmented reality in retail. By experimentally verifying the linkages of the technology acceptance model, the study employed an experimental design on bookstore visits to explore the usefulness and acceptability of ARIT (TAM).

Nintendo, the well-known gaming firm, created Pokémon Go, a cell phone-based treasure hunt game that opened up a new vista for Augmented Reality, and merchants have now adopted that technology. From eyewear to sofas to cosmetics, users now have a plethora of augmented reality-based apps at their disposal. As merchants and customers accepted the technology, it is now utilised to offer home renovation items, fashion, cosmetics, and furniture, and it has significantly enhanced the whole online shopping experience. People's reactions and interactions with reality have evolved as a result of interactive technology. As we all know, over the previous decade, consumers have been exposed to a wide range of technologies, with augmented reality being one of the most interesting.

Several studies have been undertaken over the last five years by researchers all around the globe to explore the adoption of augmented reality in retail utilising various types of augmented reality applications. The constructs used in these studies were based on theories such as TAM, flow theory, equity theory, virtual liminoid theory, self-referencing theory, excitation-transfer theory, situated cognition theory, prospect theory, narrative theory, script theory, and theory of interactive media effects, among others.

According to one of IBM US's estimates, the COVID-19 epidemic has moved the retail industry into the future by approximately five years. Despite the fact that numerous physical stores are opening across the world, everyone's primary objectives are sanitation, health, and safety. Keeping this in mind, merchants have begun to employ augmented reality (AR) to aid customers in digitally testing out things rather than physically assisting them in seeing, trying, and purchasing the product. According to the Nielsen Global Survey 2019, augmented and virtual reality are the top technologies that customers want.

The impact of picture qualities, technical features, design components, media characteristics, psychological variables, and environmental impacts, among others, was studied in studies on the acceptability of AR in retail. The majority of respondents in these studies were students, young adults, online shoppers, and mall visitors. The bulk of these research used an experimental design, used survey instruments to collect responses, and were performed in the United States, Europe, and East Asia. The apps utilised in these experiments enhanced physical

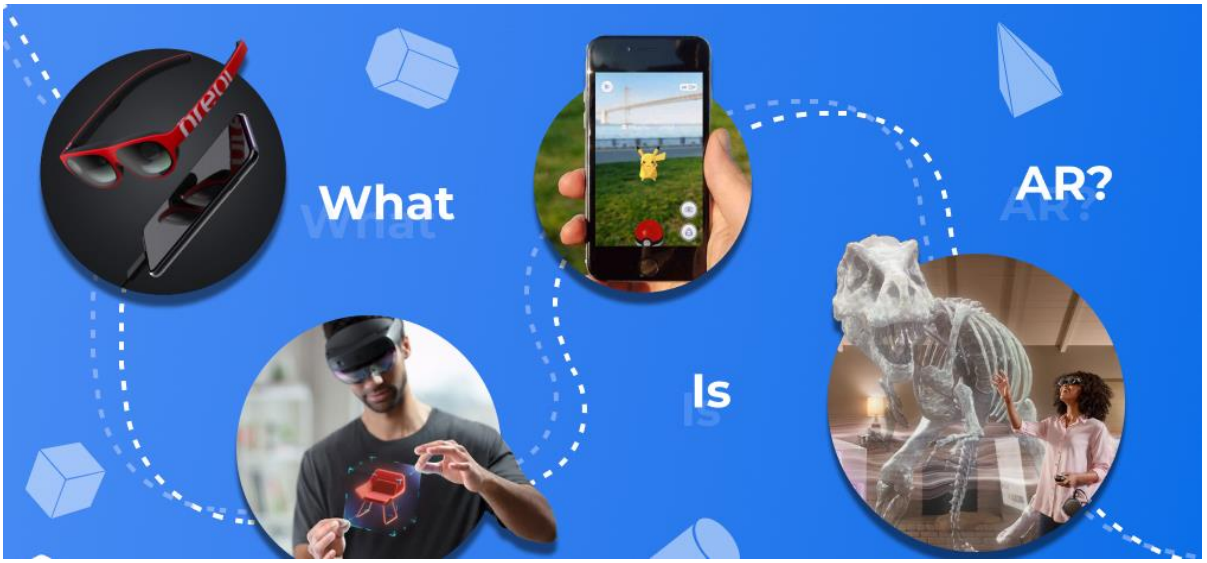
reality by superimposing virtual material on people, goods, or the surrounding environment.

Because of the abundance of AR articles, literature reviews and meta-analysis studies have been written to describe ongoing progress in diverse fields of AR research. However, there is no published research that has explored the impact of numerous aspects on the acceptability of AR in retail. The authors address the aforementioned research gap in the current study by assessing factors addressed in the available research literature and modelling them in a conceptual framework.

What is Augmented Reality?

"Augmented reality (AR) is an interactive experience of a real-world environment in which the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory, and olfactory," according to Wikipedia. AR is defined as "a system that combines the real and virtual worlds, allows for real-time interaction, and precise 3D registration of virtual and real things." This reality experience is so interactive with the actual world that it is seen as a part of the natural environment by a person's perception and through the integration of senses. It is related to a wider concept known as mediated reality, in which a computer changes (perhaps decreases rather than augments) a person's view of reality.

As a result, technology operates through enhancing a person's current perception of reality. Virtual reality, on the other hand, replaces the real world with a simulated one. In most situations, augmentation is performed in real time and in combination with ambient components, such as sports scores displayed on TV during a game. With the application of advanced AR technology, information about the user's immediate surroundings becomes interactive and digitally manipulable (e.g., adding computer vision and object recognition). The real world can be overlaid with fictitious information about the environment and its constituents.



The concept of augmented reality first arose in the early 1950s with the triumph of cinematography, but it gained popularity in the 1990s with the advent of computer science and its applications and implementation. The US Air Force built the Virtual Fixtures system in 1992 with the assistance of Armstrong Laboratory, but it was only the beginning. Following that, it was developed for commercial usage to better the entertainment and gaming experience, and it steadily spread commercially.

AR was first utilized to augment real-world events or environments by providing a wide range of enhanced experiences, and as technology advanced, the information grew more interactive and manipulating. Not only is it employed in the retail sector as a whole, as well as other sectors and organizations, but it is also being used to extract tacit knowledge in real time and with actual context to the existing elements.

Augmented Reality vs Virtual Reality

There are a few instances where buyers believe Augmented Reality and Virtual Reality are the same thing, which is not the case. Virtual reality is a computer-based stimulation that allows device users to feel as if they are in a completely other reality and allows them to experience parts of modernity in a technologically dominated society. In an ever-changing environment, virtual reality is used to plan, build, investigate, and improve consumer experiences by taking the customer's desires and requirements into account. Augmented reality, on the other hand, blends virtual aspects with the actual environment via the use of computer-generated augmentations. These enhancements are then presented in such a way that they assist us in being more efficient in our many everyday chores.

In basic words, virtual reality (VR) bases the user's impression of reality entirely on virtual information, whereas augmented reality (AR) augments the user's vision of reality with extra computer-generated information. The reality in VR is entirely virtual, that is, it is manufactured by a computer. However, with augmented reality, layers of virtual items are added via gadgets and in reality, as in, in the real world and surroundings.

Augmented Reality in Retail

The client became more tech-savvy as technology evolved over time. With the innovations and improvements in mobile phones, practically everyone now has access to the information they require with the push of a button. Though the concept of Augmented Reality has been around for a while, its use in the retail industry began in the 2000s.

Giving clients a virtual shopping option is a widespread practise among companies such as American Apparel, Uniqlo, Lacoste, Kohls, and Sephora. Others have created immersive changing rooms for their customers. Customers will now test products before purchasing them from the convenience of their own homes. This is especially important given how social distancing rules impact shopping during the COVID-19 epidemic. AR is uniquely positioned to address this issue. This isn't only for apparel. Customers will utilise augmented reality (AR) technology to visualise how furniture and other things will appear in their own homes using IKEA's app. The consumer's options do not end with his or her mobile phone at home. Smart mirrors and RFID labels in stores expand the possibilities for product suggestions to customers.

An image of Mahindra & Mahindra managing director Anand Mahindra caressing a virtual cheetah perched atop a sleek automobile constructed using augmented reality (AR) in 2012

made people sit up and take notice of the industry's 'new' method. In only two days, the commercial, which was unveiled to promote Mahindra's XUV500 during the Auto Expo, earned 42,000 views on YouTube. Since then, a lot has changed. Real estate, FMCG, luxury, and grocery businesses are all jumping on the AR bandwagon in order to reach out to new customers while also enhancing their customer experience.

Virtual changing rooms aren't going away any time soon. It is expected to have a $10 billion global demand by 2027. Since the epidemic has prompted the usage of augmented reality (AR) as an option for customers who are unable to visit a physical store, the benefits, accessibility, and rising popularity of virtual dressing room technology indicate that it will remain popular for many years to come.

According to reports, augmented reality is one of the few technologies that appears to be awaiting the arrival of smartphones. Initially, AR is utilized to integrate print and video marketing through the use of triggering pictures. When scanned with an image recognition-AR-enabled device, these photos were utilized to explain the information about the product or a promotional video of the product, and only a few people owned that gadget. Smartphones, on the other hand, have provided a boost to AR technology by combining the camera with quick connectivity and an effective CPU to cover all types of photos and live material. Consumers' interest in augmented reality has risen as its realism, clarity, and capacity to imitate the physical world have improved. By utilizing lighting conditions surrounding the consumer, advanced facial recognition, and personalized coaching, AR retail experiences are intended to fundamentally improve the customer buying experience.

With the advent of interactive technologies, the way people interact with reality has shifted, and many firms are adapting and creating AR technology. AR has taken numerous forms, including – – Mobile Applications (e.g. – IKEA catalogue, YouCam Makeup) - Head-mounted displays (for example, Google Glass and Microsoft Hololens). - Glasses with Contact Lenses - Devices (for example, Magic Mirror, Memory Mirror)

All of these formats can be used depending on the demands of the firm and the convenience of the consumer. Retailers are also assisting customers in adopting AR and introducing them to the technology. To adopt the technology, retailers must have experience, plans, and leverage the technology of augmented reality (AR) across multiple domains of marketing, supply chain, and merchandising.

Here are a few instances of how AR is utilised in retail and how it has helped the firm become successful and attract customers. The first thought that sprang to me was to turn the bedroom into a new fitting room where clients could try on different things before making a final decision.

Warby Parker, an eyewear firm, was founded in 2010 with $2,500 in venture funding and stellar business school credentials. Thanks to a well-timed Vogue profile and a fresh idea — try on affordable glasses digitally or at home, with free shipping and returns — the company grabbed up its Series A through D investment rounds and gained a $1.2 billion value within five years. Others have seized on consumers' need for diversity. Rent the Runway enables customers to browse gowns online before renting one for a few days, with a complimentary second size included. Amazon also introduced Prime Wardrobe, a new programme that encourages customers to choose 3-15 pieces and try them on for up to seven days, as well as free shipping and refunds for anything they don't like.

These businesses recognise that savvy clients desire the convenience of online purchasing as well as the option to sample new goods in a real store. This is called as "bracketing," and it entails acquiring multiple versions of an object to determine which one they like and returning the rest, thereby transforming the bedroom into a suitable place. More firms will follow in the footsteps of Amazon, Warby Parker, and Rent the Runway and adopt bracketing as a means to build loyalty by assuring that consumers find the greatest things in the future.

Unlike eyeglasses and clothing, certain things are impossible to put on and then return. Retailers are experimenting with new approaches to provide sensory experiences in areas such as décor and cosmetics. IKEA recently released augmented reality software that enables customers to see virtual furniture in their homes. Sephora, a 50-year industry veteran, offers customers to purchase from anywhere with their famed Virtual Artist app. The software allows you to test out over 1,000 cheek hues by using submitted pictures, virtual reality, and artificial intelligence. Consider what else could be done if a consumer could buy furnishings without leaving her home or experiment on cosmetics without ruining her cheeks. What if you could buy an engagement ring by taking a picture of your partner's wrist, or use your phone to calculate and place artwork in your living room? Augmented reality has a lot of promise for simulating major in-person buying experiences.

In the last two decades, the internet has replaced the front door of nearly every retail establishment. Mobile devices are quickly becoming the entrance point, with voice-activated personal assistants and other smart gadgets close behind. Consumers are abandoning shopping malls in favour of bringing the retail experience into their homes, and new technology are supporting innovative companies in making the move simpler. Retailers that don't find out how to mix the showroom experience of a supermarket with the convenience of personal shopping at home will lag behind.

Methodology

The present research focuses on information analysis and synthesis, condensing the essence of literature by focusing on the findings of each research article under consideration and deducing a rational conclusion from them. A questionnaire was also created to obtain quantitative data on how well the general population understands the idea of Augmented Reality. The focus of this study is on the demands of the major audience, which includes merchants and human–computer interaction researchers.

Initially, a search in the EBSCOhost data repository was undertaken using keyword variations in the title that included the phrase "AR" and words in the topic terms such as "retail," "store," "shopping," "fashion," "virtual mirror," "product," "e-commerce," and "experience." The search parameter ensured that the reach of the review was broad and did not wander from the issue of augmented reality in retail. In order to identify publications concerning the acceptance of AR across commerce, the snowball sampling methodology was adopted frequently towards the sources of the research articles, following the initial search method. The snowball sampling method was used until hypothetical saturation was achieved, at which point no further available information was found

The design of an inclusion criterion considers relevant, timely, and high-quality research publications for this investigation. The 30 research papers chosen for this study meet the following inclusion criteria:

- The research articles were published in academic journals between January 1, 2014 and March 1, 2019.
- The research articles are available in English on the internet; and
- The research articles looked at the factors that influence AR acceptance in the commercial sector.

The year 2014 was chosen as the cut-off point since the majority of the highly referenced publications were published in that year. To distinguish the current study from previous research publications concentrating on existing research, this review solely includes studies that use statistical approaches to evaluate hypotheses about correlations between customer behaviour variables relevant to AR in retail. To assure the authenticity of the current review,

only research publications published in peer-reviewed academic journals were evaluated.

The studies in this review compared AR versions to traditional interfaces and employed virtual mirrors based on ARIT as one of the stimuli to investigate consumer responses to interactive technologies. The evaluation also looks into the adoption of augmented reality (AR) by e-commerce enterprises, as well as the user experience (UX) associated with AR-enabled items in both online and offline retailing environments. The present study also includes an evaluation of two research articles concentrating on smart retail experiences with AR as one of the primary technologies.

The study's data corpus is made up of the 30 research papers. While reviewing the selected research articles, remarks on theories, frameworks, structures, findings, methodology, and research context were highlighted, forming the data set for this study. The technique of discovering patterns in a data collection and offering comprehensive interpretations of different parts of the data set on the research topic is known as thematic analysis. Thematic analysis is a technique used in the current study that uses the information in the data set as the foundation for constructing codes and organizing codes into themes.

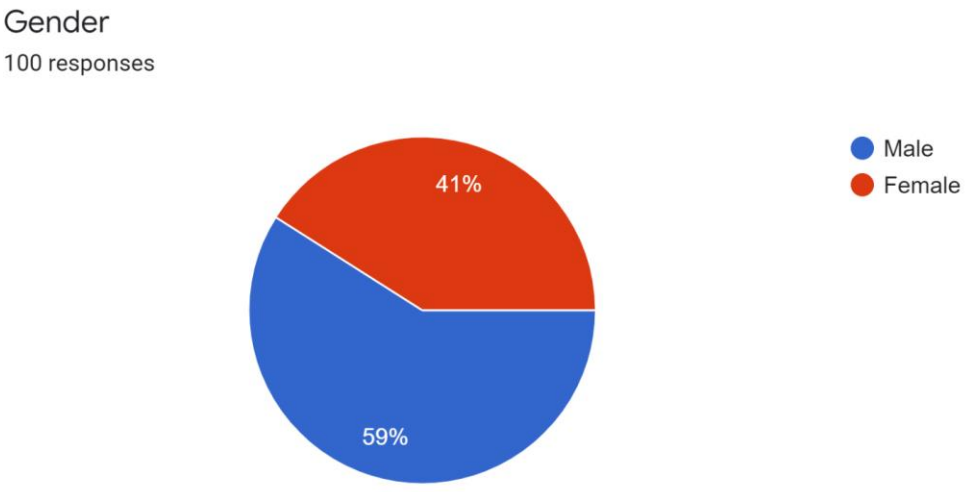
Results

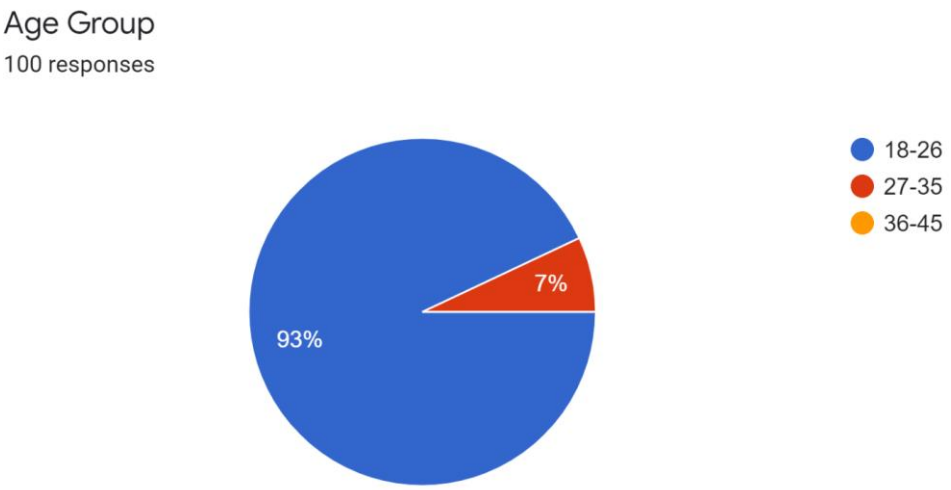
The current section discusses the results of the survey, in which participants were asked a series of questions about their understanding of the term Augmented Reality, whether or not they had used the technology, how their experience with it was, and whether or not it influenced their decision to make a purchase.

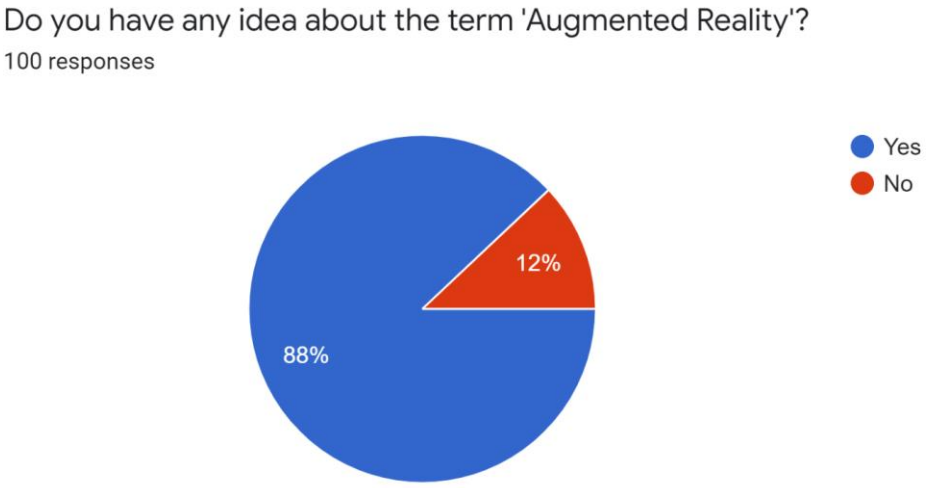
The conclusions drawn from the literature review include the impact of variables evaluated in the available research on the acceptability of AR in retail.

Findings from the Survey

The questionnaire was designed to know the general public's understanding about AR and their experience with it. We distributed the questionnaire amongst family and friends and our classmates. A maximum of the respondents belonged to the age group 18 years to 26 years and out of them, only 88 had some understanding about AR which indicated that the majority of the respondents had some knowledge about AR and have possibly used it as well.



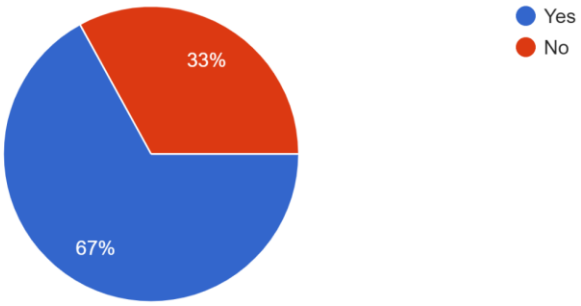




Further, we asked whether they had ever made any kind of purchase using AR and how it has impacted their purchase. We also gave an example of a 3D trail of spectacles on the Lenskart application for ease of understanding. To our surprise, a fair and good number of respondents had made some kind of purchase using the AR technology and it did impact their purchase to a good extent that they were ready to use the technology again for their next purchase.

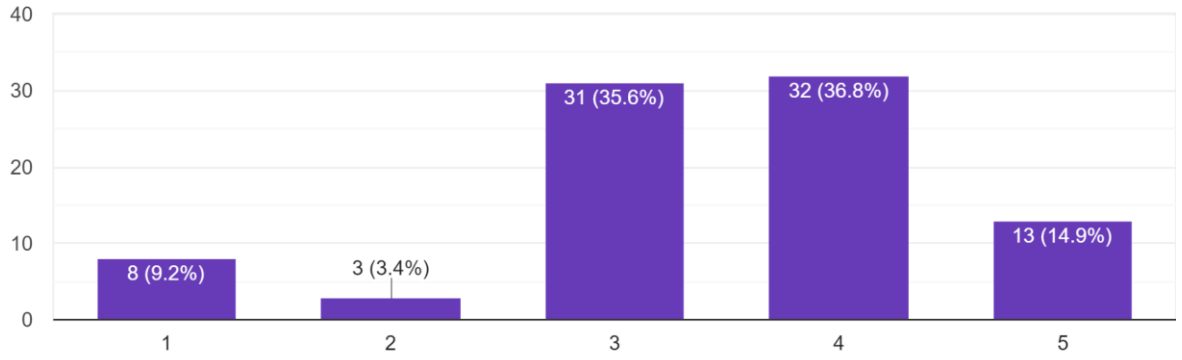
Have you ever used Augmented Reality while shopping online? (eg - 3D trial of spectacles on Lenskart)

100 responses



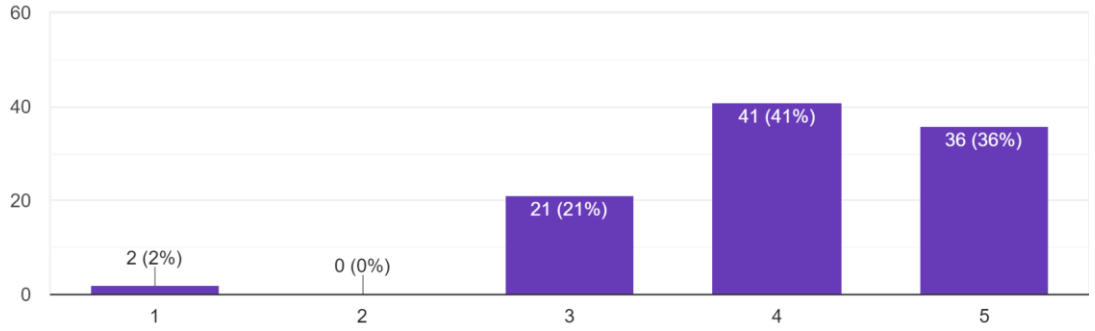
If yes, how has it impacted your purchase?

87 responses

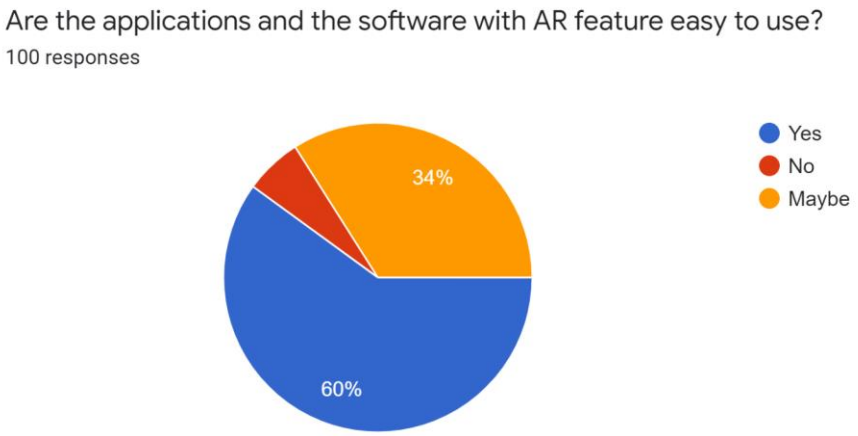


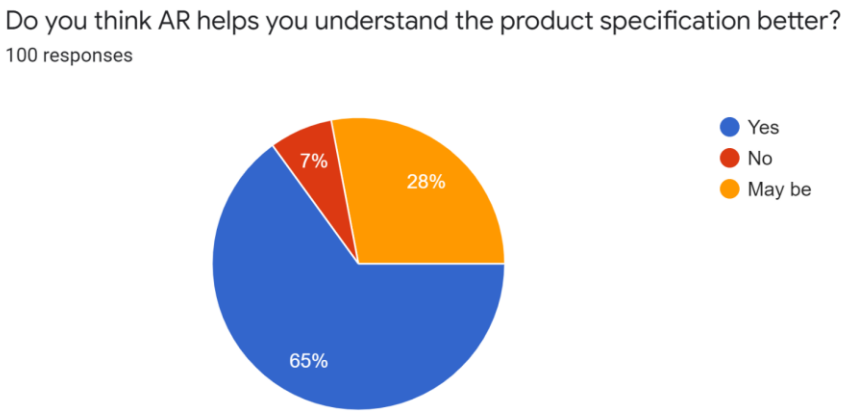
How important is the visual appearance of a store/website/application for you?

100 responses

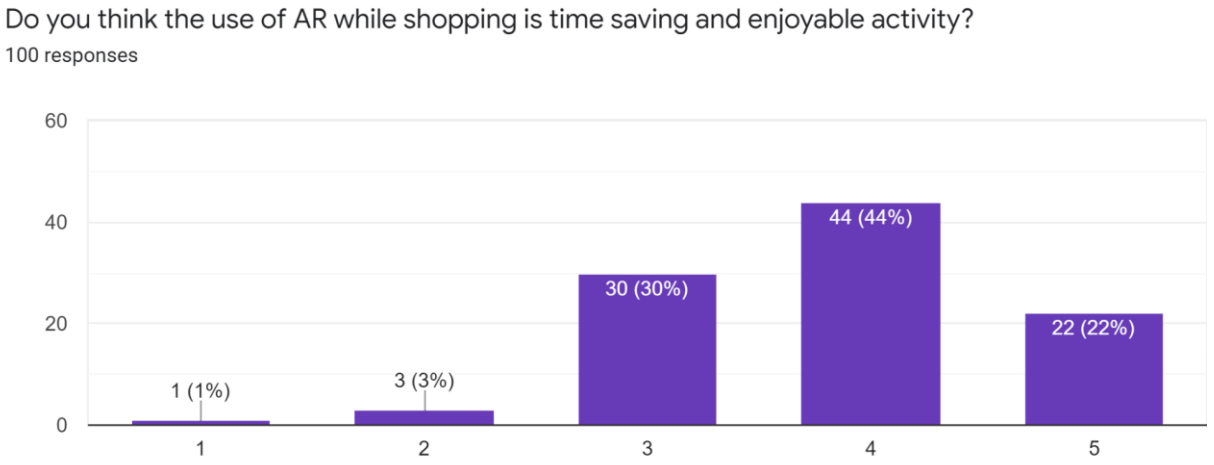


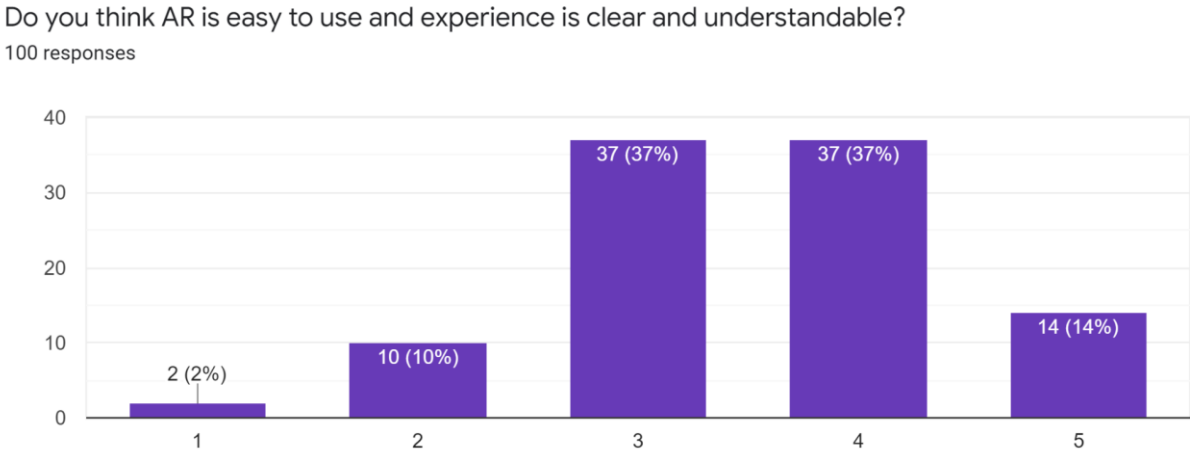
The customer is ready to make a purchase when they feel connected or seek to communicate with the product in some form and that's where the ease of AR comes in. AR makes the customer strengthened towards their choice of product. According to respondents, the AR feature is easy to use and it helps them to understand the product specification better. AR technology is really easy to use as everyone has smartphones now. The customer needs to just point the camera in the desired direction with proper purpose and they have what they need on their small screens, giving them a real experience of the product and making a purchase according to their need and desire.



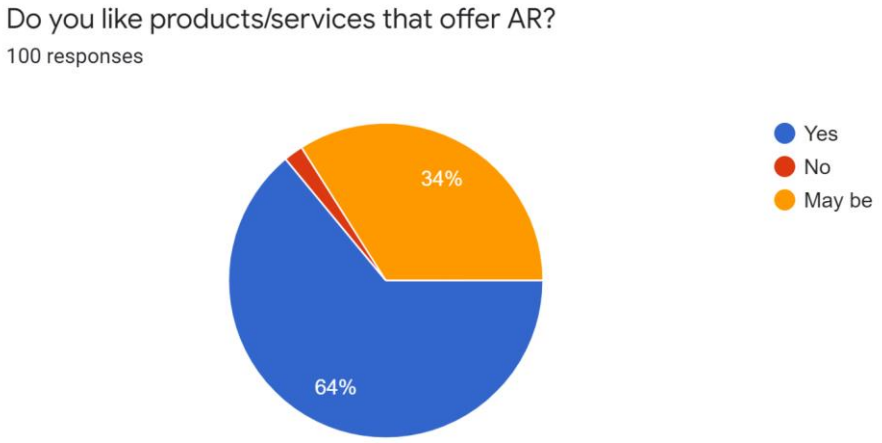


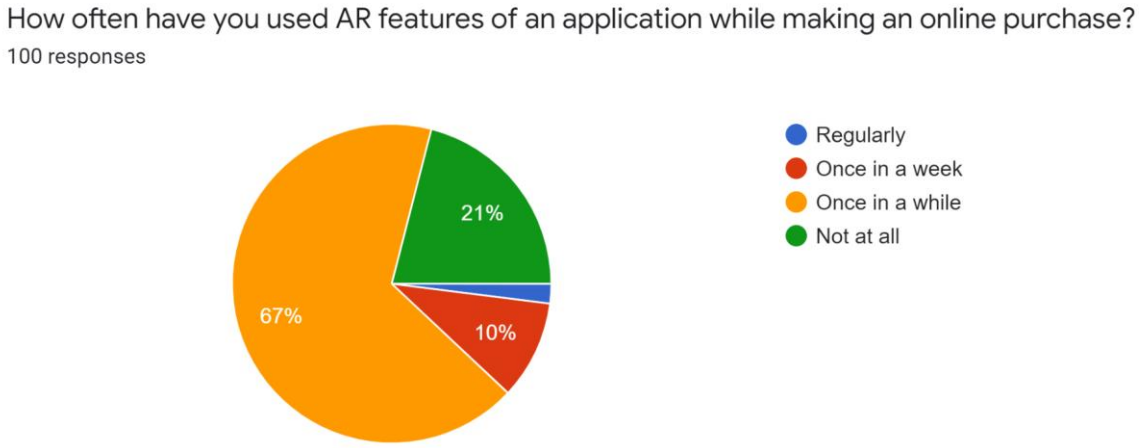
According to our respondents, we got to know that using AR while shopping was a time saving and enjoyable activity as the feature was easy to use and helped them experience the product more clearly and understandable. The AR helped in creating interest and a positive brand engagement with higher level of customer satisfaction. The use of AR also led to greater customer satisfaction along with improved retail loyalty.



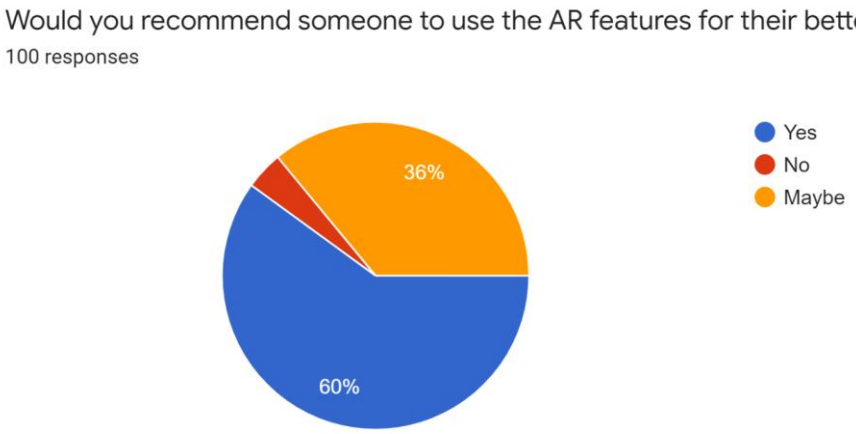


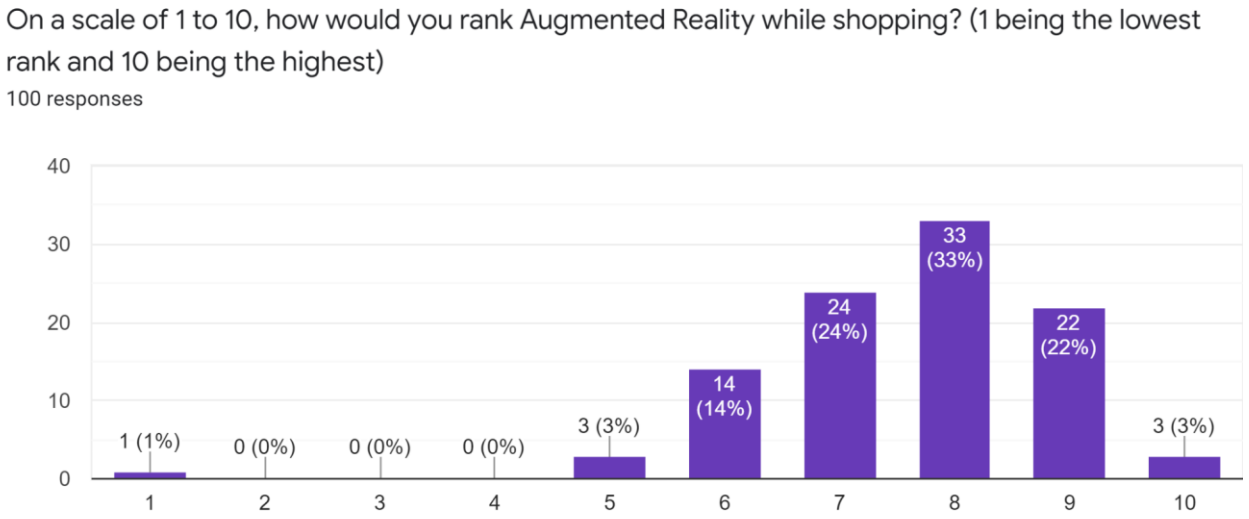
Using AR shopping apps create fun and interactive experiences for customers to ensure high satisfaction and loyalty. In the further part of the questionnaire, the respondents helped us to know that the maximum of them (64) liked using AR while making an online purchase. Though they did not use them on a regular basis, a maximum of them (67) used some kind of AR feature of a shopping application once in a while. The result indicated that customers most likely reuse AR apps for shopping online.





The intention to use the AR and recommend it to someone was indicative of their intentions to reuse the feature. It also showed that the customer wanted to engage in the AR and had a positive attitude towards the technology. The degree to which the respondents ranked the use of AR while shopping only indicated their likeness towards the feature. Customers with luxurious shopping motivation could use the technology more to enhance their experience.





With the above responses and findings, we came to the conclusion that, maximum number of respondents had used AR technology whether to make a purchase or just browse through products, they had fun and experienced the product. They most likely would be using the feature again for their next purchase and would be glad in recommending it to others too as it was easy to use and helped them to understand the product properly.

Technology acceptance model

The majority of research found that TAM connections are valid for AR apps. Along with item scales, writers employed adjective pairs and crucial episodes to validate TAM connections, demonstrating that in experimental situations, self-reported surveys may be substituted with textual material and online evaluations.

In a study of students, the link between usefulness and ease of use was not significant when using the scale-based technique, but it was significant when using the adjective pairs-based approach. Similarly, in a study done in Germany, the critical episodes sample did not support the influence of felt pleasure and perceived informativeness on perceived usefulness, but the item-based sample did. Furthermore, the relationship between ease of use and attitude was positive in the German sample but negative in the Italian group, resulting in a difference.

Code name	Variable name
Perceived ease of use	Perceived ease of use
Perceived usefulness	Perceived usefulness
Perceived enjoyment	Perceived enjoyment
Perceived informativeness	Perceived informativeness
Attitude toward using	Attitude toward using
Behavioral intention to use	Behavioral intention to use

Technology acceptance model theme

Store impression and consumer satisfaction were significantly influenced by perceived ease of use and enjoyment. The influence of perceived ease of use on the intention to reuse could not be substantiated in a survey of bookshop visitors. According to the same study, felt enjoyment, rather than perceived usefulness, accounted for the bulk of the variance in the intention to reuse, contradicting prior findings assessing the acceptability of various digital points of sale (PoS) media.

Flow concept

The flow notion is conceptualized as a reflecting second-request part with four aspects: inundation, interest, satisfaction, and control. In the connection between AR presence and client responses, stream and its aspects filled in as an arbiter. In one review, the three improving mental conditions of feeling of body possession (having a virtual symbol that looked like the actual self), feeling of responsibility control (capacity to control symbol), and self-explorative commitment came about in a multisensory stream insight, which thusly decidedly affected conduct results. In another review, distinctive memories impacted four kinds of exploratory consuming encounters emphatically.

Gamification, like flow theory, deals with making activities enjoyable by avoiding boredom. The two most often employed gamification elements, challenge and fantasy, had a good influence on arousal and compelling experience, but not on control sentiments. In non-challenge situations, fantasy also influenced patronage intentions.

Code name	**Variable name**
Flow	Flow Immersion Playfulness Concentration Time distortion Exploratory behavior
Gamification	Challenge mechanics Fantasy mechanics

Flow concept theme

Behavioral intentions

AR presence affected buying and verbal expectations emphatically. The effect of expanded reality on support goals was intervened by elements like utilitarian and gluttonous worth, spatial presence (the experience of virtual substance being situated in actual reality) and choice solace; shopping esteem, full of feeling responses and fulfillment; demeanor; and directed by familiarity with security rehearses. The impacts of savvy client experience on conduct expectations, WOM, tenacity to the retailer (invest more energy with the store), and shopping adequacy was intervened decidedly by fulfillment and adversely by saw risk. As per a similar report, satisfaction interceded the relationship between savvy client experience and personal satisfaction.

When mediated by flow, the perceived augmentation of AR had a favorable influence on revisit intentions, referral intentions, and application attitude but not on purchase intentions, brand attitude, or cognitive response. The presence of AR had a beneficial impact on long-term relationship behaviour, usage intentions, and readiness to devote more time to ARIT. These interactions were mediated by user perceptions, utilitarian performance anticipation, and flow experience, whereas user personality factors modulated these associations. The association between attitude toward AR and behavioural intentions was also affected by user personality factors.

Code name	**Variable name**
Patronage intentions	Patronage intentions Purchase intentions Word of mouth intention
Satisfaction	Satisfaction
Consumer responses	Affective responses Cognitive responses Behavioral intentions
Relationship intentions	Relationship behavior Usage intention

	Spend more time on AR
Customer feelings	Arousal feelings Control feelings Compelling experience Brand love
Customer valuations	Valuation of retailer/product/information Valued benefits Ad preference

Behavioral intentions theme

Purchase intentions were impacted by self-viewing, which was mediated through self-brand associations. AR's effect on purchase intentions was mediated by perceptual curiosity and patronage intents. The use of gamification approaches in an AR environment led in patronage intents, captivating experiences, and arousal experiences, but not control sensations. Mobile AR apps raised store valuation and were judged to add value to retail settings by giving product presentation capabilities and comprehensive information. Although AR advertising outperformed conventional and quick response code hypermedia (QRH) ads in terms of quality, attractiveness, memorability, success, and attitude toward ad, customers preferred traditional ads overall.

AR adoption intention was adversely linked with e-commerce business age and favorably associated with customer preparedness, top management support, the relative advantage of AR, and the organization's technical competency level. AR e-commerce systems were also linked to simplicity of use, contentment, higher levels of confidence in the final decision, and better information evaluation.

Attitude

The enjoyment and utility of media has a major impact on attitudes regarding AR. The user's attitude toward the AR application environment was mediated by the user's attitude toward the AR application environment, and technology self-efficacy moderated the negative relationship between exposure time and attitude toward the brand, according to a study conducted on the automobile category (belief in the ability to use technology). Another study employing the VAB decision model discovered that utilitarian performance expectation affected usage intentions positively, but there was no significant link between hedonic performance expectancy and usage intentions. AR presence influenced purchase intent, which was mediated by pleasant emotional responses and regulated by hedonic purchasing incentives.

Code name	Variable name
Attitude	Attitude toward augmented reality Attitude toward the brand
Performance expectancy	Utilitarian performance expectancy Hedonic performance expectancy
Attitude of other individuals	Attitude of other individuals

Attitude theme

Value

Utilitarian performance expectation was positively connected with monetary, convenience, emotional, and social factors. In addition, convenience and emotional values were positively connected with hedonic performance anticipation, but not social value. AR exposure resulted in a lower time–effort score and a higher ad effectiveness score as compared to QRH or traditional advertising, but had no influence on annoyance, ad value, or amusement ratings. AR has a beneficial impact on perceived fun and service excellence. On utilitarian and hedonic

values, simulated physical control and contextual embedding (integrating virtual material into personally meaningful real-world context) had a considerable impact. Utilitarian and hedonic advantages influenced attitudes about AR as well.

Code name	**Variable name**
Monetary value	Monetary value Trade-off between price value
Convenience value	Convenience value Time–effort score Irritation Cognitive effort
Emotional value	Emotional value
Social value	Social value
Hedonic value	Hedonic value Entertainment Enjoyment
Utilitarian value	Utilitarian value Pragmatic quality Advertising value Ad effectiveness
Experiential value	Playfulness Return on investment Aesthetics Service excellence Shopping value

Value theme

The value and price trade-off did not moderate these associations, but AR had favourable impacts on aesthetic quality, pragmatic quality, hedonic quality by stimulation, and hedonic quality by identification, all of which are components of UX. The reported satisfaction and convenience of usage were both positively influenced by aesthetic quality. AR utilisation showed a beneficial impact on retail environment perceptions, which influenced customer pleasure, shopping value, and emotive reactions. Similarly, the impact of tangibility (physical and mental) on purchase intention was mediated by perceived diagnosticity (confidence in the utility of the shopping experience).

Media characteristics

AR and other interactive technologies include media characteristics, which refer to communication factors associated with the transmission of data at various stages. AR's immersion is linked to a novelty effect, and because ARIT is still relatively new, AR hypermedia advertising have a high novelty level when compared to other forms of media (Yaoyuneyong et al., 2016). Previous media experience, on the other hand, lowered AR's media novelty (Yim et al., 2017), and an increase in AR hypermedia exposure duration had a negative impact on attitudes toward the AR environment.

The presence of augmented reality elicited powerful recollections. The degree of interactivity and vividness (the clarity and intensity of the augmented experience) has an impact on pleasure and media utility. The ease of usage was also affected by AR interaction (Pantano et al., 2017). AR interaction had no significant impact on satisfaction since reaction time positively affected perceived utility and the non-AR site was judged to be more responsive than the AR site. Consumers with a negative body image had a limited influence on their desire to adopt due to media annoyance and engagement.

There was a substantial link between media richness and experience value aspects including aesthetics and service excellence. On decision comfort, the interaction impact of spatial presence and knowledge of privacy practises was shown to be unfavourable. Furthermore, when it came to AR's influence on UX, the user's information privacy control variable was not a moderator. Finally, the combination between the user's control over access to personal information and the quality of the augmentation decreased user happiness.

Code name	Variable name
Novelty	Media novelty Previous media experience AR exposure time
Vividness	Vividness
Media efficiency	Media usefulness Media richness
Interactivity	Interactivity Perceived responsiveness Response time
Perceived risk	User's control of access to personal information Awareness of privacy practices Perceived risk

Media characteristics theme

Augmentation quality

Specificity (the capacity of customers to comprehend product attributes) and tangibility were both affected by the technology utilised for product display. The association between rehearsability (ability to alter material), self-referencing, information technology identity, and brand love was also controlled by the AR environment. While body image views had no effect on media enjoyment, consumers with a negative body image thought AR was more beneficial, had a positive attitude toward it, and were more likely to embrace it. Product kind had the most impact on aesthetic appeal and purchase/recommendation intents, whereas person's familiarity and image format had an interaction effect. When a product was put to their favourite image with visual upgrades and a pleasant face expression, customers rated it higher.

Self-empowerment, mapping quality, and information quality all contributed to augmentation quality, resulting in a favourable attitude toward AR and improved pleasure, according to participant narratives. Another study done in two nations discovered that the perceived utility of an AR application correlates with the quality of the information delivered by AR. Users of AR apps also agreed that they had found all of the information they required and rated the information offered at the point of sale higher than non-AR users, showing that AR applications had higher perceived augmentation capabilities than non-AR applications.

There was a strong link between the perceived story and characteristics of experience value such as beauty, fun, customer ROI, and service excellence. Only correlations involving aesthetics and service excellence were significant when perceptual present was taken into account. Sensory variables including self-location perception and haptic imaging (mental simulation of touch) have a good influence on three main psychological states. The effects of contextual embedding and simulated physical control on hedonic and utilitarian values were mediated by spatial presence.

Code name	**Variable name**
Perceived augmentation	Perceived augmentation Technology employed
Information quality	Information quality Information presentation Perception narrative Information characteristics
Mapping quality	Mapping quality
Sensory factors	Environmental embedding Spatial presence Self-empowerment Self-location Haptic imagery Specificity

Augmentation quality theme

Psychological factors

The inner workings of the mind and different mental states that influence the users' decision-making process are referred to as psychological factors. Brand love was positively influenced by a sense of ownership control and rehearsability. In series, self-referencing and information technology identity mediated the above-mentioned link. The association between vivid recollections and exploratory consuming experience was strongly moderated by a sense of ownership control. However, a study of students in Switzerland indicated that users did not perceive any substantial difference between AR and non-AR applications when it came to offering a better level of control.

Code name	**Variable name**
Decorating psychological states	Sense of body ownership Sense of ownership control Self-explorative engagement
User personality traits	Innovativeness Style of processing Decision comfort Emotional intensity Technology self-efficacy Autotelic need for touch Big Five traits Self-concept
User knowledge	User knowledge Familiarity

Conceptual framework

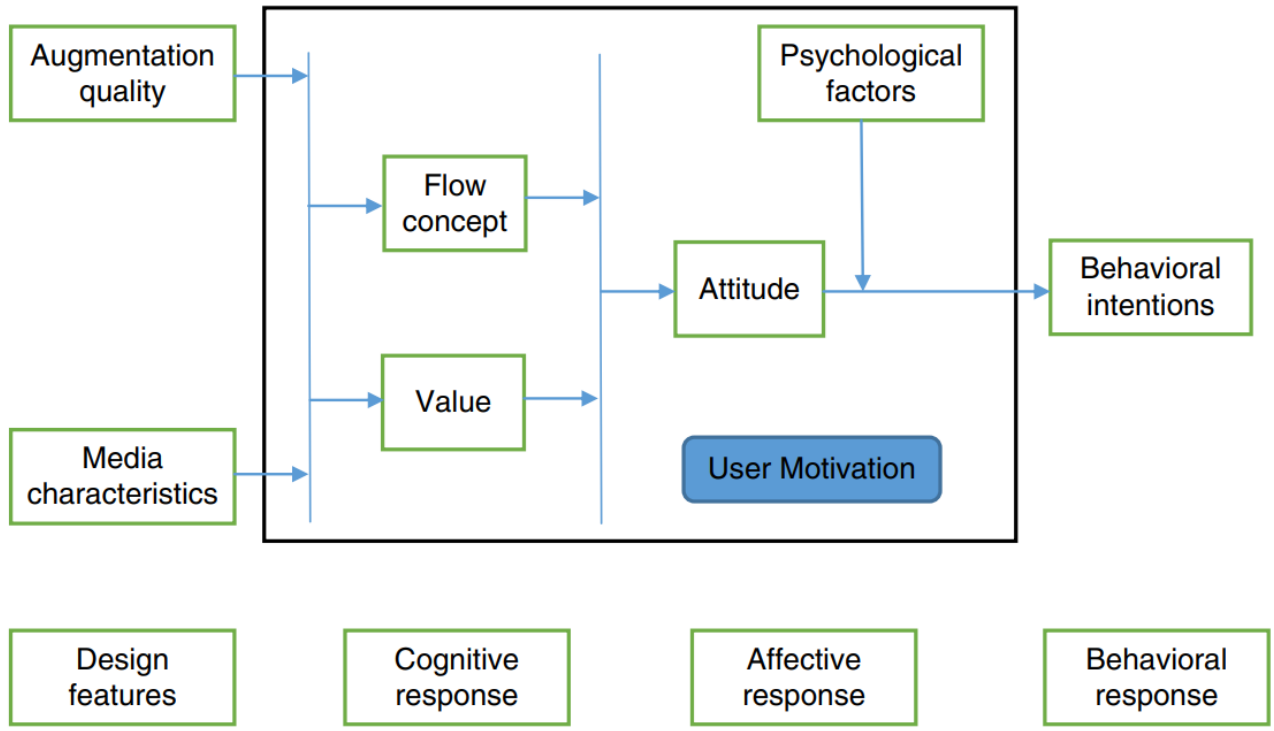
Topical analysis was utilized in this review to assemble the reasonable structure, with the first Cap model filling in as the reference worldview. Cap proposes that the framework's attributes and abilities work as outside boosts, inspiring a human to answer by using the framework. Cap characterizes client inspiration as a blend of mental and emotive parts, with the mental response prompting a viable reaction. Information corpus factors are arranged into four kinds: autonomous factors, subordinate factors, directing elements, and mediating factors. In light of the vast majority of variable classifications in the subjects, the topics have been named having a place with one of the four parts of plan attributes, mental reactions, close to home reactions, and social reactions.

A design feature refers to external characteristics that are distinctive to technology and context of usage in Davis's original TAM model (1986). Quality of augmentation and media characteristics are two design aspects that have been examined in the literature. Similarly, the flow idea and value themes are linked to technology-related cognitive processes. While variables underflow ideas reflect a condition when utilizing new technology becomes entertaining, resulting in the feeling of ease of use, variables undervalue themes have parallels with perceived usefulness constructed in TAM. Affective and behavioral reactions are also captured through variables investigated under the attitudinal and behavioral outcome themes.

The psychological aspects of the theme's variables operate as moderators of emotional and behavioral reactions. Customers' motivation to utilize ARIT is influenced by psychological variables. Although there is no moderator in the original TAM, newer versions of TAM, such as TAM2 and TAM3, have looked into the influence of moderators on technology acceptance. A popular theory on technology acceptance, the unified theory of acceptance and usage of technology, acknowledges the relevance of moderators in affecting technology adoption. The suggested conceptual framework is depicted in the diagram below, which shows how numerous topics are organized.

Findings

ARIT offers value to the sale of experiential items like fashion, cosmetics, and furniture by taking a low-cost approach to product trails, boosting buy certainty and lowering return rates. AR's capacity to tailor the customer experience by enhancing physical reality gives it the opportunity to provide a comprehensive purchasing experience by combining sensory and omnichannel marketing methods.



Retailers should evaluate ARIT on a variety of aspects before incorporating it into their products, including compatibility with the product category, customer personality factors, user perceptions of body image, ecosystem technological preparedness, and organisational features, among others. Retailers should also exercise caution when deciding between different forms of AR and allow consumers to play with and enrich digital material, since AR allows for experience co-creation among the actors.

When it comes to building AR offers, merchants should keep in mind that as customers' exposure to ARIT grows, the novelty element connected with AR diminishes. To combat this

impact and immerse users in the app, businesses could employ original content and novel engagement marketing methods to evoke the "Wow" factor. Because personalising AR services necessitates the acquisition and storage of personal data, businesses must disclose the data acquired and its possible uses.

Retailers should examine the influence of cultural variations and the servicescape on UX when building AR-based service augmentation initiatives. Existing research has also shown that internet reviews are a great source of information for identifying difficulties encountered by AR app users. If online reviews are needed to better understand the consumer experience, significant occurrences must be chosen from a big pool of reviews and must comprise a minimum number of both positive and negative incidents.

Benefits of Augmented Reality in Retail

“I think that a significant portion of the population of developed countries, eventually all countries, will have AR experiences everyday like eating three meals a day. It will become that much part of you.” - Tim Cook

“One day, we believe this kind of immersive, augmented reality will become a part of a daily life for billions of people.” - Mark Zukerberg

The impact of augmented reality on the retail business has been immense, and the industry has enjoyed several advantages. From optimising procedures to making purchasing simple for customers, augmented reality in retail is a whole new ballgame (both online and offline). Customers have seen the following major benefits of augmented reality in shopping:

User content personalization:

Retailers also modify content to meet the greatest needs of their customers. You may have seen department shops filtering material for you so that you can locate what you're looking for quickly. This has been achieved in a number of ways. Another technique that may be utilised to enhance things is virtual reality (VR). They collaborate to create comprehensive AR and VR retail solutions.

Ease of tryout or trails:

Waiting in line outside a courtroom for your turn may be tiresome and time-consuming. As a consequence, interactive mirrors are now available where you can simply determine the size of the gowns you desire and see how they appear and compliment your body on a computer screen in front of you. This is an excellent application of virtual reality in the retail sector. When you shop online, you'll do the same thing. Assume you're looking for glasses, and the app scans your face to display a pair on your digital mirror. These kind of gamification tactics have a high success rate in increasing retail sales.

A perfect combination of traditional retail store and online shopping:

Shopping is viewed as a pleasurable pastime. Finding the greatest items might be challenging with so many department stores and such a vast population. One of the most significant benefits of augmented reality in ecommerce is that it duplicates the same 'fun' experience as traditional retail without the inventory pricing or never-ending lines.

Bringing printed material to customers:

Printed products will not disappear in the future since they are such an important aspect of marketing. It's one of the most innovative augmented reality marketing tactics ever conceived. Have you ever noticed how merely holding your phone over a photo pulls up all of its features, as well as comparable things of interest? You may do so with augmented reality in retail apps. Many companies have adopted this tactic, such as magazine publishers, who utilise entertaining animation and visuals on the front and back pages to attract customers.

Increasing brand recognition and visibility:

AR is an excellent tool for improving a company's brand recognition among a larger audience. By utilising mobile applications with cutting-edge AR capabilities, brands can present customers with exclusive chances. The use of augmented reality in retail marketing campaigns gives advertisers a lot of latitude to come up with novel methods to communicate, while also giving a channel for instant feedback.

Dissolving language barriers:

Despite the fact that the world's languages are so diverse, there are still certain barriers to overcome, although they are only temporary. Using Google Translate AR mode, you may view any of the 40 foreign languages as your native language. AR-based shopping applications have features that channel language(s) in a way that is either local specific or allows you to comprehend offerings utilising AR and AI techniques. If you use printed catalogues, the AR text will direct you to the most appropriate language for you.

Better returns:

Because augmented reality is a rapidly evolving technology, an e-commerce or mobile commerce shop that provides such services would surely gain substantially more than those who do not. In recent years, augmented reality integration has become a must-have advancement in the retail business. Moreover, developing an augmented reality app is now straightforward and affordable.

Enriched shopping experience:

This is the pinnacle of all advantages, as well as one of the most important AR breakthroughs in modern retail. When you purchase online or in person, a retailer can use the most engaging methods to ensure that you have a positive shopping experience and return to the

shop/store/portal/app. Digital/virtual mirrors are a vital component to the Advanced In-Store Experience that is evolving over time.

Future Scope

This study synthesises key findings from the literature and quantitative analysis and emphasises the need of incorporating AR capabilities into retail strategy planning. Themes that emerged from the study were subjected to a critical examination, which assisted in identifying gaps and suggested research paths. The following parts make up the future research agenda.

Improving the generalizability of the findings

Because the product categories related with AR are typically used by the above client demographics, most existing research employ students or female respondents. However, as ARIT evolves and more consumer segments use the technology, it will be important to verify and confirm the underlying linkages utilising samples from other adopter groups. The current study literature has mostly concentrated on cross-sectional data and has neglected to consider the impact of time on technology adoption. To gain a better understanding of the phenomena, future study should use a longitudinal approach. Future study should also empirically evaluate and validate the paradigm illustrated in Figure 1 utilising various immersive technologies.

Role of social forces in influencing AR acceptance

The influence of numerous psychological and technological elements on AR acceptability has been researched in depth in the available literature. Many research on technological adoption have highlighted the relevance of social impact, since new attitudes are developed in the social environment as a result of many conformance variables such compliance, identification, and internationalisation. The influence of social environment and cultural norms on AR acceptability should be the focus of future study. Because it has been widely utilised to examine the role of social elements in motivating and controlling human behaviour, social cognition theory may be used to the AR setting.

Research on extended reality

Given the omnipresence of technology in one's life and its importance in interpersonal interactions, digital technology is regarded as an extension of one's self. AR is also being coupled with other immersive technologies and digital solutions to create extended reality, thanks to technological advancements (XR). Future study should look at the numerous aspects

that influence XR acceptability, as well as the impact of the change on retail and human life quality.

Impact of AR application features on customer experience

AR apps provide a variety of functionalities for product presentations and virtual product testing. The research emphasis necessitates a knowledge of how these elements influence the customer's AR experience, and this focus has major consequences for companies developing AR apps. Features such as the ability to post material on social media platforms aid in the engagement of users and the dissemination of product awareness. The impact of AR content-based social media marketing methods is a promising subject for further research.

Identifying underlying motives behind AR usage

While much of the existing literature uses a basic experimental design to validate hypotheses, future research should adopt a higher-order factorial design with additional degrees of manipulation to investigate the causes and repercussions of AR use. To counteract the biases inherent with the use of the self-reported survey, scale alternatives like as biometric measurements and machine learning-based recognition/coding can be utilised. Because the majority of studies concentrated on the primary impacts of factors, future study should focus on the interaction effects of variables.

Role of retail atmospherics in influencing AR usage

Because human senses function in tandem, the importance of retail atmospherics aspects on consumer experience cannot be overlooked. Although AR apps typically stimulate the visual sense, businesses should invent techniques to include other senses in order to provide an immersive AR experience. Future study might look at how ARIT can be utilised as a sensory enabling technology and to enhance sensory marketing in order to establish subconscious triggers that alter human perception. Similarly, most studies test hypotheses using a single product or brand as stimulus. Future study should put the assumptions to the test by giving customers a wide range of alternative systems, product categories, and brands to choose from in order to replicate real-world scenarios and improve the ecological validity of the findings. Another area of investigation is the effect of different organisational and infrastructure elements on AR acceptability.

Integrating AR media into retailers omnichannel strategy

Digitization and many touchpoints have altered the emphasis from multi-channel to omnichannel commerce, with a focus on personalisation and offering a consistent experience across various channels of communication. Retailers must engage in a wide range of activities to blend social, local, and mobile ideas in order to deliver an omnichannel experience. To facilitate such integration, merchants must adapt their corporate culture, upgrade their information systems, and reallocate staff to handle numerous channels. The scope of future study will be to investigate how AR may be integrated into an omnichannel commerce strategy. Future study should also attempt to examine the function of AR in providing value for merchants and customers through the use of the jobs-to-be-done perspective.

Conclusion

Augmented reality has grown into a cutting-edge platform for merchants to interact with clients via their cell phones. AR provides a new digital interface that improves the consumer-brand interaction and can be utilized everywhere, such as at home, on smart devices, and in shop mirrors.

AR is installed on more than half of mobile users' devices. Augmented Reality, or AR, is a game-changing technology that creates 3D/CGI items to help you purchase. This is done by brands to improve your shopping experience and make it easier for you to shop. It's now really simple to create an AR app. The cost of using augmented reality in retail is dictated by how big a retailer wants their brand to be. Your intellect, originality, and business experience will determine how you wish to include a personal element. When it comes to being inventive and cost-effective, it is revolutionizing the retail business. In retail, the goal of augmented reality is to raise brand recognition among customers through immersive shopping experiences.

Retail is an intriguing industry to explore augmented reality in because the results can be seen in actual figures, with live consumer feedback, and viral popularity owing to its originality. AR has now infiltrated all aspects of the retail business. Wearing AR-enabled glasses or scanning through Augmented Reality Mobile Apps, you'll soon be shopping for everything you need while sitting on your sofa or enjoying a cup of coffee in the kitchen.

India is still catching up to the West, where the advertising business began blooming with innovations in 2007-08. To reach the public, amazing initiatives require ongoing PR and marketing coordination. AR must become more extensively utilised in order for it to become mainstream, offering customers with a range of methods to experience with and learn from it. The retail industry anticipates that Augmented Reality will become more thoroughly integrated with the systems that surround us in the future years. Large AR expenses will be accounted for in the same manner that digital marketing expenditures are.

The year 2020 has gone, leaving some notable growth records in the domain of Augmented Reality in the retail business as the future develops toward more digital tools. This technology will surely develop in the business, generating a flurry of additional nesting programmes and eventually morphing into large-scale operations.

Many pioneering ventures have demonstrated to the rest of the world that augmented reality

has broad market appeal and potential for merchants. Large corporations have noticed the emergence of augmented reality and have opted to include it into their future endeavours. Experts are working on converting augmented reality ideas into real-time customer apps. According to the estimates for Augmented Reality, the technology will begin to expand and pick up speed in 2021, and will continue to make headlines.

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Annexure

Augmented Reality in Retail

A survey to understand customer experience regarding the use of Augmented Reality while shopping.

* Required

1. Gender *

Mark only one oval.

- ◯ Male
- ◯ Female

2. Age Group *

Mark only one oval.

- ◯ 18-26
- ◯ 27-35
- ◯ 36-45

3. Do you have any idea about the term 'Augmented Reality'? *

Mark only one oval.

- ◯ Yes
- ◯ No

4. Have you ever used Augmented Reality while shopping online? (eg - 3D trial of spectacles on Lenskart) *

Mark only one oval.

- ◯ Yes
- ◯ No

5. If yes, how has it impacted your purchase?

Mark only one oval.

	1	2	3	4	5	
Had no impact	◯	◯	◯	◯	◯	Impacted highly

6. How important is the visual appearance of a store/website/application for you? *

Mark only one oval.

	1	2	3	4	5	
Least important	◯	◯	◯	◯	◯	Extremely important

7. Are the applications and the software with AR feature easy to use? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

8. Do you think AR helps you understand the product specification better? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ May be

9. Do you like products/services that offer AR? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ May be

10. Do you like to buy products online or you prefer to go to store and buy it? *

Mark only one oval.

- ◯ Online
- ◯ Go to store
- ◯ Depends on the product

11. Do you think the use of AR while shopping is time saving and enjoyable activity? *

Mark only one oval.

	1	2	3	4	5	
Highly Disagree	◯	◯	◯	◯	◯	Highly Agree

12. Do you think AR is easy to use and experience is clear and understandable? *

Mark only one oval.

	1	2	3	4	5	
Very easy	◯	◯	◯	◯	◯	Very difficult

13. How often have you used AR features of an application while making an online purchase? *

Mark only one oval.

- ◯ Regularly
- ◯ Once in a week
- ◯ Once in a while
- ◯ Not at all

14. Would you recommend someone to use the AR features for their betterment? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

15. On a scale of 1 to 10, how would you rank Augmented Reality while shopping? (1 being the lowest rank and 10 being the highest) *

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Least rank	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Highest rank