# ADVANCING METAVERSE E-COMMERCE: A QUANTITATIVE DATA ANALYSIS STUDY ON USAGE OF AI IN VIRTUAL SHOPPING AND LIVE COMMERCE

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## Dedication

This dissertation is dedicated to all those who have inspired and supported me throughout this academic achievement.

To my family, for their unwavering love, patience, and encouragement; to my mentors and colleagues, for their guidance and wisdom; and to my friends, for their constant support and understanding.

This work would not have been possible without each of you. Thank you for believing in me and for being my pillars of strength.

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ABSTRACT

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Dissertation Chair: <Chair's Name>
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This dissertation aims to analyze one of the most significant and continuously evolving areas in the modern world of commerce – the Metaverse and its significant aspects, focusing on virtual shopping and live commerce. Over time, the digital environment has grown, leading to businesses incorporating sophisticated technologies such as virtual reality and artificial intelligence. These technologies are helpful when designing new means to provide customers with enhanced and individualized buying experiences. The research aims to pinpoint what these innovations are doing to consumers' behavior, expectations, and the landscape of the retail environment.

It is for this reason that the study commences with the early backgrounds and evolution of the eCommerce business, from simple websites that were merely virtual shops to the current highly developed systems that encompass multiple features and capabilities. It

defines the significant events that have formed the contemporary context of online shopping and considers how these events have affected customers. Particular emphasis is placed on virtual shopping and live commerce and the conditions that facilitated the launch of these activities and techniques.

Quantitatively, the research evaluates the critical changes in consumers' expectations and satisfaction levels after incorporating AI and virtual shopping technologies. The studies present the type of response that consumers have received regarding these technologies and how these technologies are perceived, and the results shown are that while these technologies go a long way in providing convenient and personalized solutions, there is still the reality that there must be a considerable gap on those with awareness of such sophisticated facilities. This gap sometimes leads to different satisfaction levels due to the effectiveness of implementing these technologies and passing information to consumers.

The dissertation also takes time to explain some of the problems the conventional eCommerce industry faces, such as too much competition and constantly evolving consumer views on what constitutes practical eCommerce. It elaborates on how social aspects of live commerce within the Metaverse improve the shopping experience and consumer behavior. Besides, the studies describe live commerce's effectiveness in increasing sales conversion, customer retention, and building brand loyalty.

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LIST OF ABBREVIATIONS

AI……..Artificial Intelligence

VR …….Virtual Reality

IoT …….Internet of Things

AR …….Augmented Reality

CRM …….Customer Relationship Management

CMS …….Content Management System

IE ……..Immersive Experience

UI ……..User Interface

CX …….Customer Experience

EDI …….Electronic Data Interchange

EFT ……Electronic Funds Transfer

mCommerce ……...Mobile commerce

ML ……..Machine Learning

NFTs ……..Non-Fungible Tokens

# CHAPTER I:

# INTRODUCTION

## 1.1 Introduction

The metaverse is a digital environment where physical and virtual realities merge, facilitated by network connectivity, augmented reality, virtual reality, and Artificial Intelligence. Advances in technology have made it possible for people to interact with each other and with virtual environments in increasingly immersive and realistic ways. The concept of the metaverse has acquired major attention in a couple of years as it offers numerous opportunities for various industries, including e-commerce. Metaverse e-commerce refers to the integration of virtual shopping experiences and live commerce in the metaverse. Metaverse e-commerce comes with an innovative frontier for businesses looking to reach customers in innovative ways.

Advancements in metaverse technology have paved the way for a transformative shopping experience. Virtual commerce, also known as v-commerce, has become a game-changer in the world of e-commerce. With virtual commerce, businesses can engage with customers in a virtual environment, providing them with unique and immersive shopping experiences. V-commerce is a business operation performed in an immersive virtual environment, allowing customers to explore products and make purchases through their avatars. However, it is necessary to note that the virtual world is still in its infancy and there is much room for growth and development. The metaverse holds immense potential for e-commerce, but there are several key considerations to keep in mind when developing a framework for metaverse e-commerce. One important aspect to consider when developing a framework for metaverse e-commerce is the technological infrastructure required. To create a successful metaverse e-commerce experience, businesses need to ensure that they have the necessary technological resources and capabilities.

This includes having a robust virtual reality platform, augmented reality capabilities, and high-speed internet connectivity. Additionally, incorporating blockchain technology can enhance security, transparency, and trust in virtual transactions within the metaverse. Another crucial consideration when developing a framework for metaverse e-commerce is creating a seamless and user-friendly interface. Users should be able to navigate the virtual shopping environments easily and intuitively, with clear product displays and easy access to information about pricing, availability, and other relevant details.

E-commerce, which stands for electronic commerce, is about buying and selling things online. It started in the 1990s with the internet and has changed significantly. At first, it was just essential online stores, but now it includes secure online payments, mobile phone shopping, and even social media. E-commerce covers many things, like online marketplaces, digital services, and subscription models. It is a big part of the world economy.

Virtual shopping means using digital platforms to pretend you are in an actual store. You can look at and buy things in 3D, often with a digital character representing you. Live commerce is when you watch live videos of things you might want to buy and can buy them right there as you watch. These new ways of shopping are becoming popular. They are part of a more significant trend called the Metaverse, which offers more fun and interactive shopping experiences than traditional online shopping.

### 1.2 Definition and Significance of the Metaverse

The Metaverse is an evolving concept that different groups define in unique ways. This section explores how technology experts, businesses, and users perceive the Metaverse, providing a comprehensive understanding from multiple perspectives.

From the standpoint of technology experts, the Metaverse is a sophisticated integration of several advanced technologies. It is a digital universe that combines elements like virtual reality (VR), augmented reality (AR), artificial intelligence (AI), and blockchain to create immersive and interactive experiences. According to Huynh-The et al. (2022), the Metaverse leverages these technologies to offer users an effortless integration of digital realities and physical, enabling interactions in a shared virtual space. This technological convergence aims to enhance user experiences by providing more engaging and lifelike environments (Huynh-The et al., 2022).

Furthermore, the role of Human-Computer Interaction (HCI) is pivotal in the Metaverse. Said (2023) describes the virtual world as an environment where users can connect, work, and access educational resources through technology-mediated interactions. This perspective emphasizes the significance of user interfaces and the overall structure of virtual environments to facilitate effective communication and interaction (Said, 2023).

Businesses take the Metaverse as an innovative solution for economic activities and customer engagement. The “Metaverse” opens up opportunities for virtual shopping, live commerce, and innovative marketing strategies. Karabacak and Güngör (2023) highlight that brands increasingly utilize the Metaverse for influencer marketing, where virtual environments allow for more interactive and personalized customer experiences. This approach helps businesses create more engaging marketing campaigns and foster deeper connections with their audiences (Karabacak and Güngör, 2023).

In addition to marketing, the Metaverse presents significant economic potential by enabling new business models and products. Amirulloh and Mulqi (2022) describe the Metaverse as a virtual economy where businesses can conduct transactions, manage supply chains, and trade digital assets. This virtual economy is expected to drive innovation and

create new market opportunities, making the Metaverse a critical area for business development (Amirulloh and Mulqi, 2022).

The Metaverse offers users a wide range of interactive and immersive experiences. It provides a platform where one can engage in socializing, gaming, learning, and shopping virtually. Kim et al. (2021) explain that the metaverse permits users to make avatars and immerse themselves with others in real-time, enhancing the sense of presence and participation in a digital environment. This immersive experience is a significant draw for users, offering them new ways to interact and engage with digital content (Kim et al., 2021).

The Metaverse is seen as a tool to enhance learning experiences in the educational context. Shao (2023) notes that the Metaverse can offer practical training and game-based learning opportunities that might not be possible in the physical world. This approach can make learning more engaging and effective, offering students immersive environments to practice and apply their knowledge (Shao, 2023).

In conclusion, the Metaverse is a multi-faceted concept defined differently by various stakeholders. Technology experts focus on the technological integration that enables immersive experiences; businesses see it as an innovative platform for economic opportunities and consumer immersion, and users appreciate the interactive and immersive environments it provides. Understanding these diverse perspectives is essential for comprehensively grasping the potential and implications of the Metaverse in our digital future.

### 1.3 Evolution of eCommerce

Since its inception, eCommerce has been marked by significant advancements and transformations. This section outlines the evolution of eCommerce from its early stages to its current state, highlighting key developments and trends.

eCommerce began in the early 1990s with the commercialization of the Internet. The initial phase of eCommerce, known as the innovation phase (1995-2000), featured the development of basic online transaction capabilities. Early implementations of e-commerce involved Electronic Funds Transfer (EFT) and Electronic Data Interchange (EDI) which allowed businesses to conduct transactions electronically (D'Andrea et al., 2014).

The late 1990s and early 2000s saw the rise of the dot-com boom, where numerous online businesses emerged. Companies like Amazon and eBay pioneered online retail and auction services, respectively. This period marked the consolidation phase (2000-2006), by this phase, conventional businesses started adopting online platforms to enhance their operations. eCommerce became more user-centric, improving customer experience and expanding the range of online products and services (Sait et al., 2004).

Web 2.0 technologies have brought about significant changes, and eCommerce entered a new reinvention phase (2006 onwards). This era was characterized by increased interactivity and user-generated content. Social media platforms like Facebook and Instagram have become influential in driving eCommerce through social commerce, where users can discover and purchase products directly through social media channels (Reynolds, 2000).

The proliferation of smartphones led to the rise of mobile commerce (m-commerce). Businesses developed mobile apps to provide customers with a seamless shopping experience on their mobile devices. This period also saw the integration of various payment systems, such as digital wallets and mobile payment apps, making transactions more convenient for users (Jindal et al., 2016).

In recent years, big data and artificial intelligence (AI) have revolutionized eCommerce. These technologies enable businesses to analyze customer data to provide

personalized shopping experiences, optimize supply chains, and enhance customer service through chatbots and AI-driven recommendations (Kumar, 2021).

The latest trend in eCommerce is integrating with the metaverse, a virtual environment where users can interact, shop, and socialize. This new frontier aims to create immersive shopping experiences by leveraging augmented and virtual reality technologies (Abid, 2020).

The evolution of eCommerce has seen significant advancements and transformations since its early stages in the 1990s. It began with the commercialization of the Internet and the development of basic online transaction capabilities such as Electronic Data Interchange (EDI) and Electronic Funds Transfer (EFT). The late 1990s and early 2000s marked the rise of online marketplaces during the dot-com boom, with companies like Amazon and eBay pioneering online retail and auction services. The advent of Web 2.0 technologies further reinvented eCommerce, leading to the growth of social commerce through platforms like Facebook and Instagram. The proliferation of smartphones gave rise to mobile commerce (m-commerce) and the integration of various payment systems, making transactions more convenient for users. In recent years, big data and artificial intelligence (AI) have revolutionized eCommerce, enabled personalized shopping experiences, and enhanced customer service through AI-driven recommendations. The latest trend in eCommerce involves integrating with the metaverse, aiming to create immersive shopping experiences using virtual and augmented reality technologies.

ECommerce's advent and rapid growth have significantly transformed consumer behaviors and expectations. This section examines these changes, drawing on various research studies to provide a comprehensive overview.

The rise of eCommerce has significantly increased consumers' ease and availability. Buying goods and services online enables consumers to purchase from their

homes anytime. This convenience has changed consumer expectations, as customers now anticipate fast and effortless access to various products (Grover, 2022). The capability to compare prices, read reviews, and access comprehensive product information has also become a fundamental expectation for online shoppers (Kochar and Kaur, 2018).

Consumers are no longer just passive recipients of products. They now play an active role in creating value. With Web 2.0 technologies, consumers can interact with businesses and other consumers. They can provide product reviews, ratings, and feedback. This active participation gives consumers more power and influence over market trends and product offerings (Zimmermann, 2010). Additionally, social commerce has emerged, where consumers leverage social networks to make purchasing decisions and share their experiences.

Using Big data and Artificial Intelligence (AI) in e-commerce has enhanced personalized and customized shopping experiences. Retailers leverage consumer data to offer individualized suggestions, precise marketing, and tailored shopping experiences. Customers now anticipate this degree of personalization, which improves their overall shopping experience and boosts satisfaction (Ying-long, 2012).

While electronic commerce provides many advantages, it has also sparked worries about privacy and security. Customers are becoming more conscious of the potential dangers linked with Internet transactions, such as data leaks and deceit. Consequently, trust and security have become essential elements affecting consumer actions. Internet merchants must guarantee strong security measures and clear privacy guidelines to establish and uphold consumer confidence (Leonard and Jones, 2015).

The use of mobile technology has changed the way people shop. More people now shop using their mobile devices, which has led to an increase in mobile purchases. People

expect online shopping to be easy and convenient on their mobile devices, with mobile-friendly websites and apps and the ability to pay using mobile phones (Tyagi et al., 2023).

The COVID-19 pandemic sped up the move to online shopping and changed how people shop. Lockdowns and social distancing made many people shop online because they had to. This change has increased online sales, and people now prefer using online stores for their shopping needs (Jílková and Králová, 2021).

The landscape of consumer behavior has been significantly altered by the rise of e-commerce, placing a strong emphasis on convenience, accessibility, and active engagement. The application of big data and artificial intelligence has enabled the creation of tailored shopping experiences, offering personalized recommendations and targeted marketing. However, privacy and security issues continue to be a concern. The increased prominence of e-commerce, coupled with the profound impact of the COVID-19 pandemic, has propelled a notable shift in consumer behavior toward a greater reliance on online shopping channels.

### 1.4 Emergence of virtual shopping and live commerce

Several key factors have driven the rise of virtual shopping and live commerce, collectively transforming the retail landscape. This section will outline these contributing factors based on recent research and insights.

Technological advancements have played a significant role in this transformation. The rapid penetration of broadband internet and the widespread adoption of smartphones have facilitated the growth of virtual shopping. The convenience and accessibility provided by mobile devices have allowed consumers to shop online at any time and from anywhere, significantly boosting eCommerce activity (Tyagi, 2017).

Web 2.0 inventions and the proliferation of social media applications have also contributed to this transformation. They have enabled a more interactive and engaging

shopping experience. Social media has become the strongest tool for influencing consumer behavior and providing live commerce platforms where sellers can interact with buyers in real-time (Liang et al., 2011).

Another key driver is enhanced consumer experience. Virtual shopping offers unparalleled convenience, allowing consumers to browse and purchase products without the need to visit physical stores. Features like cash-on-delivery, easy return policies, and extensive product information further enhance the shopping experience (Sinha et al., 2015). Live commerce provides an engaging shopping experience where consumers can interact with sellers, ask questions, and see products demonstrated in real time. This interactivity helps build trust and encourages impulse buying (Usadi et al., 2023).

Trust and reliability are critical factors in the acceptance of virtual stores. Elements such as perceived service quality, product offerings, and information richness significantly build consumer trust and loyalty (Chen and Tan, 2004). Engaging in social interactions during shopping enhances the sense of community and trust. Social support and the quality of relationships on social commerce platforms influence users' intentions to continue using these platforms (Shen, 2012).

Consumer demand for personalization is also a significant factor. Consumers increasingly seek personalized shopping experiences. Virtual shopping platforms leverage big data and AI to offer customized recommendations and tailored shopping experiences, meeting individual consumer preferences (Kalaivani et al., 2022).

The COVID-19 pandemic has also played a crucial role in accelerating the adoption of virtual shopping and live commerce. With physical stores closed or operating under restrictions, consumers turned to online platforms for shopping. This shift has led to lasting changes in consumer behavior, with many continuing to prefer online shopping even post-pandemic (Carolina et al., 2022).

The emergence and popularity of virtual shopping and live commerce result from technological advancements, enhanced consumer experiences, increased trust, and shifts in consumer behavior, mainly influenced by the COVID-19 pandemic. These factors have collectively transformed the retail landscape, making virtual shopping and live commerce integral to the modern shopping experience.

Cutting-edge technologies have made virtual shopping and live commerce popular. These technologies changed online shopping, making it more immersive, interactive, and personalized. Here is a detailed look at the key technologies driving these innovations.

- Virtual Reality (VR) and Augmented Reality (AR)

Virtual Reality (VR): Remember this: VR technology creates realistic virtual stores where customers can explore and interact with products in 3D. VR headsets and other hardware enhance the feeling of being present in a virtual store, providing a lifelike shopping experience (Papadopoulou, 2007). The use of VR in online shopping has the potential to create trust and improve customer experiences by offering a virtual version of in-person shopping (Pfeiffer, 2023).

Augmented Reality (AR): AR integrates digital content into the physical environment, allowing consumers to see products in their surroundings before buying. This innovation is particularly advantageous for furniture, home decor, and fashion industries, as it can significantly impact consumer purchasing choices through contextual product visualization (Lu and Smith, 2008). AR applications have become more prevalent, offering features such as virtual try-ons and product visualization (Cao and Wang, 2017).

Artificial Intelligence (AI) and Machine Learning (ML)

Artificial Intelligence (AI): AI improves online shopping by giving personalized suggestions, using chatbots for customer service, and streamlining inventory management.

AI looks at how people shop and what they like to create customized shopping experiences (Khaldy et al., 2023).

Machine Learning (ML): ML models can anticipate how consumers act, upgrade product suggestions, and enhance search features. These tools contribute to a more user-friendly and compelling shopping experience by analyzing consumer engagement and consistently refining the precision of recommendations (Jiang and Benbasat, 2004).

- Social Media and Live Streaming

Social Media Integration: Social media platforms have enabled social commerce, making them significant contributors to e-commerce. Brands can utilize these platforms to expand their reach, interact with consumers instantly, and use user-generated content to establish trust and reputation (Tyagi, 2017).

Live Streaming: Live commerce uses live video streams to display products, engage with viewers, and generate immediate sales. This method capitalizes on real-time interaction and social engagement to create an active shopping experience. Sellers can showcase products, answer questions, and provide promotions during the live stream, significantly impacting purchasing decisions. Live commerce uses live video streams to display products, engage with viewers, and generate immediate sales. This method capitalizes on real-time interaction and social engagement to create an active shopping experience. Sellers can showcase products, answer questions, and provide promotions during the live stream, significantly impacting purchasing decisions (Usadi et al., 2023).

- Blockchain and Secure Payment Systems

Blockchain Technology: The blockchain offers a safe and open method for managing transactions, guaranteeing the trustworthiness and protection of online business operations. This technology can be utilized for safe financial transactions, confirming the legitimacy of items, and overseeing supply chains (Damaševičius, 2023).

Secure Payment Systems: Using secure payment gateways and digital wallets guarantees that transactions are secure and convenient for customers. Security measures like encryption and tokenization safeguard sensitive data, minimizing the possibility of fraud and bolstering customer confidence.

The integration of cutting-edge technologies like Virtual Reality (VR), Augmented Reality (AR), Artificial Intelligence (AI), Machine Learning (ML), social media platforms, live streaming, blockchain, and secure payment systems is revolutionizing the landscape of virtual shopping and live commerce. By combining these technologies, businesses can create highly immersive, tailor-made, and secure shopping experiences that cater to consumers' constantly evolving needs and expectations.

### 1.5 Current Challenges in Traditional eCommerce

Traditional online stores face many challenges as they compete in a crowded market. These challenges come from too many similar businesses, changing customer needs, new technology, and more competition from different types of businesses. This section looks at these challenges closely and sees how too many stores and changing customer needs complicate things for online businesses.

Market saturation, while a significant obstacle, is a testament to the resilience of conventional e-commerce platforms. The increasing number of online retailers has indeed made the market more crowded, but it has also spurred individual businesses to distinguish themselves. The competition, intensified by eCommerce giants like Amazon and Alibaba, has not deterred smaller and mid-sized retailers from preserving their market presence. These conditions necessitate consistent innovation and diversification of offerings to attract and retain customers, a challenge that traditional e-commerce platforms are meeting head-on (Chan and Pollard, 2002).

In recent years, traditional eCommerce platforms have proactively addressed the significant changes in consumer expectations, influenced by technological progress and the widespread integration of digital channels. Today's consumers anticipate a smooth, customized shopping experience encompassing swift delivery, hassle-free returns, and top-notch customer support. They also insist on increased openness regarding product sourcing, sustainable practices, and data security. These evolving demands have compelled traditional eCommerce platforms to refine their operations and embrace innovative technologies like AI, machine learning, and blockchain, demonstrating their adaptability and commitment to remaining competitive (Sobecki et al., 2020).

The rise of online threats like phishing, data breaches, and fraud has made security a major issue for e-commerce platforms. Customers are attentive to the risks of online transactions and are more likely to trust platforms with strong security measures. Traditional e-commerce platforms face the challenge of maintaining consumer trust, protecting sensitive information, and complying with data protection regulations (Mitra et al., 2022).

The growth of online shopping has been driven by technology, but it also comes with challenges. Traditional online shopping platforms must keep up with new technology to stay competitive. This means they have to use new technologies like augmented reality (AR), virtual reality (VR), artificial intelligence (AI), and blockchain. However, these technologies require a lot of money, which can be challenging and require many resources (Winter, 2011).

Traditional eCommerce platforms need help managing their supply chains. People want their orders delivered faster, which puts much pressure on delivery systems. The COVID-19 pandemic showed that global supply chains have weaknesses, causing problems and delays. To fix this, eCommerce platforms must invest in solid supply chain

plans. This includes using automation and AI to improve operations and decrease the time it takes to get customer orders (Singh and Saha, 2018).

Today, eCommerce platforms face challenges such as competition, changing customer needs, new technology, security, and supply chain issues. These platforms must keep improving customer experiences, adopt new technologies, and address security and logistical challenges to stay competitive. Adapting to these changes will determine their success in the eCommerce market.

Market saturation occurs when the number of competitors in a market exceeds the demand for their products or services. In the context of eCommerce, this saturation has several implications:

1. Increased Competition: Consumers have many options because many online stores sell similar things. To compete, these stores must lower prices, offer more deals, and spend more on advertising to attract customers. This means they make less money, making it challenging and more accessible for smaller or newer stores to stay in business (Chan and Pollard, 2002).

2. Brand Differentiation: In a saturated market, standing out becomes increasingly difficult. Traditional e-commerce platforms must invest in brand differentiation strategies, such as unique value propositions, superior customer service, or exclusive product offerings. Please effectively differentiate to avoid a loss of market share to competitors who offer similar products at lower prices or with better customer experiences (Dixit and Sinha, 2016).

3. Innovation Pressure: The crowded market makes it essential for online stores to develop new ideas constantly. They need to use new technology, provide personalized shopping, and improve their delivery process. However, this costs a lot of money, especially for small businesses.

The evolving landscape of technology and digital platforms has significantly shifted consumer expectations, presenting new challenges for traditional e-commerce platforms:

1. Demand for Personalization: Today's consumers anticipate personalized shopping experiences catering to their preferences and behaviors. They are no longer content with generic product suggestions and are more inclined to patronize retailers that utilize data analytics and AI to provide tailored experiences. Fulfilling these expectations necessitates advanced technology and robust data management capabilities, which can pose resource challenges for eCommerce platforms (Sobecki et al., 2020).

2. Expectation of Speed and Convenience: Today's shoppers want fast delivery, easy returns, and smooth transactions. They expect websites and apps to show if items are in stock, offer quick shipping, and have easy return policies. Traditional online stores need to improve their delivery systems to meet these expectations. This often means spending much on technology and infrastructure (Singh and Saha, 2018).

3. Focus on Sustainability and Ethics: More and more people are considering how their purchases affect the environment and society. They like brands that show they care about these things. Online stores must use sustainable practices, like eco-friendly packaging and ethical supply chains, to keep their customers happy and loyal (Keserwani and Rastogi, 2021).

The challenges traditional eCommerce platforms encounter are greatly influenced by market saturation and evolving consumer expectations. These factors intensify competition and necessitate continual innovation and adaptation to meet new consumer needs. Failing to address these challenges puts eCommerce platforms at risk of losing market share and becoming less relevant in a highly competitive digital marketplace.

### 1.6 Effectiveness of Live Commerce in the Metaverse

The integration of live commerce within the Metaverse not only presents unique opportunities and challenges but also holds the potential to revolutionize marketing. The effectiveness of these strategies varies significantly across age, gender, socioeconomic status, and other demographic factors, which influence how these groups engage with live commerce platforms in the Metaverse.

- Catering to Different Demographic Groups

Engagement with Gamification: Younger users, particularly Generation Z and Millennials, are more inclined to engage with gamified experiences within the Metaverse. Using gamification in live commerce has increased engagement and drive purchase intentions by creating an immersive and interactive shopping experience (Moon and Han, 2023). Given their familiarity with digital environments, these demographics are attracted to the social aspects and entertainment value offered by live commerce.

Adoption Barriers: Older users may require assistance in embracing live commerce in the Metaverse due to their unfamiliarity with digital technologies and preference for more traditional shopping methods. However, with platforms' increasing user-friendliness and inclusivity, there is potential for broader adoption among older age groups. To enhance the effectiveness of live commerce for this demographic, emphasis should be placed on ease of use and providing clear, simple instructions for engaging with the platform (Weiss, 2022).

Perception of Usefulness and Enjoyment: Gender has been found to influence how users perceive the usefulness and enjoyment of live commerce in the Metaverse. For example, men tend to prioritize the functional aspects of these platforms, while women focus more on the components of enjoyment and social interaction. This calls for tailored

strategies to ensure the platform's features effectively cater to both genders (Jo and Park, 2022).

Access and Engagement: Socioeconomic status is a critical factor in the adoption and effectiveness of live commerce within the Metaverse. One with sufficient income is most probably to have access to the necessary innovations, such as VR headsets and high-speed internet, which can enhance their experience. Conversely, lower-income groups may face access barriers that limit their ability to fully engage with live commerce platforms (Tsai, 2022).

Variations in Effectiveness: The success of live shopping depends on how well the platform keeps people interested. People comfortable with using technology tend to return and stay engaged more often. On the other hand, older or less tech-savvy folks might need some help understanding how to use the platform and could lose interest over time. Engaging strategies, like showing content that's specific to each person and including interactive features, are essential to keeping a wide range of people interested.

Making the shopping experience personal is essential. Platforms that use data to customize the experience for each person tend to have more people engaging and buying things. However, how well you can make things personal depends on the people you are trying to reach because different groups like different things (Moise et al., 2023).

Trust and safety are crucial for live shopping, especially for older folks and people who do not need to become more familiar with using technology. The things they are worried about can differ depending on who they are. However, older folks usually need more reassurance about their information safety before they entirely use the platform (Mitra et al., 2022).

Live commerce in the Metaverse presents many opportunities to engage with diverse demographic groups, but its impact depends on age, gender, and socioeconomic

status. To optimize engagement across all demographics, platforms should customize their approaches to accommodate each group's distinct needs and preferences, prioritizing accessibility, personalization, and trustworthiness.

The inclusion of social aspects in live commerce within the Metaverse significantly enhances the shopping experience and influences consumer behavior. This improvement is due to the interactive, community-focused features distinguishing live commerce from traditional online shopping. Below, we will discuss how these social aspects affect the shopping experience and behavior.

Enhancement of the Shopping Experience: Social elements in live commerce positively impact consumer engagement. The ability to interact with streamers, other viewers, and even products in real-time creates a sense of community and immersion, making the shopping experience more enjoyable and engaging (Andika et al., 2023). This interactivity replicates the social aspects of in-person shopping, allowing consumers to discuss products with peers and seek instant feedback.

Social commerce provides emotional and informational support, crucial in building consumer trust and commitment. For example, social interactions on these platforms allow consumers to receive advice, reviews, and reassurance from others, enhancing their confidence in purchasing decisions (Chen and Shen, 2015). This trust is vital in a virtual environment where physical product examination is impossible.

Incorporating gamification elements in the Metaverse enhances shopping enjoyment, making it more than a transactional activity. This approach is efficient with younger demographics who value entertainment as part of their shopping experience. The social aspect of participating in games or earning rewards while shopping encourages repeated engagement and loyalty (Moon and Han, 2023).

Influencing Consumer Behavior: Social elements such as peer influence and real-time interaction with streamers and other shoppers can significantly drive impulse buying. The social presence in live commerce stimulates a sense of urgency and excitement, leading to impulsive purchasing behaviors that might not occur in traditional e-commerce settings (Bai et al., 2015).

Consumers often develop parasocial relationships with streamers or influencers who host live commerce sessions. These one-sided relationships can create a strong sense of trust and familiarity, influencing consumers to purchase products these influencers endorse. The perceived trustworthiness and expertise of the influencer can significantly sway purchasing decisions (Liu et al., 2021).

Social comparison is critical in shaping consumer behavior in the Metaverse. When consumers see their peers purchasing or endorsing products during live commerce sessions, they are more likely to follow suit due to the influence of perceived social norms. This effect is amplified in social commerce settings where community involvement is high, and consumer behavior is often guided by the actions of others (Shen, 2012).

Integrating social elements in live commerce within the Metaverse creates a dynamic and engaging shopping experience that profoundly influences consumer behavior. By fostering a sense of community, building trust through social interactions, and leveraging the power of social presence and parasocial relationships, these platforms enhance the shopping experience and drive consumer behaviors such as impulse buying and increased engagement. As live commerce continues to evolve, understanding and leveraging these social elements will be crucial to success in the Metaverse.

Live commerce in the Metaverse is becoming a powerful tool for businesses, offering a more interactive and engaging shopping experience. The key business metrics

include sales conversion rates, customer retention, and brand loyalty. Below is a detailed exploration of these impacts.

Boosting Sales Conversion Rates: Businesses using live commerce in the Metaverse can increase their sales. It permits them to participate with shoppers in real time, answering questions and showing products as people shop. This personal interaction often makes people feel they need to buy things immediately. According to Wongkitrungrueng et al. (2020), live streaming for sales leads to more people making purchases because it is a lively and exciting way to sell things.

During live sessions, businesses can give personalized recommendations, which also helps to increase sales. People are more likely to buy things when they get suggestions that match what they like, and live commerce platforms are good at doing this using real-time data.

Enhancing Customer Retention: Live commerce also plays a crucial role in improving customer retention. Live commerce's social and interactive elements foster a sense of community among shoppers, making them more likely to return for future purchases. Tsai and Huang (2007) found that creating a community-based experience is particularly effective in keeping customers engaged over the long term.

Building trust through transparent interactions during live sessions is another critical factor in retaining customers. When consumers feel they can trust the seller and the products offered, they are likelier to remain loyal to that brand. Research by Chang and Chen (2009) highlights the importance of perceived security and quality interactions in maintaining customer loyalty on e-commerce platforms.

Strengthening Brand Loyalty: Brand loyalty is a crucial strength of live commerce in the Metaverse. By enabling ventures to directly interact with their customers in a personalized and engaged style, live commerce helps forge stronger emotional connections

with consumers. According to Nardi et al. (2020), active customer participation in live commerce activities is closely associated with heightened brand loyalty and satisfaction.

Consistent participation in live commerce sessions further solidifies this loyalty over time. When consumers consistently enjoy positive interactions with a brand during live sessions, they are likelier to form a lasting bond with it. Otim and Grover (2006) emphasize that continuous engagement and high-quality post-purchase services are essential for maintaining customer loyalty in the competitive e-commerce landscape.

Live commerce in the Metaverse profoundly impacts sales conversion rates, customer retention, and brand loyalty. Offering personalized, real-time interactions and fostering a sense of community among consumers is an exceptionally effective strategy for driving growth and cultivating robust customer relationships in today's digital marketplace.

### 1.7 Factors Contribute to User Engagement in Metaverse eCommerce

Design and functionality are essential for attracting users in virtual stores in the Metaverse. These digital environments offer both opportunities and challenges for retailers. The Metaverse's potential for retailers is huge, and the future of virtual retail environments looks positive and exciting. We will discuss how these elements influence user engagement and what factors make shopping experiences more engaging.

- Enhancing User Engagement Using Store Appearance

The design of virtual stores, often referred to as store atmospherics, significantly impacts how users perceive and interact with the shopping environment. Research by Hassouneh and Brengman (2015) highlights those components like the visual appeal, the comfort of options, and the overall ambiance of a virtual store can either enhance or detract from user engagement. For instance, a well-designed store that leverages the unique capabilities of the Metaverse—such as 3D displays and interactive features—can make the

shopping experience more immersive and enjoyable. This immersion increases user satisfaction and the likelihood of repeat visits.

In contrast, stores that merely replicate traditional retail environments without considering the specific possibilities offered by the Metaverse may fail to engage users effectively. The study emphasizes the importance of tailoring store design to the virtual environment, suggesting that brands should innovate rather than imitate their physical store layouts. This emphasis on innovation should inspire and motivate retailers to create unique experiences for their customers in the virtual space.

- Functionality and Interactivity

Beyond aesthetics, the functionality of a virtual store is crucial for user engagement. Functional elements include ease of use, interactive features' availability, and the virtual environment's responsiveness. Papagiannidis et al. (2017) found that virtual stores offering high levels of interactivity—such as the ability to try products in a virtual setting or interact with other shoppers—significantly boost user engagement. These features make the shopping experience more engaging by providing users with a sense of control and immersion, which are critical factors in keeping them engaged.

Moreover, the study highlights the role of "telepresence," where users feel as though they are physically present in the virtual store. This sensation of presence is enhanced by factors such as vivid graphics, realistic product simulations, and responsive user interfaces. The concept of telepresence is intriguing and warrants further exploration, as it significantly enhances user satisfaction with the shopping experience, driving engagement and purchase intentions.

- Use of Gamification and Reward Mechanisms

Integrating gamification elements into virtual stores can also enhance user engagement. A gamified experience, such as earning rewards for exploring the store or

completing specific actions, makes the shopping experience more enjoyable and motivates users to invest extra hours in the store. Moon and Han (2023) demonstrated that gamification in the Metaverse enhances the user's brand experience and positively influences their intention to revisit the store and make purchases.

Additionally, rewards such as discounts or virtual currency earned through interaction can further incentivize users to engage with the store. These elements create a more dynamic and interactive shopping environment, making the overall experience more compelling for users.

The various ways VR and AR impact user engagement in Metaverse eCommerce.

- Immersive Shopping Experiences

Virtual reality (VR) and augmented reality (AR) technologies create highly immersive shopping environments that closely mimic or even enhance real-world experiences. In the Metaverse, customers can visit virtual outlets in 3D, realistically immerse in items, and create more informed purchasing decisions. According to a study by Owusu-Antwi and Amenuvor (2023), these immersive experiences increase user satisfaction and engagement by providing a deeper level of interaction than traditional 2D online shopping platforms.

For instance, users can use AR to visualize how a piece of furniture would look in their living room or try on clothes in a virtual fitting room using VR. This ability to experience products virtually before purchasing them enhances confidence in buying decisions, leading to higher engagement and potentially higher conversion rates.

- Enhanced Interactivity and Personalization

The interactive nature of VR and AR allows for a high degree of personalization in the shopping experience. Users can customize products in real time, receive personalized recommendations based on their behavior within the virtual environment, and even interact

with virtual sales assistants. This level of interactivity makes the shopping experience more engaging and tailored to individual needs, which is a significant factor in keeping users interested and involved.

Liang and Huang (2023) emphasize that integrating these technologies into product interaction meets specific user needs and alleviates common pain points associated with online shopping, such as the inability to inspect products physically. This increased interactivity leads to longer session times and greater user satisfaction.

- Social Shopping and Collaborative Experiences

Virtual and augmented reality also facilitate social shopping experiences in the Metaverse. Users can shop with friends or interact with other shoppers in real-time, making the experience more social and engaging. This social dimension particularly appeals to younger demographics who value community and shared experiences.

Furthermore, the ability to participate in live events, such as virtual product launches or live-streamed shopping sessions, adds another layer of engagement. The immersive capabilities of VR and AR enhance these events, making them more memorable and impactful for participants. As Quintela et al. (2023) noted, these collaborative interactions within virtual environments foster a sense of presence and community, critical drivers of user engagement.

Integrating virtual and augmented reality technologies into the Metaverse significantly enhances user engagement in eCommerce by providing immersive, interactive, and social shopping experiences. These technologies allow users to interact with products and brands in ways that were impossible before, leading to higher satisfaction, longer engagement times, and, ultimately, more excellent conversion rates. As these technologies evolve, their impact on user engagement in Metaverse eCommerce is likely to grow even further.

## 1.8 Research Problem

In the present digital era, there exists a fascinating concept known as the metaverse - a fusion of augmented reality, virtual reality, and the internet. It is revolutionizing the way we engage in online shopping. This research delves deeply into two captivating aspects of the metaverse: virtual shopping and live commerce. Our objective is to ascertain people's preferences and identify the challenges they encounter during these experiences. Envision exploring a digital store where products come to life in three dimensions or attending a live event where you can shop and interact in real time. However, there is a catch: the expectations you have for these virtual encounters may not align with the reality of a physical store. Hence, we are consulting both experts and regular shoppers to comprehend this disparity. We are equally curious about live commerce, where one can shop and interact with products in real time. Businesses desire to understand how they can utilize this virtual reality technology to enhance their shopping experience. We are examining the advantages and potential obstacles that arise when live commerce becomes a part of the virtual reality realm. By doing so, we aim to provide businesses with guidance in creating online shopping that is not only convenient but also enjoyable and immersive.

In the epoch of virtual reality apparatus, the assurances of virtual occurrences frequently deviate from real confrontations in tangible establishments. This investigation delves into the rationales behind this sporadic discrepancy, concentrating on both virtual procurement and in-person trade. Comprehending this is of paramount importance for enterprises striving to employ VR technology proficiently, examining its conceivable drawbacks and extraordinary possibilities in the framework of in-person trade within the virtual reality phenomenon.

## 1.9 Purpose of Research

In the present business world, there is a lot of buzz surrounding the trendy virtual reality (VR) devices that you wear on your head. Just picture yourself in a store that isn't a physical store but rather a virtual one! It sounds incredible, doesn't it? However, there's a catch: what you anticipate from this virtual experience may not align with what you encounter in an actual store. That is the challenging aspect that we aim to comprehend.

Therefore, we are conducting this study to determine the reasons behind the occasional disparity between the promises of virtual reality and the actual experiences of shopping in a physical store. We are engaging in conversations with both industry experts and regular shoppers to obtain a comprehensive understanding of the situation. But that's not all! We are also delving into the realm of live commerce, where you can interact with products in real time while indulging in your virtual shopping spree.

Why is all of this important? Well, businesses want to grasp how they can utilize this amazing VR technology to enhance their shopping experience. Additionally, we are exploring potential pitfalls as well as remarkable prospects when live commerce becomes a part of the virtual reality phenomenon.

## 1.10 Significance of the Study

In the quest for driving forward the development of metaverse e-commerce, this research strives to carry out a quantitative data analysis study that concentrates on the utilization of virtual shopping and live commerce. The metaverse not only blurs the lines between physical and digital realities but also introduces unique characteristics and obstacles in the realm of online retail. The objective of this study is to uncover the preferences and obstacles encountered by e-commerce customers within the metaverse, with a particular emphasis on virtual shopping and live commerce experiences.

Traditional e-commerce platforms have made significant progress in meeting consumer needs, but the metaverse brings forth a whole new level of consumer-centric engagement. Businesses can align their strategies with the evolving expectations of the modern shopper by comprehending user preferences and challenges in virtual shopping and live commerce. The incorporation of cutting-edge technologies like augmented reality and virtual reality in e-commerce serves as a major driving force. This research aims to provide insights that can stimulate innovation in technology integration within the e-commerce sector by exploring the metaverse.

### 1.11 Research Purpose and Questions

This research aims to thoroughly investigate how the increasing use of virtual reality (VR) and head-mounted devices is profoundly transforming consumer expectations and experiences throughout the shopping journey. As these advanced technologies become more seamlessly integrated into the retail space, they are reshaping the way people shop and setting new benchmarks for what they expect from in-store experiences.

This study explores the evolving nature of consumers' expectations as they engage with immersive VR environments during their shopping journey. By grasping these shifts, we can gain crucial insights into what consumers now demand when they visit physical stores and how these expectations diverge from traditional shopping experiences.

Furthermore, the research will delve into potential discrepancies between the high expectations set by VR experiences and the reality of in-store shopping. It will address whether VR's immersive and interactive nature creates expectations that real-world stores struggle to meet and how this disparity impacts customer satisfaction and loyalty.

In addition, the study will meticulously identify and assess the risks associated with integrating VR and head-mounted devices into the shopping process. These risks may range from technological challenges, such as ensuring a seamless and reliable VR

experience, to operational issues, including the impact on store layout and customer flow. There are also potential consumer-related risks, such as how these technologies might affect customer privacy or lead to over-reliance on virtual experiences at the expense of in-person interaction.

Finally, this research will scrutinize how live commerce—where shopping is combined with live streaming—fits into the VR framework and influences consumer behavior. By incorporating live interactions into the immersive VR environment, retailers may be able to enrich the shopping experience. However, it also raises questions about its impact on consumer expectations and whether it enhances or complicates their shopping journey.

Through this research, we intend to offer a complete knowledge of how V R and live commerce are reshaping the retail landscape, offering invaluable insights for brands and retailers looking to navigate and excel in this evolving market.

### 1.11.1 Research Questions

1. How do consumer expectations of the in-store experience change with the accelerating adoption of head-mounted devices and virtual reality (VR)?

2. How do consumer perceptions of the in-store reality differ from the expectations set by the use of VR, particularly in the context of live commerce within the shopping journey?

3. What are the identified risks associated with the integration of head-mounted devices and VR within the shopping journey for both brands and retailers?

4. How does the incorporation of live commerce within the VR framework influence consumer expectations and experiences across the shopping journey?

# CHAPTER II:

# REVIEW OF LITERATURE

## 2.1 Theoretical Framework

The metaverse is a dynamic and evolving concept of a unified virtual space formed by combining physical and digital reality. It encompasses virtual reality, augmented reality, and the internet, offering users an -immersive, interactive, and seamless digital experience. In simpler words, the meta-verse is a comprehensive digital universe where consumers can engage with computer-created environments in real time while interacting with one another. This concept can potentially revolutionize how we conduct business, particularly in e-commerce. With the metaverse, the boundaries between online and offline shopping are blurred, allowing for a more enriched and personalized shopping experience. By leveraging the technologies of augmented reality, virtual reality, and smart glasses, retailers can make virtual outlets that offer innovative and tailored experiences for their customers (Wider et al., 2023).

The metaverse, characterized by its persistent nature, allows users to make, own, and trade digital values within this shared space. Avatars represent users, and different activities, such as gaming, working, socializing, and now, even shopping, can take place within the metaverse. What sets the metaverse apart is its immersive and interactive nature, which distinguishes it from traditional online experiences, offering a more dynamic and engaging environment.

The emergence of electronic commerce in the digital age has significantly transformed business operations and consumer interactions. E-commerce, which entails online buying and selling goods and services, has become a dominant force in global economic activities due to widespread internet adoption and advancements in digital technologies. The metaverse presents a new frontier for e-commerce, combining the

convenience and accessibility of online shopping with immersive virtual experiences. This augmented reality experience connects online and offline shopping, offering customers improved product comprehension and enabling well-informed buying choices.

## 2.2 Evolution of eCommerce

The evolution of the Metaverse has been an incredibly fascinating journey. It has completely transformed how individuals interact with digital environments and significantly altered the landscape of e-commerce. The Metaverse, once a concept popularized by science fiction, has become a tangible reality thanks to the advancements in virtual and augmented reality technologies. This virtual space offers users a unique and immersive experience, allowing them to interact with each other and digital objects in real time, completely revolutionizing the online shopping experience. Users can explore virtual stores, try on virtual clothing and accessories, and even interact with virtual influencers who provide personalized product recommendations. This shift towards a more immersive and interactive shopping experience presents numerous exciting opportunities for businesses in the e-commerce industry. The idea of the Metaverse originated in science fiction, with influential works like Neal Stephenson's "Snow Crash" depicting a virtual - realm where the public may interact and engage with each other. Through advancements in technology, this concept is rapidly becoming increasingly attainable. Early examples such as Second Life and VR platforms were mere precursors to what we now understand as the Metaverse. With the rise of augmented and virtual reality, the Metaverse has progressed into a more realistic and immersive digital environment. Welcome to the Metaverse, a three-dimensional virtual space where users can explore, interact, and conduct activities similar to those in the physical world (Vig, 2022). In this new era of the Metaverse, the possibilities for e-commerce are genuinely endless. With virtual and

augmented reality integration, customers can visualize high-quality 3D graphics and interact with products in a more engaging and immersive way.

The history of eCommerce is characterized by several significant milestones that have profoundly influenced its development and expansion. Below is a summary of the most crucial milestones in the evolution of eCommerce.

- The Inception of eCommerce (1960s - 1980s)

The introduction of Electronic Data Interchange (EDI) in the 1960s laid the foundation of e-commerce. EDI enabled businesses to electronically exchange documents like purchase orders and invoices, thus facilitating electronic transactions between companies (Hui Yao, 2022). Subsequently, the development of the Internet in the 1970s and 1980s, initially for academic and military purposes, paved the way for its commercial utilization, ultimately proving pivotal for the expansion of eCommerce.

- The Emergence of Online Shopping (1990s)

In the early 1990s, the World Wide Web was created by Tim Berners-Lee in 1991, allowing online commerce to begin. During this time, the first websites for online shopping emerged, including Amazon (founded in 1995) and eBay (founded in 1995). They changed how people buy and sell goods (Wangmo et al., 2018).

- The Dot-Com Boom and Bust (Since 1990s - Early 2000s)

The late 1990s saw a rapid increase in Internet-based businesses. This led to the dot-com boom as many companies rushed to establish an online presence, and venture capital flowed into the sector. However, this period also experienced the dot-com bust in the early 2000s. Many online businesses failed due to unsustainable business models (Mayhew, 2012).

- The Rise of Mobile Commerce and Social Media (2000s - 2010s)

In the 2000s, they were using smartphones, and creating mobile-friendly websites and apps led to the growth of mobile commerce (m-commerce). This allowed people to shop online from anywhere, further boosting eCommerce. In the 2010s, social media was integrated with eCommerce, giving rise to social commerce. Platforms like Facebook, Instagram, and Pinterest became practical tools for marketing and direct sales, helping businesses to interact with customers more personally.

- The Advent of Omnichannel Retailing and the Expansion of Global eCommerce (2010s - Present)

Omnichannel Strategies: Retailers have embraced omnichannel strategies, seamlessly integrating their online and offline operations to offer customers a unified shopping experience. This allows customers to shop across various channels, including online, in-store, and mobile apps, while receiving consistent service and branding (Yan et al., 2006).

Global Expansion: The eCommerce landscape has witnessed global expansion, particularly with countries like China and India emerging as critical players in the market. Companies such as Alibaba have become important by tapping into the growing middle class and increasing Internet penetration in these regions (Shelke et al., 2022).

- The Impact of the COVID-19 Pandemic (2020)

The COVID-19 pandemic significantly accelerated- the adoption of eCommerce as lockdowns and social distancing measures forced consumers to shop online. This period saw a surge in online sales, with businesses quickly adapting to the increased demand for digital shopping options (Shelke et al., 2022).

The history of eCommerce is defined by significant milestones that have shaped its growth and development. It all began with the introduction of Electronic Data Interchange (EDI) in the 1960s, laying the foundation for electronic business transactions. The 1990s

saw the rise of online shopping with the creation of the World Wide Web, leading to the launch of renowned online shopping platforms such as Amazon and eBay. The late 1990s experienced the dot-com boom, followed by the dot-com bust, as many online businesses grappled with unsustainable models. The 2000s and 2010s witnessed the ascendance of mobile commerce, social commerce, and omnichannel retailing, which have redefined the eCommerce landscape. Moreover, the global expansion of eCommerce was expedited, with countries like China and India playing critical roles. Finally, the COVID-19 pandemic significantly accelerated the adoption of eCommerce as consumers turned to online shopping because of lockdowns and social distancing measures.

The history of eCommerce is marked by critical milestones that have shaped the online shopping landscape we see today. It all began with the early adoption of Electronic Data Interchange (EDI) in the 1960s, which laid the groundwork for secure digital transactions. The proliferation of the Internet in the 1970s and 1980s further facilitated global connectivity, transforming commerce into a global marketplace. The mid-1990s saw the rise of online giants like Amazon and eBay, which set new standards for consumer trust and convenience. Their success demonstrated the viability of eCommerce as a mainstream retail option and popularized the marketplace model, where multiple sellers offer products on a single platform.

The dot-com boom and subsequent bust in the late 1990s and early 2000s emphasized the importance of sustainable growth and user experience. This era led to refined business models and focused on improving website design and customer service. The 2000s brought about the rise of mobile commerce (m-commerce) and social media integration into e-commerce, making shopping more accessible and interactive. Additionally, the move towards omnichannel retailing and global expansion reshaped customer expectations and opened new opportunities for businesses and consumers.

The COVID-19 pandemic further accelerated the adoption of eCommerce, forcing businesses to rapidly enhance their digital capabilities to meet the surge in online activity. Overall, the history of eCommerce has been characterized by continuous innovation, global expansion, and a focus on enhancing the digital shopping experience to meet evolving consumer needs.

### 2.3 Metaverse: Concept and Development

Metaverse and ecosystems spearhead the Metaverse's evolution, offering distinct features and advancements. These platforms harness state-of-the-art technologies such as virtual reality (VR), augmented reality (AR), blockchain, artificial intelligence (AI), and advanced networking to construct immersive, interconnected virtual worlds. Let's delve into a closer examination of the prominent platforms and ecosystems that are molding the landscape of the Metaverse.:

1. Extended Reality (XR) Platforms

VR and AR Integration: The development of the Metaverse relies heavily on platforms that use VR and AR technologies. These platforms offer immersive experiences, allowing users to interact with digital objects and environments in a lifelike manner. In VR Chat, users can socialize in 3D spaces, while AR applications like Pokémon overlay digital content onto the physical world. The integration of these technologies is crucial for building the immersive environments of the Metaverse (Lee et al., 2021).

2. Blockchain and Decentralized Platforms

Ownership and Economy: Utilizing blockchain technology facilitates decentralized ownership and economic transactions within the -Metaverse. Outlets like -Decentral and the -Sandbox empower users to possess, exchange, and monetize virtual assets, encompassing real estate and digital art. These platforms leverage Non-Fungible Tokens

(NFTs) to establish verifiable ownership of digital items, thus establishing a resilient virtual economy (Song et al., 2023).

3. AI-Powered Ecosystems

Enhanced Interactions and Intelligence: Artificial Intelligence (AI) plays a crucial role in creating intelligent virtual agents, tailoring user experiences, and powering advanced data analytics in the Metaverse. Through AI technologies, we can achieve more genuine interactions within the virtual environment, ultimately enriching the overall immersion and functionality of Metaverse platforms. (Huynh-The et al., 2022).

4. Social and Collaborative Platforms

Community and Social Interaction: Platforms like Meta's Horizons prioritize social interaction and collaboration in the Metaverse. These platforms enable users to create and share virtual worlds and explore them, emphasizing the communal and collaborative aspects integral to the Metaverse experience (Davis et al., 2009).

5. Infrastructure and Networking

Connectivity and Scalability: The Metaverse depends heavily on a strict infrastructure to scale and perform effectively. This infrastructure incorporates cutting-edge networking technologies such as 5G and edge computing. These technologies facilitate seamless, high-speed connections with minimal delay, essential for real-time interactions within expansive, enduring virtual environments. They form the backbone of the Metaverse, supporting its extensive, interconnected framework (Sami et al., 2023).

The progress of the Metaverse is fueled by a wide range of platforms and ecosystems that incorporate technologies such as VR, AR, blockchain, AI, and advanced networking. Each platform has an essential role in developing the immersive, interactive, and interconnected environments that characterize the Metaverse, pushing the limits of our interactions with digital spaces and one another.

The last decade witnessed notable progress in augmented-reality (AR) and virtual-reality (VR) technologies. These advancements have facilitated extra engaging and immersive -experiences, broadening the potential uses of the Metaverse beyond gaming to encompass education, healthcare, and commerce. Consequently, the concept of the Metaverse has garnered increasing attention from both technology firms and the public as a conceivable future for digital interaction (Zubillaga and Elordi, 2022).

The emergence of blockchain technology has played a pivotal role in shaping the Metaverse by enabling decentralized ownership and establishing digital economies. Platforms like Decentral and the Sandbox have utilized blockchain to empower users to securely own virtual land and trade assets, ushering in a new economic dimension to the Metaverse (Song et al., 2023).

Facebook's rebranding to Meta in 2021 marked a significant milestone in the evolution of the Metaverse. This transformation demonstrated the tech behemoth's dedication to developing a comprehensive Metaverse ecosystem encompassing social interaction, professional endeavors, and entertainment. The rebranding propelled the concept of the Metaverse into the mainstream, igniting widespread interest and investment in the domain (Kim, 2021).

The contemporary Metaverse is characterized by the integration of multiple emergent technologies, including AI, blockchain, 5G, and advanced VR/AR systems. These technologies enable the creation of increasingly intricate and scalable virtual environments, fostering highly immersive experiences that blur the boundary between the physical and digital realms (Lee, 2022).

The Metaverse continually evolves, driven by ongoing technological advancements and mounting interest from diverse industries. Nevertheless, challenges such as privacy,

security, and bridging the digital divide remain pressing concerns that warrant attention to ensure the sustainable growth and accessibility of the Metaverse (Wang et al., 2022).

The last decade has seen significant progress in virtual reality (VR) and augmented reality (AR) technologies, expanding the potential uses of the Metaverse beyond gaming to include education, healthcare, and commerce. Blockchain technology has enabled decentralized ownership and digital economies in the Metaverse. Facebook's rebranding to Meta in 2021 signaled a major shift towards developing a comprehensive Metaverse ecosystem. The current Metaverse integrates AI, blockchain, 5G, and advanced VR/AR systems to create immersive virtual environments. However, challenges such as privacy, security, and bridging the digital divide are required to be resolved for the sustainable growth and accessibility of the Metaverse.

**2.4 Virtual Shopping in the Metaverse**

Different virtual reality platforms have unique ways of incorporating virtual shopping features into their systems. Below, it discusses three leading platforms—Decentral and, Roblox, and Meta's Horizon Worlds—for their approaches to virtual shopping.

Decentral is an innovative blockchain-powered virtual world allowing users to own, develop, and monetize digital land through Non-Fungible Tokens (NFTs). The platform's decentralized structure seamlessly integrates virtual shopping, permitting users to sell, buy, and trade virtual products such as real estate, digital clothing, and art. Each parcel of land in Decentraland is represented as an NFT, which can be acquired and utilized to establish virtual storefronts, galleries, or other commercial spaces. At the heart of Decentraland's economy is its native cryptocurrency, MANA, which facilitates transactions within the platform. This blockchain-based approach ensures ownership and

provenance of virtual goods, fostering a thriving digital economy that allows users to generate real-world income (Guidi and Michienzi, 2022).

Roblox is a viral platform, especially among younger users. It lets people create and explore virtual worlds. On Roblox, people can make and sell virtual items like clothes, accessories, and game passes using Robux currency. This means users can make money from their creations. In Roblox, buying virtual items is often part of the game experience. Players can purchase items that help them play the game or change how their character looks. This approach has made Roblox successful for both the company and its users (Blackwood, 2023).

Meta's Horizon Worlds by Facebook, created a social VR platform called Horizon Worlds. It is designed for people to interact and collaborate in virtual reality. The platform is still developing its virtual shopping feature. However, it already lets users buy and use digital clothing for their avatars, decorations for virtual spaces, and even tickets for virtual events. Meta works with brands to create branded experiences and virtual goods within Horizon Worlds. This means that users can shop for virtual items from their favorite brands while socializing in the virtual world. This approach connects virtual shopping with social interactions in the Metaverse (Park and Kim, 2022).

Decentraland influences blockchain technology to establish a decentralized marketplace, while Roblox prioritizes user-generated content and in-game purchases. Horizon Worlds seamlessly integrates virtual shopping with social commerce and brand experiences. These distinct approaches highlight the vast array of possibilities within the Metaverse for developing compelling and economically sustainable virtual shopping experiences.

The integration of interactivity, immersion, and social features in virtual environments, particularly within the Metaverse, significantly impacts user participation

and satisfaction. These elements combine to create immersive and engaging experiences that encourage users to spend more time in the virtual space, interact with others, and form lasting connections with the environment. Below is an exploration of how each factor contributes to enhancing user engagement.

Interactivity refers to the ability of users to engage with virtual environments and other users in real-time. High levels of interactivity, such as manipulating objects, making decisions, or customizing avatars, lead to increased user participation and satisfaction. For example, a study on virtual reality environments found that user interaction significantly influences satisfaction and the intention to recommend the experience to others (Xu and Zhang, 2022). Interactive environments allow users to feel more in control and invested in the experience, enhancing their overall satisfaction.

Immersion is the sense of being enveloped in a virtual environment, which can significantly impact how users perceive and interact with the virtual space. Immersive experiences create a sense of presence, where users feel as though they are genuinely part of the virtual world. This deepened connection increases emotional engagement and satisfaction, leading to more prolonged and more frequent participation in the virtual environment (Hudson et al., 2019). Immersion can also amplify the effects of interactivity; making actions within the virtual space feel more meaningful and impactful.

Social features, such as communicating with other users, forming communities, and engaging in shared activities, are crucial for increasing user satisfaction in virtual environments. These features create opportunities for users to build relationships, collaborate, and share experiences, which can lead to a stronger attachment to the virtual environment. A study on shared virtual reality experiences found that social interaction significantly enhances positive affect and overall satisfaction with the experience (Guertin-

Lahoud et al., 2023). The presence of other users, combined with interactive and immersive features, creates a dynamic and engaging environment that keeps users returning.

Overall, interactivity, immersion, and social features are fundamental components that drive user participation and satisfaction in virtual environments like the Metaverse. These elements work together to create engaging, emotionally resonant, and socially fulfilling experiences, ultimately leading to higher levels of user retention and loyalty.

The development and expansion of virtual shopping features in platforms, -especially in the relevance of the Metaverse, bring various -challenges and limitations. These challenges stem from technological restrictions, user experience concerns, and the need for solid infrastructure. Here, we will explore some critical challenges platforms encounter in this area.

- Technological Limitations

Scaling virtual shopping features comes with the primary challenge of ensuring the platform can effortlessly handle numerous simultaneous users without compromising performance. As user numbers increase, platforms must adeptly manage server load and maintain seamless interactions within the virtual environment. Issues such as latency, network bandwidth, and computational power become increasingly significant as the platform scales. For example, the scalability of edge cloud platforms for IoT services emphasizes the complexity of managing distributed resources to ensure smooth operation under heavy user loads (Sonkoly et al., 2020).

Integrating virtual shopping platforms with existing eCommerce systems is no small feat and demands complex compatibility with payment gateways, inventory management systems, and customer relationship management (CRM) tools. The complexity escalates as platforms strive to deliver real-time updates and seamless transitions between virtual and traditional online shopping environments (Chen, 2017).

- User Experience Challenges

Creating a good user experience in virtual shopping is hard. The virtual store needs to be easy to use and feel natural. However, current VR and AR technology has limitations that make it hard to do this. For example, X3DOM offers a new way to shop but needs help with a specific device and requires users to download a lot before using it (Pimsuwan et al., 2012).

Another big challenge is ensuring that lots of people can use virtual stores, even if they aren't good with technology. The store needs to work well for people who are new to VR and AR. It also needs to work on different devices, from fancy VR headsets to everyday smartphones.

- Economic and Logistical Constraints

Creating and maintaining a virtual shopping platform can be costly. The expenses involved in developing high-quality, immersive environments, integrating advanced technologies like AI and blockchain, and ensuring scalability can be too high for smaller companies. Furthermore, the need for continuous updates and improvements to stay competitive adds to the financial burden.

Even with a fully functional and scalable platform, widespread adoption is not guaranteed. The appeal of virtual shopping needs to be balanced with practical benefits to encourage users to switch from traditional online shopping methods. If the platform fails to attract and retain users, the return on investment may be too low to justify the costs, making it hard to sustain the platform long term.

Implementing and expanding virtual shopping capabilities in the Metaverse requires overcoming various challenges, including technological constraints, user experience difficulties, and economic limitations. Platforms must surmount these obstacles

to establish immersive, adaptable, and inclusive virtual shopping spaces that cater to the requirements of both businesses and consumers.

Different industries, including fashion, gaming, and real estate, have successfully integrated virtual shopping features into the Metaverse, leveraging the unique capabilities of these platforms to enhance user experiences and expand market opportunities. Below is an analysis of how these industries have approached the combination of -virtual shopping into the Metaverse.

The -fashion industry has been a front-runner in adopting virtual shopping features within the Metaverse. This integration has allowed fashion brands to explore new branding, customer engagement, and sales avenues.

Fashion brands increasingly utilize virtual environments to offer digital clothing options for users to purchase and dress their avatars in branded apparel. These digital assets are often available as NFTs, allowing users to own unique virtual items that can be worn across different Metaverse platforms. Furthermore, virtual try-on features enable users to visualize how clothes might look on their avatars before making a purchase, thereby enhancing the shopping experience by minimizing uncertainty (Alexandrova and Poddubnaya, 2023).

Moreover, the concept of "phygital" commerce, which blends physical and digital retail experiences, is gaining momentum in the fashion industry. Brands are actively developing omnichannel strategies enabling consumers to interact with products in physical stores and the Metaverse. This approach bolsters brand presence and fosters a seamless shopping experience across various touchpoints (Weiss, 2022).

The gaming industry is inherently suited to the Metaverse, with many games already featuring virtual economies and marketplaces.

In-Game Purchases and Virtual Economies: Games like Roblox and Fortnite let players buy virtual items, like clothes and accessories for their characters, using virtual money. Players can also use real money to make these purchases. The Metaverse takes this idea further by creating more immersive and connected worlds where shopping is part of the gameplay (Damaševičius, 2023).

The real estate industry is exploring the potential of the Metaverse for virtual property transactions and immersive experiences.

Virtual Property Transactions: Real estate in the Metaverse allows people to buy, sell, and develop virtual land using blockchain technology. These transactions often involve NFTs, which provide secure ownership and the ability to trade properties on secondary markets. Decentraland and The Sandbox are leading platforms in this trend, letting users purchase virtual plots and build custom environments for personal or commercial use (Bhattacharya et al., 2023). Virtual reality (VR) offers immersive property tours, allowing potential buyers to explore properties in a highly realistic environment before buying. This saves time and provides a more complete view of the property than traditional methods, improving the overall buying experience.

Implementing virtual shopping capabilities within the Metaverse differs between industries, yet they all aim to improve user engagement, broaden market potential, and offer immersive shopping experiences. The fashion sector utilizes digital fashion and phygital commerce, the gaming industry incorporates in-game purchases and partnerships with fashion labels, and the real estate industry concentrates on virtual property transactions and immersive tours. These strategies demonstrate the various ways the Metaverse is revolutionizing traditional sectors and opening up new opportunities for commerce.

## 2.5 Live Commerce

Live commerce is a cutting-edge integration of e-commerce and live streaming, enabling customers to engage with products and sellers in real time. This unique approach seamlessly integrates the real-time experience of live video with the interactive nature of social media and the ease of online shopping. Below, find live commerce's fundamental principles and distinguishing features.

- Real-Time Interaction

Live Demonstrations: An essential aspect of live commerce is the ability for sellers to showcase products live, enabling consumers to witness the product in action. This real-time interaction settles the gap between in-person and online shopping experiences, offering a dynamic and engaging way to display products.

Instant Feedback: Customers can ask questions and promptly receive answers from the seller, creating a highly interactive shopping experience. This immediacy builds trust and aids in making well-informed purchasing decisions (Wongkitrungrueng and Assarut, 2020).

- Engagement through Entertainment

Gamification and Entertainment: Live commerce often integrates entertainment features like gamification to enhance the shopping experience. These can include interactive games, challenges, or engaging segments designed to entertain and captivate the audience while they shop (Han et al., 2023).

Authenticity and Credibility: Creating trust is crucial in live commerce. The genuineness of the host, the openness in presenting the products, and the capacity to handle consumer inquiries instantly are crucial elements that impact consumer trust and buying choices. This genuineness often increases consumer contentment and commitment (Sun et al., 2022).

Seamless User Experience: The success of live commerce majorly relates to the technological infrastructure of the platform. It is essential to provide users with a seamless experience encompassing high-quality streaming, user-friendly interfaces, and integrated payment mechanisms. These factors are pivotal in sustaining consumer engagement and ensuring a hassle-free transaction process (Lee et al., 2023).

Live commerce is a distinctive form of -online buying that integrates real-time interaction, authenticity, entertainment, social engagement, and cutting-edge technology. These fundamental elements come together to craft an engaging and dynamic shopping experience. Live commerce is an effective method for captivating consumers and boosting sales in today's digital landscape.

*Table 1*

*Comparison of Live and Tradition eCommerce*

| Aspect | Live Commerce | Traditional eCommerce | Source |
|---|---|---|---|
| Interaction | Real-time interaction with sellers, including live demonstrations and instant feedback. | Asynchronous shopping with limited interaction, relying on static product descriptions, reviews, and images. | (Wongkitrungrueng and Assarut, 2020); (Lee et al., 2023) |
| Social Engagement | High social engagement through community interaction, | Typically, a solitary shopping experience with limited social interaction. | (Sun et al., 2022); (Xu, 2023) |

| | | | |
|---|---|---|---|
| | including participation in live streams, commenting, and sharing. | | |
| Role of Influencers | Active involvement of influencers who engage directly with viewers, offering personalized recommendations and fostering a sense of connection. | Influencer involvement is generally limited to static posts or pre-recorded videos, without real-time interaction. | (Xu, 2023); (Sun et al., 2022) |
| Entertainment and Gamification | Incorporates entertainment elements such as live games, challenges, and interactive content to make the shopping experience more enjoyable. | Primarily transactional with a focus on the purchasing process, with little to no emphasis on entertainment or gamification. | (Han et al., 2023) |
| Authenticity and Trust | Builds authenticity and trust through real-time product demonstrations and | Relies on static information, which may not fully convey product | (Sun et al., 2022) |

| | | | |
|---|---|---|---|
| | the ability to address consumer concerns immediately. | quality or authenticity, leading to potential trust issues. | |
| Consumer Experience | More dynamic and immersive, offering a personalized, interactive, and engaging shopping experience. | More uniform and impersonal, focusing on the convenience and efficiency of the shopping process. | (Han et al., 2023); (Xu, 2023) |

Table 1 compares live commerce and traditional eCommerce, highlighting their critical differences. It illustrates how live commerce distinguishes itself through real-time interaction, higher social engagement, active involvement of influencers, and a focus on entertainment and authenticity, resulting in a more dynamic and immersive shopping experience than traditional eCommerce.

The progress of live commerce has changed the online shopping landscape by integrating real-time interaction, entertainment, and social engagement into the consumer experience. This section explores how different live commerce strategies are tailored to cater to varying consumer demographics and shopping behaviors, drawing insights from recent literature.

- Age and Generation-Based Strategies

Live commerce strategies often target specific age groups, particularly younger demographics such as Millennials and Generation Z, who are extra aware of digital outlets and live-streaming technologies. These younger consumers tend to value interactive and engaging shopping experiences beyond traditional eCommerce's transactional nature. For

instance, platforms like Taobao Live leverage social media elements and interactive features that resonate strongly with younger users, who seek social validation and community engagement during their shopping experiences (Wen-Cheng Fu, 2021). These strategies emphasize entertainment and gamification, which are crucial to attracting and retaining the attention of younger audiences.

In contrast, live commerce strategies tailored to older consumers, who may need to be more comfortable with rapidly evolving technologies, focus more on ease of use and trust-building measures. Simplified user interfaces and detailed, real-time product demonstrations are often employed to reduce the shopping process's perceived complexity and build confidence among older shoppers. This demographic tends to value precise and reliable information, which can be effectively conveyed through live sessions that emphasize product quality and reliability (Mengqiu et al., 2021).

- Gender-Specific Approaches

Gender-specific strategies in live commerce have also been a focus of recent research, particularly in the context of fashion and beauty products. Female consumers are often more engaged with live commerce platforms, especially in categories such as fashion and beauty. To cater to this demographic, live commerce strategies frequently involve collaborations with beauty influencers, who provide personalized recommendations and exclusive deals on beauty and fashion products. These strategies are designed to meet the preferences of female consumers, who place a significant value on aesthetics, personalization, and the social aspects of shopping (Kim et al., 2023).

For male consumers, live commerce strategies typically focus on technology products, gadgets, and other utilitarian categories. These strategies highlight the technical specifications, functionality, and practical benefits of products, catering to the decision-making style of male consumers more inclined toward utility-driven purchases. The

involvement of tech influencers, who can effectively communicate the technical aspects of products, plays a crucial role in engaging male audiences (Zhang et al., 2022).

- Technological Familiarity

The level of technological familiarity among consumers also influences the design of live commerce strategies. For tech-savvy consumers, live commerce platforms often incorporate advanced features such as augmented reality (AR) try-ons, virtual product customization, and interactive games. These features are designed to engage users who seek cutting-edge experiences and are comfortable navigating complex digital environments (Zhang et al., 2020).

Conversely, for consumers who may need more time to get comfortable with technology, live commerce platforms focus on offering a simplified user interface and providing step-by-step guidance during live sessions. The goal is to make the shopping experience as seamless and intuitive as possible, thereby reducing the barriers to entry for less tech-savvy users (Lee, 2002).

- Motivation-Based Strategies

Understanding consumer motivations is crucial for developing effective live commerce strategies. Hedonic shoppers, who shop for pleasure and entertainment, are attracted to live commerce experiences incorporating gamification and exclusive offers. These strategies focus on creating an enjoyable and immersive shopping experience, emphasizing fun and excitement, such as limited-time discounts and interactive games during live sessions (Shibin, 2022).

On the other hand, utilitarian shoppers who prioritize practicality and efficiency are more likely to respond to live commerce strategies emphasizing product functionality and cost-effectiveness. These strategies include detailed product demonstrations, clear

comparisons with competing products, and straightforward pricing information, catering to consumers who value efficiency and informed decision-making (Kambil et al., 2000).

The literature reviewed highlights how live commerce strategies are tailored to cater to the varied needs of different consumer demographics and shopping behaviors. By focusing on factors such as age, gender, technological familiarity, and consumer motivations, live commerce platforms create personalized and engaging experiences that resonate with diverse consumer groups. These tailored strategies are crucial for enhancing customer satisfaction, building trust, and ultimately driving sales in the rapidly evolving digital marketplace.

Live commerce has undeniably revolutionized consumer behavior and purchasing decisions, backed by compelling case studies and empirical research. In this section, we will delve into the pivotal impacts of live commerce on consumers, emphasizing the driving forces behind these behavioral shifts.

Impulse Buying Behavior: One of the most striking effects of live commerce is the noticeable surge in consumer impulse buying. Numerous studies have established that live commerce platforms' interactive and captivating nature triggers impulsive purchases. For example, Lim (2023) revealed that the sense of reality, credibility, and entertainment provided by live commerce platforms significantly heightens the flow experience for consumers, resulting in a higher propensity for impulsive buying. This impact is amplified when products are perceived as trendy or offered at a discounted price, enhancing their allure during live sessions.

Similarly, Zhang et al. (2022) delved into how the "hunger marketing" strategy, encompassing limited-time promotions and scarcity cues, further propels impulsive purchases in live commerce. The study unveiled that external stimuli, such as anchor

characteristics and promotional incentives, positively influence impulse buying behavior by bolstering perceived trust and value.

Influence of Interactivity and Social Engagement: Live commerce's interactivity and social features play a pivotal role in shaping consumer behavior. Usadi et al. (2023) discovered that interactivity significantly impacts consumer arousal, ultimately triggering impulse buying. The study proposes that the ability to engage with sellers and fellow consumers in real time fosters a sense of togetherness and intimacy, thereby fostering spontaneous purchasing decisions.

Moreover, Hou and Chen (2023) illustrated how live commerce platforms' popularity, interactivity, and personalized service positively impact consumer purchase behavior. These elements augment the perceived value of the shopping experience, leading to greater consumer satisfaction and an increased likelihood of purchase.

Perceived Trust and Purchase Intention: Trust is another crucial factor influenced by live commerce, wielding a tangible impact on purchasing decisions. Li et al. (2023) found that environmental features of live-streaming solutions, such as the presence and perceived trustworthiness of the host, directly affect consumers' purchase intentions. The study underscored that trust is placed as a resolver between live-streaming characteristics and buying decisions, highlighting the pivotal role played by the host's credibility and the transparency of interactions in fostering consumer confidence.

Roh (2021) similarly emphasized the significance of perceived value and self-consistency in live commerce. The study demonstrated that practical and hedonistic values derived from live commerce interactions positively influence purchase intentions. This highlights the dual role -of entertainment and information in creating customer decisions, with trust emerging as a linchpin.

The effect of live -commerce on customer behavior and purchasing decisions is profound, particularly in fueling impulse buying, enriching interactivity and social engagement, and cultivating trust. These factors create a more immersive and persuasive shopping environment, ultimately enhancing consumer satisfaction and increasing sales. As live commerce continues to evolve, its power to influence consumer behavior will undoubtedly become even more pronounced, solidifying its status as a vital tool for businesses seeking to tap into the burgeoning market of online shoppers.

**2.6 Consumer Behavior in Virtual Environments**

Consumer behavior in virtual environments differs significantly from that in traditional eCommerce platforms due to the unique characteristics and capabilities of immersive, interactive technologies. This section explores these differences by examining how interactivity, social engagement, and user experience influence consumer behavior in these two shopping environments.

The level of interactivity and immersion in virtual environments far surpasses that of traditional eCommerce platforms. Virtual shopping experiences empower consumers to interact with products and environments, increasing their engagement dynamically. For example, virtual reality (VR) users can explore products through 3D interactions, enhancing their sense of presence and emotional connection. This heightened interactivity can drive more impulsive buying decisions and foster stronger brand loyalty than traditional eCommerce sites' static and linear browsing experience (Cheon, 2013).

Virtual environments can fully absorb consumers, making them deeply engaged and losing track of time, enhancing their shopping experience. This kind of immersive experience is uncommon in traditional eCommerce platforms, where the main focus is navigating through text-based or image-based interfaces (Erensoy et al., 2022).

Social interaction is a significant factor in consumer behavior in virtual environments. In these settings, people can interact in real time, attend social events, and make purchases together. This social aspect creates a sense of community and shared experience, which can significantly impact what people choose to buy. For example, in virtual social platforms like Second Life, people are more likely to buy products based on recommendations from others in the community rather than just product descriptions or reviews (Hassouneh and Brengman, 2015).

In contrast, traditional eCommerce platforms are more individualistic, with limited real-time consumer interaction. While there may be reviews or ratings, community and social influence are less pronounced, leading to more independent decision-making processes (Naz, 2019).

In virtual environments, the user experience is highly personalized and tailored to individual consumer preferences, resulting in a heightened perceived value of the shopping experience. By offering customized environments, avatars, and interactive elements, virtual stores cater to individual tastes and preferences. This personalized approach fosters increased consumer satisfaction and loyalty, as users feel a stronger connection to the brand and the shopping process. For instance, virtual fitting rooms empower consumers to try on products virtually, boosting their confidence in purchasing (Jeandrain, 2001).

While offering some level of personalization through recommendation algorithms, traditional eCommerce platforms generally provide a more standardized shopping experience. The lack of interactive and immersive elements can make the experience feel less engaging and more transactional, which may reduce its perceived value (Chen et al., 2002).

People behave differently when they shop in virtual environments than on traditional eCommerce platforms. Shopping is more interactive and social in virtual

environments, giving people a more interactive and immersive experience. This can make them happier with their purchases, more likely to buy on impulse, and more loyal to the brands they buy from. On the other hand, traditional eCommerce platforms focus more on making shopping efficient and convenient, so the experience tends to be less interactive and more individual.

### 2.7 Technological Innovations and Challenges

External factors like social trends, economic conditions, and technological advancements significantly influence consumer behavior in virtual environments. These factors affect how consumers interact with virtual platforms, make purchasing decisions, and engage with brands in digital spaces. Relevant case studies and research findings support this exploration of the key external factors and their impacts.

- Social Trends

Social media and influencer culture profoundly impact consumer behavior in virtual environments. These platforms provide a space where trends can quickly gain popularity and influence consumer preferences. For instance, social media trends in fashion retail drive consumer engagement and purchase decisions by promoting specific styles or brands through influencers and viral content. A study by Nash (2019) highlighted how social media platforms have become a critical factor in the decision-making process for consumers in the UK fashion retail sector, where online content influences both inspiration and final purchasing decisions.

Furthermore, social trends, such as the increasing demand for sustainable and ethical products, significantly shape consumer behavior in virtual environments by driving the adoption of green products and services. As consumers become more environmentally conscious, their preferences shift towards brands that align with their values, which is increasingly reflected in their online shopping behavior. A study by Piligrimienė et al.

(2020) found that social factors, including the influence of family, friends, and cultural norms, play a substantial role in promoting sustainable consumption behaviors in virtual settings.

- Economic Conditions

Economic conditions influence consumer behavior in virtual environments. When the economy is uncertain or in a downturn, consumers tend to be more cautious with their spending, impacting their purchasing patterns online. A study by Rayevnyeva et al. (2023) shows how factors like inflation, changes in household income, and market stability affect consumer decisions in virtual spaces. For example, during economic instability, consumers may focus on essential purchases rather than luxury items, leading to changes in demand for specific products. Economic conditions can also drive the uptake of virtual shopping as consumers look for cost-effective and convenient alternatives to traditional shopping. Online platforms often offer competitive pricing and better accessibility, making them appealing during economic downturns. Research by Valdez-Juárez et al. (2021) demonstrates how economic factors influence the adoption of e-commerce and virtual shopping, especially in regions affected by economic challenges, where the need for convenience and value for money drives consumers.

- Technological Advancements

Technological progress, especially in virtual reality (VR), augmented reality (AR), and the Internet of Things (IoT), is changing how people behave when shopping in virtual environments. These technologies improve the shopping experience by offering immersive and interactive features that regular online stores cannot provide. For example, in virtual stores, customers can see products in 3D, interact with them in real time, and make better buying choices because the experience is more engaging. Ploydanai et al. (2017) explain

how virtual stores allow detailed customer behavior analysis, showing how technology is essential in shaping customer interactions and decisions in digital spaces.

Technological advances also enable personalized marketing strategies, where customer data is used to customize shopping experiences based on individual preferences. This customization leads to more customer engagement and higher sales, as customers are more likely to respond to content that matches their interests and needs. The study by Țoniș and Blăjină (2019) highlights the role of IoT and data-driven marketing in influencing online consumer behavior, where technology is crucial in creating a more responsive and adaptive shopping environment.

In virtual environments, consumer behavior is significantly impacted by external factors like societal trends, economic circumstances, and technological progress. These factors shape how consumers interact with digital platforms, make buying choices, and engage with brands. For businesses seeking to successfully navigate and take advantage of the changing virtual commerce landscape, it is crucial to grasp the influence of these external factors.

**2.8 Exploration of Business Strategies for Metaverse E-commerce**

The emergence of the Metaverse presents an exciting frontier for businesses seeking to broaden their eCommerce presence. However, navigating this new digital realm also comes with its own set of distinctive hurdles. The following section will delve into practical strategies companies can employ to establish and maintain their eCommerce ventures within the Metaverse successfully.

1. Using Virtual Commerce (V-Commerce) Models

In the Metaverse, businesses can use virtual reality (VR) to create immersive shopping experiences. Customers can interact with products in 3D, making shopping more engaging and enjoyable. This strategy helps increase customer engagement and can lead to

more informed buying decisions (Damaševičius, 2023). In V-Commerce, providing personalized experiences using VR and AR is essential. This can include virtual try-ons and tailored product recommendations. These personalized experiences make shopping more relevant to each customer, which can strengthen brand loyalty.

2. Developing a Strong Data Strategy

In the Metaverse, it is essential to handle data effectively. We need a robust data strategy to collect and analyze real-time data quickly. This will help us understand virtual environments' customer behavior and market trends (Tancharoen and Pongpech, 2023). A good data strategy helps businesses understand what their customers want and how they interact with products in the Metaverse. This information can improve customer experiences and make better business decisions.

3. Integrating Social Commerce

Social interaction plays a significant role in the Metaverse, and businesses can leverage this by incorporating social commerce strategies. This involves enabling customers to engage with one another and exchange their shopping experiences. Additionally, businesses can collaborate with influencers in the Metaverse to endorse their products and interact with users (Zhao et al., 2019).

Building a sense of community around a brand in the Metaverse can increase customer loyalty. Creating virtual spaces where users can socialize, attend events, and interact with brands can make shopping fun and engaging.

4. Focusing on Sustainability and Responsible Practices

With the growth of the Metaverse, businesses need to embrace sustainable and ethical approaches. This encompasses minimizing the environmental effects of digital activities and managing concerns such as data privacy and security. Sustainable business methods align with consumer expectations and equip companies to navigate forthcoming

digital challenges (De Giovanni, 2023). Businesses should also consider the ethical aspects of their presence in the Metaverse, such as ensuring data security and protecting user privacy.

5. Forming Strategic Partnerships

Companies can benefit from partnering with technology providers and other businesses to succeed in the Metaverse. These partnerships can provide the tools to create secure virtual shopping experiences through VR, AR, and blockchain technology. Collaborating with companies from different industries, such as gaming or fashion, can lead to the development of innovative offerings in the Metaverse.

The emergence of the Metaverse offers new opportunities for businesses to expand their eCommerce presence, but it also comes with unique challenges. To succeed in the Metaverse, businesses can utilize V-Commerce models to create immersive shopping experiences using virtual reality. Personalized experiences through VR and AR, a robust data strategy, social commerce integration, emphasis on sustainability and responsible practices, and forming strategic partnerships are crucial for establishing and maintaining successful eCommerce ventures in the Metaverse.

## 2.9 Summary

This literature review chapter provides an in-depth exploration of the strategies and factors shaping eCommerce's future in the Metaverse, a complex and rapidly evolving digital ecosystem. As businesses venture into this new frontier, understanding the unique dynamics of the Metaverse is crucial for establishing and sustaining successful operations. The chapter synthesizes existing research and case studies to offer insights into the most effective strategies for thriving in this virtual environment.

The chapter begins by examining the transition from traditional e-commerce to Virtual Commerce (V-Commerce), which leverages interactive facilities like augmented -

-reality (AR) and virtual -reality (VR) to create highly engaging shopping experiences. Unlike traditional eCommerce, which typically involves browsing static product listings, v-Commerce enables consumers to interact with items in a virtual 3D space. This shift enhances the buying expertise by creating it more handheld and -personalized and increases customer engagement and brand loyalty. The ability to virtually try on products, customize avatars, and receive personalized recommendations has significantly influenced purchasing decisions, creating a deeper connection between consumers and brands.

The -chapter also highlights how V-Commerce is about enhancing the consumer experience and offering new ways for businesses to present their products. By creating virtual showrooms or stores within the Metaverse, companies can provide consumers with unique experiences that are impossible in the physical world. This opens up new marketing and brand differentiation avenues, allowing businesses to stand out in a crowded digital marketplace.

Much of the chapter is dedicated to developing a robust data strategy in the Metaverse. As the Metaverse generates vast amounts of data from user interactions, businesses must be equipped to manage and analyze this data effectively. Real-time data analytics is emphasized as a critical tool for understanding consumer behavior, predicting trends, and making informed business decisions. The chapter discusses how companies can use this data to tailor marketing strategies, optimize product offerings, and improve customer satisfaction.

The -chapter also explains the role of social commerce in the Metaverse, highlighting how social interaction is integrated into the shopping experience. Unlike traditional eCommerce, where shopping is often a solitary activity, the Metaverse enables users to engage with each other in real-time, share their shopping experiences, and even

participate in group purchases. This social aspect of shopping is becoming increasingly important as consumers seek more interactive and community-driven experiences.

Another key focus of the chapter is the use of influencers in the Metaverse. Influencers play a critical role in buying consumer habits and driving sales, particularly in virtual environments where their endorsements can feel more personal and immediate. The chapter discusses how businesses can effectively leverage influencers to reach target audiences, create buzz around new products, and build strong brand communities.

Finally, the chapter discusses the importance of forming strategic partnerships and cross-industry collaborations to succeed in the Metaverse. The Metaverse's complexity requires businesses to work with technology providers, such as those specializing in VR, AR, and blockchain, to build the necessary infrastructure for their virtual operations. These partnerships can also help businesses grow fast by use of technological advancements and maintain a -competitive edge.

The chapter highlights the potential of cross-industry collaborations, where companies from different sectors—such as fashion, gaming, and entertainment—work in a collective style to generate innovative and immersive -experiences in the Metaverse. These collaborations can lead to the development of new products and services that resonate with diverse consumers, further expanding a brand’s reach and influence in the virtual space.

This literature review chapter provides a comprehensive overview of the strategies for launching and sustaining eCommerce operations in the Metaverse. The chapter specifies the benefits of taking V-Commerce models, developing robust data strategies, integrating social commerce, focusing on sustainability, and forming strategic partnerships. By implementing these strategies, businesses can effectively navigate the challenges of the

Metaverse and leverage its opportunities to achieve long-term success in this rapidly evolving digital landscape.

# CHAPTER III:

# METHODOLOGY

## 3.1 Overview of the Research Problem

In our efforts to advance metaverse e-commerce, we aim to conduct a detailed quantitative analysis focused on the use of virtual shopping and live commerce. The metaverse blurs the boundaries between physical and digital realities, introducing distinct features and challenges to online retail. We must conduct this study to uncover the preferences and obstacles faced by e-commerce customers in the metaverse, especially in virtual shopping and live commerce experiences, as this will provide valuable insights for the industry.

While traditional e-commerce platforms have made great strides in meeting consumer needs, the metaverse introduces a new level of consumer engagement. By understanding user preferences and challenges in virtual shopping and live commerce, businesses can better align their strategies with the evolving expectations of modern shoppers. Incorporating advanced technologies like augmented and virtual reality in e-commerce is a significant driving force. By exploring the metaverse, we aim to offer insights that encourage innovation in technology integration within the e-commerce industry.

The rapid evolution and widespread adoption of digital technologies, particularly in the realms of artificial intelligence (AI) and virtual reality (VR), have significantly transformed how consumers engage with the shopping experience. The rise of the metaverse and the increasing prevalence of virtual shopping-based live commerce mark a pivotal shift in how consumers interact with brands, explore products, and make purchasing decisions. This change, however, also introduces new complexities and challenges,

especially in how consumers perceive and experience these virtual environments in contrast to traditional in-store shopping.

As businesses embrace AI-driven features, such as head-mounted devices, virtual fitting rooms, and interactive product demonstrations, there is a growing imperative to comprehend the impact of these technologies on consumer expectations and satisfaction. Despite the potential of these innovations to elevate the shopping experience, there is a noticeable gap between the anticipated benefits of virtual shopping and the actual consumer experience. This disparity is characterized by discrepancies in product representation, reliability of virtual platforms, and the overall quality of interaction with AI-powered shopping assistants, underscoring the need to address these issues.

With the integration of AI and VR into the shopping journey, significant concerns have emerged around data privacy, security, and the ethical use of consumer information. Consumers are increasingly mindful of how virtual shopping platforms collect, store, and utilize their personal and financial data, as this knowledge can impact their willingness to embrace these technologies. Building consumer awareness and trust in these areas is crucial for fostering greater acceptance and adoption of AI and VR within the shopping landscape.

### 3.2 Research Design

The research methodology of this work is framed around a quantitative approach aimed at thoroughly understanding the impact of AI and VR technologies on consumer behavior in virtual shopping and live commerce. This design is implemented through a structured questionnaire, meticulously crafted to align with the study's objectives. The survey begins by gathering essential demographic details from participants, including their age, gender, location, education level, and employment status. This demographic data is a formality and a crucial step in ensuring the study encompasses diverse participants, reflecting various consumer segments. Including this information allows a more

comprehensive analysis of how different groups perceive and interact with AI and VR technologies in a virtual shopping environment.

Following the demographic section, the questionnaire plays a pivotal role in delving into specific aspects of the virtual shopping experience. It aims to measure consumers' familiarity with AI features such as head-mounted devices and VR technologies. This section is designed to assess how these advanced technologies influence consumers' shopping preferences, expectations, and overall satisfaction. The questions are structured to capture the degree of importance consumers place on various elements of the shopping experience, such as product visibility, store layout, and the immersive nature of AI-driven features. This part of the survey seeks to establish a clear understanding of how AI and VR technologies are perceived by consumers and how these perceptions affect their shopping decisions.

To address the study's second objective, which is to identify gaps between consumer expectations and the reality of the virtual shopping experience, the questionnaire includes targeted questions that explore this discrepancy. This section focuses on consumers' perceptions of product representation in virtual environments, including the accuracy of product appearance, quality, and reliability of platform features like virtual fitting rooms. The survey also gauges consumer satisfaction with the availability and clarity of product information during virtual shopping sessions. By analyzing these responses, the study aims to pinpoint specific areas where virtual shopping platforms may fall short of consumer expectations, providing insights into potential areas for improvement.

The research design further incorporates questions to investigate improvements that could enhance the virtual shopping experience. This survey section explores consumer opinions on the value of advanced features, such as high-definition images, 360-degree product views, and interactive product descriptions. It also examines the usefulness of AI-

driven tools like virtual fitting rooms and live chats with virtual shopping assistants. These questions are designed to gather data on consumer preferences and the likelihood of these features influencing their purchase decisions. The goal is to identify which enhancements consumers believe would significantly improve their virtual shopping experience, bridging the gap between expectations and reality.

Additionally, the study considers the critical aspect of data privacy and security, which is increasingly important in AI and VR technologies. The questionnaire includes questions that assess consumers' concerns about the collection, use, and protection of their data within virtual shopping platforms. This section evaluates the level of trust consumers place in these platforms to safeguard their information, including financial details and biometric data. By exploring these concerns, the study aims to understand how privacy and security issues impact consumer confidence and their willingness to engage with AI-powered shopping platforms.

Lastly, the research design incorporates a comparative analysis between virtual shopping and traditional in-store shopping. This section of the survey examines various factors such as convenience, product variety, pricing, and the overall satisfaction derived from each shopping method. The questions are designed to provide insights into how consumers perceive the benefits and drawbacks of virtual shopping-based live commerce compared to the more familiar brick-and-mortar shopping experience. The data collected in this section will help elucidate how AI and VR technologies reshape consumer perceptions and preferences in the retail landscape.

Overall, this research design is comprehensive and methodically structured to capture a wide range of data that will be analyzed to draw meaningful conclusions. The insights gained from this study are expected to contribute valuable knowledge to virtual

shopping and live commerce, offering actionable recommendations to enhance consumer satisfaction and address the challenges posed by integrating AI and VR technologies.

### 3.3 Assessing Changes in Consumer Expectations with AI and Virtual Shopping Adoption

A structured quantitative methodology will be employed to investigate how consumer expectations of the in-store experience change with the accelerating adoption of AI features and virtual shopping. This approach is designed to capture consumers' nuanced perceptions and expectations as they engage with emerging technologies like AI and VR in retail environments.

First, the study will utilize a structured questionnaire, as outlined previously, to collect data from a diverse sample of participants. The questionnaire will include various Likert scale questions to assess the importance of product visibility, the influence of store layout, familiarity with AI features such as head-mounted devices and VR technologies, and the likelihood of prioritizing stores that offer immersive experiences. These questions will allow for quantifying consumer expectations and their potential evolution in response to adopting AI-driven shopping experiences.

The target population will consist of consumers from different age groups, genders, educational backgrounds, and locations across India, ensuring a comprehensive understanding of varying consumer expectations. The sampling method will be stratified random sampling, ensuring representation from each demographic group to minimize biases and ensure the results are generalizable. This comprehensive approach will offer a robust experience of the effect of AI -and VR adoption on consumer expectations in retail.

Data will be analyzed using inferential and -descriptive statistical methods. Descriptive analysis will offer an outline of the general trends and patterns in consumer expectations, such as the mean levels of importance attributed to product visibility or the

likelihood of engaging with AI-driven in-store experiences. Inferential statistics, such as regression analysis or ANOVA, will be employed to identify significant predictors of changes in consumer expectations and satisfaction. For instance, the analysis might explore whether familiarity with AI features significantly influences the likelihood of prioritizing immersive shopping experiences.

Additionally, the study will consider cross-tabulation analyses to examine relationships between demographic variables (such as age or education level) and consumer expectations. This will help identify specific demographic groups more likely to have high expectations or prefer AI-enhanced shopping environments.

The insights gained from this analysis will be crucial in understanding how consumer expectations shift in the context of AI and VR integration in retail. These findings will contribute to academic knowledge and provide practical guidance for retailers and technology developers aiming to enhance the in-store shopping experience in a digital age.

For Objective 1, the questionnaire is meticulously crafted to gather detailed insights into how consumers, like you, perceive and respond to the evolving in-store experiences shaped by AI and virtual shopping technologies. This section of the questionnaire is structured around key aspects that influence your expectations and satisfaction with the in-store shopping experience, making your input invaluable.

1. Importance of Product Visibility: Respondents are asked to rate how crucial product visibility is in shaping their in-store shopping experience. This question uses a Likert scale ranging from "Not Important" to "Very Important," allowing participants to express the significance they place on being able to see and evaluate products clearly in a physical store setting.

2. Influence of Store Layout: This question explores how the physical layout impacts the shopper's satisfaction. Respondents rate their level of agreement with how influential the store layout is, ranging from "Not Influential" to "Very Influential." This helps in understanding store design and product placement's role in customer experience.

3. Familiarity with AI Features: Participants are asked to indicate their familiarity with AI features, such as head-mounted devices and VR technologies, used to enhance the in-store shopping experience. The options range from "Not Familiar" to "Very Familiar," providing insight into consumers' awareness and acceptance of these technologies.

4. Likelihood of Engaging with AI-Enhanced Shopping Experiences: This question measures respondents' likelihood of prioritizing shopping in stores that offer immersive experiences through AI features. The scale ranges from "Very Unlikely" to "Very Likely," assessing consumer interest and willingness to engage with these innovative technologies.

5. Anticipation of Evolving Expectations: Finally, respondents are asked to predict how their expectations of the in-store shopping experience might change with the increasing adoption of AI features. This question uses a scale from "Decreasing" to "Significantly Increasing," aiming to capture your expectations and how they might shift as technology continues to evolve, potentially enhancing your in-store shopping experience.

Rest assured, your responses will be treated with the utmost confidentiality and will only be used for the purpose of this research. This section of the questionnaire is crucial for identifying key factors that influence consumer expectations and how these expectations might be shaped by the introduction of AI and VR technologies in retail environments. The data collected will be used to analyze patterns and correlations that can inform strategies for enhancing the in-store shopping experience.

### 3.4 Identifying Factors Behind Expectation-Experience Gaps in Virtual Shopping

Objective two identifies the factors that create discrepancies between consumer expectations and the experience of virtual shopping-based live commerce. To address this objective, the methodology involves a detailed examination of various aspects of the virtual shopping experience, pinpointing areas where consumer expectations may not align with reality.

The approach begins with designing a comprehensive questionnaire specifically tailored to this objective. The questionnaire is structured to capture various experiences and opinions about virtual shopping. It includes questions on the accuracy of product representation, where participants are asked to rate how well virtual platforms depict product appearance and quality. Additionally, it assesses satisfaction with the availability of product information, such as descriptions and specifications, and measures the reliability of virtual platforms in accurately showing product size, fit, and proportions. Respondents also evaluate the extent of discrepancy between the virtual representation of products and their actual appearance upon receipt and rate their satisfaction with the assistance provided by virtual shopping assistants. Further, the questionnaire explores the level of trust in recommendations made by these assistants and assesses the overall convenience of virtual shopping compared to traditional in-store shopping. Finally, it gauges how likely participants are to recommend virtual shopping-based live commerce to others.

The data collection process for Objective 2 involves several key steps. A representative sample of virtual shopping users is selected, ensuring diversity in demographics such as age, gender, location, and education to capture a wide range of experiences. The questionnaire is distributed through various channels, including online survey platforms, email invitations, and social media, to maximize reach and accessibility.

The survey is conducted over a set period for sufficient response time, ensuring a comprehensive data set.

Once the data is collected, it is subjected to thorough analysis. Quantitative methods are used to evaluate average ratings, frequencies, and correlations, providing a clear picture of the extent of discrepancies and satisfaction levels. The analysis focuses on identifying specific areas where consumer expectations still need to be fully met, such as inaccuracies in product representation or dissatisfaction with virtual assistance. These gaps are highlighted based on the responses to relevant questions.

Based on the findings, recommendations are formulated to address the identified gaps. These recommendations are not just theoretical, but practical and actionable. They may include suggestions for improving the accuracy of virtual product depictions, enhancing the effectiveness and responsiveness of virtual shopping assistants, and increasing the reliability of virtual platforms in showing product size and fit. By following this methodology, the study aims to provide valuable insights into the discrepancies between consumer expectations and the reality of virtual shopping-based live commerce, ultimately offering actionable strategies for enhancing the virtual shopping experience.

- Designing the Questionnaire Section

The questionnaire for Objective 2 is structured to assess various aspects of the virtual shopping experience and identify gaps between consumer expectations and actual experiences. The section includes the following key areas:

1. Accuracy of Product Representation: To gauge how well virtual shopping platforms depict products in appearance and quality, respondents are asked to rate their agreement with statements about product representation on a scale from "Strongly Disagree" to "Strongly Agree."

2. Availability of Product Information: This question evaluates satisfaction with the information provided about products during virtual shopping sessions, including descriptions and specifications. Respondents are asked to rate their satisfaction on a scale from 'Very Dissatisfied' to 'Very Satisfied '.

3. Reliability of Virtual Shopping Platforms: Participants are asked to rate the reliability of virtual platforms in terms of accurately showing the size, fit, and proportions of products. Responses range from "Very Unreliable" to "Very Reliable."

4. Discrepancy Between Virtual and Actual Products: This question explores the extent of perceived discrepancy between the virtual representation of products and their actual appearance upon receipt. Respondents indicate the level of discrepancy from "Significant Discrepancy" to "No Discrepancy."

5. Satisfaction with Virtual Shopping Assistants: To assess the effectiveness of virtual shopping assistants, respondents rate their satisfaction with the assistance provided during sessions, ranging from "Very Dissatisfied" to "Very Satisfied."

6. Trust in Recommendations: This question measures how likely respondents are to trust recommendations made by virtual shopping assistants regarding product suitability and quality, with responses from "Very Unlikely" to "Very Likely."

8. Convenience of Virtual Shopping: Participants evaluate the overall convenience of virtual shopping compared to traditional in-store shopping, from "Very Inconvenient" to "Very Convenient."

9. Likelihood of Recommendation: Finally, respondents rate how likely they are to recommend virtual shopping-based live commerce to others based on their experiences, from "Very Unlikely" to "Very Likely."

Through the implementation of this methodology, the research endeavors to gain a comprehensive comprehension of the disparities existing between the expectations of

consumers and the actuality of live commerce within the realm of virtual shopping. The primary objective is to furnish practical and implementable insights aimed at enhancing the overall virtual shopping experience.

### 3.5 Developing Strategies to Align Consumer Expectations with Virtual Shopping Reality

Objective 3 offers suggestions for bridging the gap between consumer expectations and the experience of virtual shopping-based live commerce. To achieve this, the methodology involves a detailed assessment of various aspects of the virtual shopping experience to identify areas where enhancements can improve consumer satisfaction.

The methodology begins with developing a targeted questionnaire to capture detailed insights into potential improvements in virtual shopping experiences. The questionnaire includes questions focused on specific features and enhancements that could address gaps identified in previous research. Participants are asked to evaluate the effectiveness of incorporating high-definition images, 360-degree views of products, and interactive product descriptions such as zoom-in capabilities and demonstrations. The survey also explores the usefulness of live chat support with virtual shopping assistants for answering questions and assisting during shopping sessions. Additionally, it examines the potential impact of AI-based virtual fitting rooms on consumer confidence in purchasing clothing and accessories online. Other questions assess the trustworthiness of product recommendations and reviews from other consumers, the influence of personalized product recommendations on purchase decisions, and the clarity of shipping, costs, and return policies.

For Objective 3, the data collection process involves surveying a diverse and representative sample of virtual shopping users. This approach ensures that a wide range of opinions and experiences related to the suggested improvements are considered. The

questionnaire is distributed through various channels, including online survey platforms, email campaigns, and social media, to encourage participation and reach. The survey period is carefully designed to allow for sufficient responses, ensuring a comprehensive dataset.

Following the data collection for Objective 3, the responses are meticulously analyzed using quantitative methods. This includes calculating average ratings, and frequencies, and identifying patterns in responses to thoroughly evaluate the perceived effectiveness of proposed improvements. The analysis is focused on determining which features or enhancements are most likely to address consumer concerns and improve the virtual shopping experience.

Based on the analysis, recommendations are developed to bridge the gap between consumer expectations and actual experiences. These recommendations include implementing high-definition visuals and interactive features, enhancing live chat support, integrating AI-based fitting rooms, and improving the clarity of shipping and return policies. By following this methodology, the study aims to provide actionable insights into how virtual shopping platforms can be enhanced to meet consumer expectations better and improve overall satisfaction.

Objective 3 offers suggestions to enhance the virtual shopping experience by identifying features and improvements that bridge the gap between consumer expectations and actual experiences. The questionnaire designed for this objective aims to gather detailed feedback from users regarding various aspects of virtual shopping and live commerce.

1. Incorporation of High-Definition Images and 360-Degree Views: This question evaluates the perceived effectiveness of high-definition images and 360-degree product views in improving the virtual shopping experience. Respondents are asked to indicate

their agreement with the statement that these features enhance their understanding and satisfaction with the virtual representation of products. High-definition visuals and 360-degree views are expected to provide a more accurate and detailed representation of products, potentially reducing uncertainty and improving confidence in online purchases.

2. Interactive Product Descriptions: This question assesses how helpful interactive product descriptions, such as zoom-in features and product demonstrations, enhance the virtual shopping experience. Respondents rate the usefulness of these interactive elements in providing a clearer understanding of the product, which can help consumers make more informed decisions and reduce the likelihood of dissatisfaction with their purchases.

3. Live Chat Support: Here, respondents evaluate the value of live chat interactions with virtual shopping assistants. The question seeks to understand how valuable live chat support is for answering questions and assisting consumers during virtual shopping sessions. Adequate live chat support can address immediate concerns and provide personalized assistance, enhancing the shopping experience and improving consumer satisfaction.

4. AI-Based Virtual Fitting Rooms: This question gauges how AI-based virtual fitting rooms would influence consumer confidence in purchasing clothing and accessories online. Respondents rate how much these virtual fitting rooms would boost their confidence in making online purchases by allowing them to try on products virtually. AI-based fitting rooms can simulate how products look and fit, potentially reducing hesitation and returns.

5. Trust in Product Recommendations and Reviews: This question investigates the level of trust consumers place in product recommendations and reviews integrated into virtual shopping platforms. Respondents are asked to rate their likelihood of trusting such recommendations and reviews, which can influence their purchasing decisions. Reliable

recommendations and reviews can enhance the credibility of virtual shopping platforms and support informed purchasing.

6. Personalized Product Recommendations: This question explores how personalized product recommendations based on consumer preferences and browsing history affect purchasing likelihood. Respondents indicate how much these recommendations influence their buying products during virtual shopping. Personalized recommendations can make the shopping experience more relevant and engaging, potentially increasing purchase rates.

7. Clarity of Shipping, Costs, and Return Policies: Respondents are asked to rate the importance of straightforward shipping, cost, and return policies for a satisfactory virtual shopping experience. Transparent policies are crucial for building trust and reducing uncertainties related to online purchases. Clear information about these aspects can enhance the shopping experience and consumer satisfaction.

This questionnaire section aims to capture comprehensive feedback on various features and enhancements that could improve the virtual shopping experience. By analyzing the responses, the study seeks to identify which improvements are most valued by consumers and provide actionable recommendations for enhancing virtual shopping platforms.

### 3.6 Bridging the Expectation-Reality Gap in Virtual Shopping-Based Live Commerce

Objective 4 of this study investigates consumer concerns about privacy and security in virtual shopping platforms and offers recommendations to improve data protection. To achieve this, a comprehensive survey was designed, featuring questions aimed explicitly at uncovering consumer perceptions and experiences related to handling personal and financial data. This survey was distributed to participants who regularly use virtual shopping platforms, ensuring diverse and representative feedback.

The questionnaire includes Likert scale questions that explore various aspects of privacy and security. Participants were asked to rate their concerns about using personal data, biometric information, and browsing history, ranging from "Not Concerned at All" to "Extremely Concerned." This approach allows for a detailed understanding of consumer attitudes toward data privacy.

To analyze the data, the responses to questions about privacy concerns were reviewed to identify everyday worries among consumers regarding data handling practices. This analysis helps pinpoint specific areas where consumers feel their privacy is at risk. Additionally, the study evaluates consumer trust in security measures implemented by virtual shopping platforms by examining responses about the perceived effectiveness of these measures in protecting personal information.

Comfort with data collection practices was assessed to determine how willing consumers are to share their data for personalized shopping experiences. This insight helps gauge the balance between the benefits of personalization and the need for privacy. The survey also looked at consumer confidence in the protection of financial information, such as credit card details, to identify if there are gaps in reassurance that could be addressed.

Concerns about the use of biometric data, such as facial recognition, were also analyzed to understand consumer perceptions of the risks associated with these technologies. Finally, the survey explored whether consumers believe that virtual shopping platforms prioritize privacy and security over data collection for marketing purposes and assessed their satisfaction with their level of control over their personal data.

By combining these insights, the study aims to provide clear recommendations to enhance data protection practices on virtual shopping platforms, address specific privacy concerns, and ultimately improve consumer trust in the security of their personal and financial information.

Objective 4 focuses on identifying ways to enhance the security and privacy aspects of virtual shopping. To achieve this, the methodology involves assessing consumer concerns and experiences regarding protecting their data using AI-powered virtual shopping platforms.

1. Concerns About Personal Data Privacy: This question asks respondents how worried they are about their data being handled during virtual shopping. It aims to understand consumers' concerns about privacy when interacting with AI systems. By gathering this information, we can identify the key areas where consumers feel their privacy might be at risk.

2. Trust in Security Measures: Respondents are asked to rate their trust in the security measures used to protect their personal information on virtual shopping platforms. This question helps determine how confident consumers are that their data is being kept safe from unauthorized access or cyber threats.

3. Comfort with Data Collection: This question explores how comfortable consumers are with virtual shopping platforms collecting and using their browsing history and purchase behavior to personalize their shopping experience. It measures people's willingness to share data for a more tailored shopping experience.

4. Confidence in Safeguarding Financial Information: Here, respondents rate their confidence in the virtual shopping platform's ability to protect their financial information, such as credit card details. This question helps assess how secure consumers feel about their financial data during online transactions.

5. Concerns About Biometric Data: This question addresses biometric data's use and potential misuse, like facial recognition used for virtual try-ons. It helps understand how worried consumers are about collecting and using their biometric information.

6. Priority Given to Privacy and Security: Respondents are asked if they believe virtual shopping platforms prioritize protecting their privacy and security over collecting data for marketing purposes. This question aims to gauge consumer perception of how well their privacy is safeguarded compared to the data collection practices of these platforms.

7. Satisfaction with Data Management Control: The final question in this section measures how satisfied consumers are with their control over their data within virtual shopping platforms. It evaluates whether consumers feel they have enough control over sharing and managing their information.

Overall, this methodology helps to identify consumer concerns and satisfaction levels related to privacy and security in virtual shopping. The study aims to provide recommendations for improving data protection practices and enhancing consumer trust in virtual shopping platforms by analyzing these responses.

### 3.7 Comparative Analysis of Virtual Shopping's Impact on Consumer Perceptions

Objective 5 examines how virtual shopping-based live commerce compares to traditional in-store shopping in terms of consumer perceptions and experiences. A detailed questionnaire was crafted to address this objective, focusing on various aspects of the shopping experience provided by virtual platforms versus physical stores.

The questionnaire featured a series of questions designed to assess consumer views on the convenience, variety, satisfaction, trust, and immersive quality of virtual shopping compared to traditional in-store shopping. Respondents were asked to rate their experiences on various issues using Likert scales, allowing for nuanced insights into their perceptions.

Participants evaluated the overall convenience of virtual shopping-based live commerce relative to traditional in-store shopping. This involved assessing whether virtual shopping was more or less convenient than physically visiting stores. Similarly, the

questionnaire explored perceptions of product variety, asking respondents to compare the range of products available through virtual platforms versus traditional stores.

Satisfaction with interaction and engagement in virtual shopping environments was also measured. Participants rated how well virtual platforms meet their expectations compared to in-store shopping, providing insight into the quality of customer service and engagement in both settings. Additionally, the survey gauged trust in virtual shopping advice versus recommendations from in-store staff, helping to understand how much consumers rely on virtual versus physical store advice.

Another focal point was the immersive quality of the virtual shopping experience. Respondents were asked to compare the engagement and sensory experience of virtual shopping with that of in-store shopping, examining whether virtual environments offer a more or less immersive experience. Lastly, the survey compared pricing and affordability between virtual shopping platforms and traditional stores. Participants rated whether they found products more or less expensive through virtual platforms compared to physical stores.

By analyzing responses to these questions, the study aims to provide a comprehensive view of how virtual shopping-based live commerce compares to traditional shopping methods. The findings will help identify strengths and weaknesses in virtual shopping experiences and offer recommendations for enhancing the effectiveness and appeal of virtual shopping platforms.

The questionnaire section dedicated to Objective 5 compares virtual shopping-based live commerce to traditional in-store shopping. This part of the questionnaire is designed to capture consumers' perceptions and experiences of both shopping methods, providing a detailed comparison across several key areas.

1. Convenience: Participants are asked to evaluate the convenience of virtual shopping compared to traditional in-store shopping. They rate how much easier or more difficult they find each method, with responses ranging from "Much Less Convenient" to "Much More Convenient". This question aims to understand whether consumers find virtual shopping platforms more or less convenient than physically visiting stores.

2. Product Variety: Respondents assess the range of products available through virtual shopping versus traditional stores. They rate whether they believe virtual platforms offer "Much Less Variety," "Less Variety," "Neutral," "More Variety," or "Much More Variety" than physical stores. This question helps determine if virtual shopping provides a broader or narrower selection of products compared to in-store shopping.

3. Satisfaction with Interaction and Engagement: This question measures how satisfied consumers are with the interaction and engagement offered by virtual shopping compared to traditional stores. Participants rate their satisfaction from "Much Less Satisfied" to "Much More Satisfied." This helps gauge whether virtual shopping platforms meet or exceed consumer expectations for interaction and engagement compared to physical stores.

4. Trust in Shopping Advice: Consumers are asked to compare their trust in virtual shopping advice to recommendations from in-store staff. They rate their trust from "Much Less Likely" to "Much More Likely." This question aims to understand if consumers are more or less likely to trust advice provided by virtual assistants compared to in-person store staff.

5. Immersive Experience: Respondents evaluate how immersive and engaging they find the virtual shopping experience compared to traditional in-store shopping. They rate this aspect from "Much Less Immersive" to "Much More Immersive." This question seeks

to determine whether virtual shopping environments offer a more or less engaging experience than traditional shopping settings.

6. Pricing and Affordability: Finally, participants compare the pricing and affordability of products offered through virtual shopping versus traditional stores. They rate whether they find prices to be "much higher," "higher," "Neutral," "Lower," or "Much Lower" on virtual platforms compared to physical stores. This question helps assess consumer perceptions of cost differences between shopping methods.

These questions are designed to provide a comprehensive view of how virtual shopping-based live commerce is perceived about traditional shopping methods. They aim to highlight strengths, weaknesses, and areas for improvement in virtual shopping platforms based on consumer experiences and expectations.

**3.8 Population and Sample**

The population for this study consists of individuals who engage in or have the potential to engage in virtual shopping and live commerce. This includes a diverse group of consumers across various demographics, such as age, gender, educational background, and geographic location. The target population encompasses anyone who uses or is interested in using virtual shopping platforms and live commerce services, which may include both current users and potential future users of these technologies.

The sample for this study is a subset of the larger population, explicitly consisting of 200 respondents who completed the questionnaires designed to gather data on consumer experiences and perceptions related to virtual shopping and live commerce. Here is a detailed breakdown of the sampling process:

The study uses a non-probability sampling technique, likely a convenience sampling approach. This means respondents are selected based on their availability and willingness to participate rather than using a random sampling method. This approach is

often used in exploratory research when a specific subset of individuals is targeted based on their relevance to the study's objectives.

- Sample Size:

Number of Responses: A – a total of 200 responses were gathered. This sample size is adequate for a quantitative study, providing sufficient data to conduct meaningful statistical analyses and draw reliable conclusions.

- Sample Characteristics:

Demographic Diversity: The sample includes a range of demographic characteristics such as different age groups, genders, educational levels, and geographic locations. This diversity ensures the findings reflect a broad spectrum of consumer experiences and perceptions.

Geographic Distribution: Respondents are from various regions within India, including Central, North, North East, East, South East, South, South West, West, and North West India. This geographical diversity helps in understanding regional differences in virtual shopping experiences.

Educational and Employment Backgrounds: The sample includes individuals with varying educational qualifications and employment statuses, which provides insights into how these factors influence perceptions and experiences with virtual shopping and live commerce.

In summary, the study's sample of 200 respondents provides a diverse cross-section of individuals engaged with or interested in virtual shopping and live commerce. This sample allows for a thorough analysis of consumer expectations, experiences, and perceptions, contributing valuable insights to the research objectives.

### 3.9 Participant Selection

Inclusion Criteria: Respondents were required to have some experience or interest in virtual shopping and live commerce. This ensures that the data collected is relevant to the study's objectives.

Exclusion Criteria: To maintain the data's relevance, individuals without any experience or interest in virtual shopping were excluded.

Questionnaire Distribution: The questionnaires were distributed through online platforms or direct outreach to reach potential respondents. The distribution method was chosen to maximize response rates and ensure a diverse sample.

While the sample provides valuable insights, it may only partially represent some of the population of virtual shopping and live commerce users. The non-probability sampling method and the specific sample size limit the generalization of findings to all consumers. However, the data collected offers meaningful insights into consumer behaviors and preferences within the sample group.

### 3.10 Instrumentation

In the study, Python is employed as the primary tool for data analysis due to its versatility and extensive capabilities. The process begins with data collection and preprocessing, where Python libraries such as `pandas` and `numpy` facilitate the import and integration of data from various sources. This step includes cleaning the data by handling missing values and transforming it into a suitable format for further analysis.

For statistical analysis, Python’s `pandas` and `numpy` libraries provide essential descriptive statistics, such as mean, median, and standard deviation, offering a foundational understanding of the dataset. Visualization tools like `matplotlib` and `seaborn` create graphs and charts that visually represent the distribution and relationships within the data. This helps interpret the results and identify trends.

Regarding inferential statistics, Python's `scipy` library is utilized to conduct hypothesis testing, such as t-tests or chi-squared tests, to evaluate assumptions about the data. Correlation analysis uses `pandas` and `seaborn` to understand the relationships between different variables. For more advanced analysis, Python's `statsmodels` and `scikit-learn` libraries are employed to perform regression analysis, including linear and logistic regression, to examine the impact of various factors on the outcomes of interest. These libraries also support machine learning techniques for pattern recognition and predictive modeling.

Data visualization and reporting are crucial components of the analysis. Advanced visualizations are created using libraries like `matplotlib`, `seaborn`, and `plotly`, which provide interactive and complex charts to present the findings effectively. Additionally, Python's `jupyter notebooks` and `report lab` are used to generate detailed reports and documentation of the analysis process. Automated reporting tools ensure that results are compiled into accessible formats such as PDF or HTML, summarizing key insights and visualizations.

Overall, Python's robust ecosystem of libraries and tools makes it an ideal choice for comprehensive data analysis in this study. Its capabilities in data cleaning, statistical and advanced analysis, visualization, and reporting enable a thorough and efficient exploration of how AI and VR technologies influence consumer expectations and experiences in virtual shopping and live commerce.

### 3.11 Data Collection Procedures

The primary data for this study was collected through a structured online questionnaire designed to capture respondents' perceptions, experiences, and satisfaction levels related to AI features in virtual shopping and live commerce. The questionnaires were broken into 5 sections, corresponding to one of the respective objectives:

Section 1: Consumer expectations and AI adoption in virtual shopping.

Section 2: Factors contributing to gaps between consumer expectations and reality.

Section 3: Impact of live commerce on consumer perceptions.

Section 4: Security and privacy concerns in virtual shopping.

Section 5: Overall satisfaction and engagement in live commerce experiences.

Each section included multiple-choice questions, Likert scale items, and rating scales to quantify respondents' attitudes and experiences.

**3.12 Data Analysis**

The data collected from the study was subjected to rigorous analysis utilizing both descriptive and inferential statistical methods to derive valuable insights and test the research hypotheses. Various advanced analytical techniques were applied, including:

1. Histograms: These were utilized to visually represent the distribution of responses for each variable, offering a comprehensive view of how participants perceive different aspects of virtual shopping and live commerce.

2. Correlation Analysis: A correlation matrix was constructed to discern the strength and direction of relationships between different variables, such as product visibility, store layout, AI familiarity, and consumer satisfaction.

3. Factor Analysis: This analytical technique enabled the identification of underlying factors that elucidate response patterns and facilitated data dimensionality reduction, thus enhancing interpretability.

4. Regression Analysis: The research team deployed regression analysis to evaluate the influence of independent variables, such as AI features and platform reliability, on dependent variables, including consumer satisfaction and engagement.

These meticulous analytical methods provided a comprehensive and robust examination of the data, ultimately identifying pivotal trends and correlations pertinent to the research objectives.

### 3.13 Research Design Limitations

Acknowledging the limitations is crucial for providing context and understanding the scope of the findings. The research design for this study on the impact of AI and VR technologies in virtual shopping and live commerce has several limitations that need to be considered.

A significant limitation is the reliance on self-reported data. The study gathers information through questionnaires, which inherently depend on participants' perceptions and honesty. Respondents might have biases or not accurately recall their experiences, leading to potential inaccuracies in the collected data. Self-reporting can also be influenced by social desirability, where respondents might provide answers they believe are expected rather than their genuine opinions.

Another limitation is the sample size and demographic representation. Although the study received 200 responses, the sample may only partially represent the diverse population of virtual shoppers. Factors such as age, gender, location, and internet usage frequency may impact the generalizability of the results. If specific demographics are underrepresented, the findings might not accurately reflect the experiences and expectations of all consumer groups.

The study's cross-sectional nature poses a limitation. It collects information at one time, providing a snapshot of consumer attitudes and behaviors. This design does not account for changes over time, such as shifts in technology adoption or evolving consumer preferences. Longitudinal studies, which track changes over extended periods, could offer more insights into how attitudes and behaviors develop.

In summary, the research design provides valuable insights into the impact of AI and VR technologies on virtual shopping and live commerce; these limitations would be - considered when interpreting the analysis. New research could address these limitations by incorporating diverse sample populations, longitudinal approaches, broader technological aspects, and mixed methods to provide a more comprehensive understanding of consumer experiences in the evolving landscape of virtual commerce.

### 3.14 Conclusion

In conclusion, the methodology chapter provides a comprehensive framework for investigating the impact of AI and VR technologies on consumer experiences in virtual shopping and live commerce. The study employed a structured questionnaire as the primary data collection tool, distributed to a carefully selected sample of 200 respondents. This questionnaire was designed with multiple objectives, covering various factors such as consumer expectations, satisfaction levels, perceptions of AI and VR features, and the perceived gaps between virtual and traditional shopping experiences.

The data gathered through the questionnaire was subjected to rigorous analysis using Python, which was chosen for its robust data processing capabilities. Python allowed for detailed statistical analysis, including frequency distributions, correlation analysis, and regression modeling, providing insights into the relationships between different variables. This analysis helped identify critical patterns and trends in consumer behavior, shedding light on how AI and VR reshape the shopping experience.

The population and sampling strategy were carefully considered to ensure the data's representativeness. The study targeted a diverse group of respondents, considering age, gender, location, and internet usage habits. This diversity was essential to capture a broad spectrum of consumer perspectives, making the findings more generalizable to the wider population.

Despite the thorough design and execution of the study, several limitations were acknowledged. These include the reliance on self-reported data, which can introduce biases such as social desirability or recall bias. Additionally, the study's focus on specific AI and VR features may limit the generalizability of the findings to other technologies or contexts.

Overall, this methodology chapter lays a solid foundation for the research, ensuring the study is systematic and rigorous. The careful design of the questionnaire, the strategic selection of the sample, and the sophisticated data analysis techniques used all contribute to the reliability and validity of the research findings. These findings provide good inputs into the developing landscape of e-commerce, particularly in understanding how emerging technologies like AI and VR are transforming consumer expectations and experiences in the digital marketplace.

# CHAPTER IV:

# RESULTS

## 4.1 Assessing Changes in Consumer Expectations with AI and Virtual Shopping Adoption

For Objective 1, the data collected through the questionnaire reveals how consumer expectations of the in-store experience evolve with the adoption of AI features and virtual shopping. Histograms show that the majority of respondents consider product visibility to be very important, and store layout significantly influences their shopping experience. The research delved into consumers' evolving expectations regarding their in-store experiences, particularly in the context of the growing integration of AI functionalities and the emergence of virtual shopping environments. This phase of the study, termed Objective 1, involved using the initial section of a comprehensive questionnaire to gauge these dynamics. This segment encompassed crucial metrics such as product visibility, store layout, familiarity with AI, priority shopping, and expectations related to AI.

To gain a comprehensive understanding of how shoppers perceive and interact with AI-driven features in virtual stores, the analysis relied on histograms and a correlation heatmap. Each visualization derived from the questionnaire offered an intricate view of various facets of the virtual shopping experience, ranging from how products are presented to the effectiveness of store layouts and the general awareness of and expectations related to AI technologies among users. These visual representations not only shed light on the current levels of consumer satisfaction but also pinpointed areas where AI utilization and consumer education could be further improved.

The findings indicated an overall positive reception of AI features while highlighting the necessity for enhanced personalization and efficiency to elevate the shopping experience. The subsequent correlation heatmap was particularly enlightening,

providing valuable insights that could guide the more effective deployment of AI capabilities in virtual retail environments by elucidating the relationships among different variables.

The questionnaire was divided in 5 sections: Here for Objective 1 SECTION 1 is utilized.

Objective 1.- To investigate how consumer expectations of the in-store experience change with the accelerating adoption of AI features and virtual shopping.

To understand the distribution of the columns / questions asked, we plot histograms

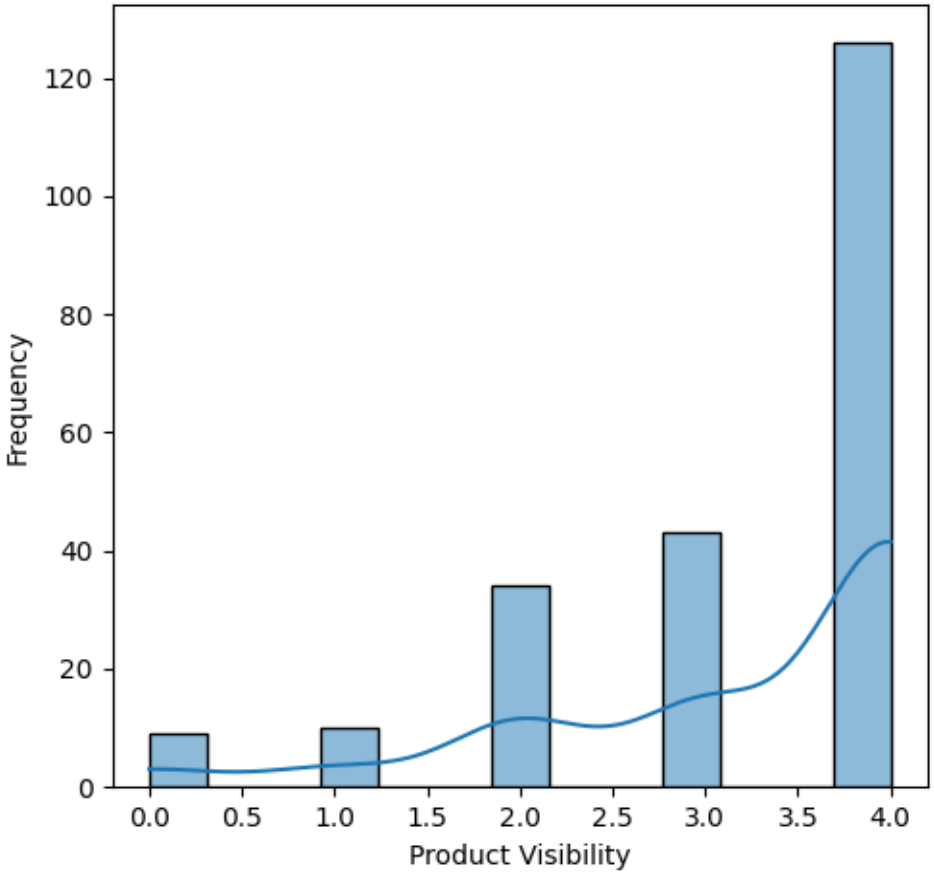


*Figure 1*

*Product Visibility*

The figure 1 indicates that the most respondents rated Product Visibility highly, with a significant concentration in the 3-4 range. This suggests that users are generally satisfied with how products are displayed in the virtual shopping environment, indicating that product visibility is clear and effective for the majority of participants. The skewed distribution suggests that high product visibility is more common than low visibility in this particular dataset.

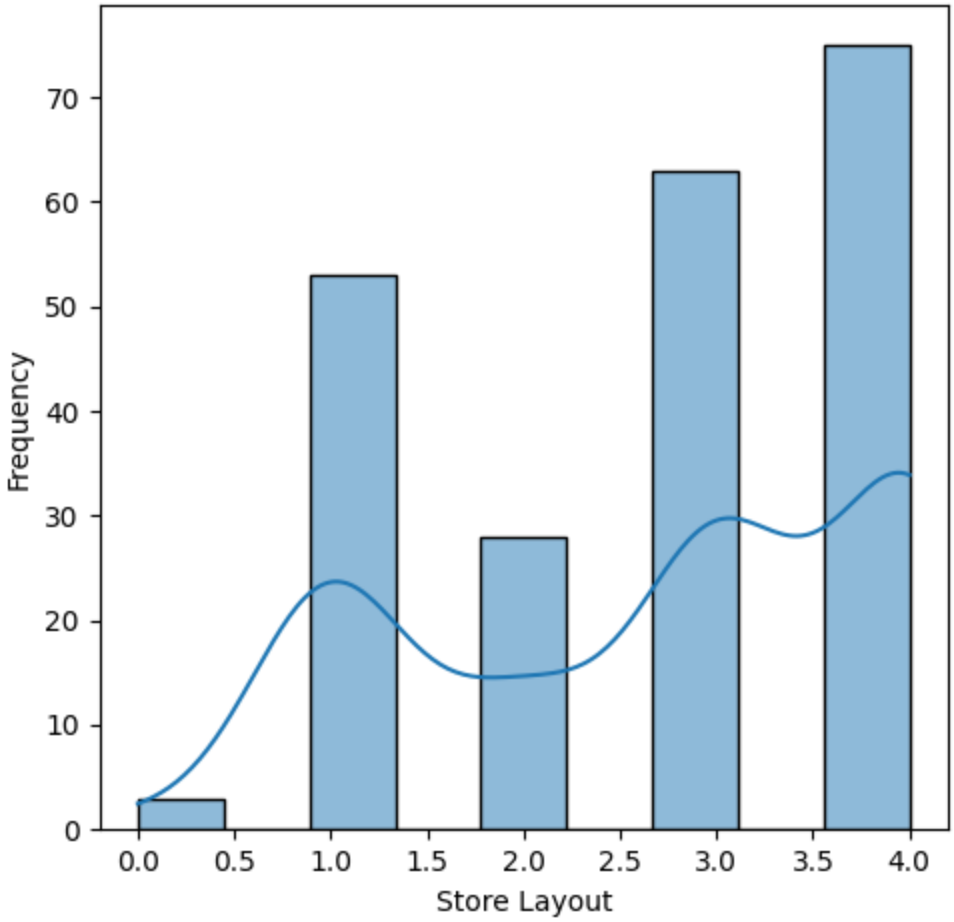


*Figure 2*

*Layout Representation of Stores*

Figure 2 shows that there is a varied distribution of store layout scores, with a significant number of stores having layouts rated highly, particularly around 3 and 4. This indicates that many participants find the store layouts effective and satisfactory. There are

fewer responses in the lower ranges, suggesting minimal dissatisfaction, while the overall trend points toward a positive perception of store layouts in the virtual shopping environment.

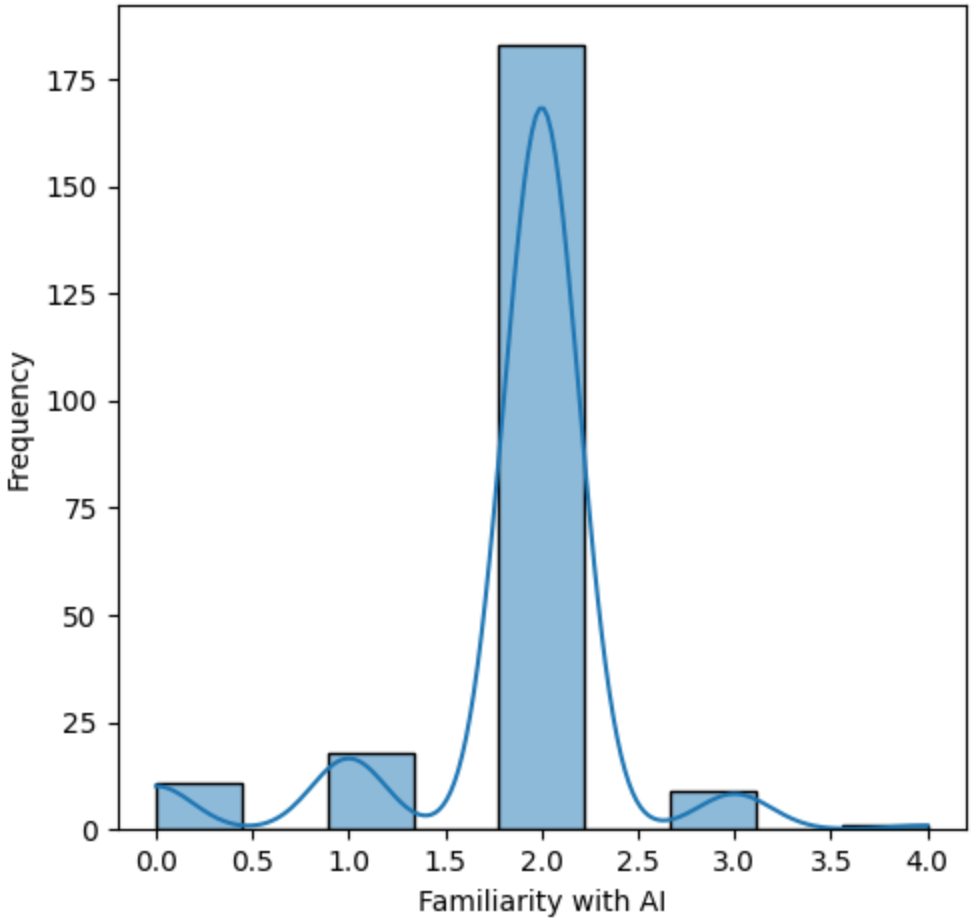


*Figure 3*

*Familiarity within AI Technologies*

The graph for Familiarity with AI in figure 3 shows a strong concentration of responses at a rating of 2, indicating that most participants have a moderate understanding of AI. The peak frequency is significantly higher compared to other rating levels, with minimal responses in the lower (0-1) and higher (3-4) ranges. This suggests that while most users have some knowledge of AI, few are either completely unfamiliar or highly

knowledgeable, highlighting an opportunity for further education and exposure to AI technologies.

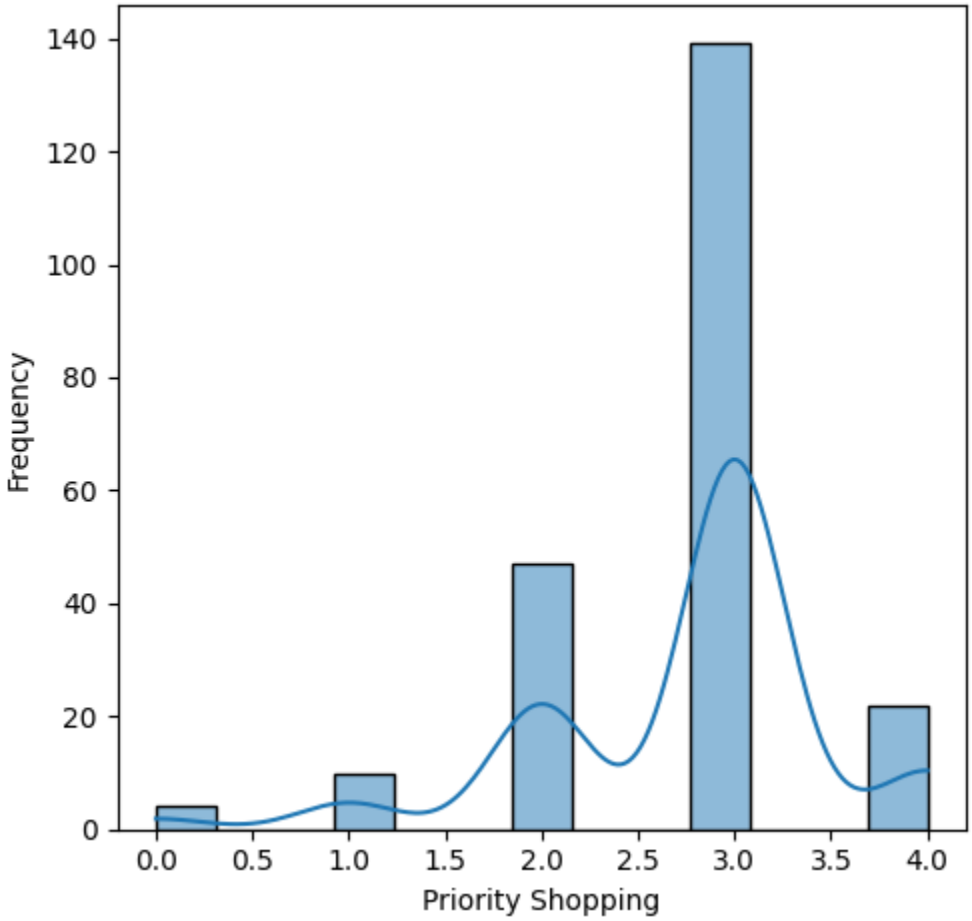


*Figure 4*

*Priority Shopping*

Figure 4 shows that the graph for Priority Shopping shows a clear peak at a rating of 3, with a significantly higher number of responses compared to other ratings, indicating that most respondents moderately prioritize shopping. There is a smaller cluster of responses around rating 2, with fewer participants giving lower or higher ratings. A notable dip is observed around ratings 1 and 4, suggesting that fewer people consider shopping

either a low or a very high priority. Overall, this distribution reflects that for the majority of respondents, shopping is an important but not topmost priority.

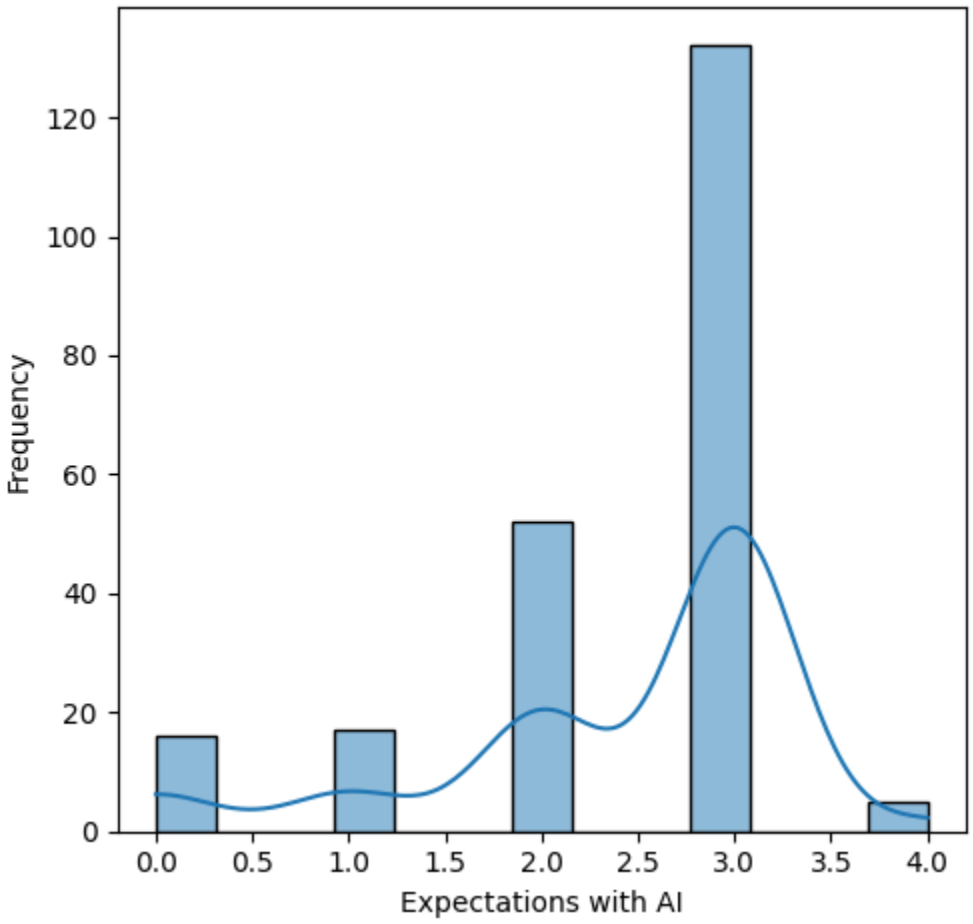


*Figure 5*

*Expectations with AI*

Figure 5 graph for Expectations with AI shows that the majority of respondents have moderate expectations, with a clear peak at a rating of 3. A smaller group rated their expectations at 2, and very few responses are seen at the lower (0-1) and higher (4) ends. This distribution indicates that most participants expect AI to play a role in enhancing their shopping experience, but their expectations are balanced and not overly high. The trend

suggests moderate optimism about AI's potential to improve the shopping process, with room for further development.

Overall histograms visually represent that users are generally satisfied with product visibility and store layout in virtual shopping, but there is room to enhance AI integration, as familiarity and expectations with AI remain moderate. While shopping is important to users, it is not their top priority, suggesting a focus on efficiency and personalization could enhance the experience. Overall, businesses have an opportunity to further educate users on AI benefits and introduce advanced AI features, which could improve engagement, satisfaction, and loyalty over time.

To understand the correlations between the variables/questions within this section, we plot a heatmap for visualizing the correlation coefficients.

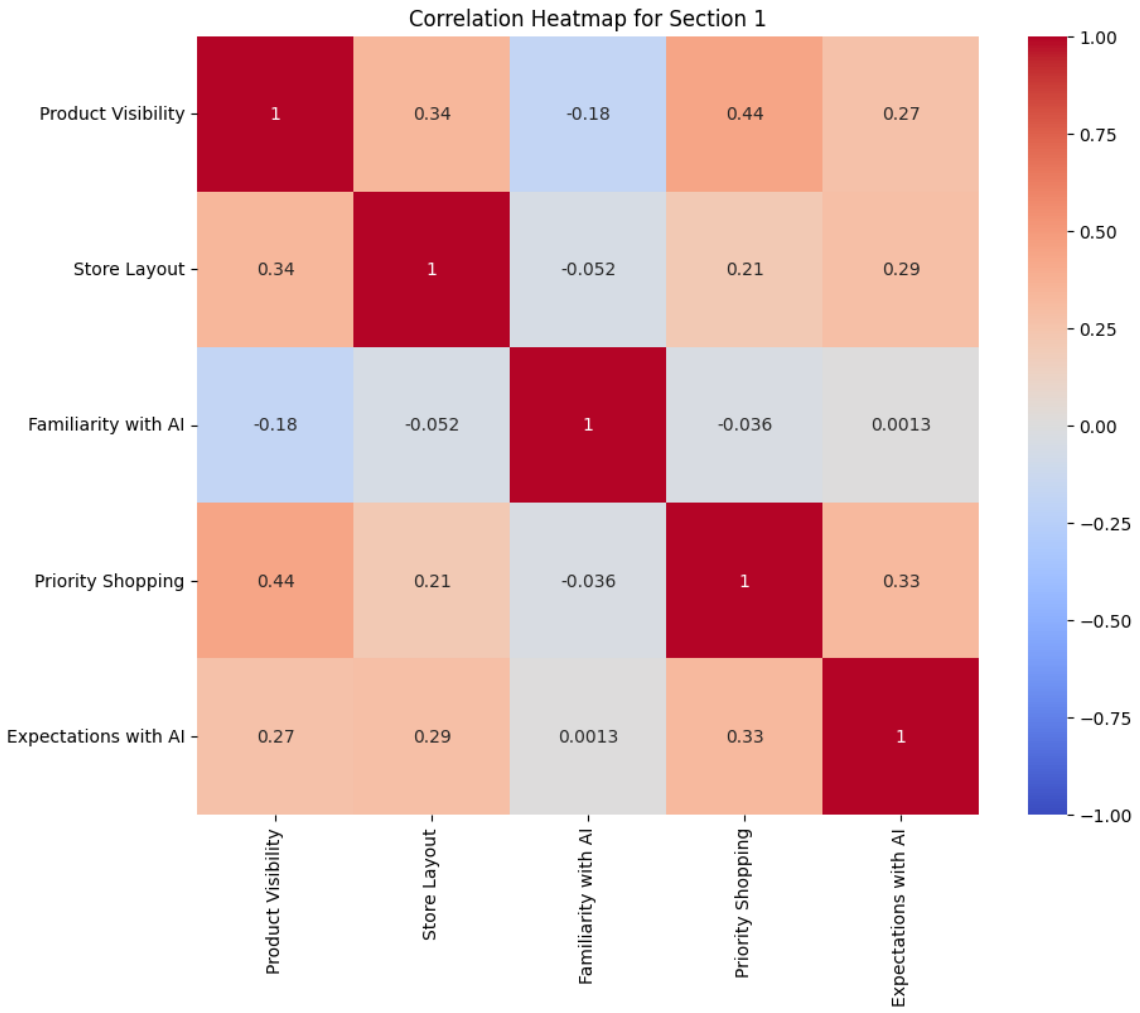


*Figure 6*

*Correlation Heatmap for Section 1*

Columns: Product Visibility, Store Layout, Familiarity with AI, Priority Shopping, Expectations with AI

Interpretation: figure 6 shows the correlation matrix for section 1.

Figure 6 depicts Product Visibility has a moderate positive correlation with Store Layout (0.34), Priority Shopping (0.44), and Expectations with AI (0.27), but shows a negative correlation with Familiarity with AI (-0.18). Store Layout has weak positive correlations with Priority Shopping (0.21) and Expectations with AI (0.29), while its

correlation with Familiarity with AI is negligible (-0.052). Familiarity with AI generally shows negligible correlations with other variables, including slight negative correlations with Product Visibility (-0.18) and Priority Shopping (-0.036), and a very small positive correlation with Expectations with AI (0.0013). Priority Shopping, in turn, has a moderate positive correlation with Expectations with AI (0.33).

Summary: The findings suggest that improving store layout and shopping priorities can enhance user expectations of AI, while increasing AI familiarity requires targeted efforts, as it currently has minimal impact.

### 4.2 Identifying Factors behind Expectation-Experience Gaps in Virtual Shopping

For Objective 2, the analysis focuses on identifying the factors that cause gaps between consumer expectations and the reality of virtual shopping experiences. The histograms illustrate that respondents generally expressed moderate satisfaction with various aspects of the virtual shopping experience, such as the quality of the virtual experience, product information, platform reliability, and assistance provided. Representation discrepancies were noted but were not considered extreme, and recommendations for live commerce were met with a more neutral response. The correlation analysis shows that a strong virtual experience is linked to better product information and platform reliability, which in turn fosters greater trust in recommendations and minimizes representation issues. Satisfaction with assistants significantly influences trust in recommendations, while platform convenience plays a role in encouraging live commerce recommendations. Overall, platform reliability and effective assistant interactions are essential for enhancing user trust and addressing concerns in virtual shopping.

SECTION 2 of the questionnaire is utilized and analyzed for objective two.

Objective 2 -To investigate factors causing gaps between consumer expectations and in-store reality for enhanced Virtual shopping-based live commerce. To understand the distribution of the columns/questions, we plot histograms of the same in this section.

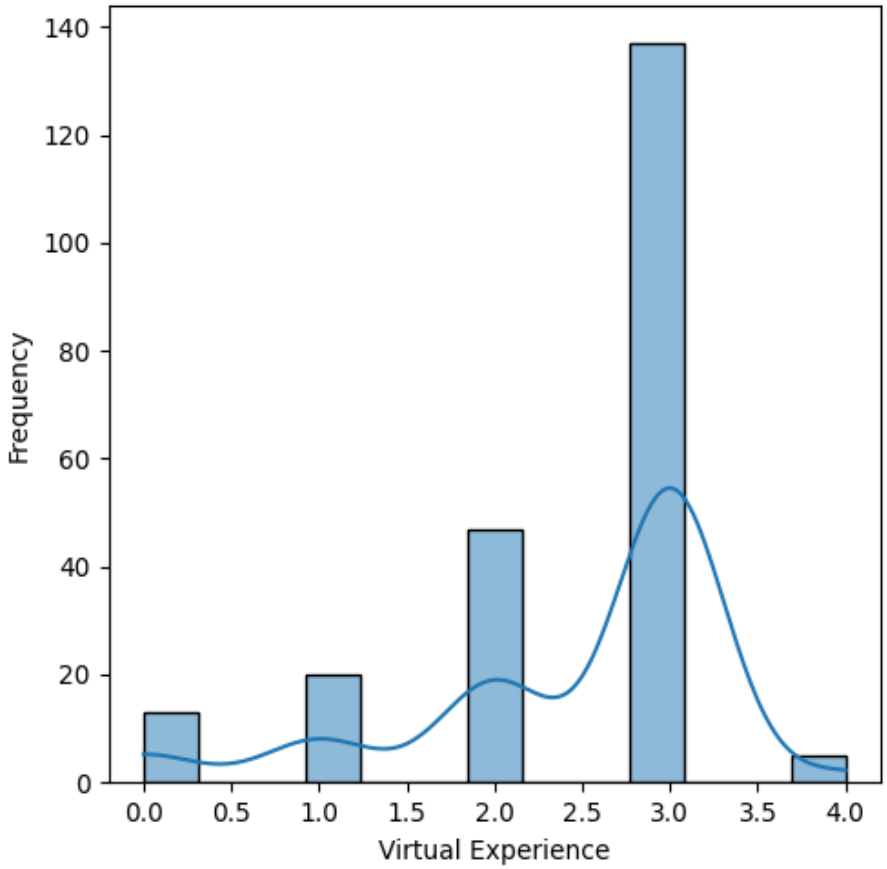


*Figure 7*

*Virtual Experience*

The chart in figure 7 shows how people rated their virtual shopping experiences. The graph for Virtual Experience shows that the majority of respondents rated their experience around 3, with the highest frequency of responses concentrated at this rating. A smaller number of participants rated their virtual experience either very low (0-1) or very high (4), suggesting that most users found their experience to be moderate and satisfactory,

but not exceptional. The distribution peaks at 3, indicating a generally balanced perception of the virtual shopping experience among participants.

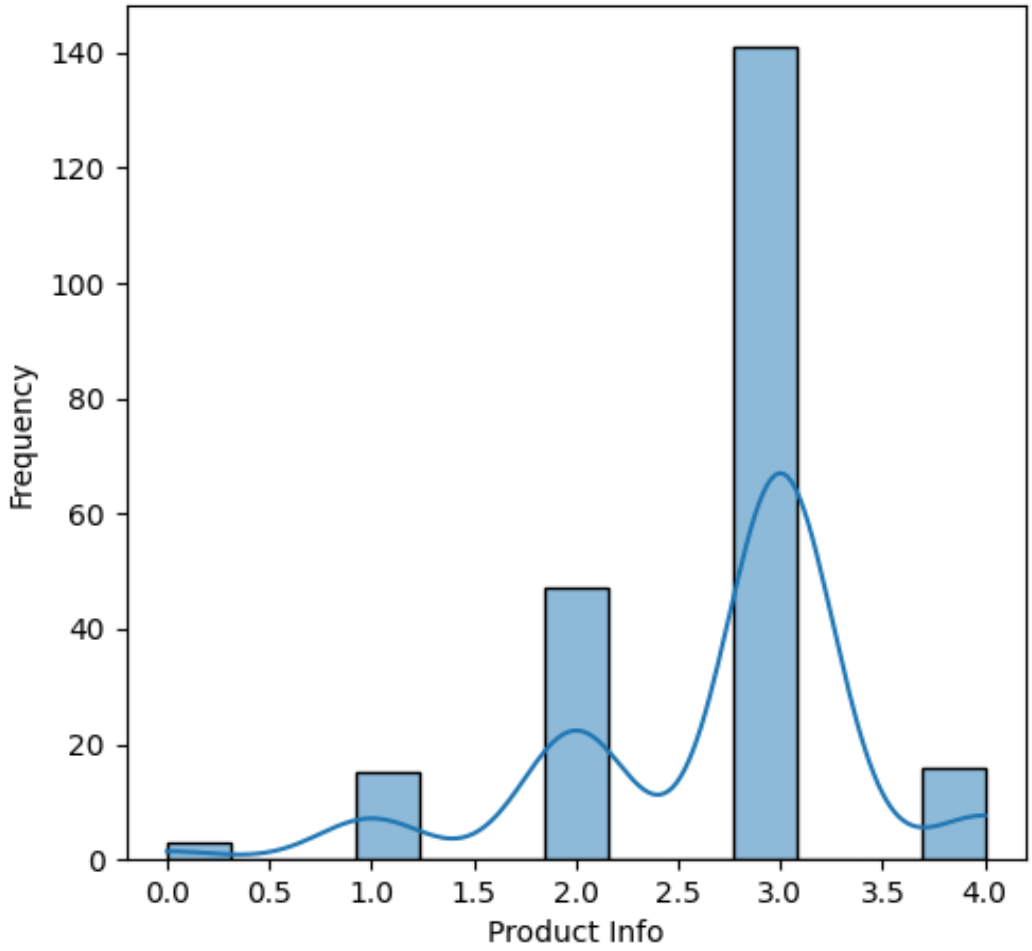


*Figure 8*

*Product Information*

This chart in figure 8 Product Info shows that most respondents rated the information provided about products at 3, indicating moderate satisfaction. This rating has the highest frequency, with over 140 responses. A smaller number of participants rated product information at 2, while even fewer rated it at the extremes (0-1 and 4). This distribution suggests that most users found the product information to be satisfactory, but

not exceptional, with a relatively balanced view across different rating levels, though the highest concentration remains at 3.

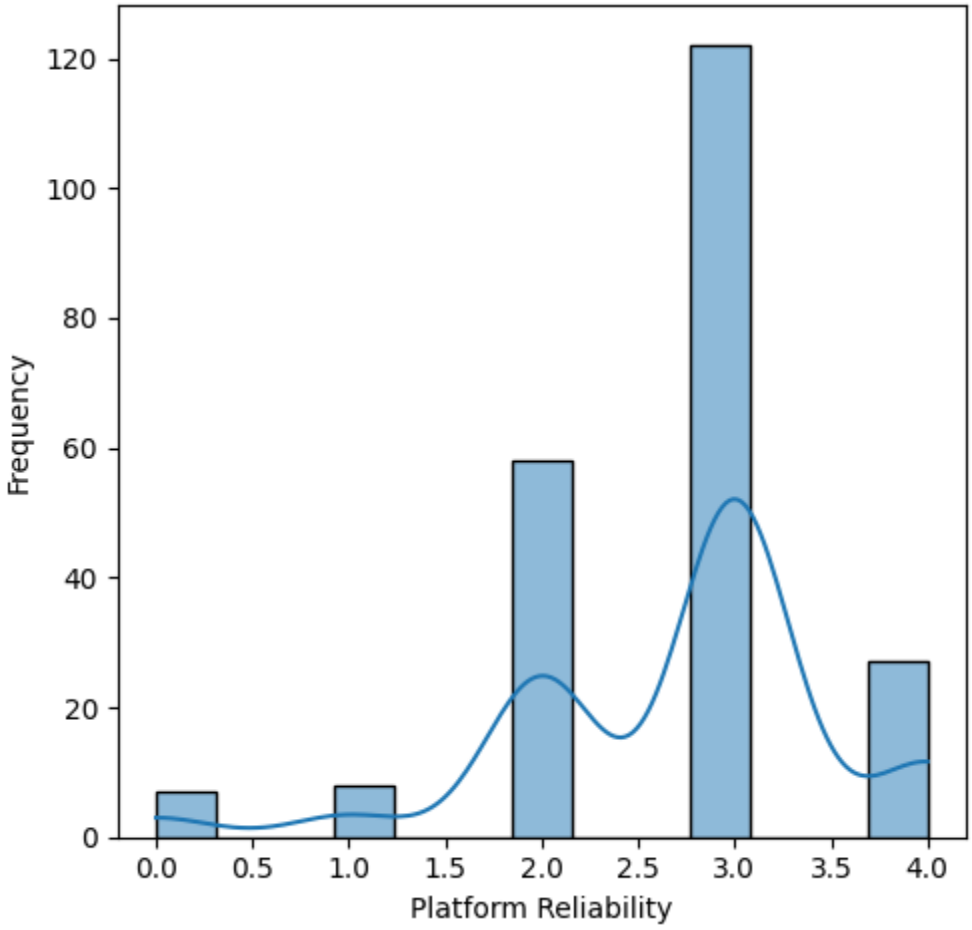


*Figure 9*

*Platform Reliability*

This chart in figure 9 Product Info shows that the majority of respondents rated the product information at 3, indicating a moderate level of satisfaction. The second most frequent rating is 2, while very few participants rated the product information at the extremes of 0-1 or 4. This distribution highlights that most users were generally content with the product information provided, with a significant concentration at the moderate rating of 3.

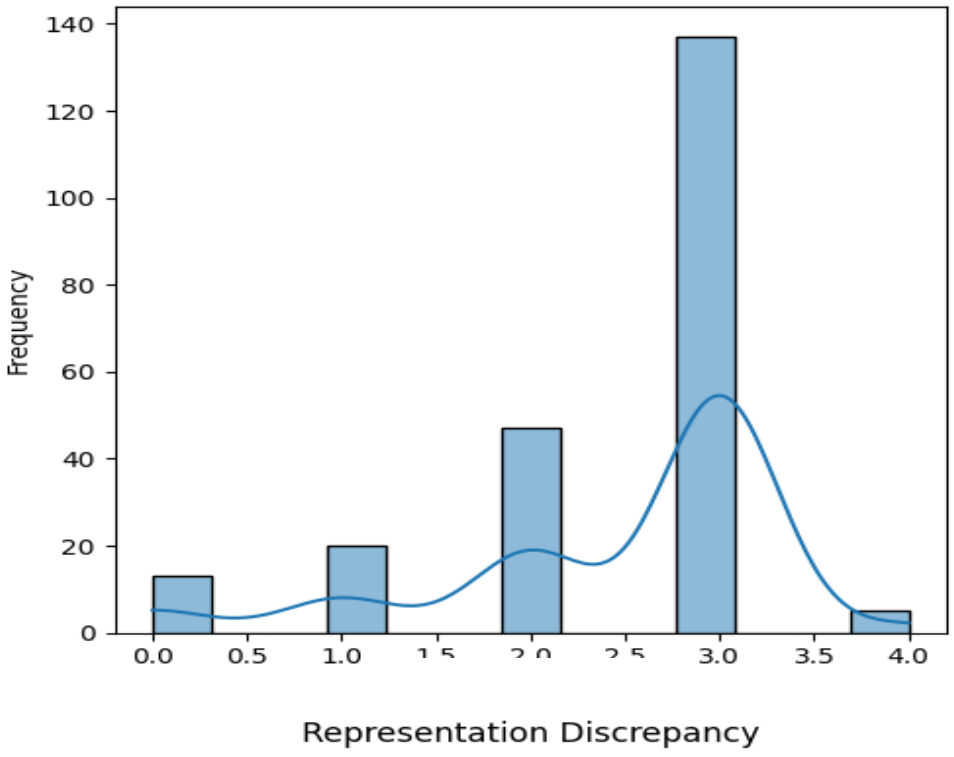


*Figure 10*

*Representation Discrepancy*

This graph in figure 10 illustrates a significant skew towards higher ratings in assessing virtual experience concerning representation discrepancy. Most of the responses are concentrated at a rating of 3, suggesting that most participants perceive the representation within the virtual environment as highly accurate and satisfactory. There are fewer responses as ratings decrease, indicating less frequent issues with representation inaccuracy. This pattern underscores that while representation in virtual environments is generally well-received, a segment of users experiences some level of discrepancy, meriting attention for further improvements in virtual representation fidelity.

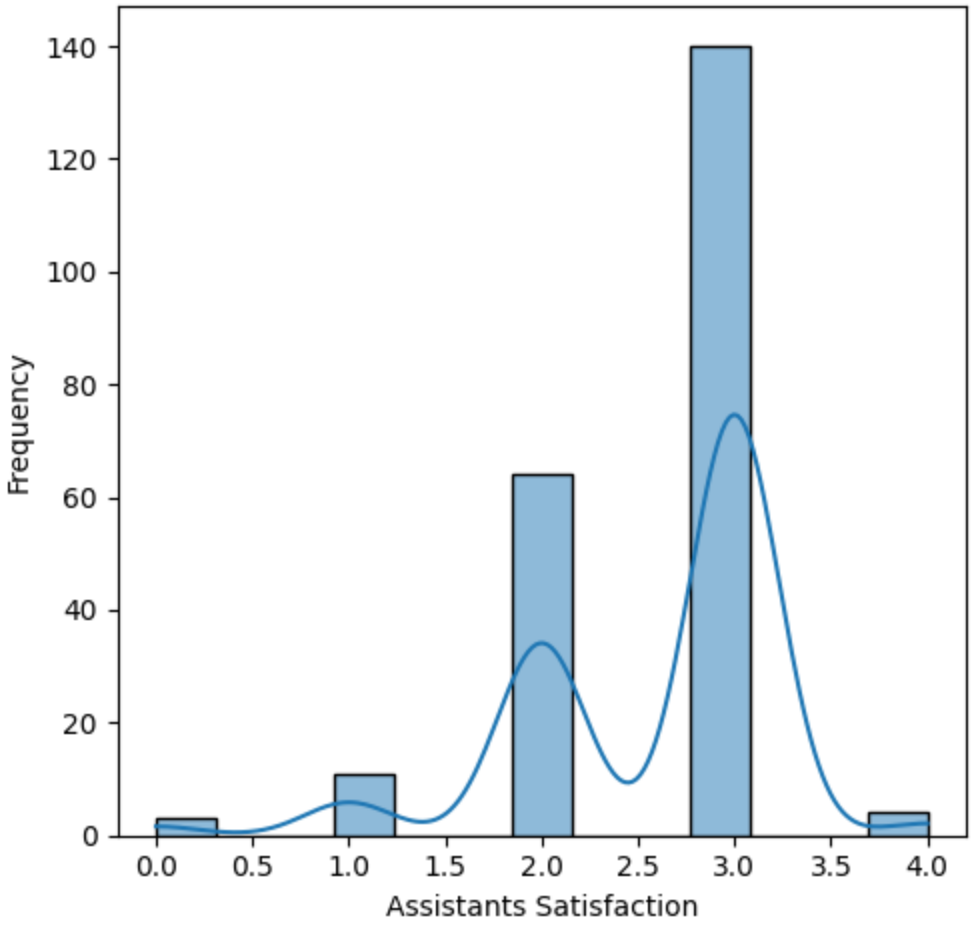


*Figure 11*

*Assistants Satisfaction*

The graph in figure 11 for Assistants Satisfaction shows that most respondents gave a rating of 3, reflecting a moderate level of satisfaction. A smaller portion rated their satisfaction at 2, with very few responses at the extremes of 0-1 or 4. This indicates that while users generally found the assistance satisfactory, it did not exceed their expectations. The highest concentration of responses at 3 suggests a balanced but moderate perception of the assistance provided.

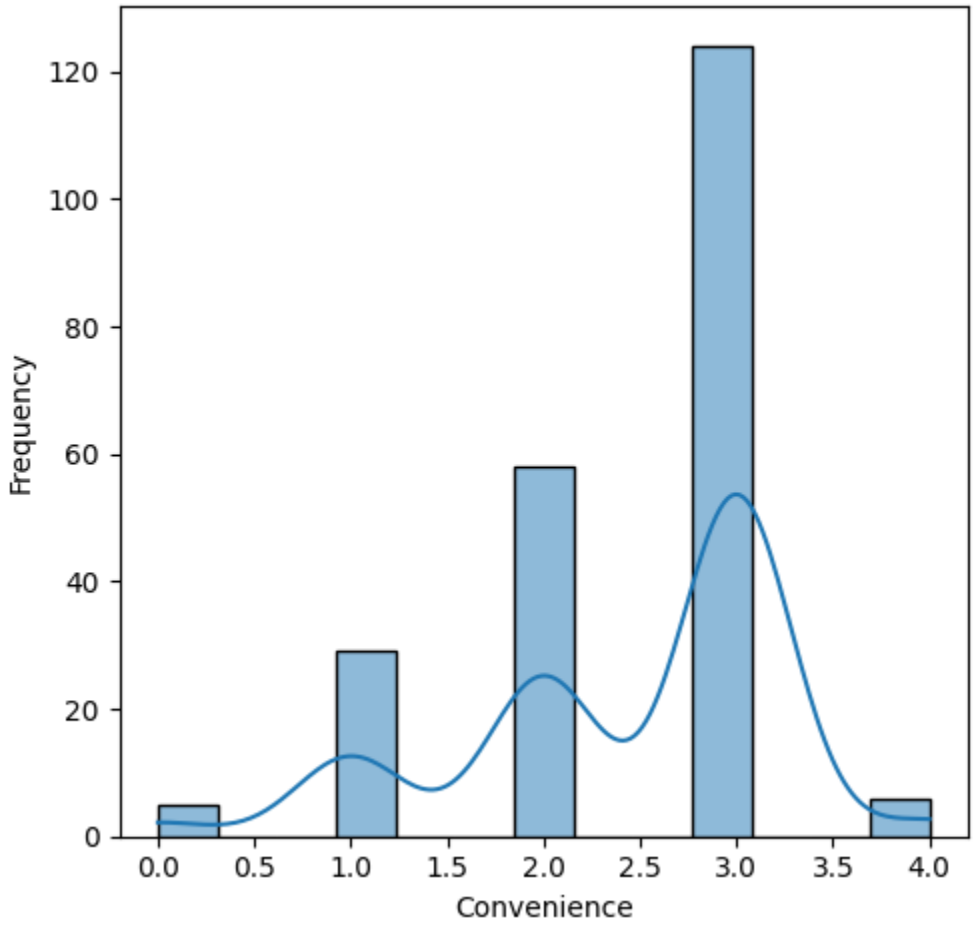


*Figure 12*

*Convenience in Usability*

This graph in figure 12 shows how people rated their overall convenience of the virtual shopping experience. The graph for Convenience in Usability shows that most respondents rated their experience around 3, with the highest frequency of responses concentrated at this rating. A smaller number of participants rated their virtual experience low 1 and very few participants rated very low (0) or very high (4). This indicates that while most users found their experience was adequate and met their needs, it didn't stand out as particularly remarkable. The distribution peaks at 3, indicating a generally balanced

perception of the virtual shopping experience related to convenience, possibly influenced by factors such as accessibility, user experience, or service efficiency.

- Summary

The six histograms reveal a consistent pattern of moderate satisfaction across various elements of the virtual shopping experience. Participants generally found the Virtual Experience and Product Info to be satisfactory, with a similar level of confidence expressed in the Platform Reliability. Assistants Satisfaction also reflected a balanced view, where users were content but not overly impressed with the assistance provided. Convenience followed the same trend, indicating that users found the platform to be practical, though not exceptional. Overall, the data suggests that while the shopping experience meets users' expectations, there is potential for further enhancement across all areas.

To understand the correlations between the variables/questions within this section, we plot a heatmap to visualize the correlation coefficients.


*Figure 13*

*Correlation Heatmap for section 2*

- Virtual Shopping Experience

Columns: Virtual Experience, Product Info, Platform Reliability, Representation Discrepancy, Assistants Satisfaction, Convenience

Interpretation: The heatmap shows that Virtual Experience correlates with Product Info (0.26) and Platform Reliability (0.26), while Platform Reliability is linked to reducing Representation Discrepancy (0.36) and improving Trust Recommendations (0.37). Assistants Satisfaction strongly impacts Trust Recommendations (0.45), and Convenience

is moderately related to users recommending live commerce (0.32). Overall, reliability, satisfaction with assistants, and trust are key to improving the virtual shopping experience.

### 4.3 Developing Strategies to Align Consumer Expectations with Virtual Shopping Reality

For Objective 3, the analysis seeks to develop strategies to bridge the gap between consumer expectations and the reality of virtual shopping experiences. The findings show that participants generally have moderate satisfaction across various virtual shopping aspects, including high-definition images, interactive descriptions, live chat helpfulness, virtual fitting rooms, and trust in consumer reviews. Personalized recommendations and clarity in shipping and returns also receive moderate feedback. The correlations suggest that improving interactive descriptions, live chats, and fitting rooms can enhance user confidence, while trust in consumer reviews is linked to the effectiveness of personalized recommendations and shipping clarity. Businesses can boost customer satisfaction by refining product visuals, live chat support, and recommendation algorithms while clarifying shipping and return policies. These improvements can enhance engagement, build trust, and ultimately drive sales. To understand the distribution of the columns / questions asked, we plot histograms.

To understand the distribution of the columns / questions asked, we plot histograms.

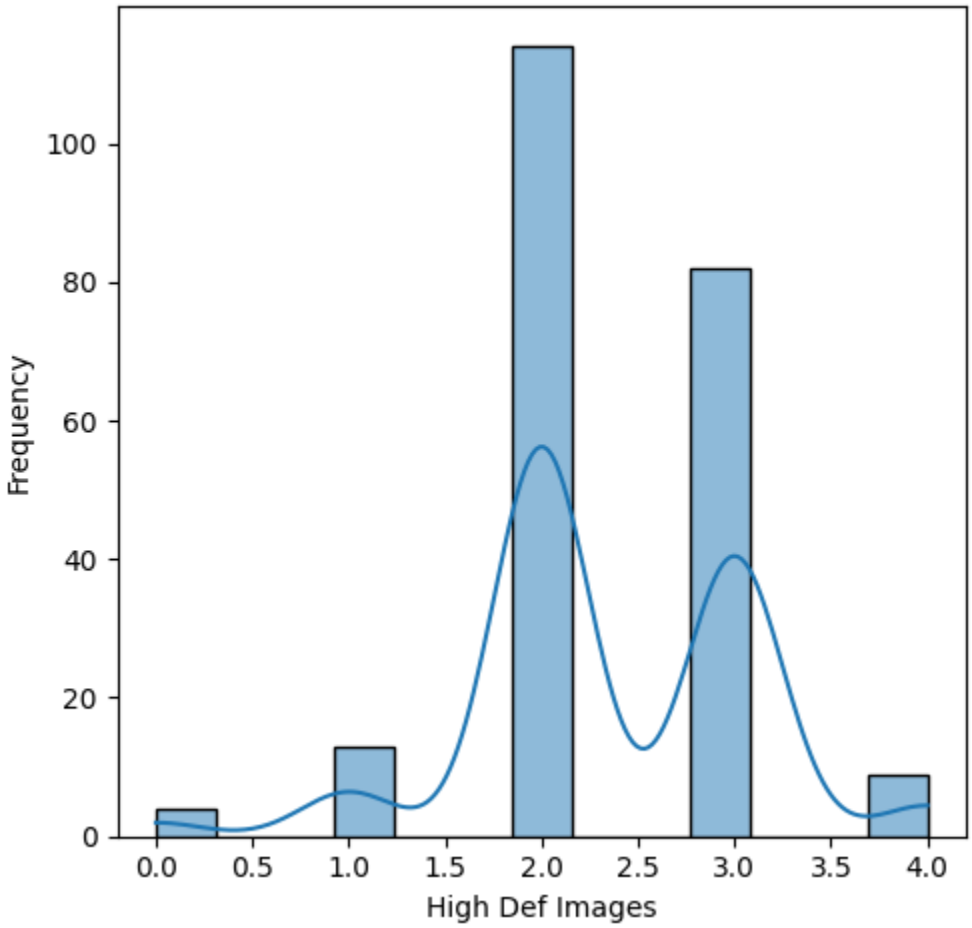


*Figure 14*

*Uses of High-Definition images*

This graph in figure 14 for High-Def Images shows that most respondents rated their satisfaction with high-definition images at 2, indicating moderate satisfaction, with over 100 responses at this level. A smaller but notable number of participants rated it at 3, suggesting a slightly higher satisfaction for some. Very few respondents rated the images at the extreme ends of 0 or 4, indicating that most users were neither highly dissatisfied nor highly satisfied. The overall distribution suggests a majority of users found the quality of high-definition images to be adequate but with room for improvement.

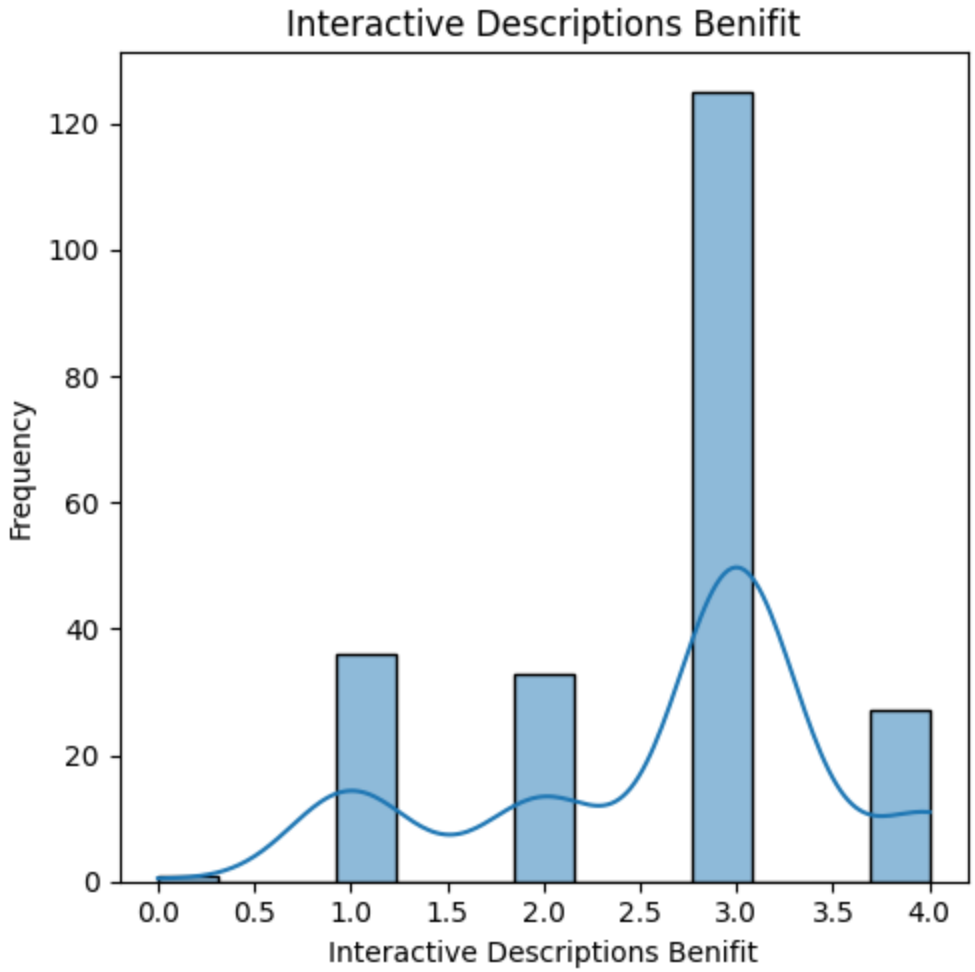


*Figure 15*

*Interactive Description Benefits*

The graph in figure 15 for Interactive Descriptions Benefit shows that the majority of respondents rated the benefit of interactive descriptions at 3, with over 120 responses at this level, indicating a generally positive view. A smaller number of participants rated it at 2, suggesting moderate satisfaction for some users. Very few participants rated it at the extremes of 0-1 or 4, implying that most users found interactive descriptions to be beneficial but not exceptional. The overall distribution reflects that interactive descriptions are appreciated by users, but there is potential for enhancement.

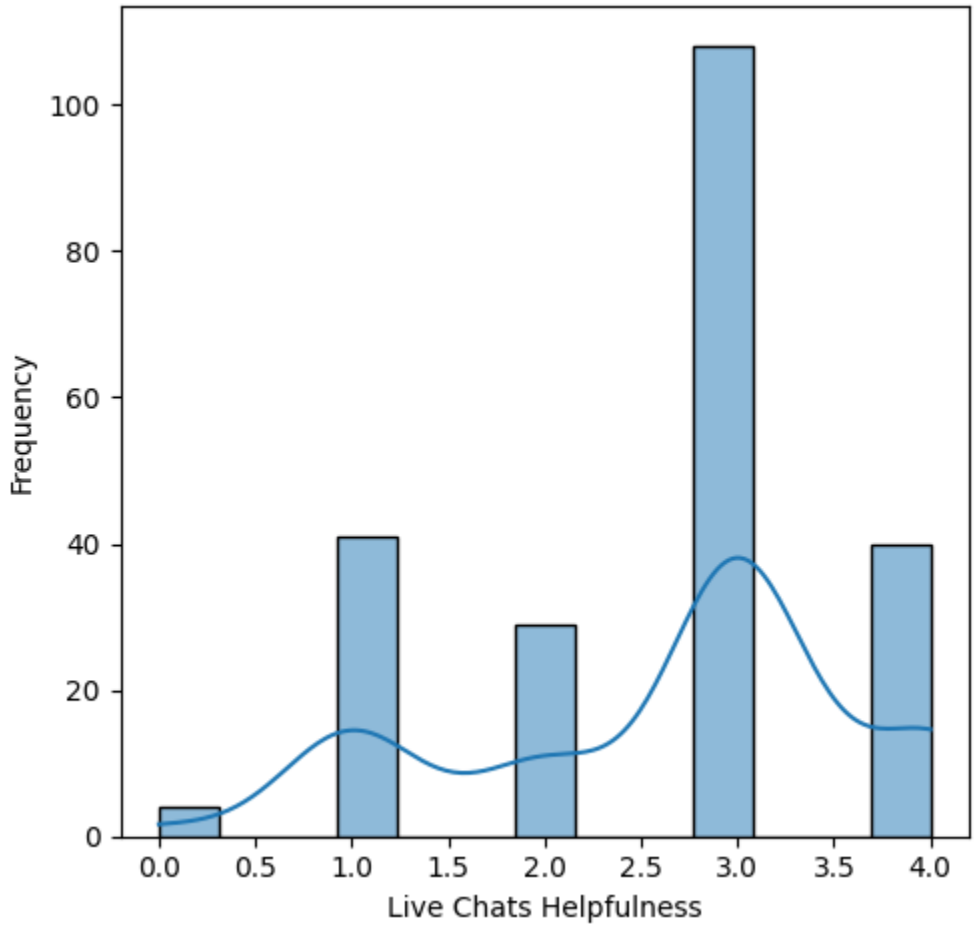


*Figure 16*

*Live Chats Helpfulness*

The graph in figure 16 for Live Chats Helpfulness shows that the majority of respondents rated the helpfulness of live chats at 3, with over 100 responses at this level, indicating a moderate to high level of satisfaction. A smaller number of participants rated it at 2, showing some users found live chats to be somewhat helpful. There are relatively fewer responses at the extremes of 0-1 or 4, suggesting that while live chats are generally viewed positively, they are not universally exceptional. The distribution highlights that live chat support is moderately helpful, with room for further improvements to increase its effectiveness.

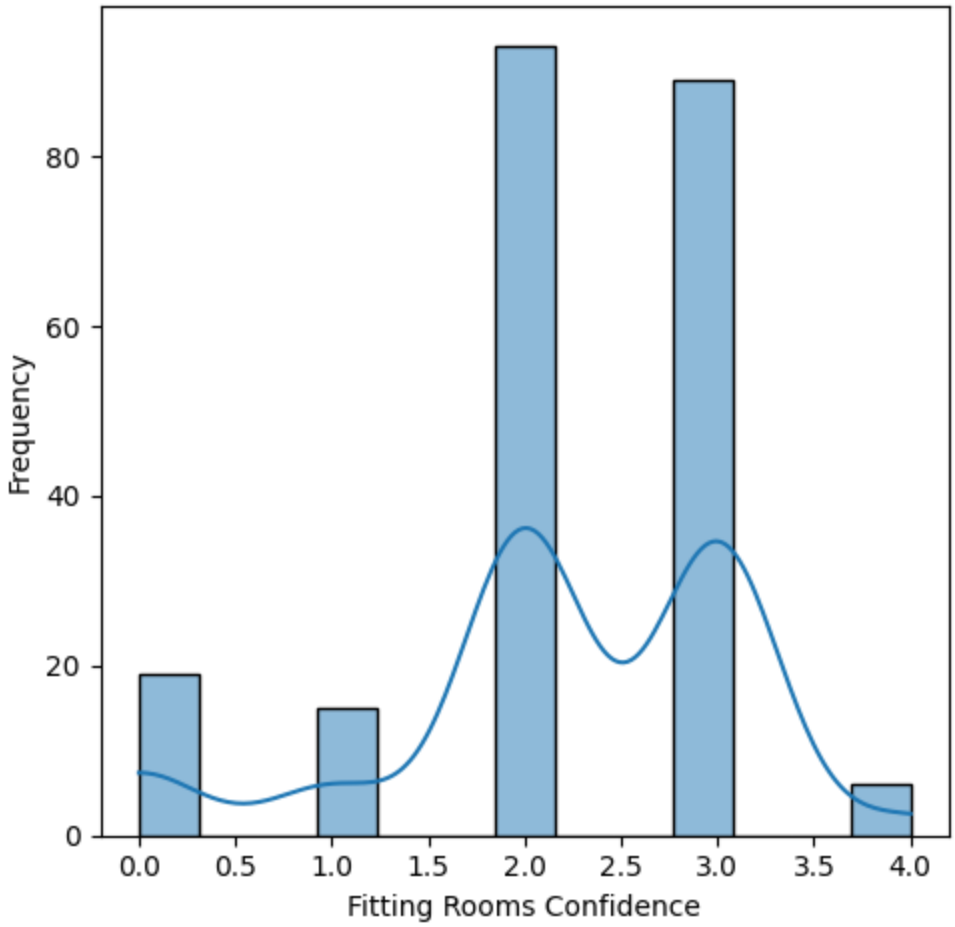


*Figure 17*

*Fitting Rooms Confidence*

The graph in figure 17 for Fitting Rooms Confidence shows that most respondents rated their confidence in virtual fitting rooms at 2 and 3, with both categories having high and nearly equal frequencies, indicating moderate confidence. A smaller number of participants rated it at 1 or 4, suggesting a mix of lower and higher confidence among fewer users. Very few responses were recorded at 0, indicating minimal dissatisfaction. Overall, the distribution suggests that while the majority of users have moderate confidence in virtual fitting rooms, there is room for improvement to boost user confidence further.

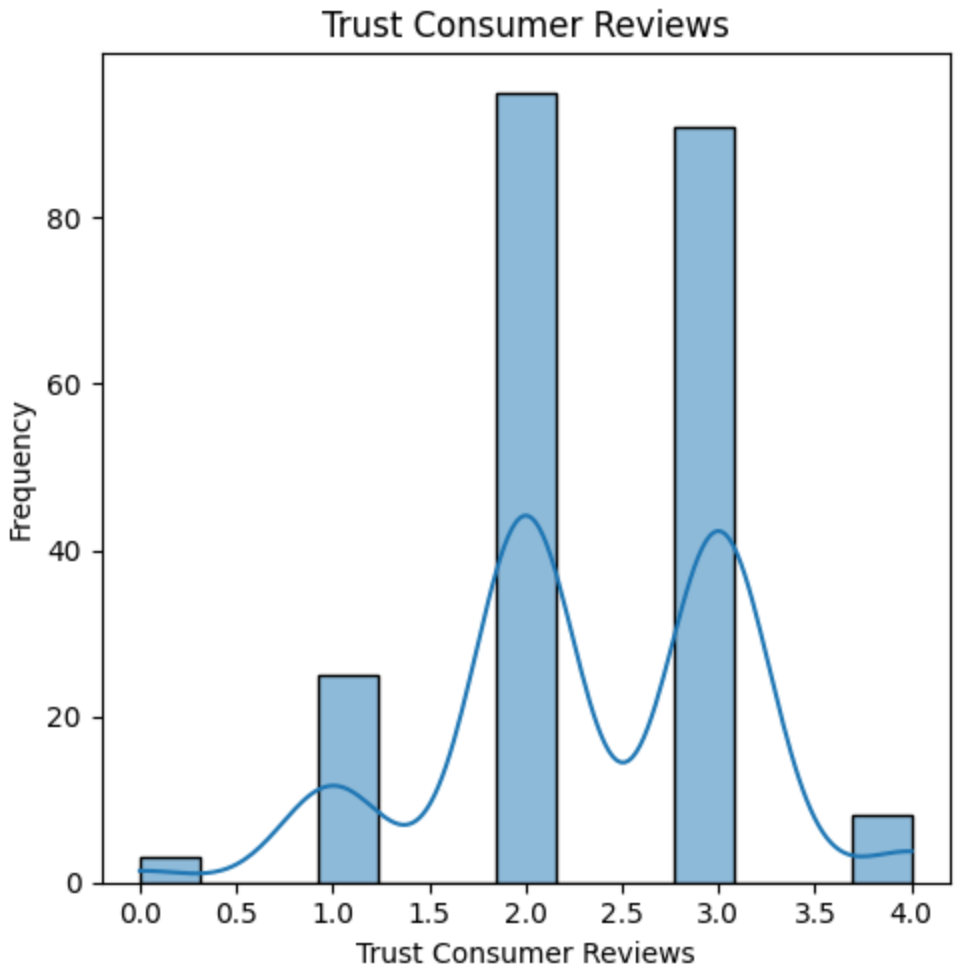


*Figure 18*

*Trust Consumer Reviews*

The graph in Figure 18 for Trust in Consumer Reviews shows that the majority of respondents rated their trust in consumer reviews at 2 and 3, with both categories having high and nearly equal frequencies, indicating moderate trust. A smaller number of participants rated their trust lower at 1 and higher at 4, while very few rated it at 0, indicating minimal distrust. The distribution suggests that most users have moderate confidence in consumer reviews, but there is room to enhance the credibility and trustworthiness of reviews to build stronger consumer trust.

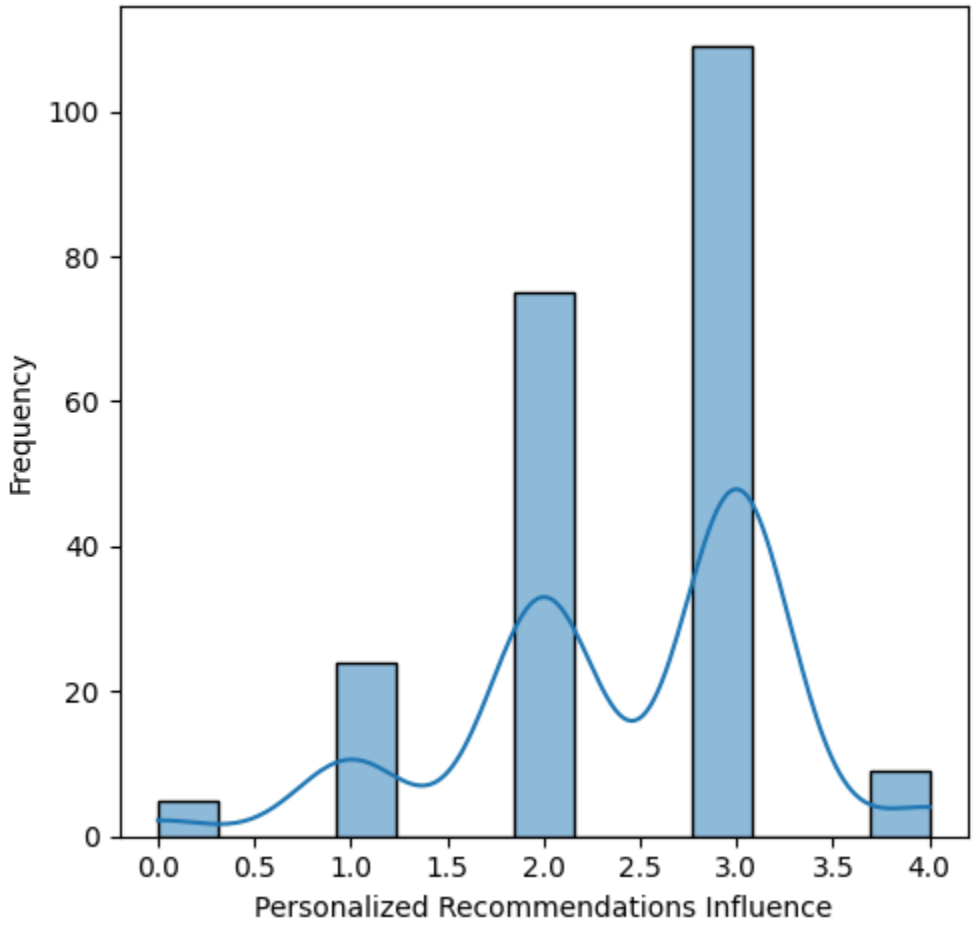


*Figure 19*

*Personalized Recommendations Influence*

The graph in figure 19 for Personalized Recommendations Influence shows that most respondents rated the influence of personalized recommendations at 3, with over 100 responses at this level, indicating moderate influence. A smaller but notable number of participants rated it at 2, reflecting some level of influence. Very few responses were recorded at the extremes of 0-1 or 4, suggesting that personalized recommendations have a generally positive, yet moderate, influence on users. This distribution highlights the potential for personalized recommendations to shape consumer decisions, though there is room to increase their effectiveness.

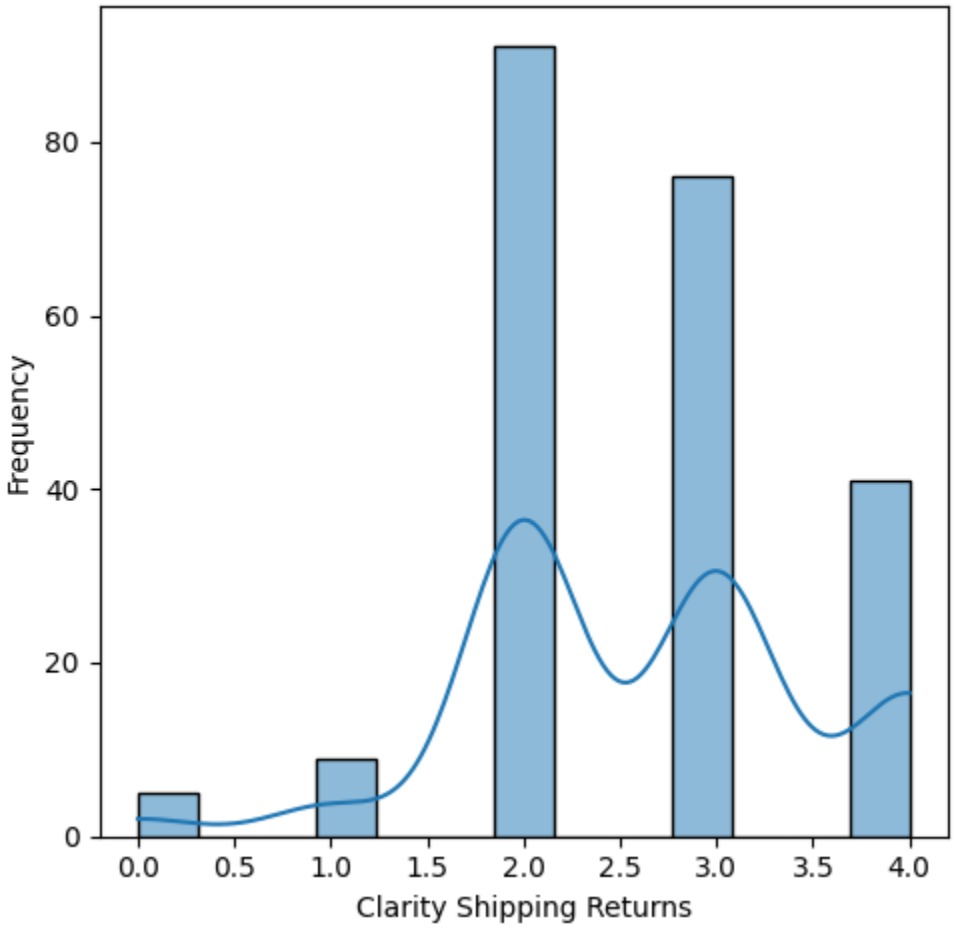


*Figure 20*

*Clarity Shipping Returns*

The graph in figure 20 for Clarity Shipping Returns shows that the majority of respondents rated the clarity of shipping and return policies at 2 and 3, with the highest frequency at 2, indicating moderate satisfaction with the clarity provided. A smaller but notable number of participants rated it at 4, suggesting some users found the policies clearer. Very few responses were recorded at the lower end (0-1), indicating that few participants were highly dissatisfied with the clarity of shipping and return policies. Overall, the distribution suggests that while the clarity is adequate for most users, there is

room for improvement in making shipping and return policies more transparent and easier to understand.

To understand the correlations between the variables/questions within this section, we plot heatmap for visualizing the correlation coefficients.

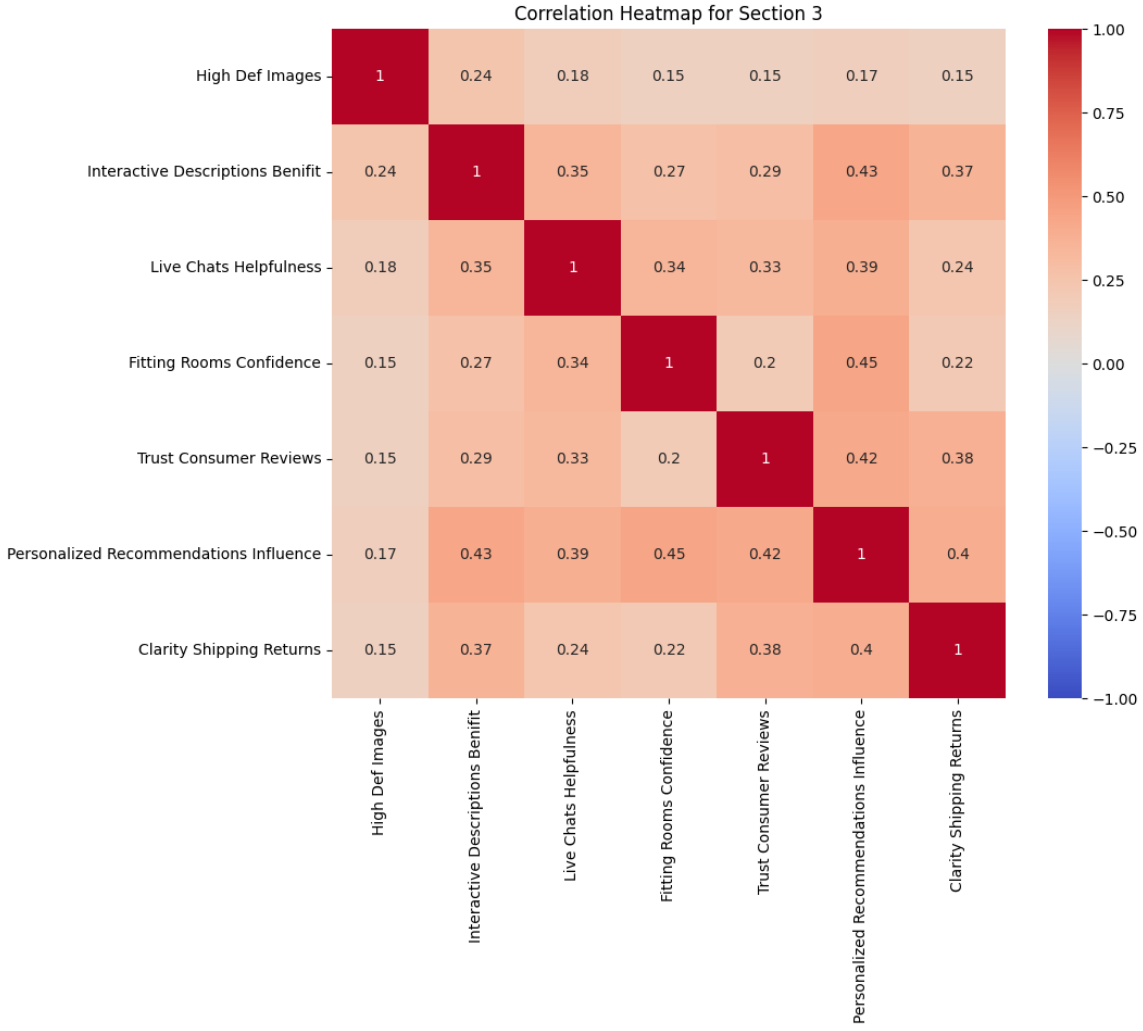


*Figure 21*

*Correlation Heatmap for Section 3*

Columns: High-Definition Images and Comfort with Data

The correlation heatmap shows that **Interactive Descriptions** (0.35) are positively related to **Live Chat helpfulness**, **Personalized Recommendations Influence** (0.43), and **Clarity Shipping Returns** (0.37). Users who find interactive descriptions helpful also rate live chats, personalized recommendations, and shipping policies more positively. **Live Chats Helpfulness** has moderate correlations with **Fitting Rooms Confidence** (0.34), **Trust in Consumer Reviews** (0.33), and **Personalized Recommendations** (0.39). **Fitting Rooms Confidence** is strongly correlated with **Personalized Recommendations Influence** (0.45), while **Trust in Consumer Reviews** is linked to clearer **Shipping Policies** (0.38) and better **Personalized Recommendations** (0.42). Overall, interactive descriptions, live chats, and personalized recommendations are key drivers of user satisfaction.

### 4.4 Bridging the Expectation-Reality Gap in Virtual Shopping-Based Live Commerce

The focus is on bridging the gap between expectations and reality in virtual shopping-based live commerce. The findings indicate that respondents generally have moderate concerns regarding privacy, security, and data handling in the context of virtual shopping. Most participants expressed moderate privacy concerns with virtual assistants, trust in security measures, and comfort with data handling. Similarly, financial security, biometric data concerns, and control over personal data were all rated moderately, suggesting a balanced view but with room for improvement. Key correlations show that improving comfort with data handling can enhance feelings of financial security, while concerns about privacy in marketing are linked to a desire for more control over personal data. Businesses can use these insights to build trust by improving transparency, enhancing security protocols, and offering users more control over their data, ultimately fostering customer loyalty and satisfaction. To understand the distribution of the columns / questions asked, we plot histograms.

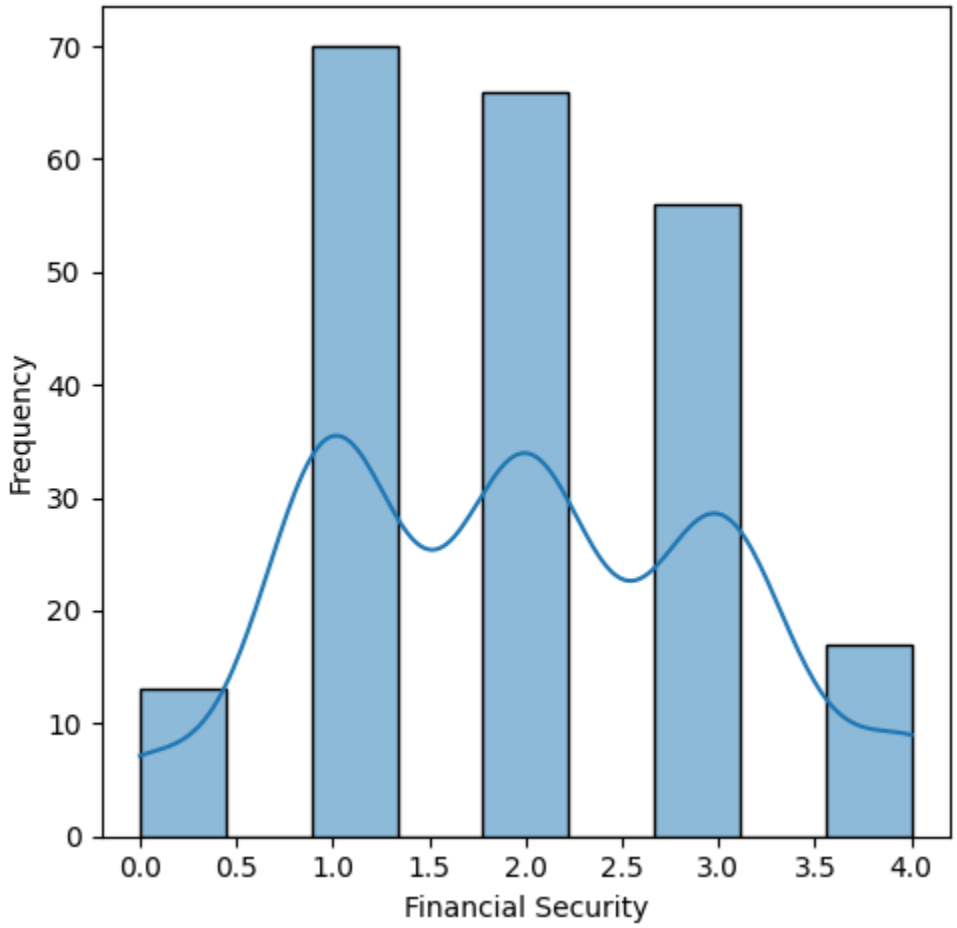


*Figure 22*

*Financial Security*

Figure 22 of the graph for Financial Security shows a fairly even distribution of responses, with most respondents rating their financial security between 1 and 3. The highest frequency occurs at 1, indicating that a significant number of participants feel somewhat insecure regarding financial security. Ratings at 2 and 3 also have high frequencies, suggesting that while many users feel moderately secure, there is still some uncertainty. Fewer participants rated their financial security at 4 or 0, indicating that very few people feel either completely secure or completely insecure. Overall, the distribution reflects moderate feelings of financial security, with room for improvement in user confidence.

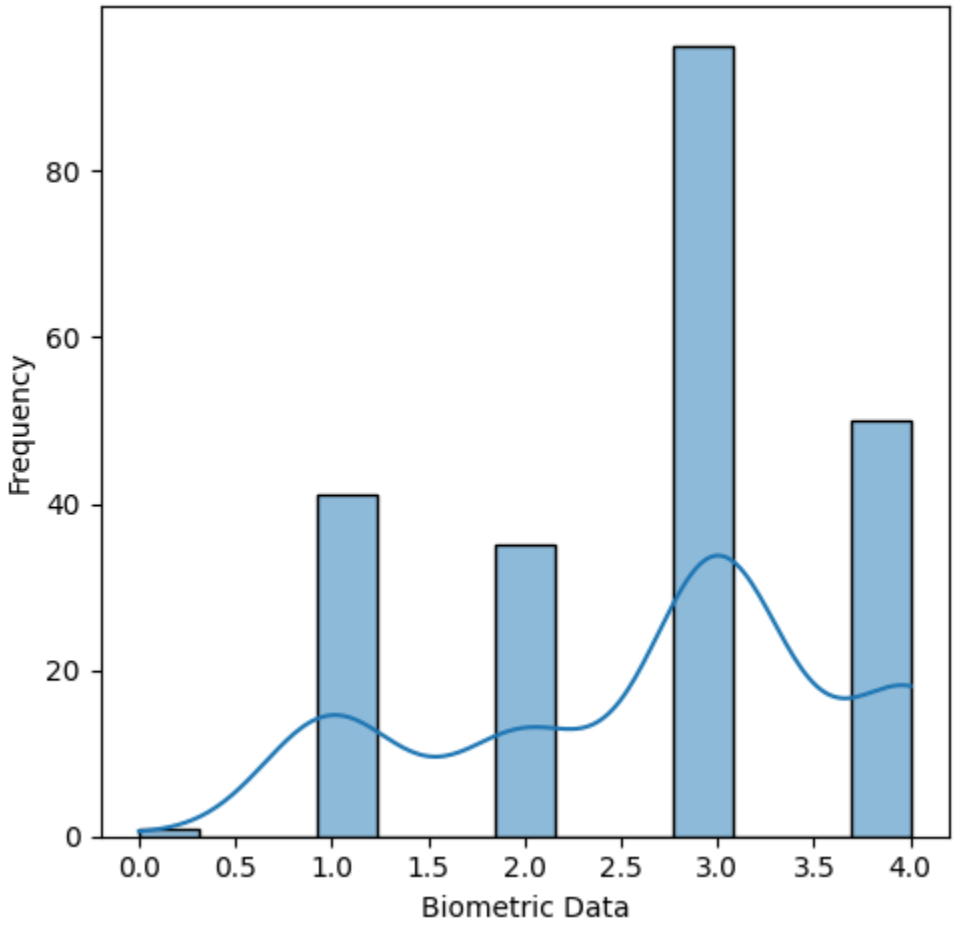


*Figure 23*

*Biometric data*

The graph in Figure 23 for Biometric Data shows that the maximum of respondents rated their beliefs and suitable with biometric data at 3, indicating a moderate level of trust. A smaller but notable number of participants rated their trust at 2 and 4, suggesting that while some users are more comfortable with biometric data, others have lower levels of trust. Very few responses were recorded at 0-1, indicating that only a small number of users have little to no trust in biometric data. The overall distribution highlights that most users

feel moderately comfortable with the use of biometric data, though there is variability, with some users feeling either more or less confident.

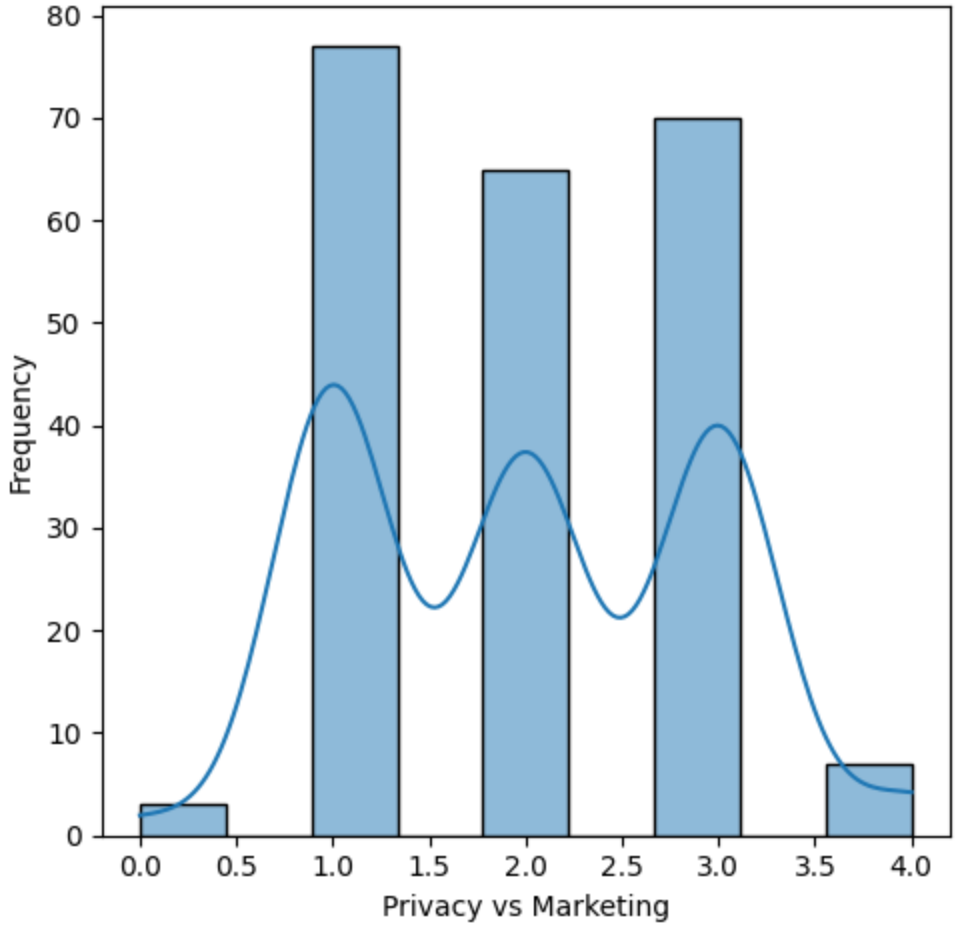


*Figure 24*

*Privacy Vs Marketing*

The graph in Figure 24 for **Privacy vs Marketing** shows that most respondents rated their concerns about privacy about marketing between **1** and **3**, with the highest frequency at **1** and **3**, indicating a moderate balance of privacy concerns with marketing practices. A smaller number of participants rated their concerns at **4**, suggesting that fewer users have stronger concerns. Very few responses were recorded at **0**, indicating minimal

users with no concerns. The distribution suggests that while privacy concerns related to marketing exist for many users, they are generally moderate, with a few participants expressing higher concerns.

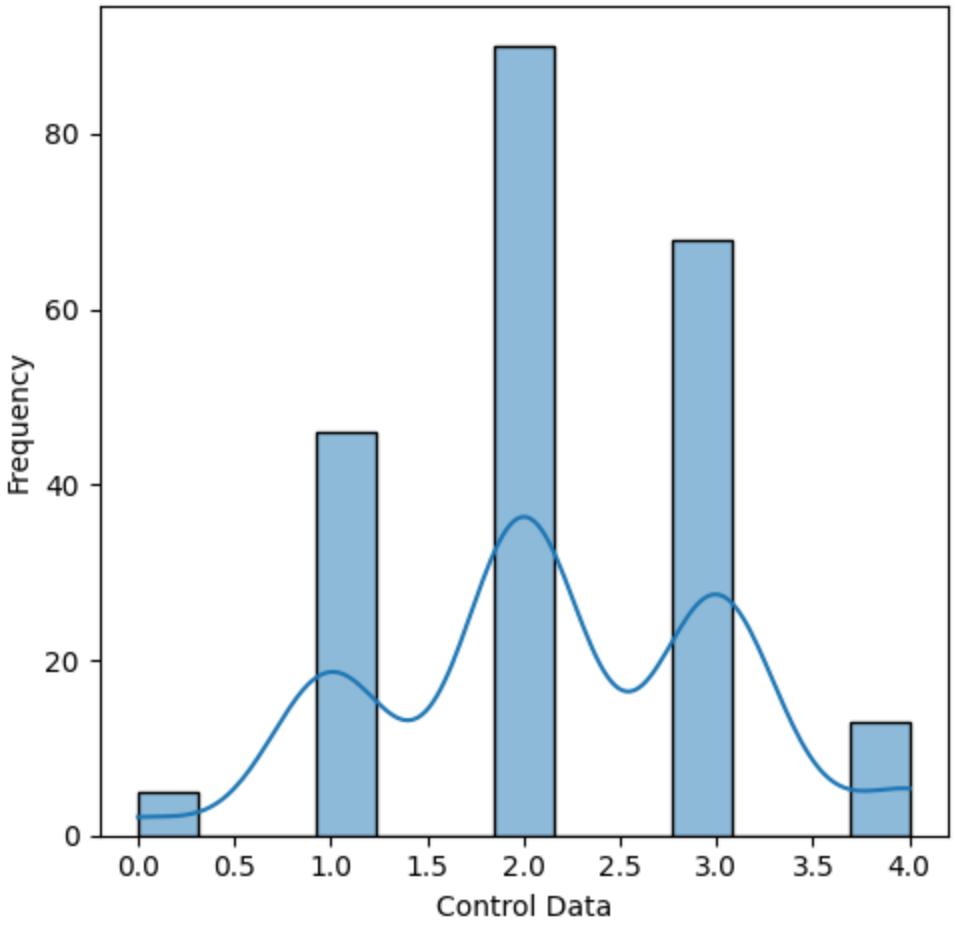


*Figure 25*

*Control Data*

The graph in figure 25 for Control Data shows that the majority of respondents rated their concerns about control over personal data at 2 and 3, with the highest frequency at 2, indicating moderate concern. A smaller number of participants rated their concern at 1 and 4, suggesting that while some users have higher or lower concerns about control over

their data, most fall in the moderate range. Very few responses were recorded at 0, indicating minimal users with no concerns about data control. Overall, the distribution reflects that most users are moderately concerned about control over their personal data, with some variability in levels of concern.

For understanding the correlations between the variables / questions within this section, we plot heatmap for visualizing the correlation coefficients.

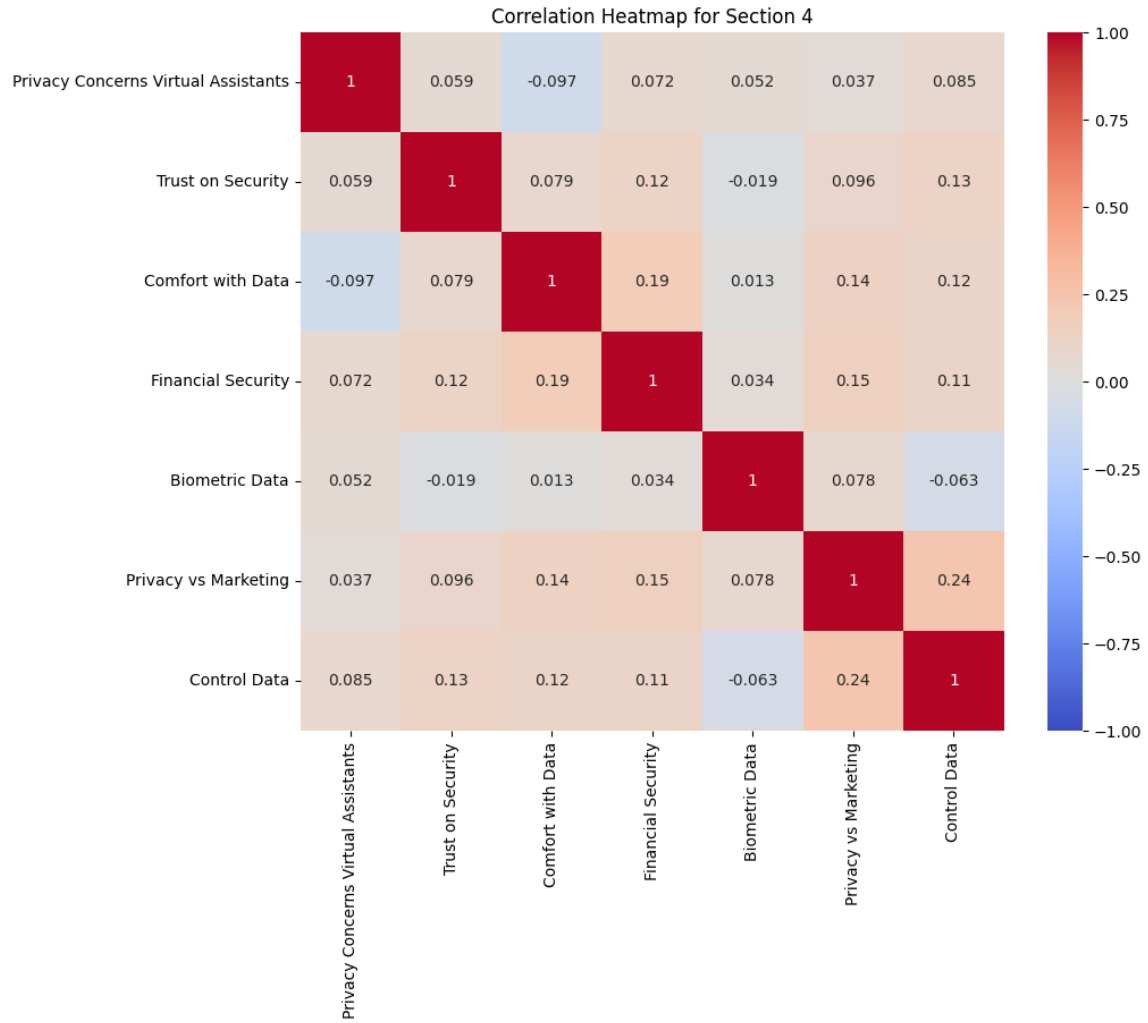


*Figure 26*

*Correlation Matrix for Section 4*

Columns: Financial Security, Biometric Data Interpretation:

The correlation heatmap for **Section 4** in figure 26 shows that while most correlations are weak, there are some notable relationships. **Privacy Concerns with Virtual Assistants** are slightly related to **Trust on Security** (0.059) and **Control Data** (0.085), but negatively correlated with **Comfort with Data** (-0.097). **Comfort with Data** has a moderate positive correlation with **Financial Security** (0.19), indicating that users who are more comfortable with how their data is handled tend to feel more financially secure. **Privacy vs Marketing** is moderately related to **Control Data** (0.24), suggesting that users concerned with privacy in marketing also want more control over their personal data. Overall, improving data transparency and control can help address user concerns.

The findings reveal that users have moderate concerns about privacy, security, and control over their data. Most respondents expressed moderate privacy concerns with virtual assistants, financial security, and biometric data, with a focus on control over personal data. The heatmap shows weak correlations, but highlights that users who feel comfortable with data handling tend to feel more financially secure. There is also a link between privacy concerns in marketing and a desire for more control over data. Enhancing transparency and offering greater control over personal information can help.

### 4.5 Comparative Analysis of Virtual Shopping's Impact on Consumer Perceptions

For Objective 5, the analysis provides a comparative view of how virtual shopping impacts consumer perceptions, especially in relation to traditional shopping methods. The data indicates that the majority of respondents find live commerce less convenient, offering less variety and engagement compared to traditional shopping. The immersive experience is also perceived as lacking, suggesting that there is significant room for improvement. However, the pricing of products in live commerce is generally viewed as affordable, which is a positive aspect. The correlation matrix shows that live commerce variety

significantly influences convenience and engagement, and an immersive experience is linked to higher engagement and perceived variety. The overall findings suggest that while there are positive aspects of live commerce, such as pricing, there is a need to enhance the variety, convenience, and engagement levels to better meet consumer expectations and improve their overall perception of virtual shopping.

To understand the distribution of the columns / questions asked, we plot histograms.

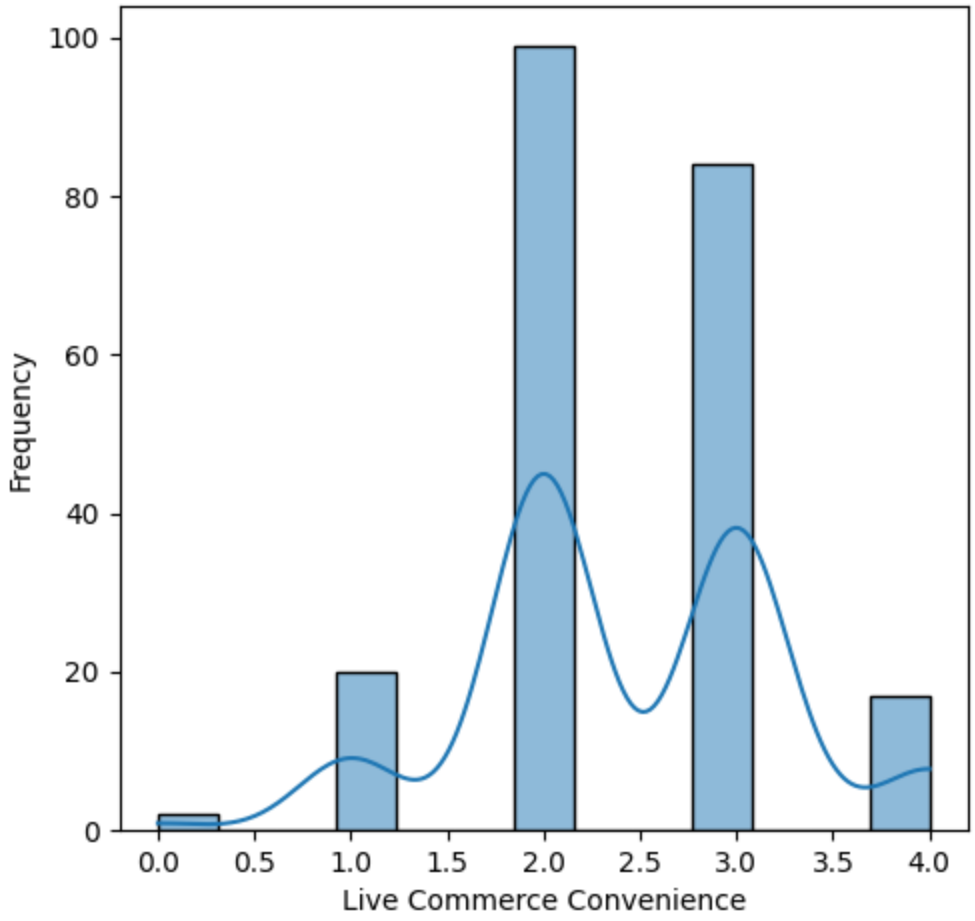


*Figure 27*

*Live Commerce Convenience*

The graph in figure 32 for Live Commerce Convenience shows that most respondents rated convenience at 2 and 3, indicating moderate satisfaction with the

convenience of live commerce. A smaller number of participants rated convenience at 1 and 4, suggesting that some users found it either less or more convenient than others. Very few participants rated convenience at 0, indicating that nearly all users found some level of convenience in live commerce, though there is room for improvement to achieve higher satisfaction.

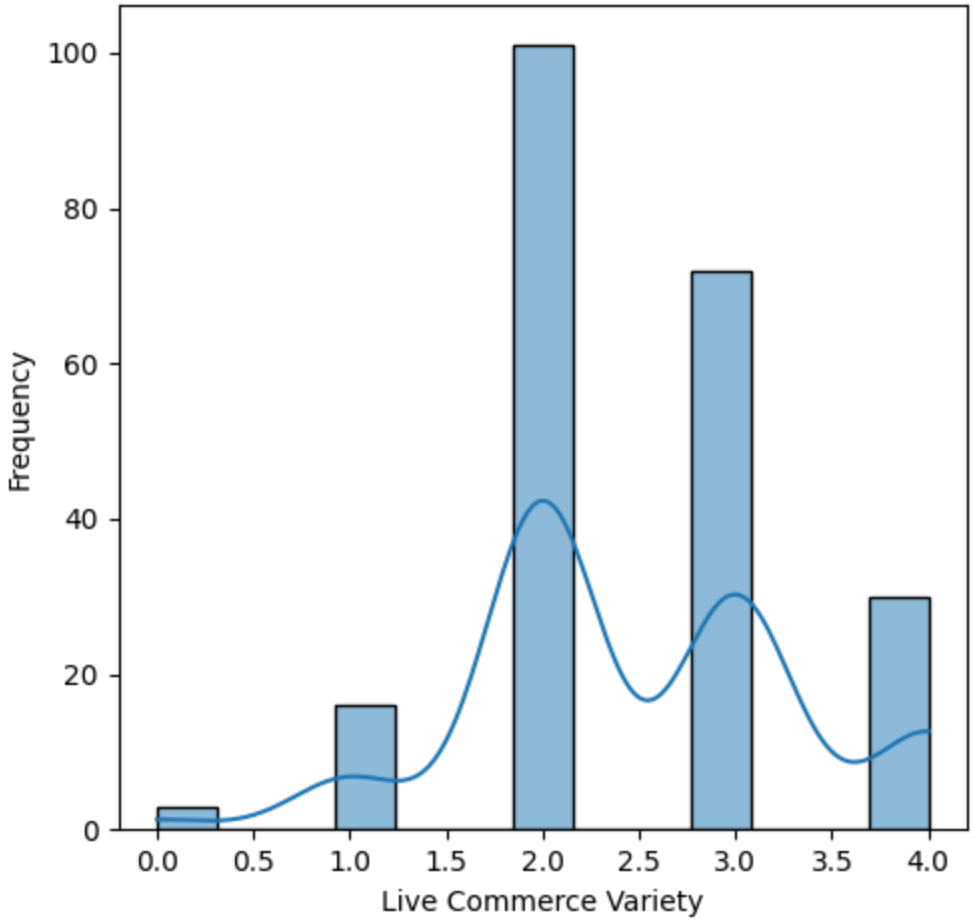


*Figure 28*

*Live Commerce Variety*

Figure 28 for Live Commerce Variety shows that most respondents rated the variety offered in live commerce at 2 and 3, indicating moderate satisfaction with the range of products or services available. A smaller number of participants rated variety at 1 and 4, suggesting that some users found it either lacking or more diverse than others. Very few

participants rated variety at 0, indicating that nearly all users found some level of variety, though there is still potential for improvement in expanding the diversity of live commerce offerings.

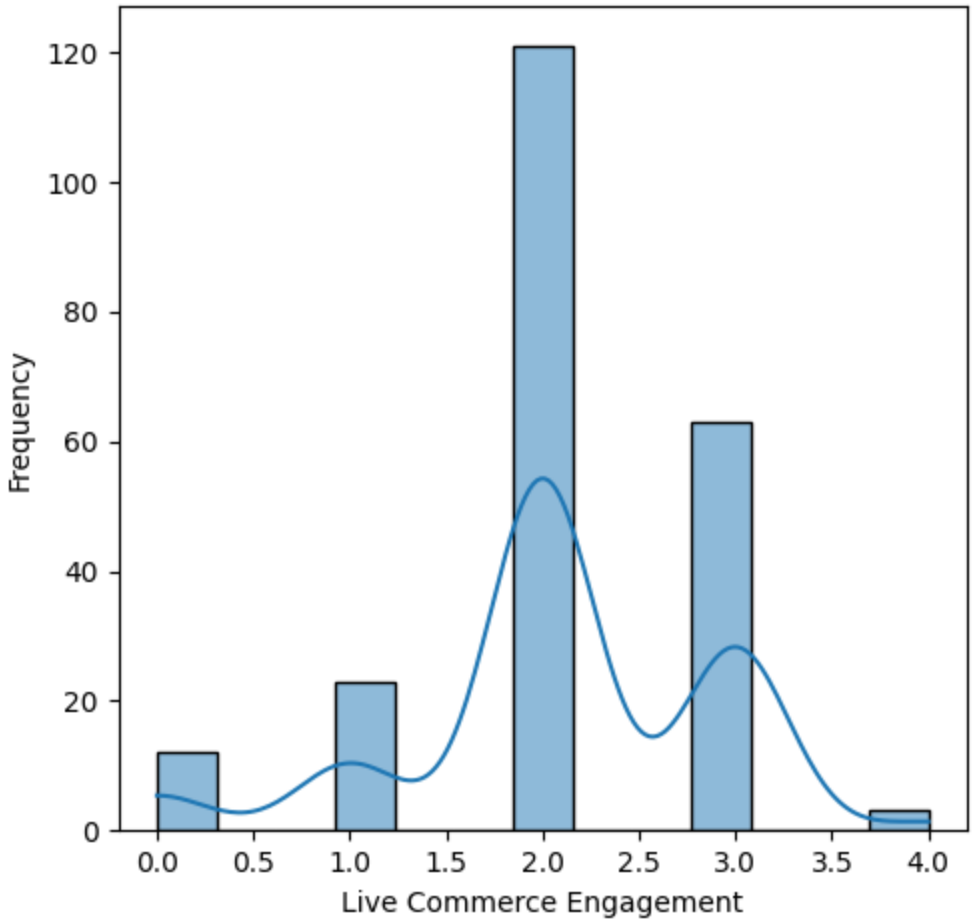


*Figure 29*

*Live Commerce Engagement*

Figure 29 for Live Commerce Engagement indicates that the majority of respondents rated engagement at 2, reflecting moderate levels of engagement with live commerce experiences. A smaller but notable group rated engagement at 3, suggesting higher engagement for some users. Fewer participants rated engagement at 1 and 4, while very few respondents rated it at 0, indicating that nearly all users had some level of

engagement, but overall, engagement remains moderate, with room for improvement in creating more interactive or engaging live commerce experiences.

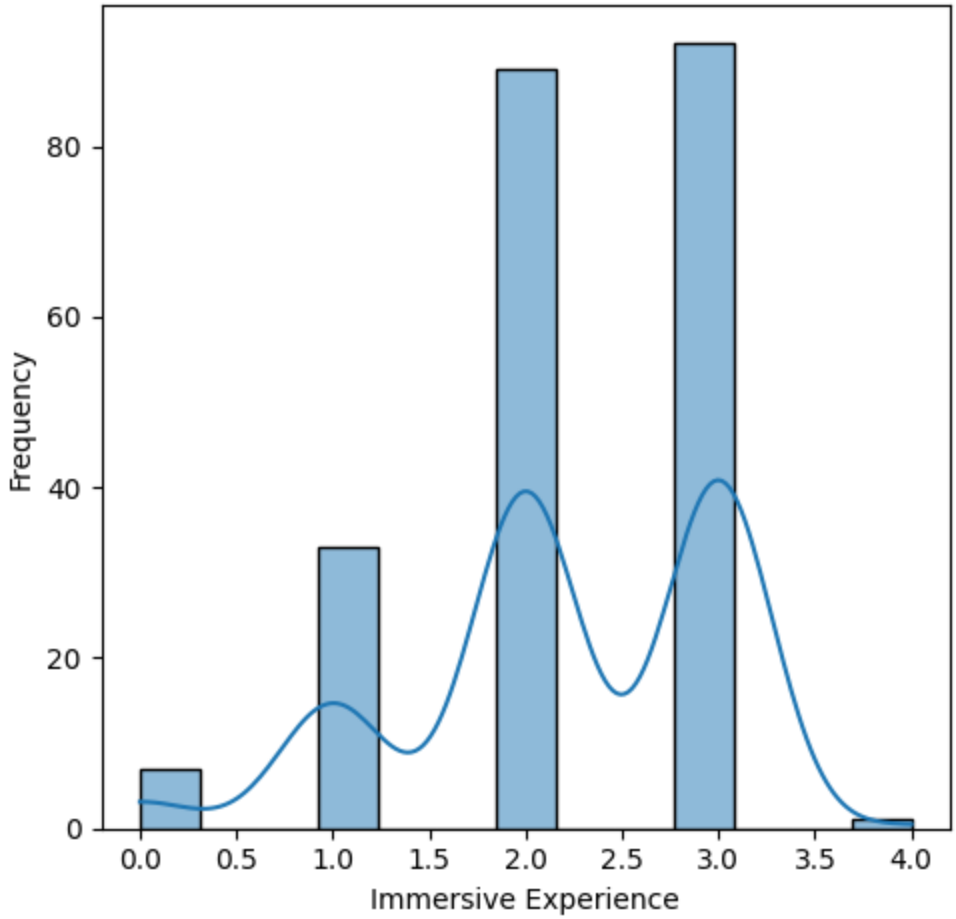


*Figure 30*

*Immersive Experience*

This data visualization in Figure 30 The graph for Immersive Experience shows that most respondents rated their experience at 2 and 3, indicating moderate satisfaction with the immersive aspects of live commerce. A smaller number of participants rated their experience at 1, with very few ratings at 0 and 4, suggesting that while some users found the immersive experience lacking or highly engaging, the majority experienced moderate levels of immersion. This indicates room for improvement in creating more engaging and immersive live commerce environments to enhance user experience.

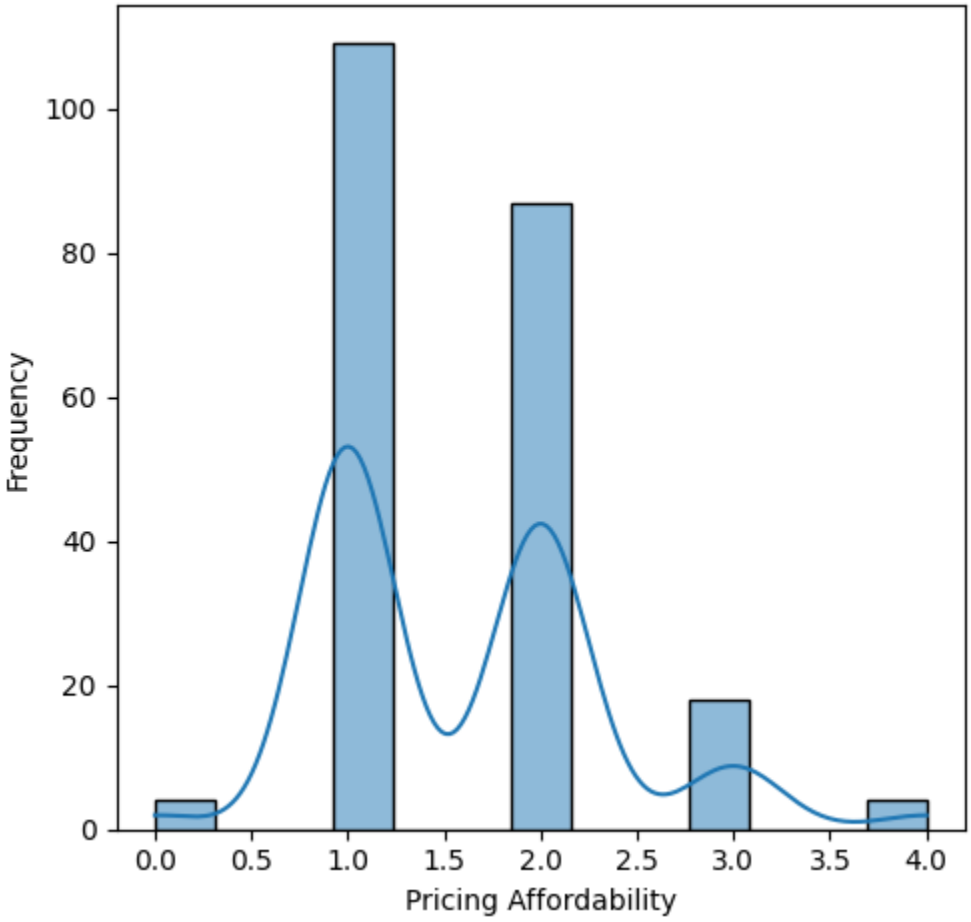


*Figure 31*

*Pricing Affordability*

Above figure 31 for Pricing Affordability in live commerce shows that the majority of respondents rated affordability at 2 and 3, suggesting moderate satisfaction with pricing levels. A smaller group rated affordability at 1, indicating less satisfaction with the cost, while very few rated it at 0 or 4, showing that perceptions of extremely low or high affordability are less common. This distribution suggests that while most users find the pricing reasonably affordable, there is a noticeable segment that sees room for

improvement, potentially seeking more competitive or clearer pricing structures in live commerce.

- Summary:

The histograms reveal that most users have moderate satisfaction with various aspects of live commerce. **Live Commerce Convenience**, **Variety**, and **Engagement** were rated around **2** and **3**, indicating that users find these features moderately satisfying but not exceptional. **Immersive Experience** also saw a similar distribution, suggesting that while users feel somewhat engaged, there's potential for more immersive experiences. Finally, **Pricing Affordability** received mixed ratings, with most users finding it moderately affordable, but some expressed concerns about the cost. Overall, these findings highlight the need for improvements in enhancing engagement, variety, immersive experiences, and pricing in live commerce to better meet user expectations.

To understand the correlations between the variables/questions within this section, we plot a heatmap for visualizing the correlation coefficients.

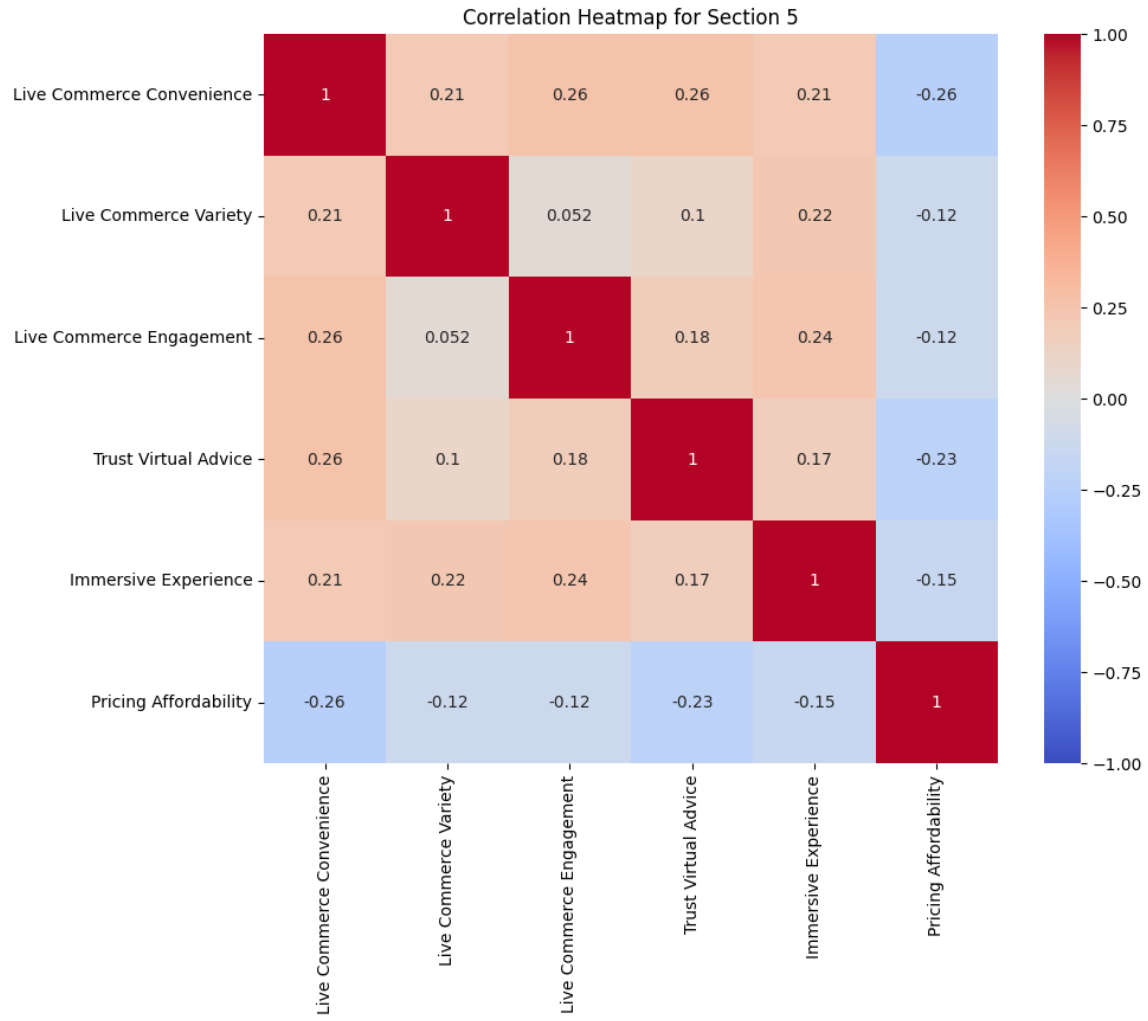


*Figure 32*

*Correlation Matrix section 5*

Live Commerce Experience Columns: Live Commerce Convenience, Live Commerce Variety, Live Commerce Engagement, Immersive Experience, Pricing Affordability

Interpretation: In figure 25 The correlation heatmap for Section 5 shows several notable relationships between live commerce features. Live Commerce Convenience has a moderate positive correlation with Live Commerce Engagement (0.26) and Trust Virtual Advice (0.26), suggesting that convenience is linked to better engagement and trust in

virtual advice. Immersive Experience is also moderately correlated with Live Commerce Engagement (0.24), indicating that more immersive experiences enhance engagement. Conversely, Pricing Affordability has a negative correlation with Live Commerce Convenience (-0.26), implying that as convenience improves, users perceive pricing as less affordable. The overall findings suggest that improving convenience and immersive experiences could positively impact user engagement, but businesses need to balance this with pricing strategies to maintain affordability.

**4.6 Summary of Findings**

- Section 1: Assessing Changes in Consumer Expectations with AI and Virtual Shopping Adoption

In Section 1, most respondents rated product visibility and store layout highly (3-4), showing satisfaction with virtual shopping environments. Familiarity with AI was moderate (2), indicating users have some experience but room for growth in AI integration. Priority shopping (3) and AI expectations (3) were also moderate. Correlation analysis shows product visibility is positively correlated with store layout (0.34), priority shopping (0.44), and AI expectations (0.27), while AI familiarity had a negative correlation (-0.18). Improving store layout and AI familiarity could enhance user expectations.

- Section 2: Identifying Factors Behind Expectation-Experience Gaps in Virtual Shopping

In Section 2, moderate satisfaction was seen across virtual experience (3), product information (3), and platform reliability (3). Correlation analysis shows that a strong virtual experience is linked to better product information (0.26) and platform reliability (0.26), which improves trust in recommendations (0.37). Assistants' satisfaction (3) significantly influences trust in recommendations (0.45). Effective platform reliability and assistant interactions are crucial for enhancing user trust.

- Section 3: Developing Strategies to Align Consumer Expectations with Virtual Shopping Reality

Section 3 highlights moderate satisfaction with high-definition images (2), interactive descriptions (3), live chat helpfulness (3), and virtual fitting rooms (2-3). Correlation analysis shows interactive descriptions correlate positively with personalized recommendations (0.43) and shipping clarity (0.37). Fitting room confidence (0.45) and live chat helpfulness (0.34) are key to boosting user satisfaction. Improving these areas will enhance engagement and trust.

- Section 4: Bridging the Expectation-Reality Gap in Virtual Shopping-Based Live Commerce

In Section 4, respondents had moderate privacy concerns with virtual assistants (2), trust in security (2-3), financial security (1-3), and biometric data (3). Correlation analysis shows comfort with data handling (0.19) enhances financial security. Privacy in marketing is linked to control over personal data (0.24). Businesses can improve trust by offering more data control and transparency.

- Section 5: Comparative Analysis of Virtual Shopping's Impact on Consumer Perceptions

In Section 5, moderate satisfaction was seen with live commerce convenience (2-3), variety (2-3), engagement (2-3), and immersive experiences (2-3). Correlation analysis shows live commerce convenience correlates positively with engagement (0.26) and trust in virtual advice (0.26). Pricing affordability had a negative correlation with convenience (-0.26), highlighting the need to balance convenience improvements with pricing strategies to maintain affordability.

- Combined Final Summary:

Respondents showed moderate satisfaction with virtual shopping and live commerce. Product visibility and store layout were rated well, while AI familiarity was moderate, highlighting potential for more AI integration. Trust in virtual experiences and product information was linked to platform reliability and assistant interactions. Users valued high-definition images and personalized recommendations but wanted better clarity in shipping and data control. In live commerce, convenience and engagement were positive, though pricing affordability was a concern, suggesting businesses need to balance improvements with cost strategies. Overall, there is room for enhancing engagement and trust.

- How This Research and Interpretation Help the Industry:

This research provides valuable insights into consumer perceptions of virtual shopping and live commerce, helping the industry identify areas for improvement. By highlighting moderate satisfaction in areas such as AI familiarity, product visibility, convenience, and pricing affordability, businesses can better understand consumer expectations. The correlation between trust, platform reliability, and immersive experiences suggests that enhancing these features could lead to increased engagement and customer loyalty. The findings also emphasize the importance of clear communication around data control, personalized recommendations, and pricing strategies. Ultimately, this research helps companies in the e-commerce and retail sectors optimize their platforms for better customer experiences, driving higher satisfaction, trust, and sales

**4.7 Answers to Research Questions**

Below table 2 shows research question and its answers based on all five objectives taken in the study.

*Table 2*

*Answers for Research Questions*

| Research Questions | Answers |
|---|---|
| How do AI and VR technologies affect consumer engagement in virtual shopping environments? | The distribution of responses shows that most participants rated their virtual experience around 3, indicating moderate engagement, with fewer participants on the extreme ends of the scale. |
| How does AI-generated product information influence consumer decisions in virtual shopping platforms? | The majority of respondents rated the product information quality at around 3, suggesting that while AI-generated information is generally sufficient, there may be room for improvement. |
| How reliable are AI-driven virtual shopping platforms perceived to be by users? | The distribution of responses suggests that most users rated reliability of AI-driven shopping platforms around 3 and found the product information to be satisfactory but not exceptional. |
| How do immersive technologies shape consumer perceptions and expectations in virtual shopping? | Consumers' perceptions are influenced by the quality and immersion level of the technologies, with moderate to high engagement reflected in the data, suggesting room for further enhancement. |

| | |
|---|---|
| How do AI features and virtual shopping experiences alter consumer expectations of traditional in-store shopping? | The data shows that consumers who experience advanced virtual shopping have shifting expectations for in-store experiences, potentially expecting higher levels of technological integration. |

**4.8 Conclusion**

The findings of this study provide valuable insights into the impact of AI and VR technologies on consumer behavior in virtual shopping and live commerce. Across all five objectives, the data revealed that while AI and VR technologies have significantly enhanced the virtual shopping experience, areas remain for improvement and further exploration.

Firstly, consumer engagement with AI and VR-enhanced platforms is generally positive, with most respondents reporting moderate to high levels of interaction and satisfaction. However, the variation in engagement levels suggests that the effectiveness of these technologies may depend on factors such as the quality of the virtual experience, ease of use, and the novelty of the technology.

Secondly, the role of AI in generating product information is crucial in shaping consumer decisions. The data indicates that while consumers find AI-generated product information generally adequate, more accurate, detailed, and personalized content is still needed to fully meet diverse consumer expectations.

The perceived reliability of AI-driven virtual shopping platforms emerged as a mixed bag. While a significant portion of users trust these platforms, many respondents expressed concerns about reliability, indicating that technical stability and consistent performance are critical areas needing attention to build greater consumer trust.

The study highlights that immersive technologies are beginning to shift consumer perceptions and expectations. As more consumers experience advanced virtual environments, they anticipate similar levels of innovation and convenience in traditional shopping settings, suggesting a potential paradigm shift in how consumers define a quality shopping experience.

Finally, the accelerating adoption of AI and virtual shopping technologies is reshaping consumer expectations for in-store experiences. Consumers increasingly expect more tech-integrated, personalized, and seamless experiences in physical stores, influenced by their interactions in the virtual realm.

In conclusion, while AI and VR technologies are undeniably enhancing virtual shopping and live commerce, this study highlights the crucial need for continuous updation and enhancement. The learning gained from this research provides a clear roadmap for future developments in the virtual shopping space. The focus should be on reliability, personalization, and immersive experiences, as these are the key areas that will help meet evolving consumer expectations.

# CHAPTER V:

# DISCUSSION

## 5.1 Discussion of Results

This study aimed to explore the evolving landscape of metaverse eCommerce, mainly focusing on the adoption and effectiveness of virtual shopping and live commerce. Through a comprehensive quantitative analysis, it sought to understand consumer behaviors, expectations, and the challenges associated with these emerging technologies. The findings from the study provide valuable insights into how consumers interact with virtual shopping environments and live commerce platforms and the factors that drive or hinder their engagement.

This chapter is dedicated to interpreting and discussing the results derived from the analysis and linking them to the existing body of literature and theoretical frameworks discussed in earlier chapters. The discussion will rigorously scrutinize the extent to which the study's findings align with or challenge previous research and theoretical assumptions. Furthermore, the implications of these results for both theory and practice in the context of metaverse eCommerce will be explored, offering potential recommendations for future research and practical applications.

We will begin by revisiting each of the study's objectives, analyzing how the results offer a more -nuanced knowledge of AI and VR's role in consumer decision-making. This discussion will also address the broader implications for retailers and developers, suggesting practical recommendations and highlighting areas for future research.

Through this discussion, we aim to provide a comprehensive interpretation of the data, offering insights that not only explain current consumer behavior but also predict future trends as technology continues to evolve. The goal is to visualize the research’s

findings within the large -discourse on digital transformation in retail, ultimately contributing to the growing body of knowledge in this dynamic field.

## 5.2 Discussion of Assessing Changes in Consumer Expectations with AI and Virtual Shopping Adoption

Adopting AI and virtual shopping technologies in the metaverse has brought about significant shifts in consumer expectations. As consumers become more accustomed to these technologies, their expectations of online shopping experiences evolve, often demanding more personalized, immersive, and interactive engagements.

- Consumer Demand for Personalization

One of the fundamental changes in consumer expectations is the demand for highly personalized shopping experiences. AI plays a pivotal role by analyzing vast consumer data to offer tailored recommendations, customized marketing messages, and personalized shopping journeys. Consumers now expect retailers to understand their preferences and needs at a granular level, providing product suggestions that align closely with their tastes and past behaviors. This shift towards personalization directly results from AI's ability to process and interpret consumer data in real-time, creating a shopping experience that feels bespoke and uniquely catered to the individual.

- Increased Expectations of Immersive Experiences

Virtual shopping technologies, such as virtual --reality (VR) and augmented -reality (AR), have elevated consumer expectations by offering more immersive and engaging shopping environments. Consumers are no longer satisfied with static product images or videos; they now expect to interact with products in a 3D virtual space to explore features, try out different variations, and make more informed purchasing decisions. Integrating VR and AR in shopping experiences allows consumers to visualize items in a context that

closely presents real-world environments, bridging the gap between online and offline shopping experiences.

- Expectations of Seamless Integration Across Platforms

As AI and virtual shopping technologies become more prevalent, consumers expect seamless integration of these technologies across various platforms and devices. They anticipate a consistent shopping experience using smartphones, tablets, or VR headsets. This expectation extends to integrating virtual shopping environments with social media platforms, where consumers often discover new products and trends. The seamless transition between discovering a product on social media and purchasing it in a virtual store is now seen as a critical aspect of the overall shopping experience.

- Enhanced Focus on Privacy and Security

With the increasing use of AI and data-driven technologies, there is also a growing consumer expectation for enhanced privacy and security. Consumers are becoming more aware of the data they share and expect companies to be transparent about how their information is used. This heightened awareness has led to a demand for more robust data protection measures and a greater emphasis on securing personal information in virtual shopping environments.

- Shift in Consumer Trust and Engagement

Adopting AI and virtual shopping technologies has also influenced consumer trust and engagement. Consumers are more likely to engage with brands that clearly understand their preferences and provide a smooth, enjoyable shopping experience. However, this engagement is contingent upon consumers' trust in these technologies. Trust is built through consistent positive experiences, clear communication of how AI enhances the shopping experience, and a commitment to protecting consumer data.

- Changes in Purchase Decision Processes

AI and virtual shopping have shortened and streamlined the consumer decision-making process. With AI-driven recommendations and virtual try-on features, consumers can quickly narrow their choices and make decisions more confidently. This has led to a shift in how consumers approach purchasing, with a preference for quick, efficient, and informed decisions.

- Implications for Retailers

These changes in consumer expectations mean that adopting AI and virtual shopping technologies is not just a competitive advantage but a necessity for retailers. Retailers must invest in these technologies to meet their customers' evolving demands and remain relevant in an increasingly digital marketplace. This includes implementing AI and VR/AR tools and ensuring that these technologies are integrated in a way that enhances the overall shopping experience.

In conclusion, adopting AI and virtual shopping technologies has significantly altered consumer expectations, making personalization, immersion, and seamless integration critical components of a successful eCommerce strategy. Retailers meeting these expectations while ensuring privacy and security will likely see increased consumer engagement and loyalty in the metaverse.

### 5.3 Discussion of Identifying Factors Behind Expectation-Experience Gaps in Virtual Shopping

The study aimed to identify the factors contributing to discrepancies between consumer expectations and actual experiences in virtual shopping. The research provided valuable insights into this emerging area by assessing how well virtual platforms meet consumer expectations and where they fall short. A comprehensive questionnaire was designed, asking participants to rate various aspects of their virtual shopping experience, such as the accuracy of product representation, satisfaction with product information,

platform reliability, and the assistance provided by virtual shopping assistants. The data was collected from a representative sample of virtual shopping users, ensuring diversity in demographics, including age, gender, and location. Online survey platforms and social media were the primary channels for gathering responses.

The key findings revealed significant gaps in several areas. One of the main issues was the discrepancy between how products were represented virtually and how they appeared upon receipt, leading to unmet expectations. Platform reliability also played a crucial role in user satisfaction, with a strong correlation observed between the stability of the platform and the reduction of expectation-experience gaps. Although overall satisfaction with virtual shopping assistants was positive, there were concerns regarding the accuracy and helpfulness of their recommendations. These findings suggest that to improve user satisfaction and close expectation-experience gaps, virtual shopping platforms must focus on enhancing the accuracy of product representation and the reliability of their systems. Furthermore, the potential impact of advancements in virtual assistant technology on the virtual shopping experience is significant, as it could further align consumer expectations with their actual shopping experiences, making the virtual shopping environment more reliable and satisfying for users.

- Product Representation: There were noted discrepancies between how products were represented virtually and how they appeared upon receipt, contributing to unmet expectations.
- Platform Reliability: A strong correlation was observed between platform reliability and user satisfaction, indicating that stable and accurate platforms are crucial in reducing expectation-experience gaps.

- Satisfaction with Virtual Assistants: While overall satisfaction with virtual shopping assistants was positive, concerns about the accuracy and helpfulness of recommendations were noted.

To improve user satisfaction and close expectation-experience gaps; virtual shopping platforms need to enhance the accuracy of product representation and the reliability of their platforms. Additionally, improvements in virtual assistant technology could help in providing more accurate and helpful recommendations, further aligning consumer expectations with their virtual shopping reality.

**5.4 Discussion of Developing Strategies to Align Consumer Expectations with Virtual Shopping Reality**

To develop strategies that align consumer expectations with virtual shopping reality, it is essential first to understand the root causes of these expectations. Consumers often bring their experiences from traditional in-store shopping to the virtual environment, expecting similar product interaction, customer service, and reliability. For example, in a physical store, consumers can touch and feel products, assess their quality, and make informed purchasing decisions. However, in the virtual space, these sensory interactions are replaced by digital representations, which may sometimes convey a different level of detail or authenticity.

Additionally, consumers' marketing communications, online reviews, and previous experiences with virtual shopping platforms shape consumers' expectations. If a platform consistently provides high-quality service, consumers will likely expect the same in future transactions. Conversely, negative experiences, such as receiving a product that differs significantly from its online description, can lead to skepticism and heightened expectations for future purchases. Understanding these expectations allows for developing

strategies that address both the sensory limitations of virtual shopping and the psychological factors influencing consumer perceptions.

To address the gap between consumer expectations and virtual shopping reality, several strategies can be implemented:

1. Enhanced Product Visualization: One of the primary reasons for the expectation-reality gap is the discrepancy between online and in-reality product appearance. Implementing advanced visualization techniques, such as 360-degree product views, augmented reality (AR) try-ons, and high-resolution images, can help bridge this gap. By providing consumers with a more accurate and detailed view of products, they can create better-acknowledged purchasing options that match with their expectations.

2. Improving Virtual Shopping Assistance: Virtual shopping assistants, powered by AI, play a crucial role in guiding consumers through their online shopping journey. However, these assistants must be highly accurate and personalized to be effective. Developing AI algorithms that better understand consumer preferences and provide tailored recommendations can enhance the shopping experience. This personalization helps align the consumer's expectations with what the platform can offer, reducing the likelihood of disappointment.

3. Realistic Marketing Communications: Marketing plays a significant role in shaping consumer expectations. It is essential that promotional materials and product descriptions accurately reflect what the consumer will receive. This includes honest depictions of product sizes, colors, and features and clear communication about delivery times and return policies. Misleading marketing can set unrealistic expectations, leading to dissatisfaction when the reality does not meet these inflated promises.

4. Feedback Loops and Continuous Improvement: Creating a robust feedback system where consumers can share their experiences is vital for ongoing improvement.

This data can be used to identify common areas where expectations are not met and make necessary adjustments. For instance, if consumers frequently report that a particular product's online description does not match its appearance, the platform can update the description or images accordingly. Continuous feedback loops ensure the platform evolves in response to consumer needs, gradually closing the expectation-reality gap.

5. Educating Consumers: Another strategy involves educating consumers about the limitations and advantages of virtual shopping. Providing clear information on how to interpret virtual product representations, what to expect from virtual shopping assistants, and how to navigate the platform effectively can help set realistic expectations. When consumers are better informed about the virtual shopping process, they are less likely to have unrealistic expectations that lead to disappointment.

6. Optimizing Platform Reliability: Technical reliability is another crucial factor that impacts consumer expectations. Frequent crashes, slow load times, and inconsistent performance can frustrate users and lead to negative experiences. By investing in robust technical infrastructure and ensuring the platform is reliable, virtual shopping platforms can build consumer trust. A stable platform that consistently delivers a seamless shopping experience will naturally align better with consumer expectations.

- Integrating Strategies into the Consumer Journey

Aligning consumer expectations with virtual shopping reality requires an integrated approach that spans the entire consumer journey. From the moment a potential customer interacts with a platform's marketing material to the post-purchase experience, each touchpoint must be carefully managed to ensure consistency between expectation and reality. This involves cross-functional collaboration between marketing, customer service, IT, and product teams to ensure that all consumer experience aspects align with the brand promise.

For instance, marketing teams must work closely with product development teams to ensure that the features and benefits highlighted in campaigns are achievable and reflect the actual product offerings. IT teams must ensure that the platform is user-friendly, reliable, and capable of supporting the advanced features that enhance product visualization and personalization. Customer service teams must be equipped to manage consumer expectations effectively, providing clear and accurate information and resolving any discrepancies quickly.

By integrating these strategies across the consumer journey, virtual shopping platforms can create a more harmonious relationship between what consumers expect and what they experience. This leads to higher satisfaction and loyalty and fosters a more positive perception of virtual shopping as a viable alternative to traditional retail.

In conclusion, aligning consumer expectations with the realities of virtual shopping is a multifaceted challenge that requires a strategic and integrated approach. By enhancing product visualization, improving virtual shopping assistance, ensuring realistic marketing communications, establishing continuous feedback loops, educating consumers, and optimizing platform reliability, virtual shopping platforms can significantly reduce expectation-experience gaps. As virtual shopping evolves, these strategies will ensure that it meets and exceeds consumer expectations, fostering trust and encouraging widespread adoption.

## 5.5 Discussion of Bridging the Expectation-Reality Gap in Virtual Shopping-Based Live Commerce

Bridging the expectation-reality gap in virtual shopping-based live commerce is a critical area of focus. Aligning consumer expectations with actual experiences provided by these platforms requires addressing several factors, such as technological limitations, interactive features, and platform reliability. One significant challenge is delivering the

immersive experience promised by AI and VR technologies. Efforts must create a highly interactive and engaging shopping environment that meets consumer expectations. This may involve addressing technical issues, improving resolution, and providing comprehensive product information to enhance the immersive experience.

Furthermore, the effectiveness of live commerce depends on the quality of live-streamed content and the responsiveness of sellers. Real-time interaction, clear product demonstrations, and a smooth purchasing process are essential for consumer satisfaction. Efforts to bridge this gap should encompass improvements to VR environments, high-definition live streams, minimal latency, and one particularly intriguing aspect-AI-driven personalized recommendations. These recommendations can significantly enhance the shopping experience, making it more personalized and interesting for consumers.

Transparent communication about what consumers can realistically expect from virtual shopping platforms is vital in managing expectations and building trust. However, it's equally important to empower consumers through detailed product information, such as interactive product descriptions, virtual fitting rooms, and comprehensive review systems. These tools can help consumers make informed decisions and reduce post-purchase dissatisfaction, giving them a sense of control over their shopping experience.

Addressing these issues can narrow the expectation-reality gap, ultimately leading to higher consumer satisfaction and a more trustworthy live commerce environment. This approach enhances the shopping experience and fosters a more profound sense of connection and loyalty among consumers, essential for the long-term success of virtual shopping and live commerce initiatives.

In conclusion, bridging the expectation-reality gap in virtual shopping-based live commerce is a complex but essential task for maintaining consumer trust and satisfaction. By enhancing product transparency, improving interactive features, ensuring realistic

marketing, leveraging data for personalization, streamlining post-purchase processes, and addressing emotional factors, platforms can create a more aligned and satisfying consumer experience. As live commerce continues to grow and evolve, these strategies will be critical in ensuring that it remains a trusted and enjoyable way for consumers to shop.

### 5.6 Discussion of Comparative Analysis of Virtual Shopping's Impact on Consumer Perceptions

The comparative analysis of virtual shopping's impact on consumer perceptions has yielded key insights. It reveals how consumers view and engage with virtual shopping-based live commerce compared to traditional in-store shopping experiences. This discussion delves into the nuances of consumer perceptions, highlighting both the advantages and areas of concern associated with virtual shopping.

One of the primary observations from the analysis is the polarization in consumer perceptions regarding the convenience of virtual shopping. The data indicates that consumers are divided, with some finding virtual shopping highly convenient while others perceive it as significantly inconvenient. This dichotomy may stem from differing levels of familiarity with technology, personal preferences, and expectations of the shopping process. For instance, consumers who are comfortable with digital interfaces and appreciate the ability to shop from anywhere may find virtual shopping exceedingly convenient. In contrast, those who value the tactile experience of in-store shopping or face challenges navigating virtual platforms may view it as less convenient.

The analysis also reveals a similar divide in perceptions of product variety in virtual shopping environments. While some consumers appreciate the broad range of online products, others find the selection lacking compared to traditional stores. This disparity might be influenced by the consumers' specific needs and how well virtual shopping platforms meet these. For example, niche products or those requiring personalized

experiences might not be as well-represented in virtual shopping as in physical stores, leading to dissatisfaction among specific consumer segments.

Engagement levels in virtual shopping also show significant polarization. Some consumers are highly engaged by the immersive elements of virtual shopping, such as AI-driven recommendations and interactive features. However, others report low engagement, possibly due to the need for physical interaction or the limitations of current virtual technologies. This split in engagement levels suggests that while virtual shopping has the potential to create compelling experiences, it still faces challenges in replicating the tactile and sensory engagement that traditional shopping offers.

Moreover, the immersive quality of virtual shopping experiences is perceived to be lower than that of in-store shopping. This perception likely results from the current technological limitations of virtual environments, which may still need to replicate physical stores' sensory richness fully. As virtual reality (VR) and augmented reality (AR) technologies advance, this gap has the potential to narrow, but for now, it remains a critical area for improvement.

Interestingly, the pricing of products in virtual shopping is generally viewed positively, with consumers perceiving virtual shopping as offering more affordable options than traditional shopping. This perception could be attributed to the ability of virtual platforms to offer discounts, a more comprehensive range of price points, and the convenience of price comparisons. However, the perceived affordability does not necessarily translate into overall satisfaction, as other factors like convenience, variety, and engagement play a significant role in shaping consumer perceptions.

Overall, this comparative analysis underscores the complexities of consumer perceptions in the evolving landscape of virtual shopping. While there are clear advantages, such as perceived affordability and potential convenience, significant challenges remain in

ensuring that virtual shopping experiences can fully meet or exceed the expectations set by traditional in-store shopping. Addressing the gaps in variety, engagement, and immersion will be crucial for virtual shopping platforms aiming to enhance consumer satisfaction and loyalty.

# CHAPTER VI:

# SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

## 6.1 Summary

The dissertation delves into the evolving world of e-commerce within the metaverse, focusing on how Artificial Intelligence (AI) and Virtual Reality (VR) are revolutionizing consumer interactions and expectations. It examines shifting from traditional shopping methods to advanced, technology-driven experiences that blend digital and physical realities.

One of the study's primary findings is the rising consumer demand for personalized experiences. AI technologies analyze consumer data to deliver shopping experiences that are not only tailored to individual preferences but also highly predictive of future needs. This personalization level transforms consumer expectations, setting a new benchmark for e-commerce platforms.

Moreover, the research highlighted the significant role of immersive technologies like VR in enhancing consumer engagement. These technologies enable a more interactive shopping experience, allowing consumers to visualize products in detailed virtual environments that mimic real-life settings. This immersion is crucial as it helps bridge the sensory gap typically associated with online shopping.

However, the study also uncovered persistent gaps in consumer expectations versus reality, particularly in product representations' accuracy and virtual shopping environments' reliability. Consumers frequently need clarification on how products are showcased online and their actual specifications upon delivery. Additionally, the reliability of virtual platforms often needs to catch up to user expectations, impacting their overall shopping experience.

The dissertation proposes a multifaceted approach to address these challenges. Enhancing the visual and interactive features of virtual shopping platforms can help provide a more accurate and engaging user experience. Strategies such as improved 3D product visualization, augmented reality fitting rooms, and interactive, AI-powered shopping assistants could significantly reduce the expectation-reality gap.

Furthermore, the dissertation stresses the importance of transparent marketing and communication strategies to manage consumer expectations effectively. Clear, accurate descriptions and realistic portrayals of products are essential for building consumer trust and satisfaction.

Finally, the dissertation calls for ongoing innovation and adaptation in using AI and VR technologies in e-commerce. As these technologies evolve, so too should their application, ensuring they continually meet and exceed the sophisticated demands of modern consumers. By embracing these advancements, businesses can enhance consumer satisfaction, foster loyalty, and drive growth in the competitive digital marketplace.

**6.2 Implications**

The overall implications of this dissertation extend across the fields of e-commerce, technology, and consumer behavior, demonstrating the transformative benefits of AI and VR inventions in the metaverse-based shopping -landscape. As these technologies evolve, they redefine what consumers expect from their online shopping experiences, emphasizing the need for more personalized, immersive, and seamless interactions.

From a business perspective, the research underscores the urgent necessity for e-commerce platforms to invest in AI and VR to stay competitive. These investments should focus on enhancing the realism and engagement of virtual shopping experiences and ensuring the accuracy and reliability of these digital environments. By closing the gap

between consumer expectations and actual experiences, businesses can enhance customer satisfaction, foster loyalty, and drive higher sales.

The findings highlight the importance of creating more robust, user-friendly, and secure virtual environments for technology developers. Innovations in AI should aim to better understand and anticipate consumer needs, while advancements in VR should focus on improving the sensory aspects of virtual shopping, making it as compelling and convenient as in-store shopping.

On the regulatory front, the study highlights the importance of establishing clear guidelines for data privacy and security within virtual shopping platforms. As consumers become increasingly aware of and concerned about how their data is used, transparency and security measures will become critical factors in gaining consumer trust and acceptance of AI and VR technologies. Academically, the dissertation contributes to the ongoing discourse on digital transformation in retail, providing a framework for understanding how emerging technologies can be harnessed to enhance consumer experiences. This research opens avenues for further studies on specific AI and VR applications in retail, the long-term effects of these technologies on consumer behavior, and the potential shifts in the retail landscape.

Overall, this dissertation offers valuable insights for businesses, technologists, and policymakers aiming to navigate the complexities of the digital economy. It sets the stage for a deeper exploration of how emerging technologies can be strategically implemented to meet and exceed the evolving expectations of today's digital consumers.

### 6.3 Recommendations for Future Research

The dissertation opens several avenues for future research that can further our understanding of virtual shopping and live commerce within the metaverse. Here are some recommendations for future research:

Longitudinal Studies on Consumer Behavior: Upcoming research could benefit from -longitudinal research that tracks how customer behavior evolves with the increasing integration of AI and VR in shopping experiences. These studies should aim at the longer impacts of technology adoption, how consumer trust develops, and changes in shopping habits over time. Longitudinal data could also help understand the lifecycle of technological acceptance and saturation in the market, providing insights into when and how consumers fully integrate these technologies into their daily lives.

Exploring Demographic Differences: Investigating how different demographic groups adapt to and are impacted by virtual shopping could uncover valuable insights into market segmentation and product targeting. This research should look at age groups, cultural backgrounds, socio-economic statuses, and geographical differences in adopting virtual shopping technologies. For example, older adults might have different usability challenges and trust issues than younger consumers, influencing their interactions with AI-driven shopping platforms.

Comparative Analysis of E-commerce Platforms: A comparative study across e-commerce platforms utilizing AI and VR could identify key features driving consumer satisfaction and technological acceptance. This research could evaluate user interface designs, personalized shopping experiences, and customer service innovations to determine what makes some platforms more successful. Such studies can also benchmark best practices and help lesser-performing platforms understand the gaps in user experience and technology application.

Technological Advancements and Their Impacts: As AI and VR technologies continue to advance, it is crucial to study their direct impacts on the efficacy and efficiency of virtual shopping. Future research should focus on emerging technologies like enhanced AI algorithms for better personalization, mixed reality for a more immersive experience,

and next-generation VR headsets that reduce discomfort and increase user engagement. Studies could experiment with these technologies in controlled settings to gather precise data on their benefits and drawbacks.

Psychological and Social Dynamics of Virtual Shopping: Investigating the psychological and social dynamics of virtual shopping can provide deeper insights into consumer behavior. This includes studying the impact of virtual reality environments on decision-making processes, how social interactions (or their absence) in virtual settings affect purchases, and the role of virtual communities in influencing shopping habits. Research could also explore the emotional connections that consumers develop with brands through personalized and immersive experiences offered by AI and VR.

These focused areas for future research could significantly deepen the understanding of how virtual shopping technologies reshape consumer behavior and influence the broader retail landscape.

### 6.4 Conclusion

The dissertation extensively delves into the profound impact of artificial intelligence (AI) and virtual reality (VR) technologies on e-commerce within the metaverse. It sheds light on the intricacies and potential of virtual shopping and live commerce, exploring how these technologies fundamentally reshape consumer interactions by enriching personalized and immersive shopping experiences. The dissertation also emphasizes the disparities between consumer expectations and technological capabilities in this evolving landscape.

The research findings underscore the significant potential of AI and VR in enhancing the shopping experience by making it more immersive and interactive. However, they also bring to the forefront various challenges that need to be effectively addressed to harness their potential fully. These technologies have raised consumer

expectations in terms of product interaction and visualization and the seamlessness and personalization of the overall shopping experience. Consumers now expect a high level of detail in product representations, consistent performance across different platforms, and robust data privacy and security measures.

The study highlights the critical necessity for advancements in AI and VR applications to bridge the existing gaps. This encompasses improving the accuracy of product representations in virtual environments to avoid discrepancies between expected and actual product qualities, which could lead to consumer dissatisfaction and mistrust. Additionally, enhancing the reliability and stability of these platforms is crucial to prevent technical glitches or inconsistencies that could detract from the user experience and impede the widespread adoption of virtual shopping technologies.

Furthermore, the research advocates a strategic approach to integrating these technologies into existing retail frameworks to ensure a seamless and intuitive user experience. It underscores the importance of designing user-centric interfaces that cater to consumers' varying levels of technological literacy, ensuring that virtual shopping remains accessible and enjoyable for all users. Addressing privacy concerns is also deemed paramount, given that the dependence on data-intensive technologies can potentially introduce vulnerabilities in data security and privacy.

In conclusion, the dissertation provides an in-depth overview of the current landscape of AI and VR in e-commerce. It charts a path forward for refining and optimizing these technologies. Future success in this domain will hinge on achieving a delicate balance between technological innovation, consumer trust, and consistently delivering reliable and gratifying shopping experiences. As the digital and physical retail environments continue to converge, this research serves as a pivotal reference point for retailers seeking to

capitalize on the opportunities presented by the metaverse, ensuring that consumer needs and expectations are met in sophisticated and secure virtual shopping contexts.

APPENDIX A

SURVEY COVER LETTER

Advancing Metaverse Ecommerce: A Quantitative Data Analysis Study on Usage of AI in Virtual Shopping and Live Commerce

Please select the most appropriate option for each of the following questions. Your responses will remain confidential and will be used solely for research purposes.

Demographic Details:

- Age Group

a. Under 18

b. 18-24

c. 25-34

d. 35-44

e. 45-54

f. 55-64

g. 65 and above

- Gender

a. Male

b. Female

c. Other (please specify): _____

- Location (State)

a. Central India

b. North India

c. North East India

d. East India

e. South East India

f. South India

g. South West India

h. West India

i. North West India

- Educational Qualification

a. Below Secondary Education

b. Secondary Education / 10th Grade Pass

c. Higher Secondary / 12th Grade Pass

d. Diploma

e. Bachelor's Degree

f. Master's Degree

g. Doctorate or Higher

- Employment Status

a. Employed (Full-time)

b. Employed (Part-time)

c. Self-employed

d. Unemployed

e. Student

f. Retired

- Number of Members in Household

a. 1

b. 2-3

c. 4-5

d. 6 or more

- Internet Usage Frequency

a. Multiple times a day

b. Daily

c. A few times a week

d. A few times a month

e. Less often

Objective 1.- To investigate how consumer expectations of the in-store experience change with the accelerating adoption of AI features and virtual shopping.

1. How important do you consider product visibility in shaping your in-store shopping experience?

a. Not Important

b. Somewhat Important

c. Neutral

d. Important

e. Very Important

2. How much does store layout influence your overall satisfaction with the in-store experience?

a. Not Influential

b. Slightly Influential

c. Neutral

d. Influential

e. Very Influential

3. To what extent are you familiar with AI features (head-mounted devices and VR technologies) for enhancing the in-store shopping experience?

a. Not Familiar

b. Somewhat Familiar

c. Neutral

d. Familiar

e. Very Familiar

4. How likely are you to prioritize shopping in stores that offer immersive experiences through AI features (head-mounted devices and VR technologies)?

a. Very Unlikely

b. Unlikely

c. Neutral

d. Likely

e. Very Likely

5. How do you anticipate your expectations of the in-store experience evolving with the increasing adoption of AI features (head-mounted devices and VR technologies)?

a. Decreasing

b. Slightly Decreasing

c. Neutral

d. Increasing

e. Significantly Increasing

Objective 2 -To investigate factors causing gaps between consumer expectations and in-store reality for enhanced Virtual shopping-based live commerce.

6. To what extent do you feel that the virtual shopping experience accurately represents the products in terms of appearance and quality?

a. Strongly Disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly Agree

7. How satisfied are you with the availability of product information (e.g., descriptions, specifications) during virtual shopping sessions?

a. Very Dissatisfied

b. Dissatisfied

c. Neutral

d. Satisfied

e. Very Satisfied

8. How reliable do you find the virtual shopping platform in terms of accurately depicting the size, fit, and proportions of products?

a. Very Unreliable

b. Unreliable

c. Neutral

d. Reliable

e. Very Reliable

9. To what extent do you perceive a discrepancy between the virtual representation of products and their actual appearance when received?

a. Significant Discrepancy

b. Moderate Discrepancy

c. Neutral

d. Minor Discrepancy

e. No Discrepancy

10. How satisfied are you with the interaction and assistance provided by virtual shopping assistants during your sessions?

a. Very Dissatisfied

b. Dissatisfied

c. Neutral

d. Satisfied

e. Very Satisfied

11. How likely are you to trust the recommendations made by virtual shopping assistants regarding product suitability and quality?

a. Very Unlikely

b. Unlikely

c. Neutral

d. Likely

e. Very Likely

12. How would you rate the overall convenience of the virtual shopping experience compared to traditional in-store shopping?

a. Very Inconvenient

b. Inconvenient

c. Neutral

d. Convenient

e. Very Convenient

13. How likely are you to recommend virtual shopping-based live commerce to others based on your experiences?

a. Very Unlikely

b. Unlikely

c. Neutral

d. Likely

e. Very Likely

Objective 3 - To offer suggestions to bridge the gap between consumer expectations and in-store reality for enhanced Virtual shopping-based live commerce.

14. To what extent do you believe that incorporating high-definition images and 360-degree views of products would improve the virtual shopping experience?

a. Strongly Disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly Agree

15. How beneficial are interactive product descriptions, like zoom-in and demonstrations, for improving understanding during virtual shopping?

a. Not Helpful at All

b. Slightly Helpful

c. Moderately Helpful

d. Very Helpful

e. Extremely Helpful

16. How helpful are live chats with virtual shopping assistants for answering questions and aiding during virtual shopping?

a. Not Valuable at All

b. Slightly Valuable

c. Moderately Valuable

d. Very Valuable

e. Extremely Valuable

17. How much would AI-based virtual fitting rooms boost your confidence in buying clothes and accessories online?

a. Not at All

b. Slightly

c. Moderately

d. Mostly

e. Completely

18. How likely are you to trust product recommendations and reviews from other consumers integrated into the virtual shopping platform?

a. Not Likely at All

b. Slightly Likely

c. Moderately Likely

d. Very Likely

e. Extremely Likely

19. How much do personalized product recommendations based on your preferences and browsing history influence your likelihood of making a purchase during virtual shopping?

a. Not Influential at All

b. Slightly Influential

c. Moderately Influential

d. Very Influential

e. Extremely Influential

20. How clear should shipping, costs, and return policies be for a satisfying virtual shopping experience?

a. Not Transparent at All

b. Slightly Transparent

c. Moderately Transparent

d. Very Transparent

e. Extremely Transparent

Objective 4 - To offer suggestions to bridge the gap between consumer expectations and in-store reality for enhanced Virtual shopping-based live commerce.

21. How concerned are you about the privacy of your personal data when interacting with AI-powered virtual shopping assistants during your shopping journey?

a. Not Concerned at All

b. Slightly Concerned

c. Moderately Concerned

d. Very Concerned

e. Extremely Concerned

22. To what extent do you trust the security measures implemented to protect your personal information while using AI features in virtual shopping platforms?

a. No Trust at All

b. Low Trust

c. Neutral

d. Moderate Trust

e. High Trust

23. How comfortable are you with the collection and use of your browsing history and purchase behaviour data to personalise your virtual shopping experience?

a. Very Uncomfortable

b. Uncomfortable

c. Neutral

d. Comfortable

e. Very Comfortable

24. How confident are you in the ability of virtual shopping platforms to safeguard your financial information (e.g., credit card details) from unauthorized access or cyber threats?

a. Not Confident at All

b. Slightly Confident

c. Moderately Confident

d. Very Confident

e. Extremely Confident

25. How concerned are you about the potential misuse or unauthorized access to your biometric data (e.g., facial recognition for virtual try-on) collected during virtual shopping experiences?

a. Not Concerned at All

b. Slightly Concerned

c. Moderately Concerned

d. Very Concerned

e. Extremely Concerned

26. To what extent do you believe that virtual shopping platforms prioritize the protection of your privacy and security over collecting data for marketing and analytics purposes?

a. Strongly Disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly Agree

27. How satisfied are you with the level of control you have over the sharing and management of your personal data within virtual shopping platforms?

a. Very Dissatisfied

b. Dissatisfied

c. Neutral

d. Satisfied

e. Very Satisfied

Objective 5 - To investigate the impact of virtual shopping-based live commerce on consumer perceptions compared to traditional shopping methods.

28. How would you rate the convenience of virtual shopping-based live commerce compared to traditional in-store shopping?

a. Much Less Convenient

b. Less Convenient

c. Neutral

d. More Convenient

e. Much More Convenient

29. To what extent do you believe that virtual shopping-based live commerce provides a wider variety of products compared to traditional in-store shopping?

a. Much Less Variety

b. Less Variety

c. Neutral

d. More Variety

e. Much More Variety

30. How satisfied are you with the level of interaction and engagement offered by virtual shopping-based live commerce compared to traditional in-store shopping?

a. Much Less Satisfied

b. Less Satisfied

c. Neutral

d. More Satisfied

e. Much More Satisfied

31.How much do you trust virtual shopping advice versus in-store staff recommendations?

a. Much Less Likely

b. Less Likely

c. Neutral

d. More Likely

e. Much More Likely

32. To what extent do you believe that virtual shopping-based live commerce offers a more immersive and engaging shopping experience compared to traditional in-store shopping?

a. Much Less Immersive

b. Less Immersive

c. Neutral

d. More Immersive

e. Much More Immersive

33. How do you perceive the pricing and affordability of products offered through virtual shopping-based live commerce compared to prices in traditional brick-and-mortar stores?

a. Much Higher

b. Higher

c. Neutral

d. Lower

e. Much Lower

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