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Buying Behavior in Metaverse

Diplomová práce

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Anotace

Tato diplomová práce zkoumá, jak environmentální podněty v metaverzu ovlivňují emoční a spotřebitelské reakce uživatelů. Zaměřuje se na roli živosti, účinnosti a interaktivity při utváření pocitu teleprezence, následné emoční aktivace a nákupního záměru. Práce je strukturována do teoretické části, která shrnuje současný výzkum digitálních prostředí, a praktické části, která prezentuje empirickou studii analyzovanou metodou PLS-SEM. Zjištění jsou diskutována ve vztahu k existující odborné literatuře a odpovídají na vymezené výzkumné otázky.

Abstract

This master's thesis examines how environmental stimuli in the metaverse influence user emotional behavior and purchase intentions. It focuses on the role of vividness, effectiveness and interactivity in shaping telepresence and, subsequently, arousal and purchase intentions. The thesis is structured into a theoretical part summarizing current research on immersive digital environments and a practical part presenting an empirical study analysed using PLS-SEM. The findings are discussed in relation to existing literature and address the defined research questions.

Declaration

Prohlašuji, že jsem diplomovou práci na téma Buying Behavior in Metaverse vypracovala samostatně pod vedením doc. Ing. Dušana Mladenovića, Ph.D. a uvedla v ní všechny použité literární a jiné odborné zdroje v souladu s právními předpisy, vnitřními předpisy Masarykovy univerzity a vnitřními akty řízení Masarykovy univerzity a Ekonomicko-správní fakulty MU.

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Glossary

AR	–	Augmented Reality
AVE	–	Average Variance Extracted
CA	–	Cronbach's alpha
CMB	–	Common Method Bias
CR	–	Composite reliability
EFA	–	Exploratory Factor Analysis
HTMT	–	Heterotrait–Monotrait Ratio of Correlations
IoT	–	Internet of Things
MR	–	Mixed Reality
NFT	–	Non-fungible Token
PC	–	Personal Computer
PLS-SEM	–	Partial Least Squares – Structural Equation Modelling
S-O-R	–	Stimulus-Organism-Response
SRME	–	Standardized Root Mean Square Residual
VIF	–	Variance Inflation Factor
VR	–	Virtual Reality
XR	–	Extended Reality

1 Introduction

The metaverse is becoming one of the most attractive ways for companies to promote products and engage consumers (Tashjian, 2021). Discussions about the metaverse have become widespread recently. In 2021, online searches for the term surged by 7,200%. Significant private investments are also being made. In 2021, companies focused on the metaverse reportedly secured over $10 billion in funding which is more than double the amount raised the previous year (McKinsey, 2022). Retail is transitioning into virtual spaces and shared experiences, consumer behavior is evolving and changing rapidly. Research by McKinsey (2022) indicates that approximately 79% of metaverse users have made a purchase, primarily to enrich their online experience. Projections by McKinsey (2022) show that the metaverse could create up to $5 trillion in value by 2030 across both consumer and enterprise applications. As investment and interest continue to grow, the metaverse is becoming a strategic tool for many businesses.

The aim of the thesis, Buying Behavior in Metaverse, is to analyse the factors influencing consumer purchasing behavior in the metaverse. The thesis builds on academic literature, particularly the work Unfolding the Impacts of Metaverse Aspects on Telepresence, Product Knowledge, and Purchase Intentions in Metaverse Stores. The study was conducted by Professors Rana Muhammad Sohail Jafar, Wasim Ahmad, and Yanming Sun, affiliated with business administration schools. Dr. Jafar is an experienced researcher in management science and emerging technologies, currently affiliated with Al-Yamamah University, while Professor Ahmad is based at UCSI University in Malaysia and Professor Sun at Guangzhou University in China. The research focused on the effects of key stimuli such as vividness, effectiveness, and interactivity and users' sense of telepresence, their product knowledge, and ultimately, their purchase intentions within metaverse retail environments. In the referenced academic study, the authors suggested that integrating consumer emotional responses, such as arousal, into future research frameworks could enhance the effectiveness of metaverse applications in the shopping environment (Jafar et al., 2023).

The thesis focuses on the impact of various metaverse aspects, such as vividness, effectiveness, and interactivity. Vividness represents the main sensory stimulus and image quality (Bogicevic et al., 2019). Effectiveness is defined as the extent to which the metaverse environment supports users and fulfils their expectations (Kounavis et al., 2012). Interactivity refers to the user's ability to influence and change the metaverse environment (Guertin-Lahoud et al., 2023). These stimuli can significantly affect users' sense of telepresence (Jafar et al., 2023). Telepresence plays a crucial role in shaping user experiences and, in interactive virtual environments, can even be a key factor in eliciting emotional responses and behaviors similar to those in real-life situations (Jafar et al., 2023). The thesis primarily examines the effect of arousal, and if it can shape users' perceptions and experiences within metaverse environments, thus enhancing purchase intentions. Arousal, also known as reactivity, refers to the body's physical and psychological response to sensory stimuli (Gaffey and Wirth, 2014).

Research on buying behavior in metaverse is important as it provides companies with key insights into how various metaverse interface aspects influence users' purchasing decisions (Tarnanidis et al., 2025). Businesses operating in this sphere can leverage these insights to better understand consumer preferences, improve interactive and visual elements of their platforms, and refine their business strategies (Jafar et al., 2023).

Preliminary Research Questions:
1. How do effectiveness, vividness, and interactivity influence users' sense of telepresence?
2. To what extent does an enhanced sense of telepresence impact users' arousal?
3. To what extent does an enhanced sense of telepresence impact users' purchase intentions?
4. What is the relationship between arousal and consumers' purchase intentions in the metaverse?

A primary tool for data collection was a questionnaire based on established research studies, distributed to target groups of metaverse users, particularly those with direct metaverse experience. The questionnaire was disseminated through various platforms to ensure access to a broad spectrum of active users, yielding a representative data sample. Collected data were analysed using statistical methods to support the questions and assess connectivity between vividness, effectiveness, and interactivity and their influence on telepresence, arousal and subsequent purchasing behavior. Periyasami and Periyasamy (2022) believe that studying buying behavior in the metaverse is essential not only for understanding current trends but also for developing future business models. The findings of this study can offer valuable insights to companies, enabling them to optimize virtual stores and interfaces to elicit positive emotional reactions. This can help businesses achieve greater customer engagement and loyalty, encouraging users to return to their platforms.

2 Metaverse

2.1 Conceptual Framework

In contemporary society, individuals are increasingly participating in both physical and virtual aspects of life. The metaverse offers opportunities for users to engage in experiences that may not be accessible or achievable in the real world (Kumar et al., 2025). As a result, it has become a rapidly expanding digital environment, attracting a diverse user base across various age groups and genders, highlighting its growing significance in modern social and economic contexts (Al-kfairy et al., 2024).

The metaverse represents a post-reality space, a continuous, multiuser environment that blends physical and digital experiences (Mystakidis, 2022). It emerges from the integration of advanced technologies such as virtual reality (VR) and augmented reality (AR), which facilitate multisensory interactions with virtual settings, digital avatars, and other users. Essentially, the metaverse forms a network of immersive, socially connected environments hosted on persistent platforms. It allows real-time, embodied communication and interaction with digital elements. While its initial form consisted of virtual worlds navigated by teleporting avatars, the current metaverse encompasses socially immersive VR platforms, large-scale multiplayer games, expansive game worlds, and collaborative AR spaces (Mystakidis, 2022). The term metaverse was originally used by Neal Stephenson in his 1992 science fiction novel Snow Crash. In the novel, he describes metaverse as a parallel virtual reality world generated by computer graphics, where users from across the globe can interact and connect using headsets and audio devices (Stephenson, 2003). The word metaverse is formed from two meaningful components: meta, a prefix of Greek origin meaning "after," "beyond," or "transcending," and universe (Mystakidis, 2022). The metaverse represents a new evolution of the Internet, offering a three-dimensional virtual environment where users engage and connect using digital avatars (Arpaci et. al, 2022). An avatar can be described as a digital embodiment of a user within a virtual environment (Dwivedi et al., 2022). Its framework supports the development of virtual communities that extend beyond just entertainment and commerce, opening the door to diverse forms of social interaction and collaboration (Arpaci et. al, 2022).

Figure 1: Nikeland

Source: Bloomberg (2021)

Figure 2: Meta

Source: Meta Platforms (n.d.)

VR and AR are key technologies driving the development of the metaverse (Sandra and Sreeji, 2025). In the coming years, key technologies expected to drive metaverse development include artificial intelligence, IoT, and extended reality (XR), 3D modelling, brain-computer interfaces, spatial and edge computing, and blockchain (Tucci and Moore, 2024).

Figure 3: Ikea on Roblox

Source: Ikea (2024)

Table 1 provides a comparative analysis of key immersive and digital technologies, namely XR, VR, AR, MR, and the metaverse. It highlights their distinctive characteristics across several dimensions, including definition, environment, user experience, devices used, and key features. The table illustrates that the metaverse goes beyond only blending virtual and physical worlds through visuals; it also integrates important social and economic dimensions, creating a more complex environment. A defining characteristic of the metaverse is the concept of digital ownership (Ante, 2022). In user-centric models of the metaverse, individuals retain full ownership of their digital assets and content. This includes virtual property, avatars, digital art, and other user-generated content, which are typically secured through blockchain technology and non-fungible tokens (NFTs) (Yoo et al., 2023). Such decentralized structures empower users with autonomy and control over their virtual possessions, enabling them to trade, sell, or transfer ownership without intermediary oversight (Jafar et al., 2023).

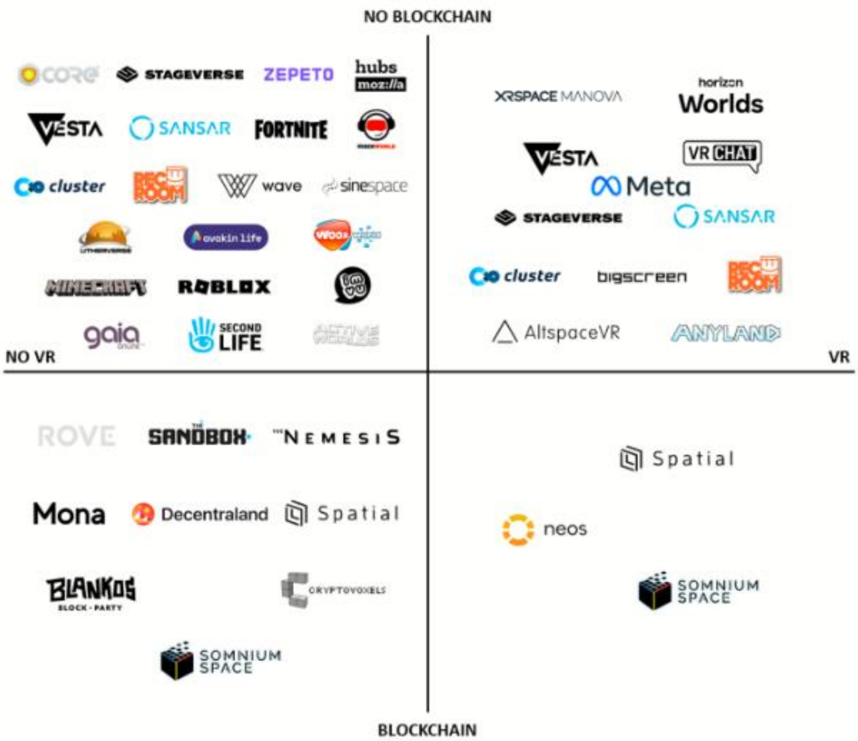
Table 1: Comparison of virtual environments

Technology	Definition	Environment	User Experience	Devices Used	Key Feature
Extended Reality (XR)	Umbrella term for immersive technologies including VR, AR, and MR	Varies (real to fully virtual environment)	Interacting with digital environments through various levels of immersion	All XR-related devices	General term combining all immersive formats
Virtual Reality (VR)	Fully artificial, computer-generated environment	Fully virtual	Fully separate from the real one	VR headsets, motion controllers, treadmills	No interaction with physical world
Augmented Reality (AR)	Real world enhanced with digital overlays	Primarily physical with digital elements	Real environment remains visible, but is augmented with virtual data	Phones, tablets, smart glasses	There is limited interaction between the digital and physical world
Mixed Reality (MR)	Interactive blend of digital and real environments	Merged physical and virtual	Digital objects respond to real-world stimuli in real-time	MR headsets, smart glasses	Real-time interaction between real and digital
Metaverse	Shared virtual world or network of 3D spaces accessed online	Mostly virtual (can include AR/MR elements)	Social, economic, and immersive experiences	VR/AR headsets, PCs, game consoles, smartphones, Web	Collective, virtual space with avatars, economies, etc.

Source: Mystakidis (2022), Tremosa (2025)

Figure 4 describes categorisation of metaverse platforms by Cosenza (2022) based on their technological infrastructure and mode of access. First, VR metaverses without blockchain are immersive 3D environments accessed via VR headsets, where users can interact in real-time. These platforms, such as VR Chat, Rec Room, and Horizon Worlds, do not incorporate blockchain technology to power their economies. Second, desktop or browser-based metaverses without blockchain represent the largest group, accessible without VR equipment and typically not utilizing blockchain. This category includes early virtual worlds like Second Life and Habbo, as well as gaming platforms with social features like Roblox, Fortnite, and Minecraft. Third, desktop/browser-based metaverses with blockchain integration use cryptocurrencies and tokenized digital assets to support decentralized economies. Platforms such as Decentraland, The Sandbox, and Cryptovoxels allow users to purchase virtual land and objects as NFTs. Lastly, VR metaverses built on blockchain combine immersive virtual environments with decentralized asset ownership. Though fewer in number, platforms like Somnium Space, Neos, and Spatial exemplify this emerging quadrant, offering both blockchain-enabled economies and VR experiences (Cosenza, 2022). This classification can equip businesses and researchers with a framework for evaluating the technological capabilities and user experiences of each platform.

Figure 4: Map of metaverse platforms



Source: Cosenza (2022)

2.1.1 Metaverse Landscape: Key Figures and Insights

This chapter provides a comprehensive overview of the metaverse in terms of revenue generation, user engagement, and demographic trends. The primary focus is on data collected between 2022 and 2024, offering a detailed analysis of recent developments within this emerging digital environment. In addition to historical data, the chapter incorporates expert projections to demonstrate anticipated growth patterns and future directions of the metaverse in the coming years.

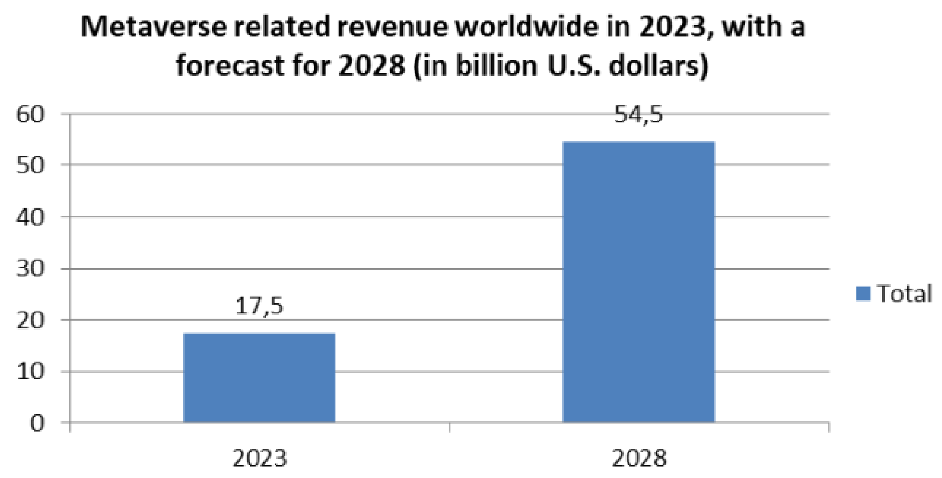
Revenue generation and user engagement

According to Bradley et al. (2022) revenue generation is one of the key indicators of business success, especially when accompanied by a growing user base. This section highlights the significant global growth in metaverse users and its positive impact on overall revenue generation. However, for the purpose of this research, the primary focus is on the revenue specifically generated from metaverse retailing, which has shown a notable year-on-year increase.

As of 2024, the metaverse boasts a global user base of over 600 million active users. The current market value of the metaverse is estimated at approximately 74.4 billion U.S. dollars (Kumar, 2025). By 2026, it is expected that 25% of the global population will spend at least one hour per day engaging within the metaverse. Among the many virtual environments, Roblox stands out as the most popular metaverse-based game, attracting approximately 70.2 million active users daily. Economically, the metaverse's influence is expected to be profound. By 2030, it could contribute an additional 5 trillion U.S. dollars to the global economy (Kumar, 2025).

According to a forecast by Statista (2024), global revenue in the metaverse market is projected to experience significant growth over the coming years. In 2023, the market generated approximately 17.5 billion U.S. dollars. This figure is projected to increase steadily, reaching around 54.5 billion U.S. dollars by 2028. Figure 5 highlights the forecast of the rapid expansion of the metaverse.

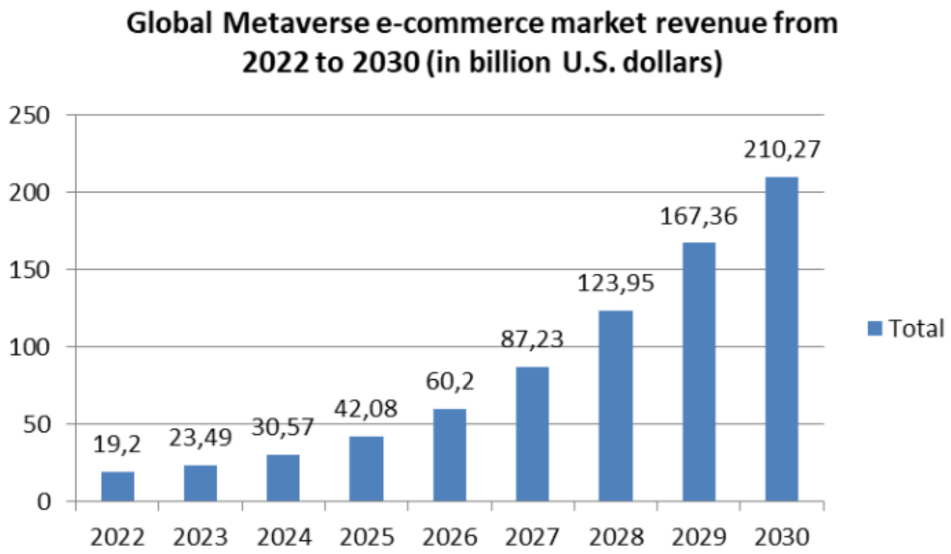
Figure 5: Metaverse-related revenue worldwide



Source: Statista (2024)

The global metaverse e-commerce market has shown significant growth from 2022 and is projected to continue expanding through 2030 (Statista, 2024). In 2022, the market revenue stood at 19.2 billion U.S. dollars. Growth accelerated in the following years when the market generated 42.08 billion in 2025. The market is anticipated to reach its highest point in 2030, with estimated revenue of 210.27 billion U.S. dollars (Statista, 2024). For this research, the growth of retail revenue in the metaverse highlights its increasing importance in the future of retail and underscores the need to study consumer buying behavior within this emerging environment.

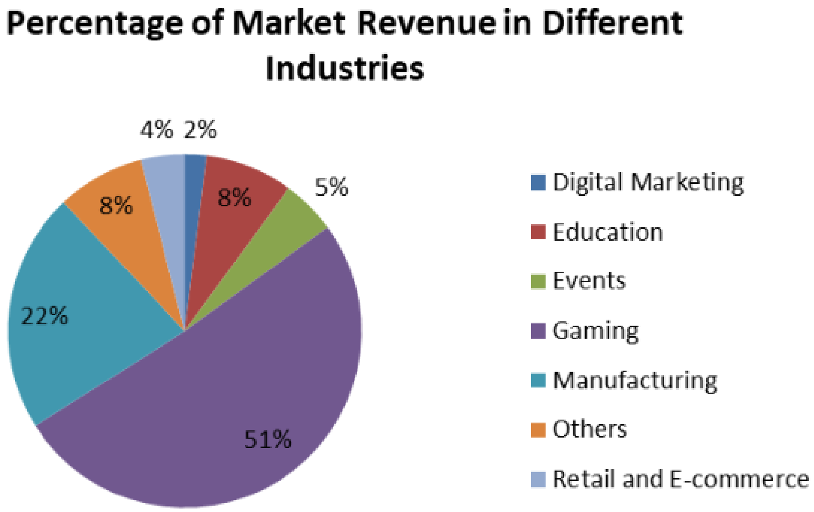
Figure 6: Global metaverse e-commerce market revenue (2022-2030)



Source: Statista (2024)

Figure 7 by Strategic Market Research (2022) presents a comparative analysis of revenue distribution across various sectors worldwide. The data reveals that the gaming industry dominates the market with a substantial 51% share, indicating its significant role and expansive growth in recent years. Following gaming, the manufacturing sector holds the second-largest share at 22%, reflecting its continued relevance and economic contribution. The retail and e-commerce industry accounts for 4%, showcasing a moderate presence despite the global digital commerce boom.

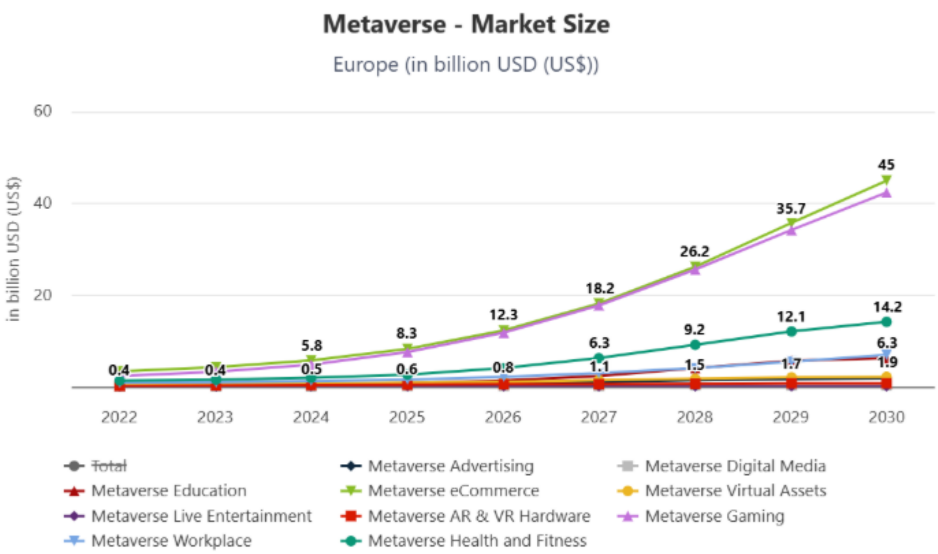
Figure 7: Percentage of market revenue in different industries



Source: Strategic Market Research (2022)

The gaming industry continues to generate the highest revenue from the metaverse, both globally and within the European market. This dominance is unsurprising given that the leading metaverse platforms originate primarily from the gaming sector. However, data for the European region, in Figure 8, indicate a different trend in metaverse revenues. While gaming still holds the leading position, e-commerce, and digital marketing are emerging as the most lucrative industries within the metaverse ecosystem, showing substantial growth and revenue potential by 2030 (Statista, 2024).

Figure 8: Metaverse market size in Europe



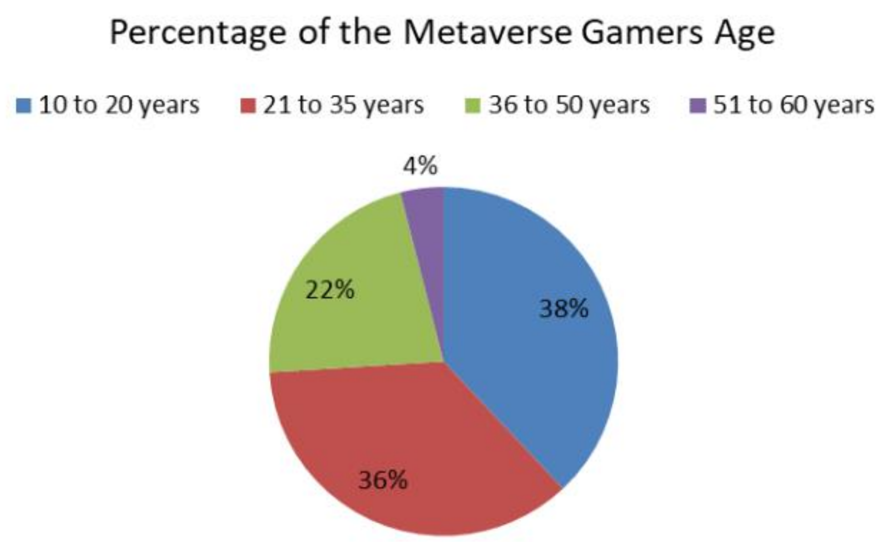
Source: Statista (2024)

Demographic Insights

Demographic insights are a key factor in understanding buying behavior and trends within the metaverse economy (Tao et al., 2025). For companies aiming to increase sales and revenue, it is essential to be aware of the demographic and social characteristics of their target consumers.

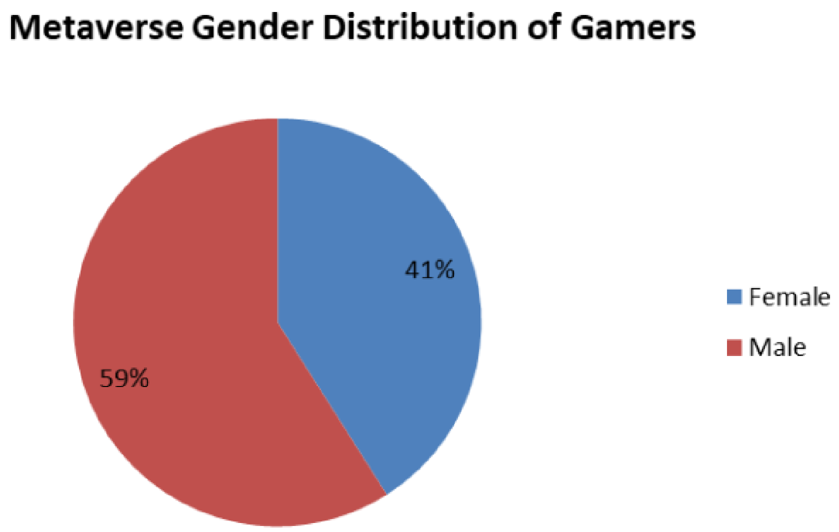
Figure 9 provides a demographic breakdown of users engaging with gaming platforms in the metaverse. The data indicates that the majority of metaverse gamers fall within the 10 to 20 years age group, comprising 38% of the total user base. This is closely followed by the 21- to 35-year-old cohort at 36%, suggesting that younger users represent the core demographic driving engagement in virtual gaming environments. This means that most users will in the period from 5 up to 15 years become economically active citizens, with greater purchasing power to spend on products and experiences within the metaverse. The second largest age group, between 21 and 35 years old, typically has higher earning power. Companies can focus on enhancing their experience in the metaverse to encourage stronger purchasing decisions and drive sales.

Figure 9: Percentage of metaverse gamers' age



Source: Newzoo (2022)

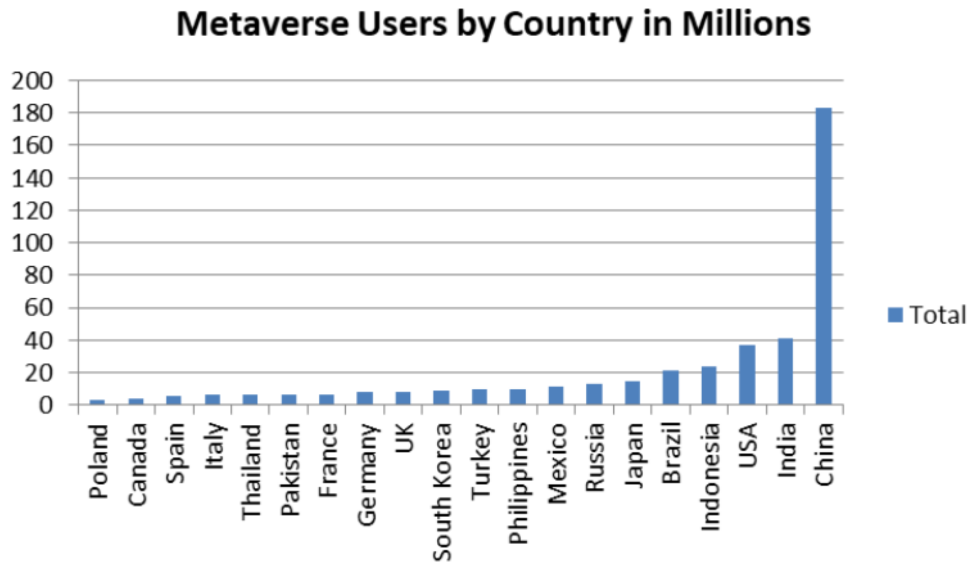
Figure 10: Metaverse gender distribution of gamers



Source: Newzoo (2022)

This gender distribution suggests a notable gender disparity in metaverse gaming participation, with males representing a clear majority. However, the 41% female representation also indicates a growing inclusivity and diversification of the metaverse gaming demographic, highlighting the increasing engagement of women in immersive digital experiences. This is an important factor to consider when operating in the metaverse retail environment. According to Kanwal et al. (2022) men and women have different preferences, needs, and decision-making patterns while shopping online. Such demographic insights are essential for developers, marketers, and retailers seeking to adapt retail strategies (Kanwal et al., 2022).

Figure 11: Metaverse users by country



Source: Metaversed Consulting (2022)

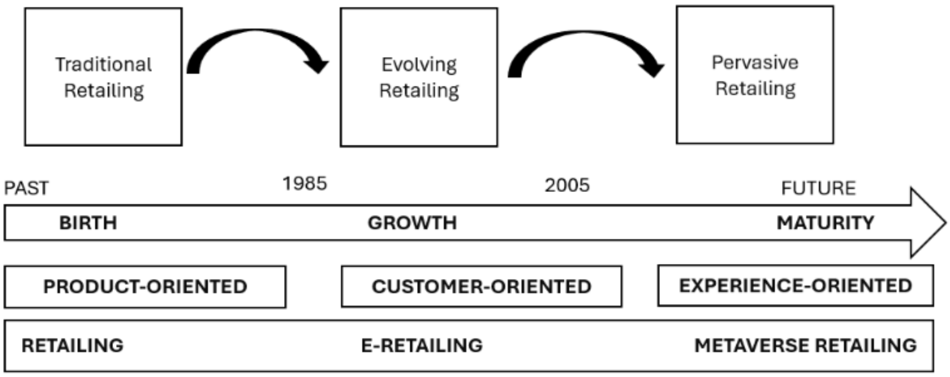
Figure 11 provides a comparative analysis of metaverse user populations across various countries. The data from Metaversed Consulting (2022) clearly indicates significant regional disparities in user engagement, with China emerging as the dominant leader, boasting close to 180 million users. This far surpasses all other countries represented in the chart. India and the United States follow as the second and third largest markets, with approximately 40 million and 30 million users respectively. These three countries China, India, and the U.S. collectively account for the vast majority of global metaverse users, highlighting their pivotal roles in driving adoption and innovation within the space. In contrast, countries such as Poland, Canada, Spain, and others in Europe and Southeast Asia report considerably lower user bases, typically ranging between 5 to 15 million. While these figures reflect relatively modest engagement, they nonetheless point to a growing global interest in metaverse platforms. The data appears predictable, as China, India, and the United States are the three most populous countries globally (World Bank, 2024), naturally contributing to a larger base of potential metaverse users. Furthermore, China and the U.S. are global leaders in technology and innovation, where digital platforms, including virtual and augmented reality, are becoming deeply integrated into everyday life, commerce, and entertainment (Carr, 2024). For companies operating in the metaverse, understanding the cultural, economic, and technological contexts of these regions is crucial for crafting localized strategies and maximizing engagement.

2.1.2 Retail in Metaverse

The metaverse has significantly influenced various aspects of both individual lives and business operations globally (Saridakis et al., 2024). As technological changes shift, businesses and retailers must adapt their strategies and business models to meet evolving consumer expectations and respond to emerging trends (Saridakis et al., 2024). This chapter explores how metaverse retailing differs from traditional and e-commerce models. It also outlines the key components of metaverse retailing and highlights the main benefits for retailers who actively leverage the metaverse environment to promote and sell their products.

The metaverse consists of immersive virtual environments that extend the physical world, providing new spaces for economic, social, and recreational activities (Papagiannidis et al., 2008). Within these digital spaces, metaverse retailing emerges as a rapidly growing trend, wherein retail activities are conducted in virtual settings. This evolution represents a potential transformative shift in the retail sector, introducing a three-dimensional digital space for retailing and offering novel opportunities for both established and growing retailers (Bourlakis et al., 2009). According to Dwivedi et al., 2022, the metaverse is expected to profoundly influence consumer engagement with digital environments, thereby reshaping the structure of the retail industry. Metaverse retailing differs significantly from both traditional and e-commerce models, particularly in terms of customer orientation and points of interaction (Bourlakis et al., 2009). The following figure illustrates the key distinctions between these three forms of retailing.

Figure 12: Retailing evolution



Source: Bourlakis et al. (2009)

According to Bourlakis et al. (2009) in the early stages, retailing was predominantly product-oriented, characterized by physical store-based transactions and limited customer interaction. With the emergence of e-commerce around the mid-1980s, the focus shifted toward a customer-oriented approach, emphasizing convenience, personalization, and online access. Around 2005, the industry began transitioning into the current and future phase called pervasive retailing which is increasingly experience-oriented purchasing. In this environment, consumers are not only buyers but also active participants in personalized, interactive brand experiences.

Figure 13: Comparison of different retailing types

	Traditional Retailing	E-Retailing	Metaverse Retailing
Touch Point	Store	Retailer's website	Metaverse
Kay Actors	Personnel and customers	Delivery and order taking personnel	Avatars
Interactions	Active, face to face interactions	Non interactive	Active, participatory-based
Key Benefits	Competitive prices and product choice	Excellent prices, satisfactory product delivery	Unique experiences
Key Limitations	The customer should visit the store to engage in social interaction and experience social integration	Minimum/basic store interaction and integration with retail personnel	It does not portray the real identity of the person, creating possibilities for misbehavior. Further limitations posed by technology.
Customer Integration	Integration with store personnels and customers	Basic integration restricted to the point of delivery	Extensive integration with other avatars limited by meta data repository space

Source: Papagiannidis and Bourlakis (2010)

Figure 13 compares traditional, e-commerce, and metaverse retailing across several key aspects. Papagiannidis and Bourlakis (2010) explain that traditional retailing is centred around physical stores with face-to-face interactions between customers and staff, offering competitive pricing and product variety but requiring physical presence. E-commerce shifts the touchpoint to websites, reducing interaction and focusing on convenience and efficient delivery, with limited customer integration. Metaverse retailing, in contrast, introduces immersive, avatar-based environments that allow active, participatory experiences (Papagiannidis and Bourlakis, 2010).

As mentioned earlier, metaverse retailing occurs in collaborative virtual environments, enabling consumers to explore immersive digital spaces via avatars and interact with other avatars, including shoppers and retail staff (Hennig-Thurau et al., 2023). Much like traditional e-commerce, retailers in the metaverse can expand their reach by allowing individuals from different geographic locations to engage virtually (Donath, 1999). Some retailers are already collaborating with video game developers to create engaging shopping experiences that appeal to early users. For instance, fashion retailer Uniqlo partnered with the creators of Minecraft to launch a collection of Minecraft-themed T-shirts, available both in the game and in Uniqlo's physical stores (Waters, 2020). Such collaborations have proven to be profitable, as evidenced by Gucci's release of a digital version of its Dionysus bag on the Roblox platform. The bag was sold for a significantly higher price than its physical counterpart in traditional retail outlets (Barry, 2021). This way, the metaverse offers a similar form of entertainment to one provided by physical malls, but on a potentially larger scale (Dwivedi et al., 2022). Brands are beginning to experiment more with money-making models in the metaverse, with direct-to-avatar sales already generating billions. Ranging from affordable virtual accessories to high-end NFTs. Companies like Nike and Chipotle are testing innovative approaches, blending virtual and real-world retail. To succeed, brands must develop metaverse-specific capabilities, often through partnerships with developer communities and influencers, as seen in collaborations on platforms like Roblox and The Sandbox (McKinsey, 2022). This shows that the collaboration of different stakeholders in metaverse retail plays a significant role. Table 2 highlights several leading global companies that are actively leveraging the potential of the metaverse.

Table 2: Companies using metaverse in various industries

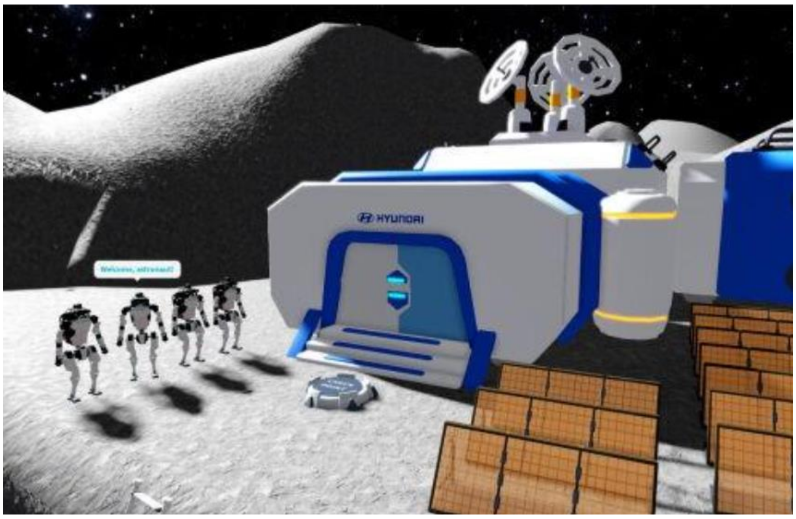
Industry	Companies / Initiatives	Sources
Retail	Walmart, Stella Artois, Target, Amazon, IKEA, McDonald's, Coca-Cola	Yoo et al. (2023); Kaur et al. (2023); Tavman (2024)
Fashion	Uniqlo, Gucci, Balenciaga, Nike, Louis Vuitton, Dolce & Gabbana, Burberry, Tommy Hilfiger, Adidas, H&M, Zara	Yoo et al. (2023); Gleim et al. (2024); Bruni et al. (2023)
Automotive	BMW Group, Hyundai Motor, Mercedes-Benz, Nissan	GlobalData (2023)
Technology	Samsung, Apple	Yoo et al. (2023); Tavman (2024)
Entertainment	Snoop Dogg and Marshmello concert, Metaverse Fashion Week, Philipp Plein's Museum of NFT Arts	Yoo et al. (2023); Viñals et al. (2024)

Source: Author's Work (2025)

Figure 14: Walmart land on Roblox

Source: Walmart (2022)

Figure 15: Hyundai in metaverse



Source: Hyundai Motor Company (n.d.)

Yoo et al. (2023) highlight that a key distinction between current metaverses and first-generation metaverse platforms is unique digital assets that can be transferred between consumers and have an established market value. These assets are made possible by blockchain technologies, which are gaining increasing use in the metaverse (Yoo et al., 2023). While blockchain was initially introduced to the public through cryptocurrencies like Bitcoin, it gained widespread popularity due to its ability to facilitate a sharing economy, where firms and individuals can rent goods and services securely (Muharam et al., 2024). Blockchain is a type of digital record system that stores transactions in a secure and shared way, without needing a central authority (Pop et al., 2020). Every time a transaction happens, it is sent to a network of computers, called a peer-to-peer network. Most of these computers must agree that the transaction is real. Once it is approved, it is added to a group of transactions, called a block, which is then connected to previous blocks forming a chain (Pop et al., 2020). This process keeps the system very secure because changing anything would require taking control of most of the network, which is extremely difficult (Yoo et al., 2023). Building on blockchain technology, most products and services in the metaverse are represented as NFTs, which are unique digital assets with identification codes distinguishing them from copies (Ante, 2022). By leveraging blockchain, metaverse facilitates the creation, distribution, and transfer of these unique assets, allowing consumers and businesses to develop complex, evolving digital economies previously not possible (Yoo et al., 2023).

Unique digital assets in the metaverse represent a new type of virtual goods, giving consumers a sense of real ownership and allowing them to interact with digital spaces, such as virtual real estate. This ownership can lead to stronger emotional and mental connections compared to traditional digital products (Cheng, 2023). A key difference between the metaverse and other digital platforms is its realistic environment and the expanded possibilities for economic activity. Thanks to features like online collaboration, non-linear social networks, true digital ownership, and custom avatars for self-expression, the metaverse opens more opportunities for retailers (Yoo et al., 2023). A key characteristic of the metaverse is the depth of consumer relationships that it fosters compared to other digital platforms, whether through online collaboration fostering localized communities, high consumer immersion enabling more realistic social interactions, or digital avatars enhancing social connections (Yoo et al., 2023).

Competitive Advantages of Metaverse Retailers

As mentioned earlier, the metaverse offers new opportunities for retailers and it gives them a competitive advantage compared to those not using virtual environments to sell products (Bruni et al., 2023). By building a strong presence in the metaverse, retailers can take advantage of its unique features. The following points highlight the key advantages that retailers gain from operating within the metaverse:

Global customer reach

Retailers with a strong metaverse presence can engage consumers from diverse geographical locations, allowing for virtual interactions across borders (Donath, 1999). This means that retailers are not only dependent on local buyers like in traditional retail but also have opportunities to sell products to consumers from all over the world.

Higher price point for digital products

Digital goods in the metaverse have been shown to sell for higher prices than their physical counterparts which is enhancing profitability (Barry, 2021). Like in the case of the Gucci bag, some unique products can be sold for higher prices. This shows that digital products are significant to metaverse users, and they can spend a high amount of money on the appearance of their avatars or ownership of digital products.

Increased consumer engagement

Research indicates that consumers spend significantly more time in immersive environments, leading to greater engagement and a higher likelihood of making purchases compared to traditional or mobile e-commerce sites (Dogadkina, 2022). Metaverse retailers must focus on improving and enabling consumers new experiences which then increases consumer engagement and purchasing decisions

.

Opportunity for testing and co-creation with consumers

The metaverse provides a platform for retailers to test digital designs in virtual form before committing to physical production, opening opportunities for co-creation with customers (Anderson, 2022). Before launching products in physical stores, retailers can use data and insights from the metaverse to test consumer interest.

Enhanced collaboration between companies

The metaverse fosters an intense level of collaboration between many companies, offering unique opportunities for greater customer engagement than current social media and networking platforms (Yoo et al., 2023). Metaverse is an environment for companies that are open to collaboration and constant innovation.

Building trust with true ownership with NFTs
By leveraging blockchain technology, metaverse retailers create unique digital goods in the form of NFTs, providing consumers with true ownership of digital assets, which boosts engagement and builds trust (Ante, 2022). As in any form of retail, trust and transaction security play a crucial role in the metaverse.

2.2 Buying Behavior in Metaverse

The next chapter will explore how consumer behavior in the metaverse differs from traditional retail or e-commerce experiences. As a result, retailers must proactively adopt metaverse technologies to enhance brand visibility and foster customer loyalty (Bruni et al., 2023). In an increasingly competitive market, innovative engagement strategies and precise customer segmentation are essential. To remain competitive, businesses must embrace innovation, adapt swiftly, and rethink the customer journey experience (Tavman, 2024).

In the previous chapter, the differences between traditional and metaverse retailing were explored. It is essential to understand that purchasing products in the metaverse goes beyond simple consumption; it involves experiencing products within a three-dimensional environment. Metaverse retailing offers hyper-personalized and uniquely tailored experiences (Tavman, 2024). Additionally, a key aspect of this environment is that all interactions and engagements are carried out through avatars, which adds a new layer of identity, social presence, and emotional involvement (Gadalla et al., 2013). In addition to immersive experiences and social interaction, an important factor influencing customer behavior in the metaverse is the use of payment gateways and digital currencies for transactions within this new virtual realm. According to Bruni et al. (2023), while pricing will continue to play a central role, as it does in traditional retailing, the nature of the metaverse and the diversity of available payment systems may introduce new dynamics.

To analyse and define buying behavior in the metaverse, scholars such as Gleim et al., 2025 and Yoo et al., 2023 utilize the customer journey map. The customer journey map is typically divided into three phases: pre-purchase, purchase, and post-purchase. Within each of these stages, there are key touchpoints that signify moments of interaction between the consumer and the brand (Gleim et al., 2025).

Figure 16: Key areas of customer journey map in metaverse

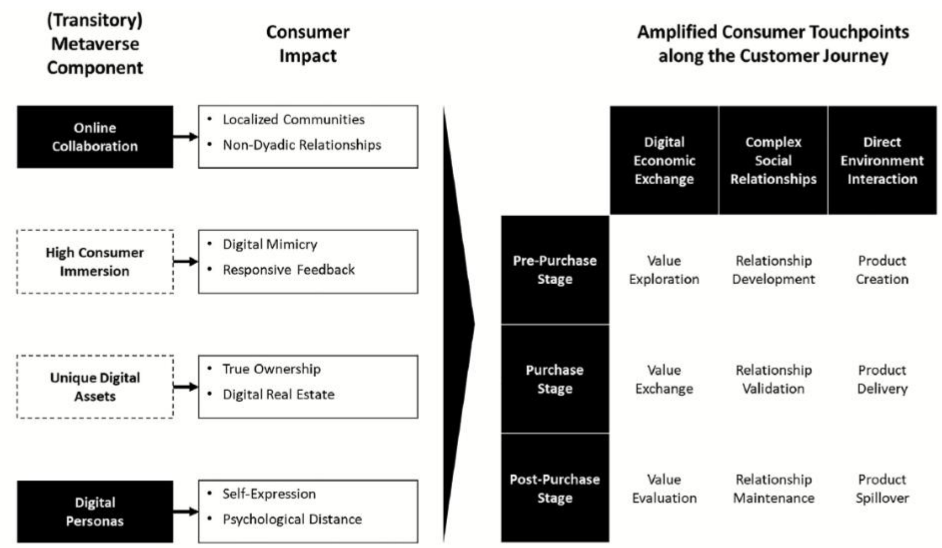
Pre-purchase	Purchase	Post-purchase
Self-Expression & engagement	Service script disruption	Unboxing
Social Influence	Hyper-Personalized experiences	Product evaluation
Risk and uncertainty avoidance	The disruption of scarcity and NFTs	Customer engagement and advocacy

Source: Gleim et al. (2025)

Figure 16 outlines the new key areas that should be integrated into the customer journey map for metaverse retailers aiming to identify the main consumer touchpoints. While the core structure of the customer journey map remains consistent with traditional retail, Gleim et al. (2025) point out that the specific phases and key elements within each stage differ in the metaverse. Pre-purchase phase in the metaverse is characterized by heightened self-expression through avatars, allowing for personalized engagement and fostering a stronger connection between the retailer and the consumer (Schweidel et al., 2022). Additionally, the metaverse offers opportunities for interaction with friends, family, employees, and other customers, effectively mirroring the social aspects of in-store shopping. When making a purchase, risk and uncertainty regarding product quality are major considerations. Metaverse environments mitigate these concerns by enabling consumers to view products in digital form, try them on their avatars, or even test items (Hilken et al., 2022). For example, IKEA furniture in a virtual home setting significantly reduces the likelihood of dissatisfaction with the purchase (Hilken et al., 2022). In the purchase phase, it is crucial to recognize that the metaverse disrupts the traditional methods of product purchase familiar to consumers. As a result, metaverse retailers must deliver distinctive value to encourage consumers to adapt to this new purchasing model (Gleim et al., 2025). Unlike physical retail, product creation in the metaverse does not rely on natural resources. Instead, retailers often employ NFTs to introduce "artificial scarcity" (Belk et al., 2022). Recent studies suggest that NFTs influence consumer perception by emphasizing uniqueness, and a sense of irreplaceability associated with digital products (Ante, 2022). The post-purchase phase is a critical component in fostering long-term relationships, trust, and brand loyalty (Gleim et al., 2025). While the metaverse currently lacks the tangible unboxing experience, Polyviou and Pappas (2023) argue that unboxing plays a significant role in enhancing the post-purchase phase, as it contributes to a more memorable and emotionally engaging experience. These moments are particularly important in the metaverse, where consumers are unable to evaluate product quality and reliability in the same way as in traditional shopping environments, such as physical testing or inspection (Tan et al., 2022).

Yoo et al. (2023) introduced a new customer journey map that integrates three key touchpoints such as digital economic exchange, complex social relationships, and direct environmental interaction across the pre-purchase, purchase, and post-purchase phases. This model emphasizes core metaverse elements such as online collaboration, deep consumer immersion, unique digital assets, and avatars. Across all three phases, it is crucial to focus on adding value for the consumer, building strong relationships, and creating both products and immersive experiences effectively (Yoo et al., 2023).

Figure 17: Consumer impact of metaverse components and amplification of customer journey touchpoints



Source: Yoo et al. (2023)

According to Chen et al. (2024), application developers and managers should design virtual worlds in a way that minimizes the distinction between real and digital spaces while offering unique, immersive experiences to consumers. Store atmosphere has long been recognized as a strategic factor for both physical and online retailers (Roberts and Grassi, 2021). Consequently, it is expected to be equally significant in metaverse retailing, where immersive environments can enhance consumer engagement. Moreover, metaverse stores enable more enjoyable shopping experience by delivering personalized interactions tailored to individual preferences (Alawadh and Barnawi, 2025). However, creating an effective store atmosphere in the metaverse presents a challenge for retailers (Roberts and Grassi, 2021). Due to this complexity, the next chapter explores various stimuli that may influence consumer purchase intentions in virtual shopping spaces.

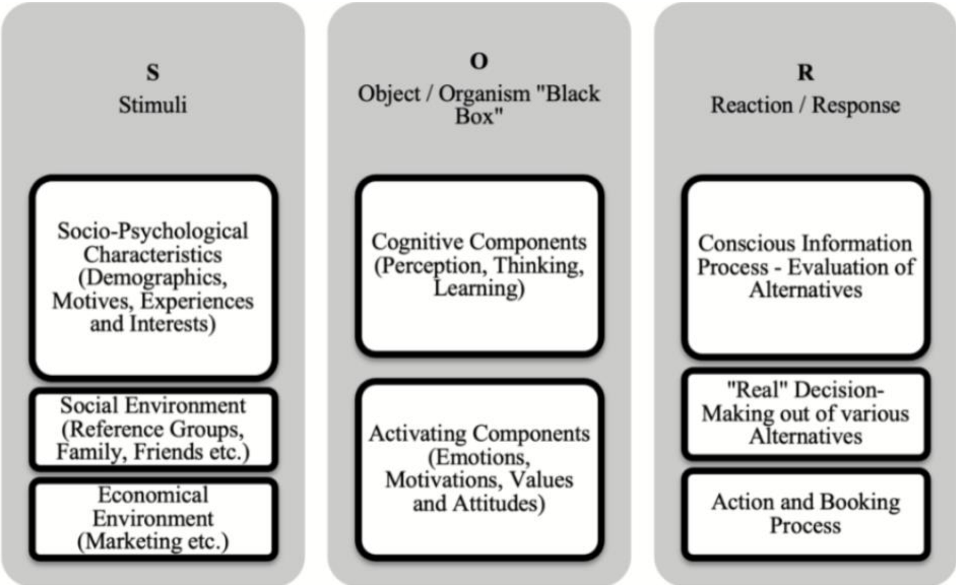
2.3 Factors Influencing Consumers' Purchase Intention

As outlined in the introduction, this thesis researches the factors influencing consumer purchase intention in the metaverse. This chapter explains the Stimulus-Organism-Response (S-O-R) paradigm to provide a structured analysis. Within this model, the stimuli consist of factors such as effectiveness, vividness, and interactivity. These stimuli impact the organism, represented by telepresence, reflecting the user's psychological sense of being present in a virtual environment. As a result of this interaction, the responses such as arousal and ultimately purchase intention emerge as behavioral and emotional outcomes.

2.3.1 The Stimulus-Organism-Response (S-O-R) Framework

The S-O-R framework is used for a better and deeper psychological understanding of consumer behavior (Islam and Rahman, 2017). The S-O-R framework suggests that consumers' behavior and feelings are influenced by external stimuli. Based on those feelings, consumers have different responses whether they are conscious or unconscious of them (Hochreiter et al., 2023). As Figure 18 shows in the S-O-R framework, there are three main stages: stimulus, organism, and response (Hochreiter et al., 2023). Stimuli refer to both external and internal inputs such as marketing signals, social influences, and individual traits like demographics or motives that trigger initial consumer attention. These stimuli are processed by the organism, representing the individual's internal state, where cognitive and emotional evaluations occur and attitudes toward the stimulus are formed. Finally, the response stage involves conscious information processing that leads to specific behavioral outcomes, such as a purchasing decision (Hochreiter et al., 2023). S-O-R framework is beneficial in explaining consumer behavior, especially in a complex virtual environment such as the metaverse (Jafar et al., 2023). S-O-R framework more comprehensively considers the impact of external stimuli on the organism's internal state and its behavioral response (Zhang et al., 2025). Based on the previously described S-O-R framework, it is evident that this model aligns well with the objectives of the thesis. The research focus on external stimuli such as vividness, effectiveness, and interactivity and their relationship with telepresence and consumer responses. The S-O-R framework is particularly suitable because it captures the psychological mechanisms underlying consumer behavior in immersive digital environments, making it highly relevant for studies involving the metaverse (Kumari, 2022). Similar studies have successfully applied this framework to explore purchase intentions in the metaverse context, including Zhang et al. (2025), who examined the automotive industry, and Jafar et al. (2023), who investigated consumer behavior within virtual retail environments.

Figure 18: The stimulus-organism-response (S-O-R) framework



Source: Hochreiter et al. (2023)

2.3.2 Stimulus

As previously noted, metaverse is a highly immersive and interactive environment that blends digital experiences with real-time social and commercial engagement (Papagiannidis et al., 2008). Understanding influences such as vividness, interactivity, and perceived effectiveness can offer valuable insights for marketers and developers aiming to optimize the user experience and drive purchasing behavior in the metaverse (Jafar et al., 2023).

Vividness

The first stimulus examined in this study is vividness, which, in the context of the metaverse, refers to a platform's capacity to deliver a multisensory and highly detailed virtual experience (Steuer, 1992). Vividness is conceptualized as the degree of sensory richness a mediated environment can provide, often described through attributes such as realness, realism, and richness (Shi et al., 2025). These elements contribute to how clearly and convincingly users perceive and interact with virtual stimuli. In immersive environments, vividness plays a foundational role in shaping users' perceptions of presence and engagement. For example, Bogicevic et al. (2019) suggest that highly vivid visual imagery enhances the clarity and intensity of the environment, improving its perceived realism and quality. Similarly, Vazquez et al. (2023) argue that vivid depictions of products and surroundings encourage deeper cognitive processing, emotional engagement, and decision-making. Cheng et al. (2014) further demonstrated that vividness can exert up to three times the influence of interactivity in evoking strong telepresence sensations in virtual reality settings. In the metaverse, where immersion and social presence are critical, vividness supports the user's sense of belonging and emotional connectedness, reinforcing both individual and collective experiences (Zhang et al., 2025).

Therefore, when users encounter vivid digital environments, their immersion deepens, allowing telepresence to emerge more naturally and powerfully. Accordingly, we propose the following hypothesis:

H1. Vividness has a positive effect on users' sense of telepresence in the metaverse.

Interactivity

The second stimulus explored in this study is interactivity, which in the metaverse context refers to the user's ability to dynamically manipulate, explore, and respond to virtual environments through real-time engagement (Guertin-Lahoud et al., 2023). Interactivity is distinctively characterized by the use of avatars, which serve as personalized digital representations that empower users to make autonomous decisions, navigate freely, and immerse themselves in multisensory digital content (Fadhel et al., 2024). Drawing from Shi et al. (2025), interactivity enhances user control over virtual elements, thereby contributing to increased enjoyment and perceived agency within immersive platforms. Similarly, Inmor et al. (2024) conceptualize interactivity as a measure of technological responsiveness enabling users to engage with virtual spaces in a fluid, dynamic manner. Verma et al. (2022) emphasize that real-time interactions and richly detailed virtual representations foster more meaningful decision-making processes, elevating user involvement. Steuer (1992) further underscores how interacting via avatars enhances the user's sense of autonomy and telepresence, the psychological state of feeling physically present in a non-physical world. Interactivity also influences consumer behavior more profoundly by strengthening emotional connections to the virtual space, which in turn intensifies brand engagement and purchase intention (Bruni et al., 2023).

Thus, when users encounter highly interactive metaverse systems those that are responsive, customizable, and socially engaging their immersion deepens, and the conditions necessary for telepresence are effectively cultivated. Accordingly, we hypothesize that:

H2. Interactivity has a positive effect on users' sense of telepresence in the metaverse.

Effectiveness

The final stimulus investigated in this study is effectiveness, which in the metaverse context encompasses the platform's ability to fulfil user goals and deliver meaningful outcomes within an immersive digital environment (Kounavis et al., 2012). Effectiveness extends beyond the mere operational functionality of the technology it is fundamentally concerned with whether the environment enables users to achieve their intended objectives in a seamless, engaging, and goal-aligned manner. Drawing on Kounavis et al. (2012), effectiveness can be evaluated through two critical lenses: "Is this the right thing to do?" and "Does it contribute to the broader purpose?" While their research focused on mobile AR in tourism, these evaluative dimensions are directly transferable to the metaverse. At a deeper psychological level, effectiveness fosters a sense of user agency and intentionality, both of which are essential for sustaining immersion. This immersion is a critical pathway through which users begin to experience telepresence, or the psychological state of 'being there' in a virtual environment (Jafar et al., 2023). Thus, when users perceive a metaverse system as effective, i.e., when it aligns with their goals, reduces cognitive load, and delivers expected outcomes their engagement deepens, and their attentional focus shifts fully into the virtual world. This facilitates the cognitive and emotional conditions necessary for telepresence to emerge. Accordingly, we hypothesize that:

H3. Effectiveness has a positive effect on users' sense of telepresence in the metaverse.

2.3.3 Organism

In this chapter, the organism component of the S-O-R paradigm is represented by the concept of telepresence. Telepresence acts as a mediator between external stimuli such as vividness, interactivity, and effectiveness and the corresponding responses, including arousal and consumer purchase intention.

Telepresence

Telepresence refers to the extent to which individuals experience a sense of "being there" in a virtual space rather than in their physical surroundings (Steuer, 1992). Telepresence reflects a psychological state in which users feel immersed and present within a digital environment, perceiving it as realistic, meaningful, and engaging (Yang and Zhang, 2022). This perception is shaped by multiple factors, including the use of avatars, which influence self-presence and the feeling of transportability into virtual settings (Christy and Fox, 2016), as well as the richness of sensory inputs such as visuals and sound that envelop the user. Importantly, telepresence is not only a product of immersive design but also of the underlying technological infrastructure, which can enhance or constrain the depth of the experience (Zeng et al., 2020). When such conditions are met, users begin to perceive minimal differences between physical and digital realities, resulting in greater satisfaction with the environment and stronger engagement (Shi et al., 2025). Within the metaverse, interactivity, vividness, and effectiveness have been found to amplify the feeling of telepresence, which fosters favourable consumer responses such as higher purchase intentions (Jafar et al., 2023).

In this way, telepresence emerges as a critical psychological mechanism through which metaverse experiences shape consumer behavior. It not only deepens immersion but also intensifies emotional reactions, creating the cognitive and affective conditions for arousal to arise. Accordingly, we hypothesize that:

H4. Telepresence positively influences consumers' feelings of arousal.

H5. Telepresence positively influences consumers' purchase intentions in the metaverse.

2.3.4 Response

The response phase follows the experience of external stimuli that trigger various emotions in metaverse users, ultimately guiding them toward desired outcomes. In this context, external stimuli such as vividness, interactivity, and effectiveness elicit a sense of telepresence. This heightened sense of immersion is expected to lead to desirable responses, specifically increased emotional arousal and a stronger purchase intention among consumers in the metaverse.

Arousal

The following construct examined in this study is arousal, a central concept in psychophysiology that reflects the body's underlying physical and neurological activity supporting cognitive, emotional, and behavioral processes. Arousal forms the foundation of emotions, motivation, information processing, and subsequent behavioral responses (Groeppel-Klein, 2005). According to Groeppel-Klein (2005), arousal can be distinguished into two forms: tonic arousal, which reflects a stable and sustained state of alertness that shifts gradually under prolonged or intense stimulation, and phasic arousal, which arises as a short-term response to specific stimuli, closely linked to attention and immediate readiness to act. Within consumer behavior, phasic arousal has been shown to be particularly relevant, as it influences decision-making and approach behaviors, including the time and money consumers are willing to spend at the point of sale (Boucsein, 2001). When combined with positive affect, heightened emotional arousal is often expressed as excitement, attraction, and enthusiasm, ultimately encouraging greater engagement and purchase activity (Herabadi et al., 2009). Moreover, research has long emphasized that consumers actively seek arousal as part of the consumption experience itself (Rodríguez-Ardura et al., 2025). Environmental factors, such as store design and atmosphere, have been found to directly stimulate arousal, which in turn shapes purchasing intentions (Groeppel-Klein and Baun, 2001).

While much of this evidence stems from physical retail contexts, similar mechanisms are expected to operate in metaverse environments. Accordingly, we hypothesize that:

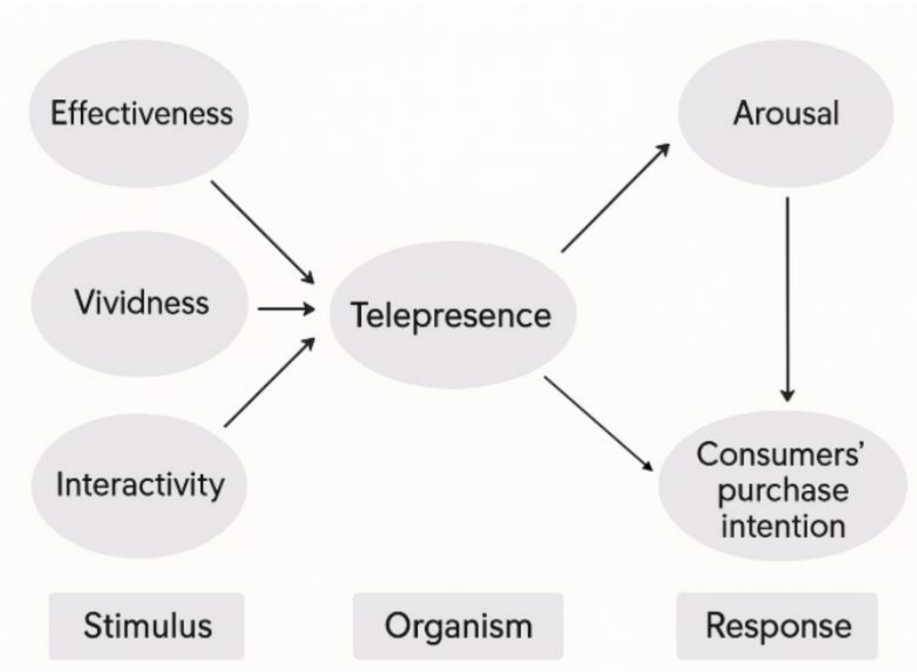
H6. Higher emotional arousal positively influences users' purchase intentions in the metaverse.

Consumers' purchase intention

Purchase intention can be understood as a consumer's subjective tendency to choose and acquire a product, which reflects both their willingness and the perceived possibility of making a purchase (Jia and Liu, 2018). It is shaped by internal factors such as attitudes toward specific products and brands, as well as by external influences including price, service quality, and the online shopping environment (Jia and Liu, 2018). In digital commerce settings consumers' willingness to purchase is often formed through interactions with online platforms, product presentations, and peer reviews (Lin and Shen, 2023). Purchase intention serves as a valuable tool for evaluating the potential of new distribution channels, enabling managers to assess whether a given concept warrants further development and to identify the most suitable geographic markets and consumer segments (Peña-García et al., 2020). Their significance lies in the fact that purchase intentions are widely regarded as one of the most reliable predictors of actual consumer behavior (Peña-García et al., 2020). According to Jafar et al. (2023) technology-enhanced experiences within the metaverse strengthen consumers' sense of telepresence while simultaneously increasing their intention to shop in metaverse environment.

Guided by the S-O-R framework and the formulated hypotheses, the thesis's conceptual model has been constructed, as shown in Figure 19.

Figure 19: Conceptual model of buying behavior in metaverse



Source: Author's work

3 Methodology

Following the literature review on the metaverse, with a particular focus on consumer behavior, an empirical study was conducted to gain deeper insights into the current trends and future potential of buying behavior within metaverse environment. The empirical part explores the consumer viewpoint through an online survey. Before presenting the results, this chapter outlines methods of data collection and analysis, and the overall implementation of the empirical study.

3.1 Methods of Data Collection

As mentioned in the Introduction part, the objective of this study is to analyse the factors influencing consumer purchase intention within the metaverse, focusing on how virtual environment characteristics affect users' psychological and emotional responses that lead to purchase intentions. To answer the research questions (see chapter Introduction) and test the hypotheses (see chapter Factors Influencing Consumers' Purchase Intention) a self-administered online questionnaire was used. The questionnaire was created in Google Forms and designed to explore the relationships between vividness, interactivity, effectiveness, telepresence, arousal, and purchase intention in the metaverse environments, based on the S-O-R framework. The online questionnaire was introduced with a short introductory statement explaining the purpose and ethical framework of the research. The questionnaire was anonymous and entirely voluntary; there was no financial or material compensation for completing it. It consisted of two main sections. The first section contained 23 statements measuring the six research constructs (vividness, interactivity, effectiveness, telepresence, arousal, and purchase intention) using a five-point Likert scale (see Appendix A) ranging from 1 (strongly disagree) to 5 (strongly agree). Each construct formed a separate subsection to ensure conceptual clarity. Before presenting the statements, each construct was defined and accompanied by an example to illustrate its meaning. The questionnaire was designed and conducted in English. The second section gathered respondents' demographic information; including gender, age, education, income level, and metaverse usage patterns (duration of use, preferred platforms, and main activities in the metaverse). The second part of the questionnaire consisted of closed-ended questions, allowing respondents to select either a single answer or multiple choices, depending on the nature of the question. A filter question at the beginning ensured that only participants with prior metaverse purchasing experience continued to the main part of the survey. All questions were mandatory to guarantee data completeness, and two attention-checking questions were placed strategically within the survey. Attention-checking questions are recommended in online survey research to detect satisficing and careless responding, which otherwise inflate measurement error and reduce statistical power (Muszyński, 2023). In the study *Exploring the Adverse Effects of the Metaverse on Users' Psychological Well-Being and Self-Esteem: A Mixed-Methods Study*, Jia and Mvondo (2024) employed attention-check questions to identify and exclude potential automated bot participants. Completing the questionnaire took approximately five to seven minutes. At the end of the survey, respondents were asked to provide feedback on the overall quality of the questionnaire, including one open-ended question. The questionnaire was inspired by and adapted from several empirical studies investigating digital consumer behavior, including Tilahun et al. (2023), Kim and Ko (2019), Han et al. (2020) and more. A pilot test was conducted between September 25 and September 30, 2025, to ensure the instrument's clarity, reliability, and suitability for the main study. The primary objective of this pilot test was to evaluate the validity and comprehensibility of the survey, identify potential difficulties respondents might encounter, and estimate the time and effort required to complete it. The standardized questionnaire was distributed to a group of nine participants, who were subsequently asked to provide detailed feedback on content and structure of the questionnaire. Their comments led to several improvements, including rewording unclear items and correcting minor typographical errors necessary to enhance precision and respondent understanding. For example, the item "*While experiencing the metaverse environment, I felt I was inside the world it created*" was revised to *"While experiencing the metaverse environment, I felt I was in the world metaverse created"* to make the meaning clearer for respondents. Some of the typographical errors that were corrected *"enviroment"* to *"environment"* and *"overall experince"* to *"overall experience"*.

The questionnaire was disseminated to the public, and data were collected over a one-month period, from October 1 to October 31. In total, 138 completed questionnaires were obtained. However, 5 questionnaires were not used because respondents had no experience in buying products in the metaverse. The distribution strategy involved sharing the survey across several online platforms, including Facebook, LinkedIn, Discord, and Roblox. These online communities were selected based on their thematic relevance, as they primarily focused on the metaverse, NFTs, gaming, and VR. All groups were active and consisted of larger number of participants ranging from one thousand to half a million. Table 3 provides the number and name of groups in which the questionnaire was distributed. In total, the survey was submitted to 19 Facebook groups; however, due to administrative restrictions, 13 posts were rejected, resulting in successful publication in 6 groups. On Roblox, the questionnaire was distributed among 11 communities, including those representing brands such as Adidas, Nike, H&M, Walmart, and Ikea. Similarly, the survey was shared with 9 LinkedIn groups, of which 4 administrators approved the post. Additionally, the questionnaire was disseminated within 6 Discord communities related to digital technologies and virtual environments. Furthermore, the questionnaire was shared on personal social media platforms and WhatsApp groups with friends and acquaintances, who were asked to complete the survey if they had experience purchasing from metaverse.

Table 3: Metaverse groups and communities

Platform	Number	Groups / Communities
Facebook	6	Multivers Official; Metaverse; Explore the Metaverse – The Road to Gold Digging; Metaverse Worlds; Metaverse Project; Metaverse NFT World
Roblox	11	Adidas; Blue Loc Rivals; NFT Never Fold to Anything; NFT; NFT Games; IKEA Group; Fenty Beauty Experience; Nike Clothing; Walmart; H&M; Zara
LinkedIn	4	Spatial Computing, AR, VR, MR, Metaverse; Reality Innovators Network for Spatial Computing, Metaverse, AI & XR – Virtual & Augmented Reality; Gaming: Esports, Music & Fashion; Media & Entertainment – Video, Audio, Image, Music, Film, Radio, Magazine, Books, Gaming, Metaverse, VR, AR, XR
Discord	6	Metaverse HQ; Reality Metaverse; Decent World Metaverse; The Sandbox; CZ/SK Community; Decentraland

Source: Author's work (2025)

The questionnaire was posted twice in each group, typically on Sundays between 10:00 a.m. and 1:00 p.m., or between 6:00 p.m. and 8:00 p.m., as these time intervals were identified as periods of higher online activity. On LinkedIn, the questionnaire was published on Tuesdays and Thursdays around 4:00 p.m. to maximize visibility and engagement among professional users (Morales, 2024).

3.2 Methods of Data Analysis

The data collected through the questionnaire survey were first subjected to a systematic pre-processing procedure. Incomplete, inconsistent, or otherwise invalid responses were removed, and all variables were checked for correct coding, missing values, and admissible value ranges. Data cleaning, editing, and construction of the final analytical dataset were carried out in Microsoft Excel. The data gathered from the Likert scale were organized into six constructs, with individual questions serving as the items within each construct. For the development of these constructs and their items see Appendix A. In the initial stage of the analysis, the dataset was examined for the presence of common method bias (CMB). CMB refers to systematic variance that stems from the measurement method (e.g. a single self-report questionnaire) rather than from the underlying constructs, which may artificially inflate or attenuate relationships between variables (Kock et al., 2021). To evaluate this risk, Harman's single-factor test based on exploratory factor analysis (EFA) was conducted in the Jamovi statistical software. All measurement items were entered into an unrotated one-factor solution. In line with Kock et al. (2021), CMB is considered unproblematic when the first factor accounts for less than 50% of the total variance and the factor solution is clearly multidimensional. In case this condition is met, CMB is unlikely to represent a serious threat to the validity of the results. Subsequently, variance inflation factors (VIF) were examined to assess linear dependencies among predictors and to provide an additional check on potential method bias. VIF quantifies the extent to which the variance of a regression coefficient is inflated due to multicollinearity with other predictors; lower values therefore indicate more stable estimates (O'Brien, 2007). Following common recommendations, VIF values below approximately 3.3 were taken as acceptable for common method bias and multicollinearity diagnostics (O'Brien, 2007). After these diagnostic checks, descriptive statistics were computed in Excel to characterize the sample of metaverse users. The analysis focused on socio-demographic characteristics and usage patterns, including income levels, motivations for using the metaverse, and the main metaverse platforms and activities reported by respondents. After completing the descriptive statistics, the data gathered from the Likert scale into six constructs were used for the core analytical method employed, which is Partial Least Squares–Structural Equation Modelling (PLS-SEM), implemented in SmartPLS4 software. PLS-SEM is a variance-based SEM approach that represents latent constructs as linear composites of their indicators and uses all available variance in the data to estimate relationships between constructs (Hair and Alamer, 2022). It is particularly appropriate when the primary objective is explanation and prediction of key outcomes, when the structural model is complex with many constructs, indicators, mediators or higher-order constructs, and the sample size is limited (Hair and Alamer, 2022). Following Hair and Alamer (2022), the PLS-SEM analysis proceeded in two main stages: assessment of the measurement (outer) model and assessment of the structural (inner) model.

For the reflective constructs used in this study, the measurement model was evaluated by inspecting:

- Factor loadings: Factor loadings represent the correlation between an item and its latent construct. Loadings above approximately 0.30 are generally considered to indicate at least a moderate relationship (Tavakol and Wetzel, 2020), while higher values are preferred in SEM applications.
- Cronbach's alpha (CA): CA assesses the internal consistency of a scale, that is, the extent to which all items measure the same construct. Values between 0.70 and 0.95 are commonly regarded as acceptable (Tavakol & Dennick, 2011).
- Composite reliability (CR): CR evaluates the reliability of a construct in structural equation modelling by considering the different loadings of the items. Reliability coefficients above 0.70 are generally judged to be satisfactory (Sujati et al., 2020).
- Convergent validity (AVE): Convergent validity was assessed using the average variance extracted (AVE), which reflects the degree to which a construct explains the variance of its indicators. AVE values of 0.50 or higher indicate that a construct explains at least half of the variance of its indicators and are typically taken as evidence of adequate convergent validity (Sujati et al., 2020).

- Discriminant validity (HTMT): Discriminant validity was examined using the heterotrait–monotrait ratio of correlations (HTMT), an estimator of the correlation between two latent variables based on the multitrait–multimethod matrix. Recommended threshold values range from 0.85, considered a conservative benchmark, to a more liberal cut-off of 0.90 which was used in this thesis (Roemer et al., 2021).

The structural model was then assessed by examining:

- Collinearity among predictors, using VIF values;
- Magnitude and statistical significance of path coefficients, estimated via bootstrapping with 5,000 subsamples (Hair & Alamer, 2022);
- Explained variance (R^2) of endogenous constructs as an indicator of in-sample predictive power. The coefficient of determination (R^2) represents the proportion of variance in an endogenous construct that is explained by its predictor constructs in the structural model. In PLS-SEM, higher R^2 values indicate greater explanatory power, although R^2 does not capture out-of-sample predictive performance (Sarstedt et al., 2021). R^2 values between 0.31 – 0.50 have a moderate explanatory power and above 0.50 strong explanatory power (Hair and Alamer, 2022).

In addition, global model fit indices such as the standardized root mean square residual (SRMR) were reported (Hair and Alamer, 2022). The lower the value is, the better the model fit, according to Dash and Paul (2021) value of up to 0.08 is considered acceptable. The processed data and all empirical results are presented in the following chapter, together with graphical visualisations and substantive interpretations. The choice of analytical procedures was made based on existing empirical research on consumer behavior and purchase intention in metaverse. In particular, the methodological approach draws on studies such as *Exploring Purchase Intention in Metaverse Retailing: Insights from an Automotive Platform* (Zhang et al., 2025), *Telepresence, Time Distortion, and Consumer Traits of Virtual Reality Shopping* (Han et al., 2020), and *Unfolding the Impacts of Metaverse Aspects on Telepresence, Product Knowledge, and Purchase Intentions in Metaverse Stores* (Jafar et al., 2023), which provided a relevant conceptual and methodological framework for the present analysis.

4 Results

This chapter presents the key findings derived from the empirical data analysis. First, descriptive statistics are reported, providing an overview of the sample in terms of respondents' age, income, gender, primary ways of interacting with the metaverse, and the main platforms they use. Subsequently, the results of the PLS-SEM analysis are introduced and interpreted regarding the proposed research model and hypotheses.

4.1 Descriptive Statistics

The final sample consists of 133 respondents whose key sociodemographic characteristics are summarised in Table 4. In terms of gender, the distribution is relatively balanced, with 52.6% female and 47.4% male participants. Although this suggests that engagement with virtual worlds and gaming is not exclusively male dominated, the composition of the sample may also reflect that female users are more open and willing to participate in the online surveys. The age profile of the sample is clearly skewed towards younger adults: 54.1% are between 18 and 30 years old and a further 29.3% are aged 31–40, while respondents aged 41–50 and 51+ each account for only 8.3%. This concentration of younger users is not surprising given the nature of the technology, but it limits the ability to generalise the findings to older segments of the population, who may have different expectations, adoption barriers and risk perceptions regarding the metaverse. So, sample data mainly capture the views of digital natives and early middle-aged users, who grew up or matured with digital technologies. From an educational perspective large majority of users hold at least a bachelor's degree or post-graduate qualification, while only 15.0% report high school and 1.5% middle school as their highest education. Similarly, the largest share of respondents report monthly incomes between $1001 and $2000, with a substantial proportion earning $2001–$3000 or more than $3000. This pattern suggests that the sample leans towards highly educated and financially better-off users, who are likely to have greater access to technology, higher digital literacy and more sophisticated expectations regarding metaverse experience. As a result, they may have more demanding expectations regarding usability, security or immersion and at the same time be less price-sensitive than average consumers. Majority of respondents have been using metaverse for one to three years or more than three years, with only 18% being relatively new users. This high level of prior exposure is adequate for studying detailed behavioral responses; therefore, the results primarily reflect the perceptions of existing, committed users rather than the broader population of potential or hesitant early adopters.

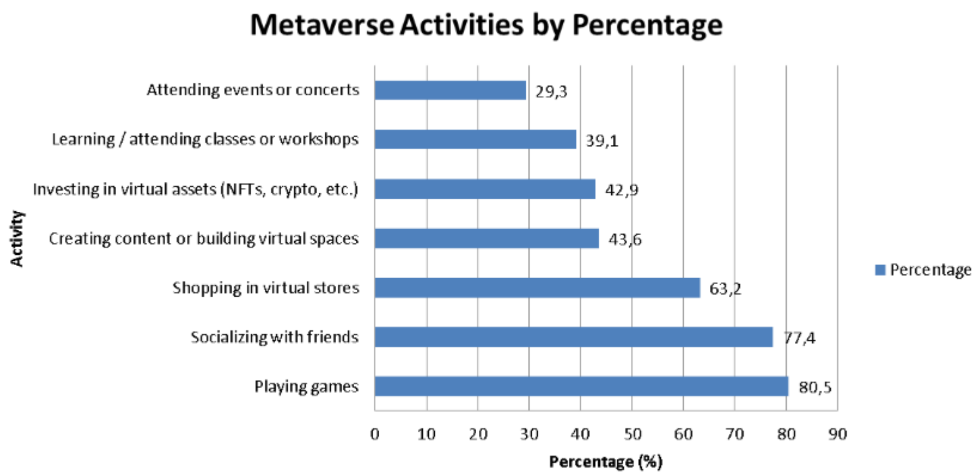
Table 4: Respondent's descriptive statistics

Category	Frequency	Percentage
Experience with metaverse		
Yes	133	96%
No	5	4%
Gender		
Female	70	52.6%
Male	63	47.4%
Age Category		
18–30	72	54.1%
31–40	39	29.3%
41–50	11	8.3%
51 and above	11	8.3%
Education Level		
Postgraduate	32	24.1%
Bachelor	79	59.4%
High school	20	15.0%
Middle school	2	1.5%
Income Category		
0–500$	15	11.3%
501–1000$	27	20.3%
1001–2000$	36	27.1%
2001–3000$	27	20.3%
More than 3000$	28	21.1%
Years using metaverse		
Less than 1 year	24	18%
Between 1 and 3 years	75	56%
More than 3 years	34	26%

Source: Author's work (2025)

Figure 20 illustrates the distribution of respondents' engagement in various metaverse activities. Overall, the pattern confirms that entertainment-oriented and socially interactive uses of the metaverse dominate the sample. The most frequently reported activity is playing games followed closely by socialising with friends, indicating that respondents primarily perceive and use the metaverse as a leisure and social interaction space rather than as a transactional or productivity environment. This is crucial when designing environments that aim to strengthen users' purchase intentions and shape their buying behavior. Users primarily seek to enjoy the experience, explore and purchase items for their avatars, and engage in social interactions with others. Commercial and creative activities are also present, but clearly secondary. Shopping in virtual stores is reported as primary activity by 63.2% of respondents and represents the third most frequent activity, which is highly relevant for this thesis. At the same time, this indicates that there is considerable potential for brands to attract new customers and position shopping as a primary activity within the metaverse. Creating content or building virtual spaces and investing in virtual assets such as NFTs or crypto currency show only moderate levels of engagement. These proportions suggest that, within this sample, users are more often consumers than creators or investors. Consequently, the behavioral patterns identified in this study are likely to reflect the perspective of entertainment- and consumption-oriented users rather than professional creators, developers or heavy crypto-investors, which should be taken into account when interpreting the results.

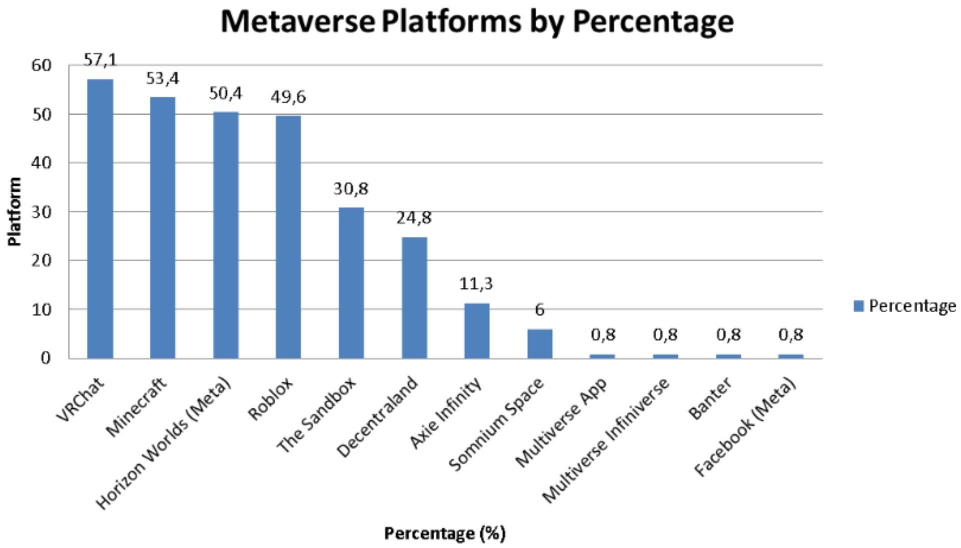
Figure 20: Metaverse activities



Source: Author's work (2025)

Figure 21 shows that respondents' activity is heavily concentrated in a few dominant, socially oriented metaverse platforms rather than being evenly spread across the broader ecosystem. VRChat and Minecraft emerge as the clear frontrunners, with Horizon Worlds and Roblox also attracting around half of the sample. This concentration suggests that, in practice, metaverse for most users still means familiar, game-like social worlds with strong community features and abundant user-generated content, rather than the more visionary, decentralised environments often highlighted in industry discourse. This is not surprising, as the results above already show that users are predominantly from a younger generation that engages with the metaverse mainly for gaming and social interaction. By contrast, engagement with specialised or blockchain-based platforms remains limited. The Sandbox and Decentraland are represented by only a minority of users, while other platforms barely register. This pattern indicates that Web3- and crypto-focused worlds are still peripheral and may be perceived as more complex, speculative or less entertaining than mainstream social-gaming platforms. Behavioral insights derived from this sample therefore primarily capture experiences within a few established ecosystems, and may not translate to users who engage with niche, experimental or investment-driven platforms, whose motivations can be more financial, technical or professional than purely entertainment- and leisure-oriented.

Figure 21: Metaverse platforms



Source: Author's work (2025)

4.2 CMB and VIF Analysis

The CMB diagnostics indicated that the first factor (*VIV1-The visuals of the metaverse environment were rich*) explained 47.2% of the total variance, which is below the commonly used 50% threshold for problematic common method bias. According to Harman's single-factor test, CMB is considered a concern if a single factor accounts for more than 50% of the total variance (Kock et al., 2021). This result suggests that no dominant single-factor structure is present; the items are not substantially biased by a single common source such as the measurement method or the use of one self-report questionnaire. Data are therefore suitable for PLS-SEM and subsequent analyses. Furthermore, VIF was calculated. All VIF values were below recommended cut-off of 3.3 (O'Brien, 2007). This indicates that multicollinearity is not problematic, the predictors are not excessively correlated, and the structural coefficients are unlikely to be biased. In terms of VIF diagnostics, the study does not exhibit serious multicollinearity among items within any factor.

4.3 PLS-SEM

This chapter presents the results of the PLS-SEM analysis used to examine how metaverse design features shape telepresence, emotional arousal and consumers' purchase intentions. The analysis proceeds in two steps. First, the measurement model is evaluated in terms of factor loadings, internal consistency reliability, convergent validity and discriminant validity for the six reflective constructs: vividness (VIV), interactivity (INT), effectiveness (EFN), telepresence (TEL), arousal (ARO) and purchase intention (PI). Second, the structural model is assessed, focusing on model fit, the explanatory power (R^2) of the endogenous constructs and the size and significance of the hypothesised paths. In this way, the chapter provides a comprehensive empirical test of the proposed S-O-R framework for consumer behavior in the metaverse environments.

The reflective measurement model was assessed using standardized factor loadings, which exceeded the recommended threshold of 0.30, indicating that the indicators share moderate variance with their latent constructs (Tavakol and Wetzel, 2020). For VIV and ARO, three items each loaded strongly all above 0.80, while VIV4 and ARO4 showed lower, but still acceptable loadings. INT, EFN, TEL and PI all exhibited consistently high loadings ranging from 0.745 to 0.925, further supporting the quality of the measurement. Across all constructs, AVE values exceed 0.50, indicating that each latent variable captures more than half of the variance of its indicators (Sujati et al., 2020). The few weaker items such as VIV4 and ARO4 still contribute to content coverage and do not reduce AVE below acceptable levels. Overall, the results support adequate to strong convergent validity for all reflective constructs in the model. All CA and CR values lie between 0.79 and 0.92, comfortably above the 0.70 threshold typically used to indicate acceptable reliability and below the upper limit of approximately 0.95, beyond which indicators may be considered overly redundant (Tavakol and Dennick, 2011). These results indicate that all scales exhibit good to very good internal consistency reliability. Constructs EFN and PI show very high composite reliability, suggesting that their indicators form highly cohesive and reliable scales.

Table 5: Measurement model

Construct	Item	Loading	VIF	CA	CR	AVE
VIV	VIV1	0.855	2.157	0.798	0.87	0.629
	VIV2	0.819	1.798			
	VIV3	0.858	2.126			
	VIV4	0.616	1.266			
INT	INT1	0.766	1.63	0.803	0.871	0.628
	INT2	0.81	1.76			
	INT3	0.764	1.451			
	INT4	0.829	1.806			
EFN	EFN1	0.793	1.822	0.877	0.915	0.731
	EFN2	0.863	2.299			
	EFN3	0.867	2.358			
	EFN4	0.892	2.539			
TEL	TEL1	0.838	2.023	0.828	0.886	0.661
	TEL2	0.843	1.916			
	TEL3	0.824	2.009			
	TEL4	0.745	1.453			
ARO	ARO1	0.863	2.125	0.790	0.864	0.62
	ARO2	0.86	2.064			
	ARO3	0.82	1.711			
	ARO4	0.569	1.225			
PI	PI1	0.826	1.713	0.862	0.916	0.785
	PI2	0.903	2.959			
	PI3	0.925	3.287			

Source: Author's work (2025)

Discriminant validity was assessed using the HTMT. The HTMT values show that some constructs are strongly, though not implausibly, related. For example, the relationships between ARO and INT, INT and TEL, and TEL and VIV indicate substantial but conceptually reasonable associations. Several construct pairs, however, exhibit relatively high HTMT values: VIV and ARO (0.893), INT and EFN (0.898), INT and VIV (0.860), PI and VIV (0.856), PI and EFN (0.878), and EFN and VIV (0.905). When a more lenient threshold of HTMT < 0.90 is used, as is common in marketing and information systems research, most pairs remain within acceptable bounds and only the relationship between effectiveness and vividness (0.905) lies at the margin (Roemer et al., 2021).

Table 6: HTMT

	ARO	INT	PI	EFN	TEL	VIV
ARO						
INT	0.737					
PI	0.825	0.774				
EFN	0.751	0.898	0.878			
TEL	0.780	0.686	0.799	0.772		
VIV	0.893	0.860	0.856	0.905	0.788	

Source: Author's work (2025)

Taken together, these results imply that the constructs can still be statistically distinguished, but they are not sharply separated. The stronger overlaps are conceptually plausible: respondents who perceive the metaverse environment as highly vivid are also likely to experience it as technically high-performing and to report stronger purchase intentions, which naturally produce high inter-construct correlations. Thus, discriminant validity can be regarded as largely acceptable when the 0.90 criterion is applied (Roemer et al., 2021). At the same time, the relatively high HTMT values especially for the pair EFN-VIV shows that users experience these aspects of the metaverse environment as closely interconnected rather than as entirely distinct dimensions.

Table 7: PLS bootstrap results

Total effects (direct + indirect)	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	2.5%	97.5%	Results
ARO -> PI	0.449	0.453	0.09	4.987	< 0.001	0.273	0.619	✓
INT -> ARO	0.037	0.055	0.096	0.381	0.703	-0.111	0.269	✗
INT -> PI	0.039	0.054	0.098	0.396	0.692	-0.123	0.262	✗
INT -> TEL	0.057	0.085	0.146	0.39	0.696	-0.17	0.401	✗
EFN -> ARO	0.246	023	0.115	2.137	0.033	0.003	0.45	✓
EFN-> PI	0.258	0.246	0.13	1.982	0.048	0.003	0.51	✓
EFN -> TEL	0.382	0.355	0.171	2.235	0.025	0.005	0.667	✓
TEL -> ARO	0.642	0.647	0.072	8.985	< 0.001	0.494	0.773	✓
TEL -> PI	0.676	0.674	0.077	8.789	< 0.001	0.504	0.804	✓
VIV -> ARO	0.201	0.207	0.088	2.284	0.022	0.047	0.392	✓
VIV -> PI	0.212	0.213	0.086	2.473	0.013	0.051	0.388	✓
VIV -> TEL	0.314	0.317	0.123	2.54	0.011	0.077	0.56	✓

Notes: SRMR – standardized root mean square residual = 0.065. $p < 0.05$. ✓ = supported, ✗ = not supported

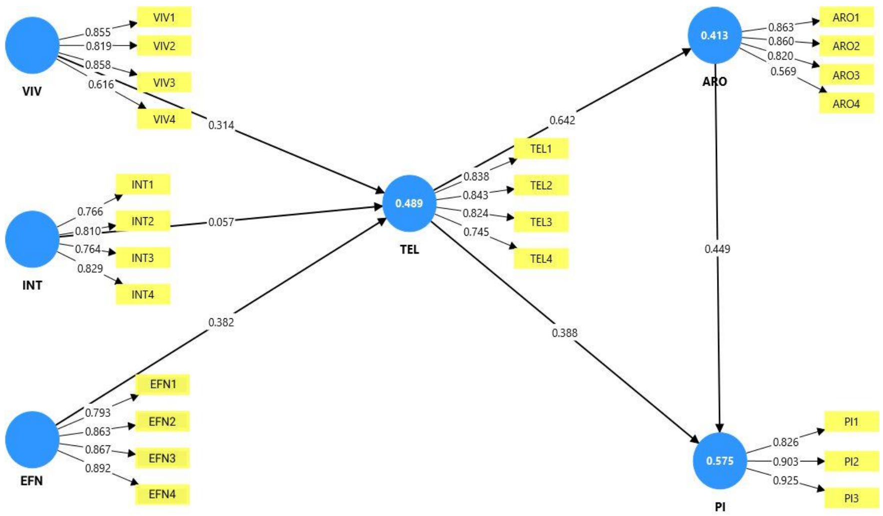
Table 7 reports the bootstrap results for a subset of the structural model, focusing on the relationships between vividness, interactivity, effectiveness, telepresence, arousal and purchase intention. The structural model was estimated using PLS-SEM with bootstrapping (5,000 subsamples, two-tailed tests, 5% significance level). Model fit was acceptable, as indicated by an SRMR value of 0.065, which is below the commonly suggested threshold of 0.08 for PLS models (Dash and Paul, 2021). The coefficient of determination shows that the model explains a moderate share of variance in the endogenous constructs: telepresence (R^2 = 0.489), arousal (R^2 = 0.413) and purchase intentions (R^2 = 0.575). This suggests that the selected stimuli together with the mediating construct provide a meaningful explanation of the two key outcome variables in the model (Sarstedt et al., 2021). Based on those findings it is evident that stimuli have a systematic and statistically important impact on how users feel and whether they intend to buy in the metaverse. However, moderate R^2 values, the estimation approach and the sample characteristics highlight that other psychological, social and contextual factors are likely to play a significant role as well.

The results indicate that telepresence is shaped primarily by how the metaverse looks and works, rather than by how interactive it is. Vividness has a positive and statistically significant effect on telepresence (VIV → TEL: O = 0.314, t = 2.54, p = 0.011), which confirms H1 and suggests that users' feeling of being present depends strongly on rich, realistic and coherent sensory input. In a similar vein, effectiveness also shows a significant positive effect (EFN → TEL: O = 0.382, t = 2.235, p = 0.025), supporting H3 and highlighting that a technically reliable system, which meets expectations and objective without glitches or delays, is crucial for sustaining immersion. Taken together, these findings imply that for users, telepresence is still largely a technical and perceptual phenomenon: if the environment looks good and runs smoothly, they feel more present. By contrast, interactivity does not significantly predict telepresence (INT → TEL: O = 0.057, t = 0.39, p = 0.696), leading to the rejection of H2. This is a noteworthy and somewhat counter-intuitive result, as prior literature often assumes that the ability to actively manipulate the environment strengthens presence. One plausible interpretation is that for these relatively experienced metaverse users, a certain level of interactivity is already taken for granted and no longer functions as a differentiating factor. Leading to the conclusion that users may only really notice telepresence when vividness or effectiveness fails.

Downstream, the role of arousal and telepresence in shaping purchase intentions is both strong and conceptually coherent. Arousal is a robust positive predictor of purchase intentions (ARO → PI: O = 0.449, t = 4.987, p < 0.001), providing clear support for H6: users who feel excited and stimulated in the metaverse are considerably more likely to intend to search for and buy products there. Telepresence shows an even stronger total effect on purchase intentions (TEL → PI: O = 0.676, t = 8.789, p < 0.001), supporting H5 and highlighting that feeling "as if it were real" is not just a pleasant side effect, but a key commercial driver. H4 is also supported (TEL → ARO: O = 0.642, t = 8.985, p < 0.001), indicating a tight emotional mechanism: as the sense of being present in the metaverse increases, arousal rises, which in turn boosts the likelihood of purchase. From a branding perspective, this implies that retailers who want to evoke emotions during shopping cannot treat immersion as a simple add-on; they should design environments that make users forget they are in a simulated space and instead experience the metaverse store as a convincing extension of their "real" shopping context that will evoke positive emotions of excitment.

Table 7 also reports the total effects, showing how VIV, INT and EFN influence ARO and PI indirectly through telepresence. In practical terms, users feel more excited and stimulated when the metaverse provides high-quality, coherent sensory input and when the system works smoothly, fulfils expectations and supports their goals. These effects are indirect and operate largely through telepresence, which confirms that emotional activation is not generated in isolation: users' first need to feel "drawn into" the environment before they start experiencing higher levels of arousal and show interest in buying products in metaverse. On the other hand, once vividness and effectiveness reach a certain threshold, simply giving users more control options does not meaningfully boost their excitement and purchase intentions.

Figure 22: PLS-SEM



Source: Author's work from SmartPLS4 (2025)

Table 8: Hypotheses results

Hypotheses	Results
H1. Vividness has a positive effect on users' sense of telepresence in the metaverse.	Supported
H2. Interactivity has a positive effect on users' sense of telepresence in the metaverse.	Not supported
H3. Effectiveness has a positive effect on users' sense of telepresence in the metaverse	Supported
H4. Telepresence positively influences consumers' feelings of arousal.	Supported
H5. Telepresence positively influences consumers' purchase intentions in the metaverse.	Supported
H6. Higher emotional arousal positively influences users' purchase intentions in the metaverse.	Supported

Source: Author's work (2025)

The PLS-SEM results show that the measurement model exhibits satisfactory reliability and convergent validity for all constructs, with largely acceptable discriminant validity given the conceptual proximity of key metaverse design features. The structural model demonstrates moderate to strong explanatory power for telepresence, arousal and purchase intention, indicating that the selected stimuli and mediators account for a substantial share of variation in users' responses. Vividness and effectiveness emerge as robust predictors of telepresence, which in turn strongly enhances both arousal and purchase intentions, while interactivity does not exert significant additional influence once other factors are considered. Overall, the findings provide empirical support for five out of 6 hypothesised relationships, summarized in Table 8 and offer clear evidence that high-quality, vivid and effective metaverse environments foster stronger telepresence experiences, heightened emotional excitement and, ultimately, higher purchase intentions.

5 Discussion

The results of the quantitative PLS-SEM analysis, together with the insights from the literature review, have several implications for both practice and academia, which are outlined in this chapter.

Research Question 1: How do effectiveness, vividness, and interactivity influence users' sense of telepresence?

The results provide clear evidence that vividness and effectiveness strongly influence users' sense of telepresence. Both factors play a pivotal role in shaping how present users feel within the metaverse. Specifically, when a metaverse environment features high-quality imagery, rich in detail and sensory information, users are more likely to perceive their surroundings as real. This relationship between vividness and telepresence is supported by Bogicevic et al. (2019), who argue that highly vivid visual imagery enhances the clarity and intensity of the virtual environment, thereby improving its perceived realism and quality. Effectiveness appears to have an even stronger influence on telepresence. As noted in the literature review, Kounavis et al. (2012) define effectiveness as extending beyond the operational functionality of the technology; it concerns the extent to which the environment enables users to achieve their intended objectives in a seamless, engaging, and goal-aligned manner. In this context, the results indicate that when users engage in shopping or other activities within the metaverse, their sense of being in the "real world" depends largely on how effortlessly they can accomplish their goals. A distinctive finding of this study, compared with prior research such as Jafar et al. (2023) or Bruni et al. (2023), is that interactivity did not influence users' perceived telepresence. Several explanations may account for this outcome. Interactivity is often conceptualized as the ability to make autonomous decisions, navigate freely, and control the environment (Fadhel et al., 2024), which may be less important to users than the visual and sensory qualities of the environment. This is explained by Cheng et al. (2014) who demonstrated that vividness can exert up to three times the influence of interactivity in eliciting strong telepresence sensations in virtual reality settings. Some authors, including Steuer (1992) and Bruni et al. (2023), emphasize interactivity as a social construct that influences consumer behavior by strengthening emotional connections to the virtual space. It is possible that results capture a relatively narrow or functional layer of interactivity and does not fully reflect richer forms such as social, narrative or co-creative interaction.

Research Question 2: To what extent does an enhanced sense of telepresence impact users' arousal?

The results suggest that when users perceive the metaverse as resembling the real world, this elicits stronger emotional reactions, making users feel more excited and stimulated. This finding supports the conclusions of Shi et al. (2025), who demonstrate that as users perceive fewer differences between physical and digital realities, their satisfaction with the virtual environment increases and their level of engagement intensifies. In line with this study, the present results suggest that perceived realism in metaverse environments not only shapes cognitive evaluations of quality and usefulness, but also functions as a powerful emotional trigger.

Research Question 3: To what extent does an enhanced sense of telepresence impact users' purchase intentions?

Telepresence plays a pivotal role in shaping users' purchase intentions, encouraging them to search for products more actively and consider making a purchase. Relationship between telepresence and purchase intention was the strongest one in the study. This impact of telepresence on purchase behavior aligns with the findings of Jafar et al. (2023), who state that telepresence leads to the increase of product knowledge and purchase intention in metaverse. Taken together, the findings indicate that in metaverse shopping environments, telepresence is not simply a side effect of immersive technology, but a key psychological mechanism through which immersive experiences are translated into concrete purchase intentions.

Research Question 4: What is the relationship between arousal and consumers' purchase intentions in the metaverse?

Research Question 4 examines the relationship between arousal and purchase intention in the metaverse. This relationship has been shown to be both strong and significant. The findings suggest that when users feel more engaged, excited, and stimulated, they are more likely to consider purchasing products within the metaverse. Similar mechanisms have been described in studies researching retail environments. For example, Herabadi et al. (2009) note that when combined with positive affect, heightened emotional arousal often manifests as excitement, attraction, and enthusiasm, ultimately encouraging greater engagement and purchase activity. Moreover, Rodríguez-Ardura et al. (2025) emphasize that consumers actively seek arousal as an integral part of the consumption experience. The results of this study indicate that comparable patterns of behavior can be observed among consumers in the metaverse.

This research contributes to the theory of consumer behavior in the metaverse by identifying the factors that can increase purchase intention in virtual environments. The study confirms the findings of Jafar et al. (2023), demonstrating that vividness and effectiveness enhance telepresence, arousal and purchase intention. However, it offers a new perspective on the role of interactivity, revealing outcomes that differ from those reported in prior studies. This opens space for a theoretical revaluation of interactivity in metaverse especially in the context of retail. Suggesting that future research should distinguish between different forms of interactivity (e.g., control, responsiveness, social or co-creative interaction) and test their effects separately. The primary contribution of this research is its detailed examination of arousal in the metaverse, building on the recommendations of the authors discussed above. This study enriches the theoretical framework by clarifying the influence of telepresence on arousal and showing how heightened arousal subsequently leads to increased purchase intention. Existing research on metaverse consumer behavior has focused mainly on technological factors and telepresence, but has not systematically examined arousal as a response in retail settings. This thesis fills this gap by incorporating arousal into a metaverse shopping framework and empirically testing its effect on purchase intentions.

Beyond theoretical contributions, the study also offers several practical insights. The findings provide clear guidance for the design and development of effective metaverse retail environments, emphasizing the importance of high-quality visual content and seamless functionality.

Retailers and platform designers should prioritize realism, clarity, and ease of use to strengthen users' sense of presence and encourage goal completion. Additionally, the demonstrated influence of arousal on purchase intention suggests that marketing strategies in the metaverse should focus on creating emotionally stimulating experiences to enhance user engagement and drive purchasing behavior. Finally, the results have implications for user experience design within virtual commerce platforms. By highlighting the aspects of the environment that most strongly shape consumer perceptions—namely vividness, effectiveness, and arousal—the study provides actionable insights for optimizing metaverse shopping experiences. These insights can assist developers, marketers, and retailers in designing metaverse environments that more effectively support consumer satisfaction and commercial outcomes.

6 Conclusion

This thesis examined how different features of metaverse retail environments shape consumers' psychological states and, in turn, their purchase intentions. Grounded in the S-O-R paradigm, the study focused on three external stimuli such as vividness, effectiveness, and interactivity an organismic state, telepresence, and two responses, arousal and purchase intention.

Methodologically, the study used a self-administered online survey based on validated measurement scales. The questionnaire included six constructs measured with five-point Likert scale items, along with basic demographic information and questions about metaverse usage. After conducting a pilot test, the survey was distributed within relevant metaverse communities, yielding a final sample of 133 metaverse users. To ensure the quality of the data, tests for common method bias and multicollinearity were conducted. The analysis was carried out using PLS-SEM with 5,000-sample bootstrapping, assessing reliability and validity, model fit, explained variance, and the significance of structural paths. Empirically, the model showed acceptable overall fit and strong explanatory power for the main outcomes. Five out of the six hypotheses were supported. Vividness and effectiveness were found to significantly increase telepresence; telepresence, in turn, strongly enhanced both arousal and purchase intention; and arousal independently and positively predicted purchase intention. Interactivity, however, did not have a significant effect when vividness and effectiveness were taken into account.

Several limitations must be acknowledged. First, the sample size (N = 133) restricts the representativeness of the findings and limits statistical power for detecting smaller effects. The sample profile is appropriate for investigating the behavior of young, experienced metaverse users who mainly use metaverse for gaming and social purposes. Therefore, the results cannot be readily generalised to older age groups or to early adopters of the metaverse whose primary activities focus on finance, NFTs and productivity-related use cases. Second, measurement diagnostics indicated strong correlations between some constructs, particularly vividness and effectiveness, suggesting conceptual overlap from the users' perspective. Finally, interactivity was operationalized primarily as functional control, whereas richer forms of interactivity, such as social or narrative interactivity, may yield different effects. These limitations highlight opportunities for future research, including the use of larger and more diverse samples of metaverse users. Furthermore, refinement of constructs, especially interactivity which can be distinguish between different forms. Finally, extensions of the model to include variables such as trust, perceived risk, enjoyment, and fear.

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Appendix A Constructs in Likert scale

Construct	Item	Question	Adapted from
Vividness (VIV)	VIV1	The visuals of the metaverse environment were rich.	Kim and Ko (2019)
	VIV2	The metaverse environment provided detailed sensory information.	Kim and Ko (2019)
	VIV3	The metaverse environment appeared realistic.	Kim and Ko (2019)
	VIV4	The sensory presentation of the metaverse environment was vivid.	Kim and Ko (2019)
Interactivity (INT)	INT1	I could easily control my interactions within the metaverse environment.	Kim and Ko (2019)
	INT2	I felt I could interact freely with items in the metaverse.	Kim and Ko (2019)
	INT3	I had a high level of influence over what happened in the metaverse environment.	Yim et al. (2017)
	INT4	The metaverse environment allowed me to actively explore virtual elements in real time.	Yim et al. (2017)
Effectiveness (EFN)	EFN1	The metaverse system worked properly without technical problems.	Wei et al. (2019)
	EFN2	The metaverse system was effective in providing the intended experience.	Wei et al. (2019)
	EFN3	The metaverse performance met my expectations.	Wei et al. (2019)
	EFN4	The metaverse technology improved my overall experience.	Wei et al. (2019)
Telepresence (TEL)	TEL1	While experiencing the metaverse environment, it created a new world for me, which suddenly disappeared when I stopped using it.	Han et al. (2020)
	TEL2	While experiencing the metaverse environment, I felt I was in the world metaverse created.	Han et al. (2020)
	TEL3	I forgot my immediate physical surroundings when I was in the metaverse environment.	Kim and Ko (2019)
	TEL4	Having experienced the metaverse environment, I felt like I came back to the "real world" after a journey.	Han et al. (2020)
Arousal (ARO)	ARO1	I feel excited while interacting in the metaverse environment.	Kim and Ko (2019)
	ARO2	Being in the metaverse environment makes me feel lively.	Detandt et al. (2017)

	ARO3	I felt stimulated during the interactions in the metaverse.	Detandt et al. (2017)
	ARO4	The metaverse experience increased my heart rate.	Detandt et al. (2017)
Purchase Intention (PI)	PI1	I often spend time browsing and searching for products in the metaverse.	Tilahun et al. (2023)
	PI2	I intend to purchase products in the metaverse in the future.	Tilahun et al. (2023)
	PI3	I am likely to continue purchasing products in the metaverse over time.	Tilahun et al. (2023)