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The Impact of the Metaverse on the Luxury Industry

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INDEX

ABSTRACT

The utilization of digital technologies is crucial in gaining an advantage in marketing and retail, but marketing managers encounter difficulties in implementing them and adjusting their digital strategies. In order to overcome these challenges, it is important for managers to have a comprehensive understanding of how consumers engage with digital technologies.

To gain a competitive edge, marketing strategists can seek guidance from academic marketing experts on how to turn these challenges into opportunities.

The study focuses on the concept of the metaverse, which is an innovative type of internet application and social structure that integrates various novel technologies. The proposed framework examines how luxury brands can leverage the metaverse to provide a superior and more inclusive customer experience. Indeed, the integration of emerging technologies like the internet of things, smart devices, artificial intelligence, and digital business processes offers an excellent opportunity also for luxury marketers and managers

This research covers advancements in virtual and augmented reality, as well as the metaverse, and the opportunities and difficulties they present when it comes to integrate them in luxury brands' strategy. It then delves into the technological revolution happening in the luxury industry. Finally, the article presents insights from a survey exploring the factors that influence consumers' willingness to experiment products and services made available by luxury brand through these technologies. The article concludes by urging researchers to further investigate this exciting area.

CHAPTER 1 INTRODUCTION

1.1 Industry 4.0: innovation and technology

In 2011, a working group commissioned by the German Ministry of Education and Research's Research Union Economy-Science introduced the concept of Industry 4.0 at the Hanover Fair in Germany (Culot et al., 2020). The term was used to refer to both the "fourth industrial revolution" and Germany's strategic plan to improve its competitiveness in the global manufacturing industry (Kagermann et al., 2013). While various terms were used to describe the global phenomenon of the fourth industrial revolution, Industry 4.0 has become the most widely used, despite lacking a clear definition in literature. Rather than referring to a single invention, Industry 4.0 encompasses a range of new technologies that work together to blur the line between the physical and digital worlds.

Originally related to the manufacturing sector, Industry 4.0 has since been associated with transformations in consumer behaviour and other economic sectors. Meanwhile, Society 5.0 aims to leverage technologies like Machine Learning, Artificial Intelligence, Virtual Reality, Augmented Reality, Blockchain, Web 3.0, and 5G/6G to create a more interconnected 21st century. With the continuous advancement of communication technology, integration of new technologies, and emergence of new internet applications, the pace of technological evolution is increasing rapidly (Figure 1).

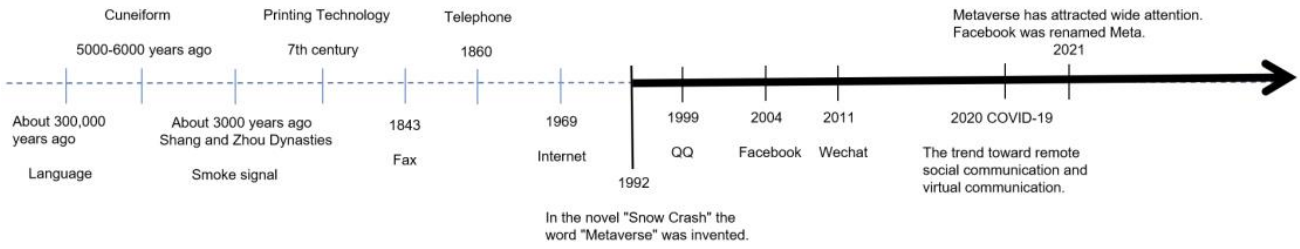


Fig. 1 – The development timeline of communication methods (Ning et al., 2021c).

As show in the figure above, technologies have been revolutionizing the industry for decades now, but the most significant shift from physical to online occurred in 2020 with the COVID-19 pandemic. Being forced to stay in their homes not only pushed the global population to shift their purchases from physical stores to online ones, but also highlighted the need to escape the confines of their homes. This need materialized in the use of both virtual and augmented reality tools and in the development of the Metaverse.

1.1.1 Virtual and augmented reality

Virtual reality (VR) as a concept has a long history. Sutherland (1970) first envisioned VR as a real-time simulation of the real world that is indistinguishable from the actual world, complete with sound, touch, and the ability for the user to manipulate it directly. Krueger (1983) expanded on this by providing more concrete references to virtual reality in his broader discussion of interactive and immersive environments. During the early 90s, most VR applications were used for the purpose of educating and planning, although they faced significant limitations in terms of system latency (Brooks, 1999). Steuer (1992) defined virtual reality as a real or simulated environment where the user experiences telepresence, which he described as the sensation of being present within a particular setting by means of a communication channel. Brooks (1999) offered a more comprehensive definition, describing VR as an encounter where the user is completely immersed in a responsive virtual world and has dynamic control over their viewpoint.

"Virtual reality incorporates computer-generated, interactive and highly vivid environments that enable the user to achieve a state of immersion through the ultimate experience of telepresence and facilitate engagements in human encounters that are multi-sensorial, dynamic and resemble the user's perception and understanding of the real world." (Boyd & Koles, 2019).

Virtual reality is a promising technology for marketing managers, with many businesses planning to adopt it in the near future. According to Boyd and Koles (2019), it can enhance product value and collaboration between buyers and sellers, especially in B2B markets. The technology enables unlimited narratives and environment simulations, making it useful for storytelling and product presentation in a limited physical space.

Wang and Chen's research (2019) suggests that when consumers have control in VR environments, it increases their interest and willingness to consider a brand. Martínez-Navarro et al.'s analysis (2019) supports this, showing that VR experiences can enhance consumer purchase intentions and post-purchase outcomes, such as satisfaction, loyalty, donations, and volunteerism. Additionally, Martínez Navarro et al. (2019) found that VR can be more effective in achieving brand recall than traditional offline environments. However, Deng, Unnava, and Lee's research (2019) indicates that VR can reduce purchase intentions for experience-related products in the context of museum visits and leisure travel. Further research is still needed to determine which additional contexts VR can replicate, so that marketers can understand how much it might affect product sales.

Augmented reality (AR) is a rapidly growing immersive experience that has become a game-changer in various fields such as healthcare, education, tourism, design, manufacturing, and more. The

inception of AR can be traced back to Ivan Sutherland, who created the first interactive graphics application called Sketchpad at MIT in 1963, thereby pioneering the AR experience. As shown in the Figure 2, starting from the 1960s, AR's widespread adoption has led to unprecedented growth and transformation in several industries.

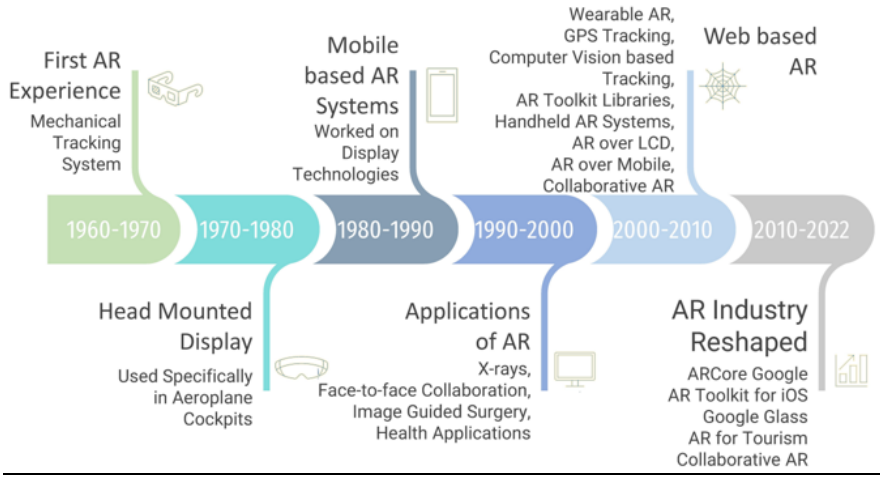


Fig. 2 – Augmented reality advancement over the last 60 years (Syed, n.d.).

Augmented Reality is a crucial tool that can help businesses increase their productivity and efficiency. AR is recognized as a key technology in Industry 4.0 and has been identified by the European Union as a critical enabling technology (De Amicis et al., 2018; Egger & Masood, 2020). It involves adding computer-generated information to the real world to create a new and improved version of reality (Johnson, 2011). This technology combines virtual and physical worlds into a single display by introducing visual, sound, and other virtual elements into the real environment. Augmented reality produces an enriched version of the primary environment by combining virtual elements with the real world. This results in a more information-dense reality, which is tailored to the perception of the AR user (Speicher et al., 2019; Zigart & Schlund, 2020). This integration of computer-generated information such as video, sound, 3D CAD models, and markers in the real environment is what makes AR a powerful technology.

Augmented reality heavily relies on tracking technologies, which serve as the basis for movement and enable the seamless presentation of virtual and real objects in a shared environment. These technologies allow users to perceive motion and interact with people and objects in augmented environments. The success of AR largely relies on users' ability to perceive distance from both virtual and real objects.

Augmented reality technology has numerous advantages in the manufacturing industry. The increasing complexity and variations in products have made assembly operations more intricate and require real-time information and instructions for operators to perform their tasks. AR systems can recommend corrective actions, prevent errors, and enhance production, quality, and efficiency in maintenance operations by integrating virtual and real objects.

AR has a wide range of potential applications in areas such as medical, tourism, fashion, museums, education, construction, civil engineering, and supply chain management, but it is most commonly utilized in the manufacturing sector. Using AR, consumers can see products in context, and visualization of the digital twin of the manufacturing environment helps achieve effective decision-making for companies.

Research has also shown that AR can improve the consumer experience by enhancing usefulness, ease of use, satisfaction, engagement, and attitude. However, there may be negative aspects, such as higher cognitive dissonance due to the ease with which more products can be evaluated or confusion by over choice. AR can help reduce confusion and make it easier for consumers to see the differences between products, leading to increased purchase intentions and ultimately higher sales volumes and margins for e-commerce companies.

Despite its benefits, AR technology is not yet perfect, and its implementation may face uncertainties, issues, and budgetary constraints. It is important to integrate technical aspects with organizational requirements and strategies to fully utilize the technology, and end-users may have concerns about privacy and the benefits of changes. Nonetheless, AR is a valuable tool to view virtual content while still being aware of the physical world, which is crucial for users to feel connected and focused. Advances in hardware and software technologies are improving AR systems, making it a promising tool for the future.

1.1.2 Metaverse

The term “metaverse” was not born recently, as it was first defined in Neal Stephenson's 1992 science fiction novel Snow Crash. Although it originated more than 20 years ago, it is only in recent years that there has been a growing focus on the subject and a subsequent study of the phenomenon. As shown in the figure below (Figure 3), metaverse is still a concept that is constantly evolving. Although there is no universally agreed-upon definition, the term "metaverse" is often used to describe a future,

more advanced form of the internet, where virtual worlds are interconnected and accessible to a wide range of users.

Illustrative Study	Scope	Metaverse Definition
Perlin & Goldberg (1996)	Single Virtual World (Narrow + Purely virtual)	"a future version of the Internet which appears to its participants as a quasi − physical world. Participants are represented by fully articulate human figures, or avatars. Body movements of avatars are computed automatically by the system"
Allbeck & Badler (1998)	Single Virtual World (Narrow + Purely virtual)	"a virtual reality world envisioned as a large cyber-planet. It contains homes, corporate headquarters, nightclubs, and virtually every other type of building found in reality and some that are not. Individuals from around the world materialize on this cyber-planet, and are represented there by avatars"
Wright et al. (2008)	Single Virtual World converging the physical and virtual realities (Narrow + Blended reality)	"an extensive 3D networked virtual world capable of supporting a large number of people simultaneously for social interaction" "implies the interaction of real people with the virtual environments and agents including avatars with increasing levels of immersion and presence" "the word metaverse (Meta -Universe) suggests the emergence of a new class of augmented social interaction which we term 'augmented duality'"
Frey et al. (2008)	Interoperable virtual worlds (Broad + Purely virtual)	"a system of numerous, interconnected virtual and typically user-generated worlds (or Metaworlds) all accessible through a single-user interface"
Davis et al. (2009)	Single Virtual Worlds (Narrow + Purely Virtual)	"immersive three-dimensional virtual worlds in which people interact as avatars with each other and with software agents, using the metaphor of the real world but without its physical limitations"
Dionisio et al. (2013)	Interoperable virtual worlds (Broad + Purely virtual)	"an integrated network of 3D virtual worlds"
Duan et al. (2021)	Interoperable convergence of the physical and virtual worlds (Broad + Blended reality)	"an evolving virtual world with unlimited scalability and interoperability" "real-time 3D rendering-related technologies like VR/AR are regarded as the main interaction interface."
Lee et al. (2021)	Interoperable convergence of the physical and virtual worlds (Broad + Blended reality)	"a virtual environment blending physical and digital, facilitated by the convergence between the Internet and Web technologies, and Extended Reality (XR)… all individual users own their respective avatars, in analogy to the user's physical self, to experience an alternate life in a virtuality that is a metaphor of the user's real worlds"

Notes: VWs = Virtual Worlds; VR = Virtual Reality; AR = Augmented Reality, XR = Extended Reality.

Fig. 3 – Evolution of the Metaverse Concept over the years (Barrera & Shah, 2023).

The metaverse is a combined virtual space, created by merging physical and digital realities, that allows real-time interactions between users and a computer-generated environment. Users can engage with both the environment and other users present within this shared virtual space.

S. S. Ahn et al. (2022) have identified several points of agreement about the metaverse, even though a comprehensive definition of it has not yet been established. One point is that advanced computer-generated environments, such as VR, AR, and XR, are generally seen as the means by which the metaverse is enabled and realized. Another point is that the metaverse is made up of various components that make up our social systems, such as avatars (i.e., representations of people), monetary systems, objects, and history. Lastly, the metaverse is understood through the characteristics of these technologies and social components, including features such as immersion, interoperability, concurrence, continuity, seamlessness, and embodiment.

The Metaverse combines cutting-edge technologies like 5G, cloud computing, computer vision, blockchain, and artificial intelligence and has applications in various fields such as video games, art, and business. It has the capacity to surpass the limitations of the physical world, offering the ability to travel through time, both past and future, as well as cross spatial boundaries within a particular timeframe. Its hyper spatiotemporal nature is demonstrated by its separation from the real world's

spacetime. The Metaverse is not simply a static digital space, but rather a virtual realm that progresses concurrently with the constantly changing real world.

It's spatial structures, scenes, and characters are represented as data, making it a carrier of big data and information technology. Indeed, as more users join, the Metaverse generates a large amount of data, forming a big data network.

"Big data" refers to data sets that are characterized by large volume and complexity in data categories. For this reason, Big data processing is a crucial aspect of the Metaverse, as the growing amount of data requires the use of intelligent analysis tools to extract useful information, make more accurate decisions, and guide various aspects of production and daily life more effectively. Therefore, big data technology is a critical component for the successful implementation of the Metaverse. Businesses across all industries can leverage big data to gain valuable insights and solutions for real-world problems.

Technically speaking, the Metaverse can be categorized into four layers - interaction layer, network layer, computing layer, and application layer - as depicted in Figure 4.

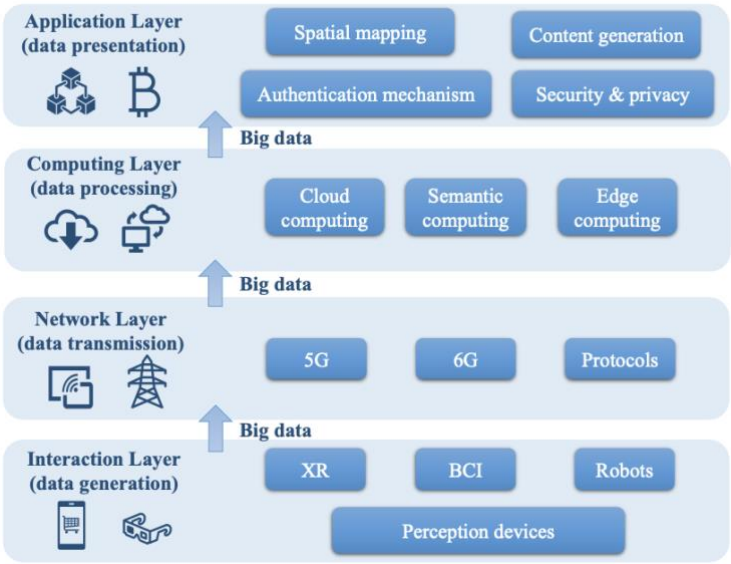


Fig. 4 – The framework of the metaverse (Sun, 2022).

The interaction layer facilitates the exchange between the material and virtual worlds, while real-time assurance of the Metaverse is provided by the network layer. Subsequently, cloud computing, edge computing, and artificial intelligence are utilized in the computing layer to analyse diverse data sources and attain data interoperability for valuable insights. Lastly, the application layer handles data visualization, content development, and authentication mechanisms, such as spatial mapping.

Upon closer examination of the technologies essential to the metaverse, it can be categorized into five groups: network infrastructure, management technology, basic common technology, virtual reality object connection, and virtual reality convergence (Figure 5).

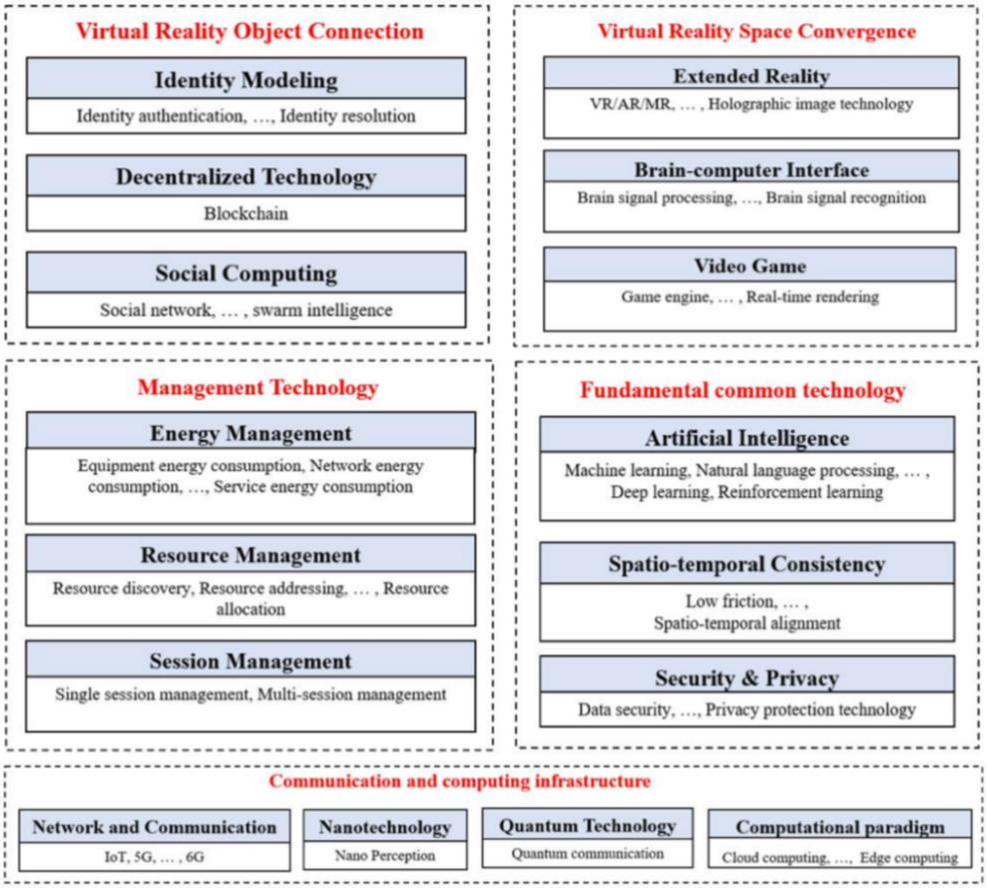


Fig. 5 – The technology Roadmap of the Metaverse (Ning et al., 2021).

Communication and computing infrastructure

The successful implementation of the metaverse heavily depends on the communication capabilities of both fifth and sixth generation networks. 5G is particularly advantageous due to its high speed, low latency, and widespread connectivity, all of which are crucial for the metaverse to function effectively. In addition, 5G's low power consumption makes it an essential aspect of interconnecting everything. Meanwhile, 6G is expected to address the shortcomings of virtual reality and time. The Internet of Things (IoT) also plays a critical role in the network infrastructure of the metaverse, with IoT sensing contributing to a fully immersive, seamless, and realistic interactive experience that connects the metaverse and real world.

Management technology

The metaverse relies on crucial management technologies that enable the integration of the virtual and real worlds. These technologies include energy management, resource management, and session management.

Foundational common technologies

They serve as the building blocks of the metaverse and include artificial intelligence (AI), spatiotemporal consistency, security, and privacy. AI algorithms, like machine learning and deep learning, play a pivotal role in connecting the virtual and real world, and the three key elements of AI - data, algorithm, and computing power - are necessary for establishing and advancing the metaverse. By utilizing AI technologies, the metaverse can participate in social and economic activities beyond the physical world while ensuring safety and security. With the virtual world collecting a substantial amount of personal data, maintaining the privacy and security of user data is a significant concern in both the virtual and physical worlds.

Virtual Reality Object Connection

The metaverse serves as a connection between the physical and digital worlds and is designed with support for identity modelling, decentralization technology, and social computing. It can be thought of as a networked world that operates parallel to the real world, and users require an identity credential, which may not necessarily relate to their real identity. Identity modelling technology meets this requirement. The emergence of the metaverse does not replace physical social relationships with virtual ones but creates a new kind of social relationship that blends both online and offline interactions. Decentralization is a critical concept throughout the metaverse, and underlying decentralization technology is necessary to ensure its security and operation. Decentralized technology encompasses blockchain, distributed storage, and distributed computing, with the most frequently employed decentralization technology in the Metaverse being blockchain.

Virtual Reality Space Convergence

The incorporation of virtual reality within the metaverse will lead to a significant overhaul in the way society is organized and functions. Augmented reality, brain-computer interface, and video game technology are critical components in achieving the integration of virtual and real-world spaces. The creation and operation of the metaverse heavily depend on AR/VR/MR technology, which is considered one of its fundamental technical building blocks.

When assessing the value of the metaverse, an important factor to consider is whether it offers new benefits to society. The metaverse provides different types of interaction categorized as social networking, collaboration, and persona dialog. Collaboration and communication are essential values that the metaverse can offer, enabling user avatars to work together and share experiences. This collaboration and sharing create new value, and the metaverse becomes a tool to complement and enhance the real world. Users exchange diverse experiences and knowledge, leading to the creation of financial wealth, new ideas, and the opportunity to showcase various aspects of themselves. However, social activities in the metaverse are subject to platform restrictions, and consistency is necessary to ensure a positive experience for all users.

1.2 A new sales and communication channel: the Metaverse

The metaverse, as a virtual world that can be accessed through the internet, has the potential to become a new sales channel for many businesses.

One of the main advantages of the metaverse is its ability to provide a unique and memorable customer experience.

Businesses can create virtual events, product launches, and other interactive experiences that are not possible in the physical world. For example, a fashion company could use the metaverse to host a virtual fashion show where customers can watch the latest designs and purchase them directly within the virtual world.

Indeed, in the metaverse, businesses can create virtual storefronts, host events, and sell digital products, such as virtual clothing, accessories, or even virtual real estate. This allows them to reach a new audience and potentially increase their sales.

Here are some examples of what a brand can do in the metaverse:

- Host virtual events: brands can use the metaverse to host virtual events like product launches, fashion shows, and concerts. These events can be interactive and provide customers with a unique and memorable experience.
- Create virtual stores: brands can build virtual stores where customers can browse and purchase products. This can be particularly useful for companies that sell digital products, such as video games or virtual items.
- Provide customer support: brands can offer virtual customer support services in a more immersive and engaging way than traditional customer support channels.

- Build virtual communities: brands can create virtual communities where customers can connect with each other and engage with the brand. These communities can be a great way to build a sense of community and foster brand loyalty.
- Create branded experiences: brands can create virtual experiences that align with their brand values and messaging. For example, a sustainable fashion brand could create a virtual world where customers can learn about sustainable fashion practices and the brand's commitment to sustainability.

Additionally, the metaverse has the potential to serve as a novel marketing and communication platform for companies.

By taking advantage of the metaverse's capacity to provide immersive and interactive experiences, companies can establish deeper bonds with their customers, which can result in heightened customer loyalty.

Advertising in the metaverse offers businesses a novel way to reach their target audience and it can also help businesses reach new audiences that may not be accessible through traditional marketing channels. For example, a company that sells virtual items, such as digital clothing, could reach a global audience of gamers and other metaverse users.

Below are some possible methods of advertising in the metaverse:

- Product placement: in virtual worlds, brands can place their products within the environment. For example, a brand could place their products in a virtual store, on a billboard, or as a part of a virtual experience.
- Sponsored experiences: brands can create sponsored experiences, such as virtual events or games, that incorporate their products or services, allowing customers to learn about a brand and its offerings.
- Branded content: companies can create content that aligns with their brand messaging and values. For example, a fashion brand could create a virtual fashion show, while a car company could create a virtual test drive experience.
- Virtual influencers: in the metaverse, brands can partner with virtual influencers to promote their products or services; these virtual influencers can reach a large and engaged audience and can be a cost-effective way to promote a brand.
- In-game advertising: firms can advertise within virtual games or experiences, such as placing their logo on a scoreboard or sponsoring a virtual event.

To sum up, the metaverse offers a significant potential as a new channel for businesses to communicate, market and sell their products or services. However, before adopting a metaverse strategy, it is crucial for companies to be cautious and carefully consider the associated risks and challenges. It is worth noting that the metaverse is still in its early stages of development and there are various technological and societal obstacles that need to be overcome. Moreover, uncertainties regarding the metaverse's evolution and regulatory framework, as well as concerns regarding privacy, security, and accessibility, are still prevalent.

1.2.1 Benefits and disadvantages for consumers and companies

The Metaverse offers customers a unique experience that blends the physical and digital worlds, whether they opt to shop at a physical store or make online purchases, according to Roe et al. (2022). Customers and suppliers can engage with products, examine their features and characteristics, and access real-time information from any location.

Moreover, a recent study has indicated that the Metaverse has the potential to address social inequalities and discrimination related to factors such as country, appearance, gender, and skin colour. In contrast to the physical world, where limited resources result in heightened competition and negative social outcomes, the Metaverse allows for infinite item production and resources, minimizing competition and promoting common interests rather than opportunity costs, as found by Dwivedi et al. (2022).

The metaverse has the potential to offer several benefits to customers, including:

- Engaging experiences: the metaverse can provide more interactive and immersive experiences that are more entertaining than both traditional online and offline experiences. Customers can explore virtual environments, interact with others, and engage in various activities that can provide a sense of excitement and adventure.
- Personalization: by collecting and analysing customer data, businesses can tailor their offerings to specific customer preferences, providing a more personalized experience.
- Convenience: the metaverse can offer customers a more convenient way to access products and services, allowing them to shop in virtual stores or attend events from the comfort of their homes.
- Social connection: the virtual world can facilitate social connection and community-building by providing a platform for customers to meet and interact with others who share similar interests.

- Access to exclusive content: customers can have access to exclusive content and experiences that may not be available in the physical world, creating a sense of exclusivity and providing unique experiences.

Although the metaverse offers many benefits for customers to create their ideal world, there are several drawbacks to consider. Of major concern are technical issues that can arise due to the metaverse being a new and rapidly evolving technology, resulting in technical glitches, bugs, or connectivity problems that can hinder user experience. Cybersecurity risks are also a significant concern since the metaverse involves storing and sharing personal data in a virtual space, which can expose users to cybersecurity threats like hacking, identity theft, and data breaches.
Moreover, participating in the metaverse may require costly hardware and software, which could be a barrier for some users. Additionally, there may be psychological risks such as isolation and addiction associated with spending too much time in the metaverse. In relation to this, while the metaverse can provide unique and immersive experiences, it lacks the social interaction and human connection that many people desire, which could lead to negative impacts on mental and physical health.

Moving to companies' point of view, they can benefit significantly by incorporating the metaverse into their business strategies, as it enables them to transform their business models and operations in a virtual world. The advantages of using the metaverse for businesses include:

- Enhanced brand exposure: it offers a unique platform for businesses to showcase their brand and products to a wider audience.
- Additional revenue streams: companies can generate new revenue streams through virtual product sales, advertising, and other monetization strategies, which can help to diversify revenue streams and boost profitability.
- Improved customer insights: by utilizing data analytics in the metaverse, companies can gain valuable insights into customer behaviour, preferences, and purchasing habits, which can be used to tailor their products and services more effectively.
- Increased customer engagement: the metaverse can provide businesses with a more engaging and interactive platform for customer engagement, offering customers a more personalized and immersive experience, leading to increased satisfaction and loyalty.
- Greater innovation: it can inspire companies to be more innovative and creative in their product development and marketing strategies, which can help them stand out from competitors and remain ahead of the curve.

Industries such as marketing, tourism, leisure, hospitality, citizen-government interaction, health, education, and social networks can all benefit from the metaverse's transformative impact on their operations.

Overall, the Metaverse offers companies and brands many opportunities. However, as for customers, it's important for businesses to carefully consider the disadvantages that might come from involving it in their business strategy. Indeed, as for customers there are costs issues, technical challenges and privacy concerns. High costs for developing a metaverse strategy, with expenses including software development, hardware, and infrastructure, are a real issue for the companies that want to implement it. Additionally, businesses will need to allocate resources to maintain and update their metaverse presence.

Technical challenges, that businesses will need to overcome to ensure a smooth customer experience, may be issues related to compatibility and connectivity. Moreover, there is a regulatory uncertainty that may lead businesses to face legal and regulatory challenges, because it is currently unclear how the metaverse will be regulated.

Another problem organizations may face is that at the moment the audience is limited. Indeed, while the metaverse is a rapidly growing platform, it may not be accessible to all audiences, especially those who lack the necessary technology or infrastructure.

Lastly there are privacy and security concerns, as with any digital platform. For this reason, businesses will need to take steps ahead to ensure that their customers' personal information is secure.

1.2.1.1 Legal issues and privacy policies

Despite extensive research on metaverse technologies, little attention has been given to security and privacy concerns in the virtual world. Just like with other social media platforms, the metaverse faces critical security and privacy issues. Unfortunately, laws and policies related to technology often come too late after the technology has been widely adopted.

As the use of the metaverse expands and investments increase rapidly, it becomes an attractive target for cybercriminals and other malicious cyber actors. Although the metaverse is seen as a fertile ground for innovation and the emergence of new markets, products, and services, concerns have been raised about governance, privacy, and ethics.

The ethical and moral dilemmas of the metaverse arise from the absence and confusion of corresponding moral norms, which can conflict with ethical norms of real-world society.

Regarding privacy issues, the metaverse is closely connected to the real world and is linked to people's real identities. As a new generation of networks, the metaverse must consider data privacy protection issues thoroughly, just like previous network environments.

In particular, there are concerns about the architectural security and insecure system designs of the metaverse. It is crucial to provide appropriate protection for different types of data and security environments to address these concerns (Rahimi & Haug, 2010; Fernandez & Hui, 2022).

According to Fernandez and Hui (2022), the metaverse has the potential to inspire individuals and create a new digital society that could have significant structural impacts on our current society.

However, governing the metaverse presents challenges not only in regulating the behaviour of its users but also in regulating the metaverse itself. To ensure safety in the metaverse, governance is required for its operation and to establish accountability, decision-making rights, and incentives that guide behaviour. Governance of the metaverse is also necessary for maintaining and updating the entire software ecosystem.

There is a risk of privacy and security breaches being inherited from the underlying technology, which emphasizes the need for regular updates and changes (Wang et al., 2022).

In the social metaverse, a person's true identity and personal information, including their location, shopping habits, and financial details, can be uncovered through their digital footprint. For this reason, protecting privacy is vital to shaping the new social virtual world.

Additionally, individuals using the metaverse are more susceptible to being manipulated by businesses due to the ability of VR/AR tools to collect extensive and detailed data that is not typically available through traditional screens. This increased data collection creates a greater incentive for companies to collect user data and share it with third parties for personalized advertising purposes. For example, Facebook's Meta is currently developing a high-end VR headset called Project Cambria that features advanced sensors capable of tracking eye movements and facial expressions of the user's virtual avatar, potentially allowing Meta to track user attention and provide advertisers with more accurate metrics. Another significant concern regarding the metaverse will be power-related issues, particularly related to the control of algorithms responsible for selecting content to be displayed to users.

To sum up here are some privacy issues that may occur in the metaverse:

- Data collection: metaverse companies may collect a large amount of data about their users, including their behaviour, preferences, and even their biometric data. All these data can be used for advertising, but also for other purposes, such as surveillance.

- Identification: in this virtual world, users may have avatars or virtual identities that are different from their real-world identities. However, there is a risk that these identities can be linked to real-world ones, which can be used for tracking and profiling.
- Access control: the metaverse may require users to share personal information in order to access certain features or areas, thus creating a trade-off between privacy and access to the full range of experiences available.
- Cyberbullying and harassment: with these technologies users can interact with each other in ways that are not possible in the real world, leading to cyberbullying and harassment, which can have serious consequences for users' mental health and well-being.
- Hacking and security: as with any online platform, the metaverse is vulnerable to hacking and security breaches, which can result in the exposure of personal information.
- Ownership and control: in the metaverse, users may create and own virtual assets, such as clothing, furniture, and even virtual real estate. However, there are concerns about who controls and owns these assets, as well as who has access to them.

These are just a few of the privacy issues that are arising in the metaverse.

To address privacy concerns in the metaverse, a comprehensive approach is needed that encompasses technical, legal, and industry-based solutions.

As the metaverse technology develops, it is essential for metaverse companies to make protecting users' privacy a top priority and to achieve this goal, a collaborative effort between metaverse companies, governments, and users is required. By working together, it is possible to create an immersive metaverse experience that also ensures the privacy of its users.

To address privacy issues in the metaverse companies should limit the amount of data they collect from users, and only collect data that is necessary for providing the service. They should also provide clear and transparent explanations of what data is collected and how it is used, ensuring that the user is informed when giving his consent.

Moreover, these companies should design their platforms with privacy in mind, integrating privacy protections into their systems from the start. This can include measures such as secure authentication, and access controls.

Not only companies must implement security and privacy measures, but also governments should establish legal frameworks that protect users' privacy in the metaverse, including laws that regulate data collection and sharing, as well as enforcement mechanisms.

Lastly, users should be educated about the potential privacy risks in the metaverse and how to protect their personal information. In order to facilitate this, metaverse companies should provide educational resources to help users understand their rights and protections.

1.3 The revolution in the Luxury Industry

The luxury industry has been experiencing a technological revolution in recent years, with new technologies being integrated into various aspects of the industry, from production to sales and marketing. Some of the most significant technological advancements in the luxury industry include: 3D Printing, Artificial Intelligence (AI), Augmented reality, Blockchain and Mobile E-commerce.

3D printing has made it possible for luxury brands to create complex designs and prototypes with greater ease and efficiency, leading to faster product development and reduced costs.

AI has been used to develop more personalized marketing strategies and to analyse customer data to understand their preferences and behaviour. This technology has also been used in supply chain management to optimize production and inventory management.

Augmented reality has been used to create immersive and interactive shopping experiences for customers, allowing them to try on products virtually before making a purchase.

Blockchain technology has been used to enhance transparency and traceability in the luxury industry supply chain, as well as to verify the authenticity of luxury goods, track their origin and production process, and ensure ethical and sustainable practices.

The rise of mobile technology and e-commerce has transformed the way luxury brands interact with customers, allowing them to reach a wider audience and offer a more seamless shopping experience.

These technological advancements are helping the luxury industry to become more efficient, sustainable, and customer-focused, while still maintaining the exclusivity and quality that defines this industry.

1.3.1 From immobility to the adoption of state-of-the-art technologies

The luxury industry has transformed from being stagnant to adopting modern technologies. In the past, luxury brands were hesitant to adopt new technologies and relied on traditional methods for production and distribution. However, the advent of digital technologies has brought dynamism to the industry and introduced innovative practices.

E-commerce is one of the most significant technological advancements in the luxury industry. By establishing an online presence, luxury brands now offer customers the convenience of shopping for high-end products from their homes. This shift to e-commerce has also expanded the brands' reach and access to global markets.

Additionally, luxury brands are now exploring the potential of cutting-edge technologies such as augmented reality, virtual reality, and artificial intelligence. These technologies offer the opportunity

to create unique and immersive experiences for consumers, allowing them to interact with products and brands in a more meaningful way.

As stated before, the luxury industry is incorporating various advanced technologies to improve their products and services. For instance, 3D printing is utilized to produce intricate designs for jewelry, watches, and fashion accessories, which offer flexibility and precision in production, enabling designers to experiment with new shapes, textures, and colours. Luxury brands are also implementing artificial intelligence to personalize customer experiences, using AI-powered chatbots to respond to queries and offer customized product suggestions. Augmented reality is another technology being used to create immersive experiences for customers, allowing them to visualize products in real-world settings before making a purchase. Blockchain technology is being used to promote transparency in the supply chain and track the origin of raw materials to ensure ethical and sustainable sourcing. The luxury industry is also adopting the Internet of Things (IoT) to create smart products with enhanced functionality and convenience, such as smartwatches that can monitor fitness levels, provide navigation, and make phone calls. Additionally, luxury brands are prioritizing sustainability by using eco-friendly materials like recycled products and 3D printing to reduce the environmental impact of production processes and meet the increasing demand for sustainable luxury goods.

In summary, the luxury industry has come a long way in adopting state-of-the-art technologies, with brands now incorporating digital and sustainable practices into their core strategies. As technology continues to evolve, we can expect to see the luxury industry continue to innovate and create new and exciting experiences for consumers.

1.3.2 New customers' expectations

In recent years, there has been a shift in the expectations of new customers in the luxury industry. These customers are often younger and more diverse, and they place greater emphasis on sustainability, social responsibility, and digital experiences.

Firstly, sustainability has become a key concern for many luxury consumers, particularly younger generations who prioritize environmentally friendly practices and ethical sourcing. Customers expect luxury brands to be transparent about their sustainability efforts and to have a clear commitment to reducing their environmental impact.

Secondly, social responsibility is also a growing expectation among luxury consumers. Many customers want to see brands taking a stance on social issues and supporting causes that align with their values. This includes diversity and inclusion initiatives, as well as charitable giving.

Finally, new customers also expect luxury brands to offer seamless digital experiences, both online and in-store. This includes everything from personalized recommendations and easy online purchasing to augmented reality and virtual try-ons. As the metaverse continues to grow, luxury brands will need to consider how they can create engaging and immersive experiences for their customers in this new digital realm.

Luxury brand customers place value on the ability to interact with products both in physical stores and online, and a 3D virtual reality interactive environment can provide this experience. The customization feature offered by a 3D VR system can have a significant impact on the perceived value of the customer experience in luxury brands' online stores.

Luxury brands will need to adapt to these changing expectations in order to attract and retain new customers.

1.3.3 VR and AR in the luxury industry

The luxury industry has increasingly adopted Virtual Reality (VR) and Augmented Reality (AR) technologies, particularly in fashion and car brands, to improve customer experience and engagement. In fashion, luxury brands use VR for virtual showrooms, virtual fashion shows, and virtual stores, while virtual try-on experiences can show customers how a product would look on them. Similarly, luxury car brands use VR to create virtual showrooms, test drive experiences, and interactive experiences that demonstrate car design and engineering. AR technology offers similar benefits, such as virtual try-on experiences for fashion, interactive shopping experiences and it can also be used for virtual showrooms and test drive experiences for luxury cars. These technologies can help luxury brands build customer loyalty and increase sales by providing immersive and engaging experiences.

The potential applications of VR and AR in the luxury industry are extensive. Among others, some potential future applications of VR and AR in the luxury industry are:

- Virtual personal shopping: luxury brands can create virtual personal shopping experiences for their customers using VR and AR technology. Customers could interact with virtual sales associates and receive personalized recommendations based on their preferences and shopping history.
- Customization: luxury brands could use AR technology to create virtual try-on experiences that allow customers to see how custom-designed products would look on them. This could include tailored clothing or accessories, as well as custom-designed luxury cars.
- Virtual events: with the pandemic still affecting the ability to hold large in-person events, luxury brands could use VR and AR to create immersive and engaging virtual events for their

customers, including virtual fashion shows or product launches that allow customers to interact with the products in a digital environment.

- Brand storytelling: VR and AR can be used to create immersive brand storytelling experiences that help customers to better understand the history, craftsmanship, and innovation behind luxury products. For example, luxury car brands could create VR experiences that allow customers to see how a car is designed and built from start to finish.
- Augmented reality shopping: in the future, AR technology could allow customers to view and interact with luxury products in a virtual environment in real-time, using their smartphones or AR-enabled devices. This could help to create a more engaging and interactive shopping experience, as well as reduce the need for physical showrooms and stores.

Luxury brands already use these technologies in a creative manner, especially in the fashion and automotive industry. Some specific examples of how VR and AR have been applied in these two sectors, are shown below.

In fashion, the luxury brand Dior has created a virtual reality experience called "Dior Eyes" that allows customers to view their products in a digital environment, explore virtual showrooms, and experience virtual fashion shows.

The luxury brand Gucci has created a virtual showroom for their products, which allows customers to browse and view their collections in a digital space.

The luxury car brand Audi has created a virtual reality experience called "Audi VR experience" that allows customers to explore and interact with their cars in a virtual environment, including the interior and exterior of the car.

The luxury car brand Bentley has created a virtual reality experience called "Bentley Inspirator," which uses AR technology to help customers choose the right car by creating a personalized experience that matches their preferences.

The luxury brand Louis Vuitton has used AR technology to create interactive shopping experiences in their stores, including a virtual pop-up shop that displayed their products in a 3D environment and a "magic mirror" that allowed customers to see how accessories would look on them.

These are just a few examples of how VR and AR are being used in the luxury industry to enhance customer experience and engagement. As the technology continues to evolve, it's likely that we'll see even more creative and innovative applications in the future.

Using VR or AR technology can offer several benefits to luxury brands, including increased customer engagement, enhanced customer experience, increased sales, reduced costs and improved brand image.

Starting with the first two benefits of the list above, VR and AR can provide an immersive and interactive experience, allowing luxury brands to engage customers in a new and exciting way, as well as provide customers with an enhanced experience by allowing them to visualize and interact with products in a virtual environment.

Moreover, if on one hand, by providing customers with an immersive experience, VR and AR can help to increase sales, by creating an emotional connection between the customer and the product, on the other hand these technologies can also help to reduce costs by enabling virtual showrooms and test drives, reducing the need for physical showrooms and test drives.

Finally, by using cutting-edge technology, luxury brands can enhance their brand image and reinforce their reputation for innovation and quality.

In support of these examples of benefits, a study by Jung et al. (2021) is presented, which, starting from the example of some fashion brands (Louis Vuitton, Balenciaga, Gucci, etc.) that use VR devices to create shows and fashion shows, demonstrates how the use of VR experiences in the luxury fashion industry can democratize exclusive physical consumption experiences, such as fashion shows, by making them available to everyone within the boundaries of virtual reality. Indeed, VR heightens the participant's feelings of importance and also elicits a sense of equality among consumers, as they possess the same access to exclusive consumption events. By making these experiences freely available to everyone, VR communications are perceived to delegitimize social hierarchies that exist in the physical world, liberating consumption experiences from social and market institutions.

However, there are also some potential disadvantages to using VR or AR technology in the luxury industry, including high cost, limited accessibility, technical issues, limited sensory experience and risk of depersonalization. Indeed, implementing VR or AR technology can be expensive, it requires specific hardware or software to run, which may limit its accessibility to some customers and technical issues may arise that can be difficult to resolve.

Additionally, while VR and AR can provide an immersive visual experience, other senses such as touch and smell are not yet fully integrated, which may limit the sensory experience for customers and the use of these technology may also depersonalize the shopping experience for some of them, potentially reducing the personal touch that is often associated with luxury shopping.

Another issue related to the use of these devices is presented by the same study mentioned above, the possibility of escapism (Jung et al., 2021c).

The concept of escapism in consumer behaviour refers to experiences that allow individuals to escape from the mental burdens of their everyday lives (Hirschman, 1983, Cruz et al., 2018).

This is particularly relevant in the context of virtual reality experiences, which can provide a sense of embodied escapism and expand consumer imagination. However, this form of emancipation is different from democratization in that it is focused on personal escape rather than dematerializing social hierarchies. While VR can provide a means of relieving anxiety and loneliness, it can also evoke dystopian discourses and fears of a loss of freedom in cyberspaces. This is due to the ambiguous materiality of VR experiences, which can feel very proximate to physical world experiences in some ways but lack social interactions.

Overall, while there are some potential challenges associated with using VR and AR technology in the luxury industry, the benefits of enhanced customer engagement and experience, increased sales, and improved brand image can outweigh these challenges.

1.3.4 Metaverse and luxury industry

The potential of the metaverse to revolutionize the luxury industry cannot be overstated. By providing an online platform that simulates the physical world, the metaverse offers luxury brands a unique opportunity to showcase their products in a virtual environment, providing a completely immersive and novel shopping experience for customers. This can expand the customer base of luxury brands while enhancing their overall experience by giving them a taste of the luxury lifestyle, even if it's not accessible to them in real life.

Moreover, the metaverse opens up new doors for luxury brands to offer personalized experiences for their customers. With 3D digital replicas of physical stores, customers can browse and try on virtual clothing and accessories, which can be customized to reflect their individual preferences. Brands can also hold virtual events, such as fashion shows, art exhibitions, and product launches, to create interactive and engaging experiences for customers. These initiatives can build stronger emotional connections with the brand and promote customer loyalty.

Lastly, the Metaverse presents opportunities for brands to offer personalized and customized experiences that are hard to replicate in the physical world. Customers can design and customize their own avatars, and luxury brands can offer unique and customized products that cater to the needs of each individual customer. This level of personalization can enhance the luxury experience and provide a competitive edge to brands in the market.

In summary, the Metaverse holds immense potential for luxury brands to transform the industry by providing innovative ways to engage with customers and offer personalized, immersive experiences that transcend the physical world.

1.3.4.1 The first luxury brands to enter the metaverse

The impact of the metaverse isn't limited to the business-to-customer sector, as it also presents significant opportunities in the business-to-business realm. Through the metaverse, users can test new products in a virtual environment, which can be done at a much lower cost, and give instant feedback. The metaverse landscape may differ across countries, resulting in different representative companies, typical products, and development plans, as shown in a study of Ning et al. (2021).
The luxury brands that have decided to have a presence in the metaverse are many and varied, ranging from fashion houses (Gucci, Balenciaga, Burberry, Dior, Bottega Veneta, Fendi, etc.) to hotellery (Four Seasons, Ritz-Carlton, Hilton, Marriott, etc.), to watch brands (Rolex, Omega, Audemars Piguet, Richard Mille, etc.), and even to automobile manufacturers (Rolls-Royce, Lamborghini, Bugatti, Porsche, Mercedes-Benz).

Upon closer examination of the fashion and automotive industries, it is evident that there are various methods that brands are utilizing to enter the virtual world.
In the fashion industry specifically, there are several examples of brands using virtual platforms to reach consumers and create new experiences, including:

- Ralph Lauren, for instance, has opened retail outlets in the virtual world of Roblox, which has 47 million active daily users, making it a more attractive platform than cities such as Milan, Tokyo, and New York. Ralph Lauren has filled its online shops with virtual items such as puffer jackets and checkered beanies that can be accessed by anyone in the world around the clock for about $5.
- Gucci has designed virtual outfits for player characters in the mobile game Tennis Clash and created a virtual shopping experience within Roblox.
- Burberry has established a virtual shopping experience within the Chinese virtual reality platform Baidu.
- Balenciaga hosted a virtual fashion event in the online driving game Gran Turismo.
- Dior has established a virtual shopping experience within the online fashion game Joys.
- Off-White partnered with the mobile gaming platform R-Planet to create digital fashion items.

- Louis Vuitton has created a virtual shopping experience within the gaming platform League of Legends.
- Prada collaborated with the mobile gaming platform Honor of Kings to create virtual outfits for player characters.

These examples demonstrate how fashion brands are using virtual platforms to create new and engaging experiences for customers, reaching new audiences, and expanding their reach in the digital world.

As for the automotive sector, among the aforementioned brands, Lamborghini has created a virtual gaming experience called "The Real Race" within the online game Assetto Corsa Competizione. Users can compete in a series of virtual races on real tracks, driving exclusive Lamborghini cars and win special prizes.
Another example is Bugatti, which has partnered with the mobile gaming platform CSR Racing 2 to create a series of exclusive virtual cars, including the Chiron Pur Sport. Additionally, Mercedes-Benz, among other things, has created a virtual gaming experience within the online game Slightly Mad Studios, where users can drive classic and modern Mercedes-Benz cars in a series of virtual races.
Finally, Porsche has collaborated with the mobile gaming platform Real Racing 3 to create a series of virtual events that allow users to compete with exclusive Porsche cars.

To conclude, luxury brands are increasingly exploring opportunities to establish a presence in the metaverse. Luxury fashion and automotive brands have already begun to experiment with various metaverse initiatives, such as creating digital fashion items and virtual racing experiences. As the metaverse evolves, we can expect to see more unique and immersive experiences that cater to the interests of target audiences, providing a new avenue for brand marketing and consumer engagement.

1.4 The case of Mercedes-Benz

Trivellato is an official dealership for Mercedes-Benz, AMG, and smart brands, which has been in business for over 100 years. The company has always been driven by the desire to explore and innovate, and it is increasingly focusing on an omnichannel approach. Trivellato's main idea is to move from a push strategy to a vision focused on accompanying the customer within an ecosystem of tailor-made experiences and services. As part of this renewal process, Trivellato has launched a virtual showroom in the metaverse, which is accessible through a link on the company's website. The virtual showroom provides an emotional and immersive user experience built on augmented reality,

allowing customers to interact with different types of content related to the automotive world, including product videos, new model launch events, national previews, restyling, and Mercedes-Benz accessories.
Before entering the virtual showroom, each user chooses their avatar from the available models or creates one from scratch using the many customization options. Once inside, the customer can view a premium selection of vehicles from the Mercedes-Benz, AMG, or smart brands and interact with the various contents, including product sheets, detailed photos, video presentations of vehicles, price lists, and a product expert who is always available to provide personalized advice and useful information on the virtual vehicles on display.
The new virtual user experience will enable customers to interact with specially designed content using various engagement methods that are integrated into the company's lead generation strategy.

The primary objective of this initiative is to create a path based on a real "digital customer journey" that immerses the customer in a unique and immersive experience, adding value to their overall experience. Trivellato hopes to convert leads into loyal customers by creating new value and reducing business risks while enhancing its offering through new services and experiences. The virtual showroom in the metaverse represents a significant milestone for Trivellato, as it is the first car dealership in Italy to experiment with this innovative digital technology and customer experience approach. Overall, Trivellato's goal is to leverage this technology to provide customers with a unique and engaging experience that drives brand loyalty and ultimately, business growth.

Additionally, on May 18th, 2022, Mercedes-Benz announced that it has joined the Aura Blockchain Consortium, becoming the only car manufacturer to do so. The consortium includes other luxury brands such as LVMH, Prada Group, and Cartier. By partnering with the consortium, Mercedes-Benz aims to explore new dimensions of digital brand development, including creating digital art as NFTs and enhancing the customer experience through blockchain technology. The Aura Blockchain Consortium aims to provide its members with cutting-edge blockchain and NFT technology and plans to expand its technical roadmap to include various NFT solutions for luxury brands. The goal of the consortium is to increase the benchmarks for innovation, blockchain technology, and transparency, and also to strengthen customers' faith in the sustainable practices and product sourcing of the brands.

During the AMG Performance Day event in Imola on May 20th, Mercedes-Benz Italy unveiled its first NFT digital art project, which was created by artist Alessandro Paglia. The artwork features the new Mercedes-AMG SL 63 in a dynamic transition from the traditional grey of the Silver Arrows to

the future-oriented Patagonia Bright Manufactur red. Paglia spent over 150 hours drawing the artwork by hand with coloured pencils on rough cotton paper, resulting in a highly evocative and hyper-realistic final product. The 170 limited edition fine art prints were each associated with an NFT and came with a signed, numbered, and certified authentication. The project was aimed at a young and innovation-oriented audience, according to Mirco Scarchilli, Head of Marketing Communication Experience at Mercedes-Benz Italy.

Mercedes-Benz plans to continue exploring the NFT market and incorporating digital art into its user interface and user experience to enhance the luxury experience for its customers. The company is also exploring ways to incorporate NFT collections into their cars to create personalized and immersive art spaces with light and sound.

1.5 Research structure

The organization of the study is structured as follows:

- Chapter 2 outlines the research background by conducting a literature review that delves into the theories and variables previously investigated by other authors.

  The purpose is to gain a deeper understanding of the metaverse phenomenon in the luxury industry. The review primarily focuses on the economic system within the metaverse, the impact of technology on the customer experience, and the ways in which luxury brands can utilize the metaverse in their marketing strategies. Once the knowledge gap in the literature is established, the research questions and a theoretical framework will be presented to examine customers' attitudes towards luxury brands utilizing the metaverse.
- Chapter 3 covers the examination and interpretation of information gathered from a survey intended to assess the hypotheses generated in the previous chapter with the goal of addressing the research question. The chapter is structured into four main parts: a descriptive analysis, a factor analysis, and a reliability analysis, followed by the hypothesis testing obtained through an ordinal logistic regression. Finally, the findings are presented and discussed, as well as the theoretical contributions and the limitations of the study.

CHAPTER 2 THEORETICAL FRAMEWORK

2.1 Literature Review

The early 21st century saw significant advancements in virtual reality and computer graphics, laying the foundation for the development of the Metaverse. To analyse its development, I will use Web of Knowledge, a comprehensive academic database that covers many disciplines. As of January 22, 2023, there have been 740 publications and 1333 citations related to the Metaverse on this database (Figure 6).

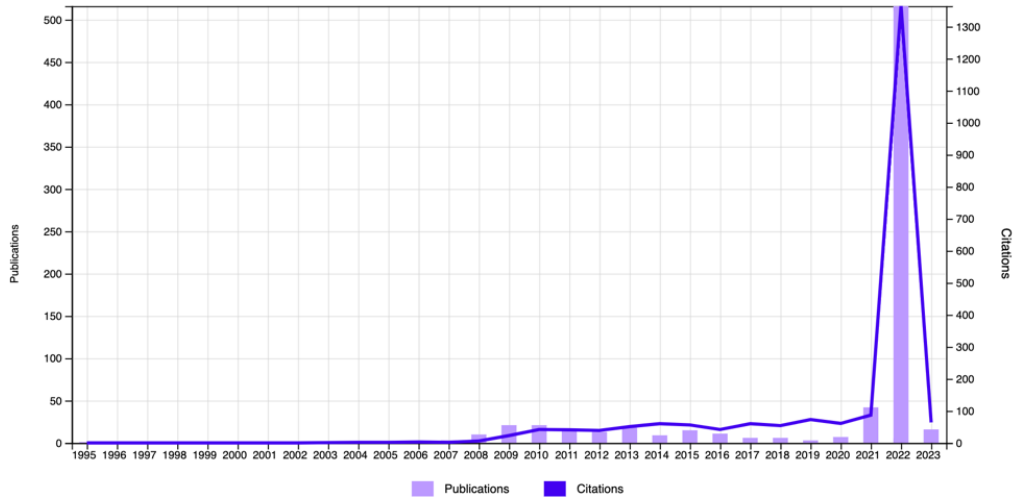


Fig. 6 - Publications and Citations related to the Metaverse on Web of Knowledge.

This chapter conducts a theoretical literature review of previous studies on the Metaverse. The review examines the various theories used by previous authors to gain insight into this new world. The focus is on the applications of the Metaverse in various aspects of life, in particular marketing related activities and its effects on customer experience. The literature review will be used as a foundation for identifying gaps in the literature that will inform the research questions of the study.

2.1.1 Economic system of the metaverse

The metaverse, a virtual world combining aspects of the internet and video games, is rapidly becoming a major trend in technology. Major tech companies have invested billions of dollars in its development, recognizing its potential for commercial applications such as video games, art, and business.

It has been estimated that 30% of global economic activity could be mediated by digital platforms by 2025 (Schenker Jennifer, 2019), leading to a fundamental change of the world economy.
As Bourlakis et al. (2009) point out, realization of the Metaverse will lead to "the development of a multi-spaced business environment far more complex than what we are used to. The nature and characteristics of this new business environment, incorporating intertwined physical, electronic, and virtual spaces" will have very significant "economic, social, and policy implications".

The metaverse economy, based on blockchain technology, is represented by utility tokens, crypto wallets and virtual collectibles, but as Ning et al. (2021) want to clarify, the development of this new world is still in its initial stage, thus its business model is not mature.
Emergen Research, a consulting firm, reported that the metaverse had a market size of US$48 billion in 2020 and is expected to reach US$829 billion by 2028. Another study focusing on digital currency has also projected that the metaverse could offer a revenue opportunity of US$1 trillion annually in the near future. Moreover, in the initial ten months of 2021, the metaverse received over US$10 billion in venture capital funding, according to Kunthara (2021).
Several studies have shown that the virtual social world must meet four design requirements:

1. Realism.
2. Ubiquity: the virtual social Metaverse must be ubiquitously accessible from various locations devices.
3. Interoperability: the ability to employ standards that allow users to move seamlessly between different virtual locations.
4. Scalability: the ability to manage computational power in a way that a large number of users can interact socially in the Metaverse without problems of connection.

(Ning et al., 2021; Dwivedi et al., 2022)
The metaverse is now an economic system linked to the real-world economy: money is transferred from the real world to the metaverse, and profits are taken out from the virtual world to the real world, but at the same time the virtual world requires an economic system that can handle activities different from those happening in the real world.
In relation to this, of particular relevance is the research by other authors, who present an overview of the possible economic systems that can enable any possible economic activities and issues in both the current and future metaverse (Figure 7) (Huang et al., 2022).

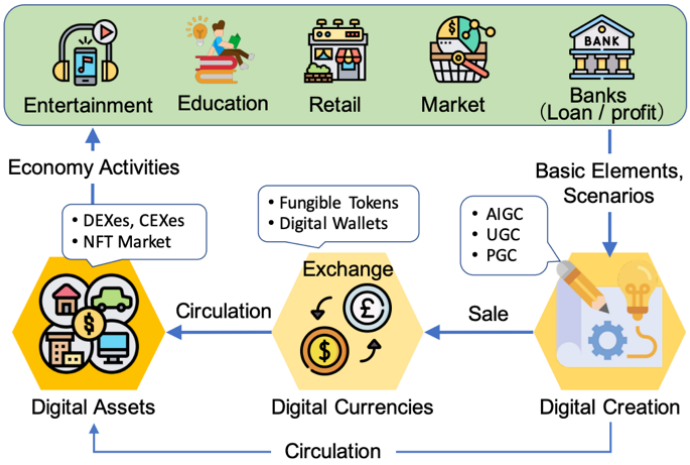


Fig. 7 - Framework of economic systems for the metaverse.

They have demonstrated that the most important foundation of the metaverse economy is the token economy based on the blockchain technology.

Indeed, blockchains, have been utilized to create many economic systems across various industries, such as DeFi, digital currencies, NFTs, and platforms for trading digital assets.

Digital assets, which are the engine to drive the development of the economic system of the metaverse have been defined by Van Niekerk as "any item of text or medium that has been formatted into a binary source that includes the right to use it".

Moreover, Huang et al. (2022) revealed in their study that in the microeconomic system of the metaverse, clients function as both producers and consumers of user-generated content and form the foundation of economic activities. The decentralized economy of the metaverse provides financial products to clients without the involvement of intermediaries such as banks, insurance companies, or brokerages.

In their study, Huang et al. (2022) also discussed Decentralized Finance (DeFi) as a financial service technology that depends on distributed ledgers established on top of blockchains.

DeFi leverages smart contracts and digital assets to introduce new economic models within the metaverse, enhancing the decentralization of the market and business in the metaverse. In this way all transactions are recorded on the blockchain and cannot be altered.

2.1.2 Monetary systems in the metaverse

Shifting form web 2.0 to web 3.0, the different monetary system used is emblematic of the change we are witnessing.

In web 2.0, payments are made using credit or debit cards, while in web 3.0, payments are made using crypto wallets, and digital assets ownership is managed through non-fungible tokens (NFTs). In web 3.0, digital assets are more easily transferable and not tied to a specific platform.

As long as content creators can't be defined just as developers and programmers, but also as the founding community, incentive mechanisms should be created to support their contributions.

These mechanisms, by providing various types of rewards, encourage high-quality contributions, thus helping sustain the economy of digital assets.

Huang et al. (2022) came up with the theory that existing incentives for the metaverse ecosystem are based on economic theories such as auction mechanisms, game theory-based strategy optimization, reward systems, and reputation mechanisms.

- Auction systems, by giving buyers the opportunity to bid on the worth of the content, can promote the effective flow of digital assets.
- Game theory can simulate the interaction between rational participants in this new economy and at the same time it can improve individual approaches to achieve maximum benefit and overall well-being.

In the economy of a metaverse, digital assets are commonly used as a medium for rewards.

According to Huang et al. (2022) the main digital assets are:

- User-Generated Content (UGC): any type of digital content created by metaverse users, such as pictures, music, and videos. UGC include personal privacy data, used for identifying user demand, thus it has economic value.
- Professional Generated Content (PGC): digital content created by experts or professional institutions.
- Artificial Intelligence-Generated Content (AIGC): digital content generated by AI, such as news reports, poetry, and photos.
- Non-Fungible Tokens (NFTs) are a distinct type of digital asset that employs blockchain technology to guarantee their uniqueness. This is accomplished by recording historical transactions on the related blockchain in a permanent manner.

Assets can be given to metaverse developers as a form of encouragement/incentive. For instance, GameFi refers to blockchain games where players can earn cryptocurrency and NFTs as rewards for completing in-game tasks.

As presented by Periyasami and Periyasami (2022), the above-mentioned digital assets are not the only reward existing in the Metaverse, there are also other different digital currencies such as:

• Stable coins (i.e., USDT/USD/USDC).

• Cryptocurrencies: they serve as money in a virtual digital world.

• Central Bank Digital Currency (CBDC) is a form of digital currency issued by a central bank. While many countries are currently testing CBDCs, China has been at the forefront of CBDC testing since 2020.

The crucial role of cryptocurrencies is also stated by Huang et al. (2022), who define Cryptocurrencies as the best-performed blockchain applications in the past few years.

Moreover, given that cryptocurrency is a medium of value exchange in the digital world, the authors also claim that these currencies can bring liquidity to the economic market of digital assets (Huang et all., 2022).

To enable the transactions of both UGC/AIGC and NFT, the metaverse's monetary systems require decentralized exchanges.

As users form the foundation of the metaverse ecosystem, it is important to consider how they interact with the economic systems within the virtual world. This includes managing their digital assets.

In this regard, the definition of digital wallet: "A digital wallet is a software that allows users to interact with blockchains. It provides users services such as storing private keys of users' crypto assets, conducting transactions, and invoking smart contracts." is of paramount importance (Huang et al., 2022).

Digital wallets allow users to store their private keys and public addresses, which in turn are used to sign on the blockchain to initiate transactions. These new types of wallets also include features such as checking account balances, receiving tokens, and transferring digital assets.

Some wallets may also have additional features. For example, both Trust Wallet and MetaMask provide access to various NFT marketplaces and game assets.

MetaMask is the most well-known crypto wallet, which can be used to link any crypto's trading platform of the user's choice.

Since blockchains are independent between each other and each individual or organization can create their own metaverse platforms, according to Huang et al. (2022), a cross chain communication protocol, that enables blockchains to communicate with each another, is required.

The following cross chain solutions are the ones presented in their article as promising for the metaverse:

1) Heterogeneous model compatibility: different metaverses may be based on various underlying blockchains with distinct cryptographic algorithms, therefore, a design challenge is to achieve interoperability between heterogeneous blockchains.

2) Privacy preservation: the metaverse should provide a cross-chain protocol that supports identity anonymity.
3) Support for multiple object interoperability: a cross-chain protocol designed for the metaverse should support the interoperability of different types of information across multiple metaverses.

2.1.3 Metaverse applications

As Periyasami and Periyasami (2022) state "One of the primary purposes of the metaverse, from a business aspect, is to increase communication between people and businesses". Undoubtedly, the metaverse is providing and will continue to provide fresh opportunities for enterprises, by enabling them to interact directly with customers through their avatars, instead of relying on traditional and indirect marketing methods like print ads or TV commercials.
Following this theory, Sun (2022) explains that the metaverse will enhance the possibilities for retail and e-commerce by offering users a more engaging shopping experience. By using their digital avatars, users will be able to test products in virtual worlds, understanding better their features. Additionally, retailers will receive valuable and immediate feedback on product improvements, thus having a clear idea of what customer demand will be.

Dwivedi et al. (2022) developed a model that classify the applications of the metaverse into two categories: "metaverse as a tool" and "metaverse as a target," as shown in the Figure 8. "Metaverse as a tool" means the metaverse is used to solve difficulties and problems in the real world (Office, Social Life, Education and Healthcare), while "Metaverse as a target" refers to how the metaverse itself can perform actions such as generating profits (Business activities and Real Estate activities, Game and Role Play).

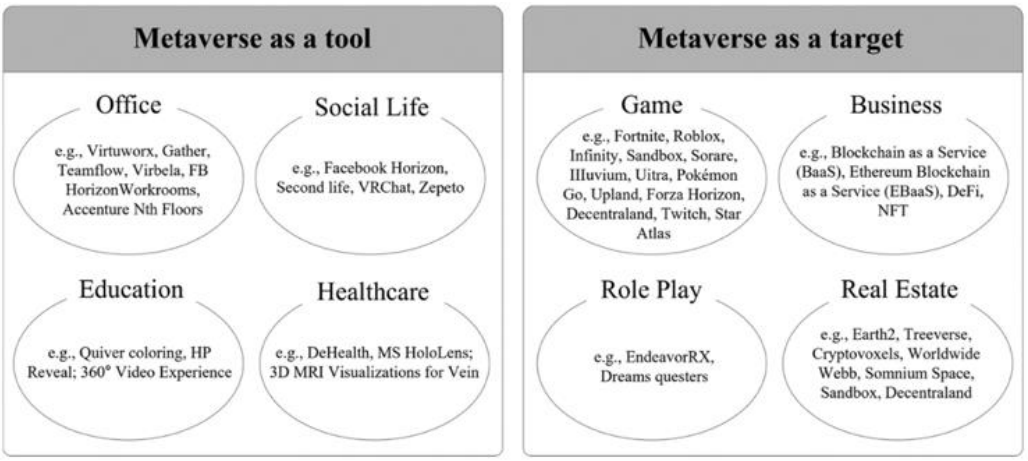


Fig. 8 - Metaverse applications classified as "metaverse as a tool" or "metaverse as a target".

This classification of the possible applications of the virtual world is taken over by Bojic (2022), who divide them by macro area:

- Metaverse and workplace: the hybrid work model has heightened interest in the Metaverse due to its potential to bring employees together in the future workplace. Rather than relying solely on video communication, the metaverse offers the ability for individuals to meet as holograms in virtual environments.
- Metaverse in education: the virtual space can provide a more realistic learning experience in classrooms by using 3D simulations, leading to more participative students.
- Metaverse in gaming: the gaming industry is at the forefront of the Metaverse concept.
- Metaverse in entertainment: the Metaverse has the potential to enhance immersive storytelling and world-creation in the entertainment sector and unleash fan creativity.
- Metaverse in architecture: architects will use the virtual space to create and have their clients visualise the new buildings, houses and environments they are designing.
- Metaverse in fashion industry: fashion companies, such as Diesel, Gucci, Balenciaga and many more, have already implemented augmented and virtual reality in their try rooms. Moreover, some famous brands, such as Dolce&Gabbana and Philipp Plein, from 24 to 27 March 2022, took part in the first Fashion Week in the history of fashion in the virtual world, more precisely the Metaverse chosen for the occasion was Decentraland (MANA).

In a wider sense, Dwivedi et al. (2022) suggest that deep involvement in the supply chain at all stages can bring about a transformation in manufacturing and logistics processes. This can result in informed decisions for suppliers and all stakeholders involved in operations management (F. Li, 2020a, 2020b). For example, the use of simulated manufacturing in the metaverse can decrease costs, improve waste management, and promote environmental sustainability (Brydges, 2021; Fatimah et al., 2020). In

addition, a more personalized experience for customers allows a better communication between designers, engineers, manufacturers, and customers.

Moreover, the metaverse, by increasing the transparency of processes, can improve visibility and purchasing patterns. (Williams et al., 2013) and, by changing the way goods are loaded or packaged onto automated vehicles or drones for final shipment, it will transform the traditional logistics. (Choi et al. 2022).

Finally, utilizing virtual or augmented reality in warehouse design can offer a simulated experience before constructing physical locations for storage and inventory management. (Hassan et al., 2015; Kov´acs, 2021).

The Metaverse enhances collaboration, optimization, transparency in all the operations management, by providing real-time tracking of raw materials, information on producers or on corporate social responsibility, lead times and delays in logistics (Giannakis et al., 2019; Dolgui et al., 2019; Garcia-Torres et al., 2019; Papaioannou et al., 2020).

2.1.4 Positive and negative impact of the metaverse on human beings

Psychological research suggests that people want to appear better than they are for self-enhancement and self-assessment (Strube & Roemmele, 1985).

This is particularly evident in social media where individuals constantly compare themselves to other people and are exposed to the comments of them. Dwivedi at al. (2022) demonstrate how the deviation from the reality can be even more profound in Virtual Reality. In the Metaverse, people can create better-looking, idealized avatars that allow them to escape the daily life troubles. However, if people begin to prefer this virtual world over reality, it could negatively impact their self-esteem and confidence, that's why policy makers should pay special attention to the needs of children and teenagers who are the users who will likely adapt more quickly to the Metaverse.

The role of policymakers in guiding the transition to the metaverse is of utmost importance. Policymakers must work with technology companies to ensure a responsible approach to metaverse development, as excessive regulations could negatively impact consumers. The necessity of regulations becomes clear when considering the tremendous power that tech companies wield today, a power that goes beyond just their financial assets.

To back this up, Bojic (2022), in his research, highlight that regulations are also necessary because the content recommended through recommender systems is influenced by the algorithms directly created by tech companies., which in this way have a huge influence in today's world.

The Metaverse allows people to have immersive experiences from their own home, accessible at any time and place. This convenience may be one of the causes of addiction to this new world, indeed past research has shown that addiction to new media can be more intense than addiction to older forms of media.
The research of Bojic (2022) prove that these are valid concerns. In fact, recent studies have shown that virtual reality gaming is more addictive than other types of gaming. The Metaverse may provide an escape from real life, known as "substitution of real life." According to statistics, in 2021, 60 million people were addicted to video gaming, which is 3.05% of all players. VRChat, in particular, has been found to be more addictive than other traditional games. The ability to replicate reality is considered to be the most addictive aspect of media, and the Metaverse, being the most realistic media yet, has the potential to be highly addictive as it includes not just sight, sound, touch, but also the sense of space and interactivity.

Investing the positive and negative impact that this technology might have on users, a not so recent research by Buchanan-Oliver et al. (2010) present an important topic that has been later supported by other authors. They have identified the presence of conflicting narratives about the portrayal of cyberspaces in consumer culture. On one hand, cyberspaces are often seen as utopian spaces of freedom, where virtual reality technology creates an idealized "public sphere" that is not controlled by the state. On the other hand, there are also opposing, dystopian narratives that view cyberspaces as tools of oppression and control, used by powerful institutions to manipulate people.
This ambivalence of feeling has been reproposed by a more recent study of Jung et al. (2021), who supports the idea that VR experiences induce ambivalent meanings that consumers construct post-experience. Indeed, he has found that virtual reality experiences can evoke positive emotions such as joy, freedom, and a sense of empowerment by providing an escape from social hierarchies. However, it has also been noted that virtual reality can cause feelings of anxiety, loneliness, and fear.
Once again, managers should be mindful of the cultural narratives surrounding virtual reality consumption, they should avoid linking it with negative themes, and instead promote positive associations with empowerment and liberation.
Another theory presented in this study is that individual differences, previous personal experiences with emerging technologies, may influence their interpretation of VR experiences (Jung et al., 2021).

2.1.4.1 Metaverse's impact on customer experience

The metaverse is predicted to gain mainstream acceptance, thanks to the social perspectives of Generation Z, where the distinction between online and offline identities is blurred. Millennials and Generation Z have grown up in a world where technology is constantly evolving and for this reason they know how to adapt to new technologies.

Bojic (2022) suggests that the popularity of the metaverse can be gauged by the number of individuals who use virtual reality games and applications, which can be regarded as predecessors to the metaverse. For instance, there are 150 million monthly active users of Roblox, and a significant portion of these users are children. Of those children, 2/3 are aged between 9-12 in the USA, and 1/3 of them are under 16 years old.

Mark Zuckerberg believes the metaverse will be the next step in the evolution of the Internet, due to its ability to offer immersive experiences for users to express themselves. The metaverse has a sense of presence that makes users feel like they are physically present with others and offers improved user interfaces with more natural forms of interaction such as speech, gestures and thoughts.

With the support of virtual reality (VR) headsets, users can interact with avatars, objects, virtual environments, organizations as well as other users.

Gursoy et al. (2022) suggests that: [...] the metaverse is a collective, persistent, and interactive parallel reality created by synthesizing all virtual worlds to form a universe that individuals can seamlessly traverse. Consumers can inhabit this virtual world using their digital avatars, co-create value, and combined with blockchain, cryptocurrency and non-fungible token, they may even perform actual economic activities.

According to Dwivedi et al. (2022), the metaverse is viewed from a social perspective and it is suggested that as activities shift to the metaverse, there will be more emphasis on enhancing the hedonic aspects of being human rather than utilitarian exchange. The metaverse is considered an extension of human experiences and should prioritize the sociological aspects over the technological ones, with the aim of improving positive human qualities such as inclusion, happiness, empowerment, and creativity.

From the firm's point of view, according to new research it has been demonstrate how they have now started to view consumers as partners and not just assets in the process of achieving success (*The Best of Both Worlds: Using the Metaverse to Enhance Customer Experience/ Emerald Insight, 2022*). Ensuring that customer needs are satisfied is now a priority and using the metaverse can allow firms to have a more authentic engagement with them.

Several studies have highlighted a crucial aspect in understanding the relationship between customers and companies in the metaverse: customers have the ability to recreate elements such as ambiance and atmosphere to their liking, giving them a sense of control and empowerment that leads to a more satisfying experience. The ability to have ultimate control over the virtual space allows for the creation of customizable, personalized environments that can be tailored to reflect customer desires. As a result, consumers can use the metaverse to increase their satisfaction (Buhalis et al., 2022; *The Best of Both Worlds: Using the Metaverse to Enhance Customer Experience/ Emerald Insight, 2022*). Another author, Spajić et al. (2022), also fits into this line of thought by saying that customers, by creating their avatars based on their gender, age, social networks, and interests, will be able to present themselves in the way they want, allowing brands to improve customer knowledge.
Authors claim that the Metaverse-based retail spaces will exist alongside other online and offline channels, such as web-based stores or physical stores: customers will have the choice of using different channels, depending on their preferences and needs (Spajić et al., 2022; Dwivedi et al., 2022). The Metaverse can provide customers with personalized purchasing experiences tailored to their specific wants, without even leaving their homes. However, it is not only the range of options that is important, but also the quality of customer interactions with a brand. Research has shown that omnichannel customer engagement leads to higher loyalty, and the inclusion of the metaverse as an additional channel can further improve the overall customer experience (Dwivedi et al., 2022).

Speaking of another benefit arising from the use of the metaverse, this new world will help in reducing costs and expand beyond what physical restrictions can allow, indeed sometimes a firm needs to have physical infrastructure and land to provide certain experiences, while, with the metaverse, these can be assigned to the virtual space (*The Best of Both Worlds: Using the Metaverse to Enhance Customer Experience/ Emerald Insight, 2022)*.
On the opposite, it’s fundamental to keep in mind that implementing this type of technology is not accessible to all firms, thus mangers need to understand when the benefit of implementing this technology far outweigh the costs and time needed to develop it.

According to Olson et al. (2019) and Sultan (2018), having an understanding of the objectives, actions, and anticipations of customers can enable the creation of experiences that result in a positive overall customer journey. The term "customer journey" typically refers to a series or sequence of steps that a customer goes through in order to access or utilize a company's product or service, as explained by Følstad and Kvale (2018).

Dwivedi et all. (2022) are of the idea that as virtual spaces offer limitless experiences, it is likely that the metaverse will lead to the creation of new types of customer journeys. To design these new journeys in an effective way, retailers must have a deep understanding of the consumer's preferences, and to do so analysing users' data is the first step. By optimizing touchpoints for each customer, retailers can better meet their expectations and improve their satisfaction (Halvorsrud et al., 2016).
For this reason, is fundamental to know how users act and behave in this virtual world.
At this purpose Kozinets (2022) has investigated the use of Netnography. Netnography is an accepted set of data collection, analysis, ethical research procedures that use online traces derived from social media to generate deep human understanding (Kozinets, 2015) and it has the potential to be used as a method to study humans' intersections in the metaverse.
Given that immersive experiences such as those in the Metaverse are multidimensional, layered and complex, the person experiencing them will undergo several layers of reality dissociation, as they would in a dream.
To summon up, the research technique of Netnography involves examining the social meaning and behaviour in networked environments through a human-cantered perspective on technology. The method of immersive Netnography is employed to study digital media, such as virtual and augmented reality and the metaverse. With the increasing utilization of immersive technology across a variety of industries and organizations, the application of immersive Netnography can yield important insights into user experiences.

2.1.5 Metaverse and Marketing

The study of Kaur (n.d.) shows that the shift from Industry 1.0 to Industry 4.0 has greatly affected marketing strategy. Indeed, while marketing strategy 1.0 primarily focuses on selling products without considering the preferences of the target market, the marketing strategy 4.0 focuses exactly on that, namely on using big data analysis to personalize services and products.
According to Kim (2021), advancements in immersive technologies suggest that the metaverse could change both the way we think about delivering advertising and how consumers react to it. In fact, as we can observe in more than one research, companies are already actively engaged in metaverse marketing, exploring new advertising opportunities especially in consumer market sectors such as sports, tourism, luxury and fashion brands, entertainment, automotive manufacturers and gaming (Ahn et al., 2021; Zhang et al., 2022).

Companies that are targeting younger demographic groups via the metaverse, tend to be from the physical world and gaming or metaverse-specific brands such as Roblox, Decentraland, and Fortnite are becoming the primary hosting platforms (Hollensen, Kotler and Opresnik, 2022).

Among other things, metaverse can also be a chance for brands to either maintain their real-world brand positioning or to fully change their brand image (Rauschnabel et al.,2022a; Rauschnabel et al., 2019). Nike, which opened a virtual replica of its global headquarters in Beaverton, Oregon on Roblox in November 2021, is an example of this.

Advertising refers to a form of communication where an identifiable entity, such as a company, seeks to persuade a specific audience to take a certain action through the use of persuasive messaging. (Kerr and Richards, 2021). The unique features of the medium, message, audience, and responses in the metaverse are likely to bring about changes in the way advertisers promote their products and services, leading to new forms of consumer responses and transforming the manner in which consumers react to advertising (Kim2021).

As stated, both by Ahn et al. (2022) and by Rodgers and Thorson (2000), with the increasing popularity of the metaverse, the focus of the advertising process should shift to the customer, as users now have greater control over the advertising content they are exposed to, compared to traditional advertising channels where advertisers held most of the control.

2.1.5.1 Triadic relationship of advertising process in the metaverse

With the sudden surge in metaverse popularity, there is a gap in understanding metaverse marketing and the need to revise advertising theories. To accurately develop these theories, it is crucial to comprehend the connection between media characteristics and the psychological and social involvement of users. However, this task is difficult as advertising studies often simplify immersive technologies into a single entity, resulting in broad generalizations about VR or AR effects.

In order to have a clearer understanding of the relationship between metaverse and customer and metaverse and physical world and their influence on marketing, is useful to analyse a framework of Ahn et al. (2022) in which he presents his idea of triadic relationship between consumers (personal), engagement (behavioural), and media features (environmental).

These interactions in the metaverse have both direct and indirect effects on human behaviour in the physical world and vice versa, adding a second layer of triadic relationships to the framework (Figure 9). This concept of human behaviour which both influence and is influenced by the relationships

between environmental factors and personal factors, can also be found in the theory of reciprocal determinism of Bandura's (1986).

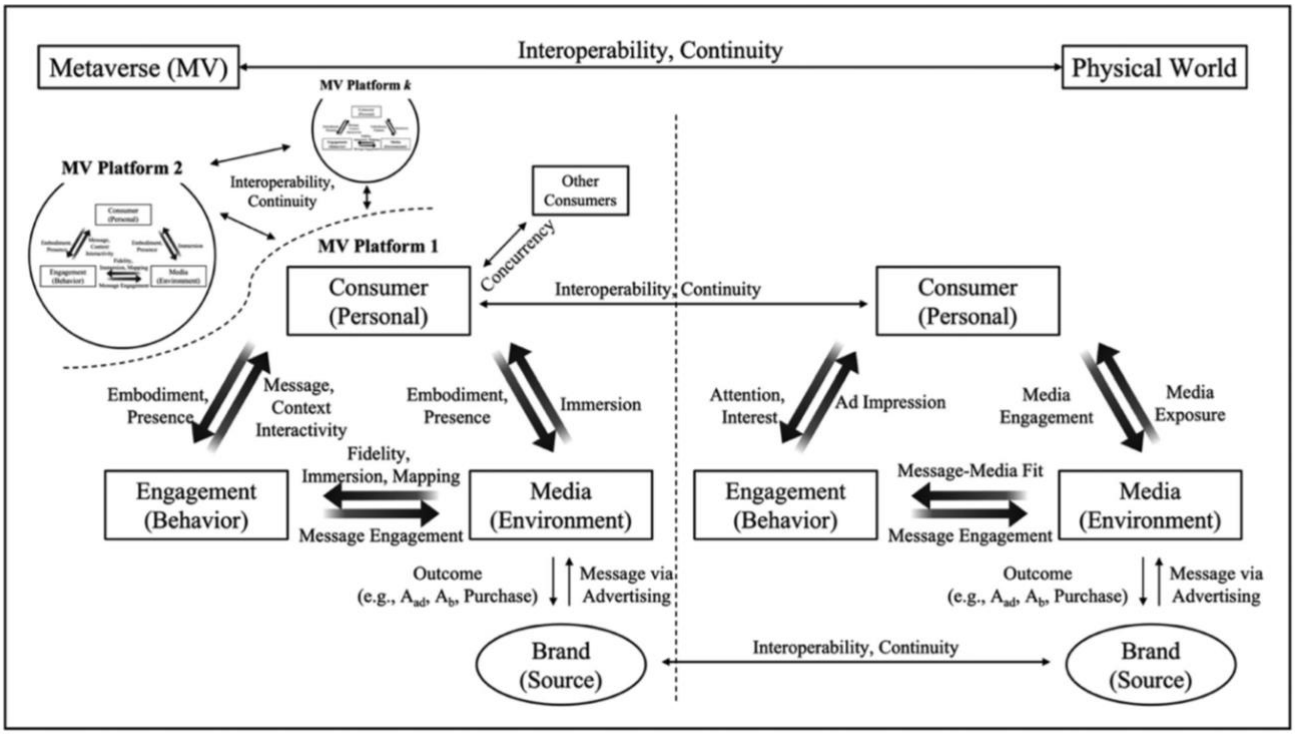


Fig. 9 – Triadic relationships in the metaverse and the physical worlds.

This framework aims to organize advertising effects in the metaverse.

Media features (environmental)

The degree of immersion in the metaverse, or how similar the virtual and physical worlds are, is a defining feature that has received considerable attention from academics, as it is believed to alter consumer experiences. In the field of computer science, the quality of immersive systems is composed of two factors - the realism of the display and the realism of the user's interactions within the virtual environment (McMahan et al.2012). These factors together create a three-dimensional experience that is distinct from traditional two-dimensional media. The realism of user interactions, known as interaction fidelity, can be divided into three categories: natural mapping, spatial mapping, and contextual mapping. Research by Ahn et al. (2022) shows that when immersive technologies offer all three types of mapping, users are able to engage with the virtual environment in a highly realistic way that is not possible with other forms of media.

Consumers (personal factors)

Considering consumers, namely the personal factors of the relationship, advertising in the metaverse must consider two factors: embodiment and presence, as they impact the personal relationship between consumers and advertisements. This means considering the full range of human senses, and not just sight and hearing, as well as how users interact with and experience the ads. Additionally, one's perception of space is influenced by the body and its interactions with the environment (Franklin and Tversky, 1990). As noted by Ahn et al. (2022), embodiment in the metaverse also involves how the avatar body allows users to interact with other avatars, agents, objects, and events within the virtual space. In short, how the avatar body is designed and interacts in the virtual world affects a person's experience and perception within that space.

Regarding presence, scholars have demonstrated that its perception leads to favourable advertising outcomes (Shen et al.2020).

Having said that, research has shown that audiences can also report presence experiences with less immersive mediums such as books, television, or video (Kim and Biocca2018), so the metaverse is not always the Holy Grail.

Engagement Factors (behavioural)

The third factor of the triadic relationship are the engagement/behavioural factors.

When consumers engage with ads that are driven by presence, their interaction is usually higher, and they are less aware of the medium itself. This form of engagement in the virtual world presents both challenges and opportunities for advertisers, necessitating a thorough understanding of advertising engagement in the metaverse. The methods used by scholars and practitioners to evaluate the effectiveness of advertising are evolving, as consumers in the virtual world tend to have a wider range of interactions with virtual goods or services that go beyond simple clicks or taps. As a result, traditional metrics such as cost per thousand or click-throughs that were used to measure the performance of digital advertising may be replaced by data collected through eye-tracking, face-tracking, or tracking of hand and body movements during interactions with immersive technologies (Ahn et al., 2022).

To summarize, advertising engagement in the metaverse is undergoing changes, and new evaluation methods are required.

This is where another study comes in, a study by Plangger (2022), who found that marketing automation can help optimize marketing resources by freeing up human resources from menial tasks that are taken over by computer resources. Marketing automation uses machine learning and AI to analyse and forecast customer behaviour, adjust marketing strategies, and enhance customer service

delivery. On the other hand, Shankar and Parsana (2022) investigated how using AI-powered natural language processing can help companies analyse unstructured data and better understand consumer behaviour, leading to improved brand positioning, more innovative product development, increased competitive advantages, and more effective marketing communication.

Coming back to Ahn et al. (2022) study, but steaking on this topic, they present another difference in advertising practices: the frequency of message exposure. In traditional advertising, the frequency is a deliberate aspect of the media plan, aimed at maximizing the impact of the ad. However, in the metaverse, since it is a vast virtual space, users are not restricted to a physical location, making it difficult to plan for regular and repeated exposure to an ad. This requires a new approach to understanding consumer engagement patterns in order to effectively plan for advertising in the metaverse.

Interoperability and continuity

Two important features of the metaverse that underscore the relationship between the three elements and the dual layers of the bifold triadic mode are interoperability and continuity (Ahn et al., 2022).

Interoperability and continuity in advertising in the metaverse refers to the seamless access of users to different virtual spaces and connection of virtual and physical worlds across different media platforms. This would allow users to access the same content regardless of the immersive technology they have access to and be able to maintain their preferences and virtual purchases across all apps. Realizing this level of continuity requires collaboration and standardization among technology companies.

These features are at the basis of the Integrated Marketing Communications concept, that according to Dwivedi et al. (2022) can still be applied in the metaverse to maintain the consistency of the mediated message across different metaverse platforms.

In Ahn's et al. (2022) framework we can finally observe a form of bifold interoperability, connecting virtual and physical worlds.

As demonstrated by researcher, user experiences in the one of the two world is carried over and bleed into the other one, impacting attitudes and behaviours in both of them (Ahn, Le, and Bailenson2013,2014). For example, consumer experiences of touching, and moving through sponsored messages in the metaverse are likely to be remembered and to have an impact on their brand preferences in the physical world. According to Ahn et al. (2022), the virtual and physical worlds are increasingly connected, and advertisers must consider the continuity of consumers' experiences across both environments instead of treating them as separate spaces.

2.1.5.2 Avatar marketing

Research has shown that online self-endorsed ads that use the consumer's name, picture, or avatar in the message tend to result in more positive brand attitudes and intentions to purchase compared to ads that feature endorsements from others (Ahn et al., 2022; de Brito Silva et al., 2022).

As more and more famous brands are aligning their marketing strategies with avatars, going into detail of the Avatar marketing with a study of de Brito Silva et al. (2022) will help understand benefits, risks, and operational mechanisms of it.

Santaella (2016) defines avatars as digital representations of users that allow them to project their identities into the parallel worlds of cyberspace. However, a new type of avatar is emerging in social media, which are independent digital entities with a human-like appearance that exist in virtual reality and have their own unique personality and backstory, according to Miao et al. (2022).

Credibility, attractiveness, spontaneity and perceived sincerity are the main attributes that scholars have identified as the basis for an effective endorsement (Balaban and Szambolics, 2022; Sokolova and Kef 2020; Masuda et al., 2022; Zhafira et al., 2022).

However, there is the possibility that users don’t perceive avatar influencer as authentic and trustworthy.

According to Miao et al. (2022), the anthropomorphic appearance of an avatar is considered a key factor in its influence, as people tend to have positive interactions with things they perceive as more human-like. Meanwhile, de Brito Silva et al. (2022) found that avatars generally have a predominantly female audience ranging from ages 8 to 34 and of various nationalities. Additionally, the characteristics of virtual influencers often reflect those of their followers.

The credibility of digital influencers in endorsing products and guiding experiences is based on users' perception of their authenticity in social media. However, the lack of clarity regarding the people who control the avatars, and its posts, lead de Brito Silva et al. (2022) to conclude that the authenticity of the avatars is compromised.

To further explore the topic this study distinguished influencers avatars into two typologies: incarnate avatars and innate influential avatars (de Brito Silva et al., 2022).

The first type of digital influencers are those that are specifically designed to embody a particular brand's identity and make the brand appear more human-like. These influencers are viewed by their audience as brand representatives and advertisements, even when they are not promoting a specific product or brand. As a result, there is no difference in engagement levels between posts that do and do not feature brand exposure, and these avatars tend to have low overall engagement rates. (de Brito Silva et al., 2022).

This second category of influencers is made up of digital human influencers that don't represent a specific brand. Instead, they are designed with a fictional background to create a life story where they endorse brands within that narrative. This leads to high engagement rates. However, due to their non-existence, they may have limited impact as opinion leaders or on their followers' decision-making. However, from de Brito Silva's et al. (2022) results, it appears that because avatars do not exist in the physical world, they become even more intriguing and appealing, allowing them to arouse interest. It's also been demonstrated that the congruence of avatars' posts with their lifestyle and personality is the main element to generate a connection between avatars and its followers (de Brito Silva et al., 2022).

Benefits

De Brito Silva et al. (2022) have found that the use of avatars as influencers have five main positive aspects:

1. The company can tailor the avatars according to the audience it would like to reach.
2. The brand can control avatars' content.
3. Using avatar allow to maintain postings regularity, which is fundamental to deeply influence followers.
4. The possible cost reduction: for example, instead of the influencer having to physically travel to different locations for endorsement purposes, the avatar can be projected onto the desired scenario without incurring travel expenses.
5. High engagement on endorsement posts.

Risks

Using avatars as influencer does not come without risks, indeed de Brito Silva et al. (2022) have highlighted three main negative aspects:

1. Posts with lacking or unclear content that lack the avatar image receive less engagement.
2. There is a risk of wasting money and time if there is a mismatch between the avatar's personality, story, and the products being endorsed.
3. Strategies aimed at boosting the followers count can lead to a loss of interest from organizations in partnering with the avatar influencer.

To sum up it's important to keep in mind that several operational mechanisms must be considered if a company wants to develop avatars. Since the avatar reflects the characteristics of its followers, the developers must understand, above anything else, the audience they want to reach. Additionally, the regularity of postings is of paramount importance if the company aim at influence potential customers.

2.1.6 Technological advances in the luxury industry

The Personal Luxury Goods market saw an annual growth of 5.7% from 2015 to 2019 but was impacted by the Covid-19 pandemic in 2020 causing a huge decline especially in tourism (-70%) and in hospitality (-45%).

However, in 2022, the growth rate returned to what it was prior to the pandemic, especially in industries such as accessory production, cosmetics, accessory sales, and furniture. This reversed the downward trend from the previous two years and is attributed to the digital age and technological advancements (Sestino, 2022).

The shift in consumer behaviour due to a changing customer culture and the rise of e-commerce and technology advancements has affected all aspects of life, requiring luxury retailers to adapt and integrate these technologies in order to maintain their connection with customers.

Javornik et al. (2021) studied the impact and possibilities of using AR technology in luxury brands, and found that this technology enhances authenticity, quality service, exclusivity and aesthetics throughout the entire customer experience.

Indeed, another researcher has found that major fashion brands like Burberry and Gucci are seeking new ways to allocate their marketing budget as traditional advertising has limitations (Bojic, 2022). These brands are exploring innovative platforms, like gaming, to connect with customers through popular games like Roblox and Fortnite, or by creating their own virtual worlds.

Luxury brands are turning to VR and AR technology as an innovative approach to engage customers and create new revenue streams. The presence of these brands in the metaverse shows its potential as a market. However, the instability of virtual assets in the metaverse raises concerns and there are currently not enough measures in place to stabilize its economy.

However, according to Xu and Mehta (2022), among luxury brands, customers view hedonic products like handbags as less desirable when designed using AI, as it reduces the emotional value of the product. On the other hand, this negative effect does not apply to functional luxury products such as automobiles.

Modern fashion consumers desire a deeper connection with luxury brands beyond just purchasing items: "experiences, quality, and the emotions that luxury goods evoke." (Pezzini, 2018). Therefore, in the luxury goods industry, disruptive technologies are being adopted to create a unified customer experience across channels and to transform stores into experience hubs, addressing the criticism of the industry being slow to adapt to consumer demands (Harba, 2019).

The introduction of new technologies has changed the customer experience and raised their expectations for a personalized and seamless shopping experience across all channels. Brands are

utilizing these technologies to engage with customers in unique ways and differentiate themselves in a competitive business environment (Hyken, 2018).

To do so the brand needs tools of VR or AR which enable their designers to immerse clients, bringing them into another world, but without the efforts and the costs of creating the physical setting.

Moreover, Neves, the founder of Farfetch, a global online platform for luxury fashion, stated that the future of luxury retail lies in "augmented retail", namely the fusion between online, offline and mobile (FARFETCH, n.d.).

To make this work, consistency and communication between all the different systems (website, digital mirror, app, checkout) need to be the feature at the basis of each Store of the Future (Kansara, 2017).

Global brands as Gucci, Ralph Lauren, Louis Vuitton and Burberry are deploying artificial intelligence (AI) in designing seamless customer onsite interactions with their brand, they incorporate NFTs to certify the authenticity of digital images available for purchase and they invest in blockchain technologies.

For example, Bulgari debuted in October 2021 with the Serpenti Metamorphosis installation, a multimedia and multisensory experience which included both AI and NFTs, which after appearing in major European cities in the same year, has later become an NFT to be sold at auction.

In the luxury industry, the trust customers place in the brand, the quality and authenticity of their products is one of the cornerstones. About that, Joy et al. (2022) emphasize the significance of Web3 utilizing technology and protocols to ensure the authenticity of transactions and fulfilment of promises made. Web3, driven by blockchain technology, enhances security and reduces the need for trust in individual transactions and intermediaries. As a result, some luxury e-commerce platforms are adopting blockchain technology to issue digital certifications to consumers to increase trust in luxury goods. For instance, the French Ethereum-based platform Arianee tracks ownership history of luxury brands, and LVMH has invested in the blockchain firm Aura to provide transparency and traceability (Whitaker, 2019).

Provenance, namely the ability to trace a product's history from its origin to its journey, is being adopted by many luxury brands. Thanks to blockchain technology each product is given a unique digital ID, creating a digital twin or NFT, which can track the product from the producers to the stores and even post-purchase. This helps maintain control over the resale market and differentiate from retail brands that may not meet the same quality standards. Additionally, it offers transparency in second-hand marketplaces and provides historical data to buyers, thereby increasing trust in the authenticity of luxury goods (Periyasami & Periyasami, 2022).

Consumers can easily access authentication information through the digital identity of luxury goods.

Luxury brands are incorporating this technology to increase consumer trust and engagement. By using blockchain technology, they can provide digital authentication and history of the product by scanning a QR code. Some brands also use chatbots for data collection but offer virtual consultants as a first point of contact, with the option for human interaction if needed. Some platforms still rely on manual authentication due to cost, but technology can help eliminate manual errors.

To address this, luxury brands such as Louis Vuitton, Burberry, Tommy Hilfiger, Dior, and Estée Lauder offer virtual consultants as the initial point of contact, with the option for human interaction if desired.

2.1.6.1 Metaverse and luxury industry

With metaverse as a new social and business platform, both academics and industry are querying how this technology will help in reshaping luxury brands (Joy et al., 2022).

The most significant imminent change may be brands' expansion into multiple metaverses.

The younger generation views the online and virtual world as a seamless extension of their daily lives, blurring the line between what is real and virtual. A study shows that metaverses have four common features: (1) a shared social space with avatars representing users, (2) a virtual world for avatars to interact in, (3) the ability for users to own virtual property just as they would physical property, and (4) the opportunity for users to create their own virtual property. (Joy et al., 2022).

As Robert Triefus, executive vice president for brand and customer engagement with Gucci, stated in a recent interview, “The idea that everything has to be physical is very quickly being disproven...People are willing to pay good money for NFTs, for digital collectibles, and to have a second life in the metaverse.” (Williams,2021).

Gucci recently unveiled the "world's first virtual sneaker," the Gucci Virtual 25, priced at $12.99 USD and which can be "worn" in augmented reality. These virtual sneakers are significantly less expensive compared to actual wearable ones, which can cost over $600 USD. However, low prices are not always a guarantee for virtual products. Indeed in 2021, a virtual Gucci handbag on Roblox sold for the equivalent of $4,115, while its real-life counterpart cost only $3,400 (Joy et al., 2022).

The idea of the metaverse builds upon that of "second life", which is a virtual world where users can create avatars and participate in a secondary existence different from their real-life experiences (Tidy, 2021). Second life debuted in 2003, with an estimated GDP of USD 500 million valuations in 2015(Maiberg,2016).

The world of metaverse commerce is an entirely new consumption space.

According to Treiblmair (2021), using tokens to represent limited actual or digital products can create a sense of scarcity and drive consumers to want these items.

Companies are now creating digital products exclusively for the metaverse and in particular, the world of fashion receives daily requests for digital outfits for avatars.

New and younger luxury customers want to take these products into their digital lives. (Kansara,2021). As the metaverse become increasingly similar to the real world, more and more users will reflect their real lives in the digital worlds. The issue inevitably arises: will consumers enjoy virtual luxury goods when the full spectrum of sensory input is missing? The pride of possession is enough for younger consumers?

According to a new research, status symbols such as digital clothing, household furniture, jewellery and cosmetics will become significantly similar to real-world purchases and possessions (Dwivedi et al., 2022).

Altarteer and Charissis (2019) found that to compensate for the lack of physical presence of a product, it is crucial for a web application to be functional, provide clear information, and offer a high level of interactivity.

The reason people purchase luxury goods is for the perceived value of the experience. However, online luxury stores present a unique type of experience as the interaction is conducted through technology. Perceptions towards these stores are shaped by factors like product information, website design, user-friendliness, and the effort required. As a result, designers of the online experience and interface face a challenge in compensating for the lack of direct interaction with customers.

2.1.7 Knowledge gap

Although, as can be seen at the beginning of this second chapter, research and studies on the metaverse have grown in the last three years, the impact that this new world will have on the luxury industry and its customers is still little explored. Moreover, most of the few studies done in this area only concern the fashion industry, leaving a shadow on what could be the applications of the metaverse in other luxury sectors such as hospitality, architecture and automotive.

Given the great novelty brought by this technology and the radical change needed in the consumer's mind for it to be accepted, as well as the need for huge financial investments, many companies are still uncertain about implementing this virtual world among their product and service offerings.

This is accentuated in the luxury sector, where the customer, having to make a financial investment of a certain magnitude, wants to have a unique and seamless experience.

It is also true that this reluctance in the adoption of the metaverse is due to the scarce studies on the subject that would allow a more general view of the situation and an objective evaluation of whether or not it would be convenient for a company to expand into this world.
Furthermore, as the luxury sector is increasingly attracting the younger generation, who are also the ones who come in contact with these technologies on a daily basis and from which they expect a service that meet their expectations, and at the same time it's easy to use, allows flexible payments and guarantee 24/7 support, I believe this is where luxury brands should focus their efforts.
In fact, almost 89% of luxury consumers believe that a brand's focus on innovation and new technologies, such as the metaverse, is a key reason for purchasing an item. Nearly half of high-end shoppers want to use a mobile app for their purchases, and as many as 78% of those who have heard of the Metaverse say they are interested in buying luxury products in it. Furthermore, buyers of luxury products also show a propensity to use new technologies, such as virtual and augmented reality experiences (28%) and virtual fitting rooms (24%) (Bertoletti, 2022).
For all these reasons the gap in the literature concerning the use of metaverse by luxury brands urgently needs to be filled.

2.2 Research question and Hypothesis

As stated above, there is a gap in the literature that needs to be filled; there is a need to investigate how the use of the metaverse will impact the world of luxury and especially whether or not its use by luxury brands will be positively welcomed by consumers.
In fact, while the applications of the metaverse have been the object of research in recent years, even though always in a small way, little research has been done on the effects this technology might have on consumers, their purchase intention, how they might be influenced by experiences in the virtual world created by brands and whether they are actually willing to pay for digital goods to be used only in the metaverse.
Therefore, the research question of this study is:

RD: Will the use of the metaverse by luxury brands be positively accepted by consumers?

Since in order to investigate whether the virtual world will be accepted positively or not by consumers, it is necessary to observe in which sectors it will be applied and made available to them, this study builds on the research presented in the literature review by Dwivedi et al. (2022) and Bojic (2022), on the practical applications of the metaverse, and that of Ahn et al. (2022) to test how the

three different factors of the Triadic relationship (environment features, personal features, behavioural features) may impact on users' perceptions of the new digital world.

2.2.1 Independent variables

Following this reasoning, five independent variables have been identified and will be tested to observe what and what features of the technology behind the metaverse might lead consumers to favourably accept its adoption in the business of a luxury brand, whether it is used only for the promotional purpose of goods sold later in the real world or the direct sale of products that can only be used in it.

The first independent variable that will be tested is defined as the perceived user-friendliness of the technologies required to connect with the metaverse. In fact, since accessing the virtual world requires an action on the part of the consumer, this action translates into the use of technologies such as VR or AR tools, which allow him to immerse himself in it.
This variable reflects one that had been tested in another study concerning the use of 3D virtual reality systems in online shops of luxury brands (Altarteer & Charissis, 2019). The study had found that the perceived ease of use of such systems positively influences user behaviour. Since the technologies used to access the new virtual world are almost the same as those used in the aforementioned study, it can be assumed that:

> *H1: The perceived user-friendliness of the technology necessary to connect with the metaverse affects customer attitudes of luxury goods positively.*

Altarteer and Charissis (2019) also tested another important factor related to the use of virtual reality technologies in online shops of luxury brands, namely the perceived presence within the 3D systems. They found that this feeling of presence positively influenced both consumer behaviour and the perceived value of the experience. Taking this into consideration and that numerous other studies have shown that the metaverse allows for a strong feeling of presence, feeling completely immersed within it (Kim & Biocca, 2018; Ahn et al., 2022), it can be assumed that:

> *H2: The strong feeling of presence and the high degree of immersion within the metaverse affects customer attitudes of luxury goods positively.*

One of the factors that still makes people prefer buying in physical shops over online ones is the possibility of trying on products before buying them. This phenomenon is preponderant in the luxury sector, where the purchase is not just an end in itself, but the customer wants to have an all-round experience that makes him feel part of the brand, wants to be able to try and see all the options available in the shop and wants to test the quality of the product he is about to buy.
Given that the experience provided through the metaverse is quite different from the mere viewing of the product online, since it also allows one to try it on, touch it, observe every detail as if one had the object in front of one in the real world, the following third hypothesis can be formulated:

> *H3: The opportunity to try and experience the product or service in the metaverse before buying it in the real world affects customer attitudes of luxury goods positively.*

In recent years, what allows luxury brands to stand out and get the better of their competitors is to put the customer at the centre of their strategy. This entails a high level of customisation of the product offered to the customer.
As shown by several studies and presented in the literature review, offering customised products makes the brand more attractive, allowing the offer to vary and satisfy the desires of as many users as possible (Spajić et al., 2022; Dwivedi et al., 2022). In the luxury environment, this service is more practised than in other sectors, because offering the customer the possibility to customise the product according to their wishes is not a service that all brands can afford, as it involves high costs and longer production times. The customers of luxury brands, whether in fashion or other sectors such as the automotive industry, expect their every wish to be fulfilled and the finished product to be one-of-a-kind. The customisation of a product is what makes it stand out from others, unique. Offering this service in the metaverse is possible because creating digital variants of the same product can be done very quickly and does not entail any extra costs or waste. For all these reasons, it can be assumed that:

> *H4: Object customization capacity in the metaverse affects customer attitudes of luxury goods positively.*

Finally, as illustrated in the literature review, many studies have shown that the metaverse, using blockchain technology, allows the product to be tracked and its authenticity certified (Whitaker, 2019; Joy et al., 2022). In this way, the Web3 reduces the need for individuals to trust the intermediary before purchasing a luxury good.

This trust needs to be even higher when buying luxury goods, perhaps used, from a third party and not directly from the brand. In this case, the trust required to purchase the luxury good from the intermediary is so high that the purchase is often not completed for fear of being scammed. For this reason, the following final hypothesis can be formulated:

> *H5: The ability to trace the provenance and authenticity of the product thanks to technologies in the metaverse affects customer attitudes of luxury goods positively.*

2.2.2 Dependent variable

The *dependent variable* will be the customer attitudes towards the adoption of the metaverse by luxury brands, expressed by their willingness to try Metaverse's technology.

This variable encompasses all the attitudes, positive and negative, that customers, be they occasional or regular customers, and in any sector (e.g., fashion, automotive, cosmetics, etc.) have towards luxury brands adopting marketing or sales strategies in the metaverse.

The study will investigate which of the five independent variables (*H1, H2, H3, H4, H5*) most positively affect the dependent variable.

It will then look at what factors lead consumers to positively embrace the use of the metaverse in their customer journey; in particular, it will explore whether there is a closer correlation between the acceptance of it and personal factors such as feeling present and immersed in this world (*H2*), or with more practical factors such as ease of use of technology (*H1*), the ability to try on products and personalise them (*H3, H4*) and the ability to trace the provenance and authenticity of products (*H5*).

2.2.3 Control variables

The metaverse is a recent topic and is still unknown to many, especially to the older generations.

For this reason, in order to avoid bias in the results and their analysis, *control variables* will be included in the study.

These variables will be of three types:

1. *Socio-demographic variables: age, gender and level of education.*
2. *Frequency variable: frequency with which customers buy luxury goods/services.*
3. *Knowledge variable of the metaverse: it will express the consumers' knowledge/understanding of the topic*.

In fact, as Bojic (2022) argues, Millennials and Generation Z have grown up and are growing along with a constant evolution of technology and for this reason they will also be those who will not only be able to adapt better to the new digital platforms, but also those who will be less biased by their use and influence in their daily lives. For this reason, in order to be able to analyse the data in an informed manner, consumers must be divided according to their age.

2.2.4 Research Framework

Starting from the research question "*Will the use of the metaverse by luxury brands be positively accepted by consumers?*", five hypotheses were formulated to investigate it. Specifically, of these five hypotheses, the second one concerns personal factors of consumers (feeling of presence and immersion) that could influence the dependent variable, while the others constitute practical factors related to the use and characteristics of the technologies of the metaverse.

These personal (*H2*) and practical factors (*H1, H3, H4, H5*), which require analysis in the present study, converge into a single conceptual framework. This will be used to study the relationship between the aforementioned five hypotheses (*independent variables X*) and consumer attitudes to the adoption of the metaverse in luxury brand strategies (*dependent variable Y*).

In addition, *control variables* will be included in the model to avoid bias in the analysis of the results (Figure 10).

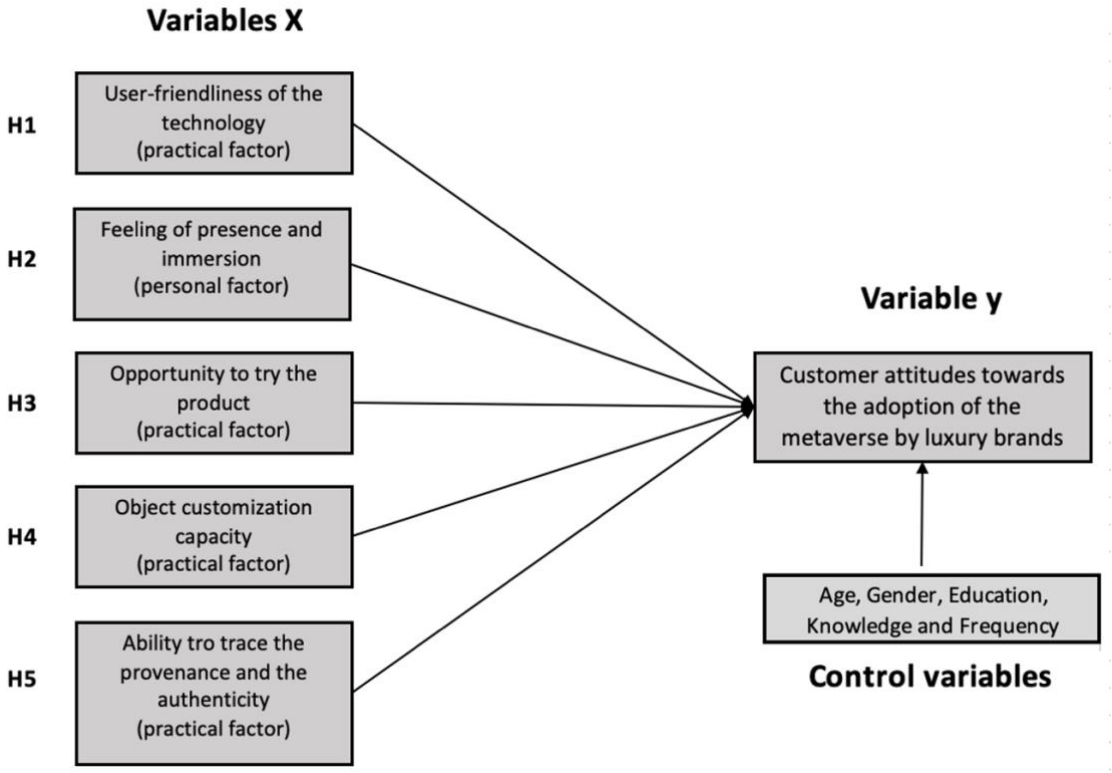


Fig. 10 – Research Framework: personal and practical factors that influence the customer attitudes of luxury goods.

CHAPTER 3 METHODOLOGY, ANALYSIS AND FINDINGS

Starting from the research question presented in Chapter 2, this study was structured as quantitative research focusing on the effect the metaverse has on consumers of luxury goods and services.
To investigate this effect, it was observed the effect that the independent variables has on the dependent variable.
Furthermore, it was observed whether consumer behaviour, as well as the dependent variable, is more influenced by personal factors (H2) or technical/practical factors (H1-H3-H4-H5).
Once collected, the responses were then analysed with IBM SPSS software in terms of descriptive statistics and reliability.
Proceeding with the hypothesis testing of the model, an ordinal logistic regression including the effect of the control variables will be performed.
The collected data, after being appropriately analysed and interpreted, will yield results that will be discussed and finally, theoretical and managerial implications will be presented as well as the limitations of the study and the space for further research.

3.1 Data collection

To study the effect of the use of the metaverse by luxury brands on consumer behaviour, the veracity of the 5 hypotheses was tested through an online questionnaire created with Qualtrics. This Experience Management platform allows the creation and distribution of questionnaires as well as the collection and analysis of responses.
The distribution of the questionnaire took place through two channels:
- personal messages;
- Instagram stories;

and lasted from 4 to 15 April 2022, with a total of 171 responses, one of which was the preview of the questionnaire, which was subsequently eliminated from the analysis (Figure 11).

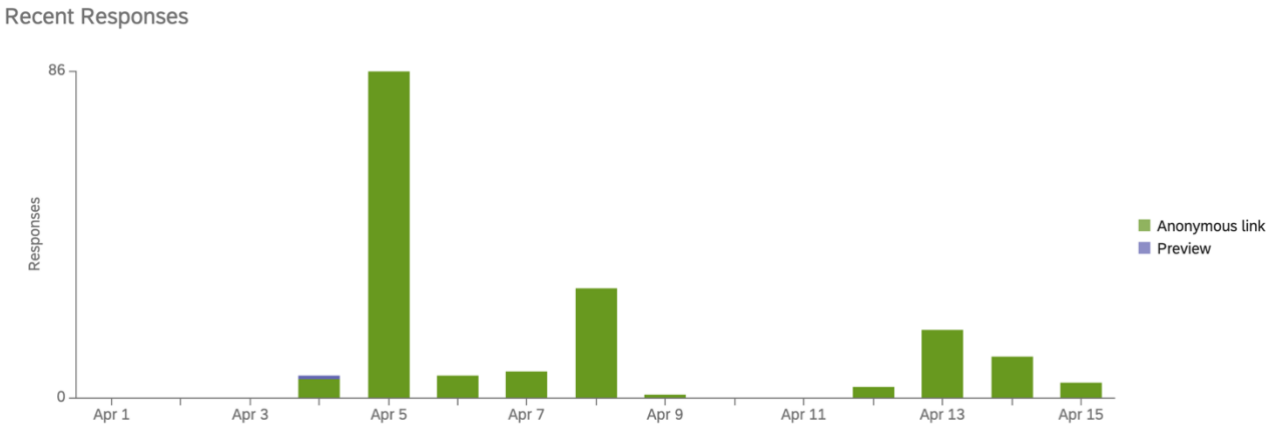


Fig. 11 – Survey responses.

The questionnaire consisted of a total of 12 questions, plus an introductory part in which the subject was briefly presented (Appendix 1).

In compliance with the laws on privacy and the processing of personal data, once the link was accessed, the first thing the participants read was the informed consent, in which it was made explicit that this was an anonymous questionnaire, in which it would be impossible to link a particular answer to a user.

After this, three socio-demographic questions were included which asked for the user's age, gender and level of education.

In order to later properly analyse the answers and draw as many conclusions as possible, three questions were then asked about the frequency of purchase of luxury goods/services, the level of knowledge of the subject matter, i.e. the Metaverse, and whether the user had ever experienced virtual/augmented reality.

The remaining 6 questions, evaluated through a 7-point Likert scale, represented the real heart of the questionnaire; in fact, each one was associated with one of the independent variables, i.e., the hypotheses to be tested, except for one that represented the dependent variable.

3.2 Sample

Wanting to analyse a large amount of data and especially wanting to see if there were any patterns in the response given by belonging to a certain generation, the decision on the distribution of the questionnaire and the subsequent choice of sample was to personally contact friends and relatives by message and ask them to forward the link of the questionnaire to their acquaintances. Furthermore, in order to reach a greater number of users, the questionnaire link was also posted on my Instagram stories, from which it was easily accessible to my followers.

In this way, the resulting sample includes all different age groups from Generation X to Baby Boomers.
No further restrictions of the participants were carried out as the aim was precisely to have a broad and varied spectrum of analysis.

3.3 Data Analysis

The analysis of the data began with the creation of a database.
This was obtained by exporting the answers collected on Qualtrics to SPSS, where they were processed and sorted to make the database clear and above all usable for subsequent analyses.
Since the software distinguishes between three types of variables, the ordinal type was used for all those that had been rated with the Linkert scale in the questionnaire (since there was an intrinsic ranking: score from 1 to 7), the nominal type only for the gender variable (since its values are unranked) and scales for the age variable.
The first analysis carried out on the data was a descriptive one.
Once this first analysis was completed, I proceeded with the factor analysis and the reliability analysis.
Finally, it was concluded with the hypothesis test derived from an ordinal logistic regression.

3.3.1 Descriptive analysis

Once the survey was closed and all responses collected, even before creating a database, the decision was made to carry out a descriptive analysis to get a general overview of the study variables.

Looking at the graph below, representing the first socio-demographic data, around 70% of respondents are aged between 18 and 41 years old while only 30% of people are over 42 (Figure 12). This is probably due to the fact that the majority of answers come from my personal contacts who are more or less my age and also from Instagram where people are statistically younger (see Appendix 4).

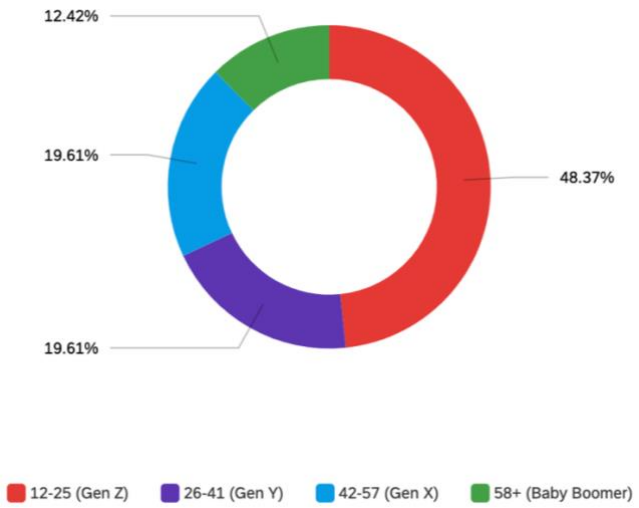


Figure 12 – Survey results/age of the respondents.

For what concern the gender there is a huge gap between male and female respondents; in fact, the sample is composed of 108 women (70.13%) and only 46 men (29.87%) (see Appendix 2).
Looking at the last sociodemographic factor, more than half of the respondents are graduated from University (66.88%), than almost 30% have an High School Diploma and only 5 participants have the Middle School Diploma, as shown in Appendix 3.

The demographic characteristics of the sample are shown in Table 1.

Variables	Items	Frequency	Percentage%
Age (years)	18 - 25	74	48.37%
	26 - 41	31	19.61%
	42 - 57	30	19.61%
	58+	19	12,42%
	Total	154	100%
Gender	Man	46	29.87%
	Woman	108	70.13%
Education level	Middle school diploma	5	3.25%
	High school diploma	46	29.87%
	Bachelor's degree	44	28.57%
	Master's degree	55	35.71%
	PhD	4	2.60%

Table 1. Survey results – Demographic characteristics

Furthermore, if we look at the answers given to question about how often the questionnaire participants buy/use luxury goods or services, the data are asymmetrically distributed towards the first numbers on the Linkert scale, i.e. from "rarely" to "neutral" (Figure 13). This is probably related to the fact that almost 50% of the participants were under 25 years of age, the majority of whom were still students; this may be an indication of lower economic availability compared to other age groups whose jobs allow them to purchase goods in higher price ranges such as luxury goods.

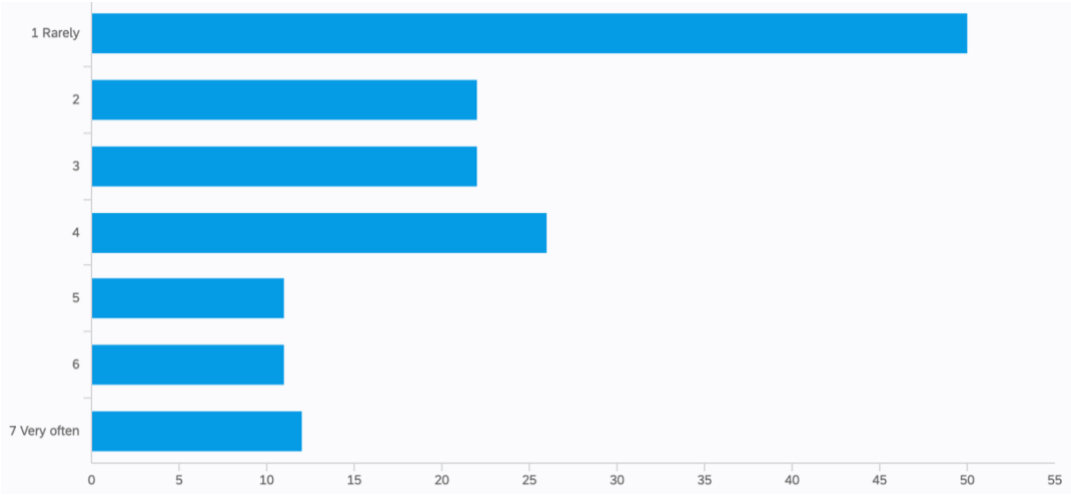


Figure 13. Survey results - Frequency of purchase of luxury goods/services.

In order to better understand the subsequent answers, the participants were asked two questions to find out if they knew what the Metaverse was, thus being able to understand if the answers they would later give were based on a knowledge of the subject or not, and if they had ever experienced virtual/augmented reality or in the Metaverse itself.

Regarding the first information, more than 70% of the respondents were aware of the Metaverse (Figure 14), a figure that is reversed in the next question with less than 30% having participated in a virtual experience (Appendix 4).

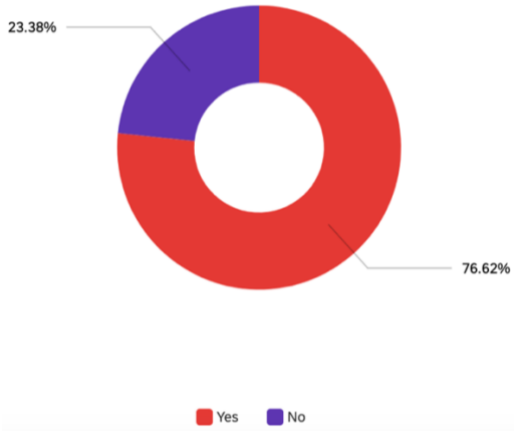


Figure 14. Survey results – Knowledge of the Metaverse.

Proceeding with a Normality Test on the dependent variable, it's reached the conclusion that it is not normally distributed.

This can be affirmed by a quick observation of the histogram below, where one can clearly see from the bars in the graph of very different heights and a greater concentration towards the centre and the right-hand side (Figure 15).

Furthermore, confirmation of this is provided by the Kolmogorov-Smirnov and Shapiro-Wilk tests in which a p-value lower than .05 was found, a value above which the distribution is usually considered normal distributed, which means the variable is not normally distributed (Appendix 5).

Indeed, there is a statistically significance Kolmogorv-Smirnov and Saphiro-Wilk test results that are lower than .05, which leads to the rejection of the null hypothesis and the assertion that the variable is not normally distributed.

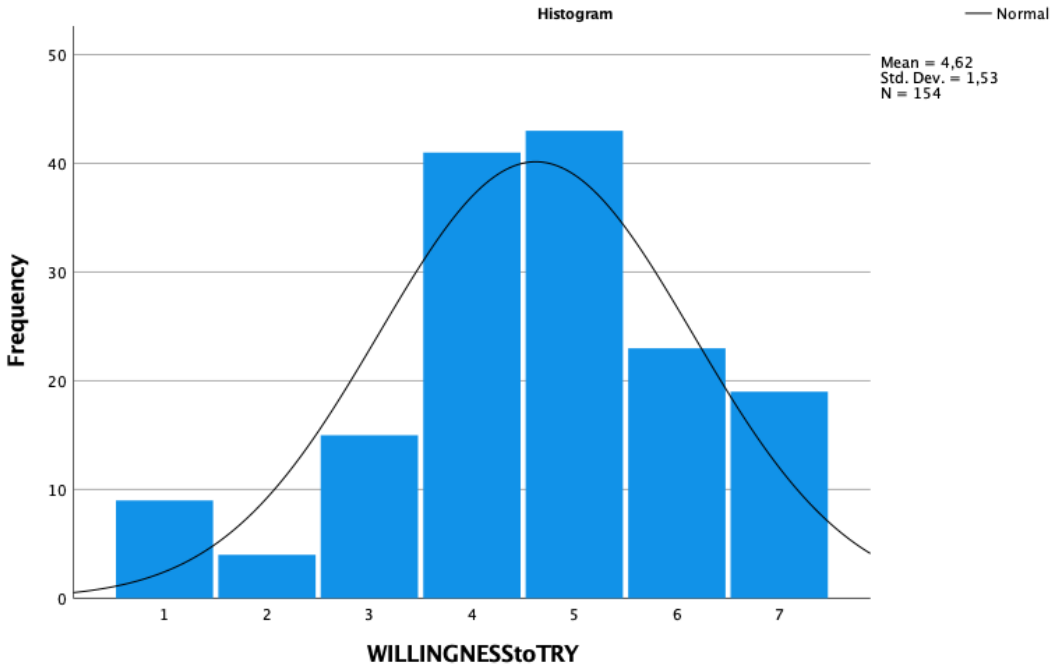


Fig. 15 – Survey results – Test of Normality of the dependent variable.

Remaining with the descriptive analysis, it is worth noting the descriptive statistics of both types of factors studied, technical and personal, representing the independent variables.

All five were measured using a Linkert scale ranging from 1, strongly disagree, to 7, strongly agree (see Appendix 6).

Looking at the average level of response, very similar and rather high values are observed, in fact all tended to 5, with the highest value reached by the traceability variable, followed by that relating to the feeling of immersion and presence within the virtual world.

As for the Bottom 3 and Top 3 columns, these indicate respectively the percentage of participants who assigned a value between 1 and 3 and between 5 and 7 (inclusive).

These percentages, together with the mean, show that there was a rather high response tendency towards Neutrality and towards agreeing with the proposed hypotheses.

For example, 62.99% of respondents agreed (5 to 7 on a Linkert scale) with the fact that having the opportunity to try products in the Metaverse before buying them and being able to trace their provenance through this technology would entice them to buy more luxury products.

Table 2. Results – Technical Factor.

Question Nº.	Technical Factor	Mean	Std. Deviation	Bottom 3	Top 3
9	EASE OF USE	4.75	1.41	6.49%	53.90%
12	TRYbeforeBUY	4.81	1.58	19.48%	62.99%
13	CUSTOMIZATION	4.66	1.67	22.08%	55.19%
14	TRACEABILITY	4.90	1.60	14.29%	62.99%

Table 3. Results – Personal Factor.

Question Nº.	Personal Factor	Mean	Std. Deviation	Bottom 3	Top 3
10	IMMERSION	4.84	1.57	14.49%	60.39%

3.3.2 Factor analysis

Once the database was created and exported to SPSS, the analysis proceeded with factor analysis.

Factor analysis aims to identify the underlying variables, or factors, that illustrate the pattern for correlations within a set of observed variables. Indeed, it is the analysis conducted on the many items that form the latent constructs of the study to identify of a small number of values that explain most of the observed variance values.

Factor analysis also has another use. Indeed, it can also be used to identify collinearity before performing a linear regression analysis.
For this study, five items, i.e., the five independent variables, were analysed.

As mentioned above, factor analysis can also be used to identify collinearity between variables and thus allows one to check for multicollinearity and eliminate any variables that create such a problem. In fact, observing the correlation matrix it is necessary to verify that there are no values higher than 0.8, obviously excluding the diagonal of the perfect correlations since it is natural that an item is perfectly correlated with itself (i.e., item Ease of Use in the row is perfectly correlated with Ease of use in the column). This is because, although the higher the value the stronger the correlation, if the value exceeds 0.8 it means that there is perfect correlation outside the normal (diagonal) one and this indicates a multicollinearity or singularity problem that can only be solved by eliminating one of the two items from the analysis.
Furthermore, another important thing to observe in this output is the determinant value below the matrix; this value must be >0.00001, so a value of 0.037 indicates that there is no problem of too low correlation and unrelated items.

Table 4. Factor Analysis output - Correlation Matrix.

		EofU	IMM	TbB	CUSTOM	TRACE
Correlation	EASEofUSE	1,000	,744	,651	,722	,532
	IMMERSION	,744	1,000	,722	,723	,536
	TRYbeforeBUY	,651	,722	1,000	,740	,638
	CUSTOMIZATION	,722	,723	,740	1,000	,602
	TRACEABILITY	,532	,536	,638	,602	1,000

a. Determinant = ,037

The determinant of the correlation matrix is a first indication but not the only alternative.
The study can use two additional tests: Bartlett's test of sphericity and its null hypothesis that the correlation matrix R is an identity matrix (*H*0: R = I), which means that the values outside the main diagonal are zero and those along the main diagonal are 1. However, this test's applicability depends on the number of variables and the size of the sample, so it may not be the most appropriate test for this study, considering the small sample size and only five variables.
A third option that is more suitable for this research is the Kaiser-Meyer-Olkin (KMO) sample adequacy test. Performing the test of Kaiser-Meyer-Olkin (KMO) allows to check the adequacy for the model construct.

This statistical index can take values between 0 and 1, but the closer this value is to 1, the more the sample adequacy improves.

For this reason, values between 0.5 and 0.6 are generally considered to be at the limit of acceptability, values above 0.6 sufficient and those above 0.8 good.

A KMO value of 0.873 indicates sampling adequacy for the constructs of the model.

Table 5. Factor Analysis output- KMO test and Bartlett's test of Sphericity.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,873
Bartlett's Test of Sphericity	Approx. Chi-Square	495,315
	df	10
	Sig.	<,001

Since the aim of factor analysis is to identify a small number of factors that explain most of the observed variance, the analysis of this research continued with the observation of the scree plot in conjunction with the observation of the total variance matrix.

Indeed, the scree plot highlights which values to extract, usually a value greater than 1 is chosen; factors with eigenvalue >1 are those that explain most of the variance.

In this case only one factor has an eigenvalue greater than 1 and that is the first one (see Appendix 12).

If we also look at the total variance matrix, we can see that this value alone explains 73% of the total variance.

Table 6. Factor Analysis output - Total Variance explained.

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,653	73,065	73,065	3,653	73,065	73,065
2	,537	10,736	83,801			
3	,322	6,443	90,244			
4	,268	5,361	95,605			
5	,220	4,395	100,000			

3.3.3 Reliability analysis

For this analysis, reliability assessment based on the criterion of internal reliability was used, i.e., that which indicates how well the items fit to measure the respective constructs.
Since this questionnaire consists of quantitative questions measured on a Linkert scale, Cronbach's Alpha, the most widely used statistical index to assess this criterion, was used to assess internal consistency.
Internal consistency means analysing whether the answers given are consistent with each other, i.e., observing whether they follow a constant thread between them.
A very important thing before using this index is to make sure that the sample is large enough. As the general rule is to have at least 100 participants in the questionnaire, with 171 it was considered possible to use this indicator.
Usually, this index is between 0 and 1, and since the higher the alpha value increases, the lower the error rate becomes, a high Cronbach's alpha value indicates that there is a high reliability within the dimension.
The most commonly used thresholds for determining whether an alpha is high enough vary depending on the domain of interest, but in general, a value between $0.8 < \text{alpha} < 0.9$ is considered to indicate very good reliability (Fornell and Lacker 2012; Hair et al. 2010) because it means that all items measure the same construct.
A Cronbach's Alpha of .906 indicates good internal reliability (see Appendix 11).

3.4 Hypothesis testing

After the descriptive and factor analysis, the study continued with the testing of the five hypotheses of the model presented in the research framework in Chapter 2.
In order to answer the research question:

RD: Will the use of the metaverse by luxury brands be positively accepted by consumers?

these hypotheses were tested by means of an ordinal logistic regression.
In this way, the relationship between the consumers' willingness to try this new technology, i.e. the dependent variable, and the independent variables will be investigated; all this in order to understand whether the practical functionalities of the metaverse technologies and the personal sensations perceived by the body while using them, have a positive effect on the consumers' propensity to experience the virtual world and thus positively accept the use of the Metaverse by luxury brands.

As control variables were also included to correctly interpret the responses from the questionnaire, the model will be controlled for age, gender, education, frequency of purchase of luxury goods/services, knowledge and experience of the metaverse.

3.4.1 Ordinal logistic regression

There are various types of regressions for analysing data collected with a questionnaire, including Ordinal Regression.
This makes it possible to generate predictions and assess the significance of various predictor variables in cases where the dependent variable is ordinal in nature. Since the dependent variable in this study was measured on a Linkert scale from 1 to 7 and thus on an ordinal scale and the independent variables are continuous, the Ordinal Regression procedure can be applied.

The purpose of logistic regression is to determine the probability of the occurrence of an event. Going into more detail, ordinal regression is a procedure for calculating the probability of the occurrence of a certain outcome in cases where the dependent variable consists of three or more outcomes.
The results of this regression are expressed as odds ratios (OR), i.e., indices representing the probability of an event occurring given a specific exposure.

The ordinal regression model of this research aims to investigate whether the odds of being willing to try the Metaverse technologies in order to take advantage of goods and services that luxury brands make available here, is positively influenced by the technical and personal factors of using these technologies. If this hypothesis is supported, the research question of whether the use of the metaverse by luxury brands is positively accepted by consumers will be confirmed.

3.4.2 Direct testing with control variables

In this model, the five hypotheses were tested together with all three types of variables: independent, dependent and control variables.
In fact, the purpose of the model is to verify the effect that the independent variables, or predictors, (Ease of Use, Immersion, Try before Buy, Customization and Traceability) have on the dependent variable, represented by the consumers' willingness to try the metaverse's technologies (Willingness to Try), but with the control of the socio-demographic variables (age, gender, education) of the purchase frequency (Frequency) and of the knowledge and experience of the metaverse (Knowledge

and Experience).To do this, an ordinal regression was run on SPSS, including all the above variables in the analysis. Table 7 is the first output of this regression and is called the Case Processing Summary. This table shows the response frequency for each case and the respective percentage of the control variables and the dependent variable.

Table 7. Ordinal Regression - Case Processing Summary.

		N	Marginal Percentage
WILLINGNESStoTRY	1 Strongly disagree	9	5,8%
	2	4	2,6%
	3	15	9,7%
	4 Neutral	41	26,6%
	5	43	27,9%
	6	23	14,9%
	7 Strongly agree	19	12,3%
AGE	12-25 (Gen Z)	74	48,1%
	26-41 (Gen Y)	31	20,1%
	42-57 (Gen X)	30	19,5%
	58+ (Baby Boomer)	19	12,3%
GENDER	Male	46	29,9%
	Female	108	70,1%
EDUCATION	Middle School Diploma	5	3,2%
	High School Diploma	46	29,9%
	Bachelor's Degree	44	28,6%
	Master's Degree	55	35,7%
	PhD	4	2,6%
FREQUENCY	1 Rarely	50	32,5%
	2	22	14,3%
	3	22	14,3%
	4	26	16,9%
	5	11	7,1%
	6	11	7,1%
	7 Very often	12	7,8%
KNOWLEDGE	Yes	118	76,6%
	No	36	23,4%
EXPERIENCE	Yes	44	28,6%
	No	110	71,4%
Valid		154	100,0%
Missing		0	
Total		154	

To go into more detail about the regression, the second output obtained is the model-fitting table.
In this the -2 Log Likelihood index provides a first indication of the model fit. The log-likelihood value is a way of measuring how well a model fits. The higher the log-likelihood value, the better a model fits a dataset.
Since the actual log-likelihood value for a given model is quite useless, it is then used to compare two or more models. In this case, as can be seen in Table 8, there are two models: the 'Intercept Only' (or Null) model and the 'Final' model (containing the entire set of predictors).
There is also a likelihood Chi-Square test to test where there is a significant improvement in fit of the Final model relative to the Intercept Only model. In this case the Chi-Square shows that the deviance is reduced almost by 302 after adding in the independent variables.
This can also be demonstrated by looking at the significant significance. Since there is statistical significance (p-value < 0.001), it is an indicator that the final model containing the full set of independent variables represents a significant improvement in fit over the Null.

Table 8. Ordinal Regression - Model Fitting Information.

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	535,402			
Final	233,597	301,805	21	<,001

The 'Goodness of Fit' table is a valuable tool to assess the adequacy of the model, as it includes the Deviance and Pearson Chi-square tests that can help determine whether the model is a good fit for the data. A model that shows non-significant test results is an indication of a good fit between the model and the data. This information has been presented by Field (2018) and Petrucci (2009).
In Table 9, it can be seen that both the Pearson chi-square test [$\chi^2(891) = 607,758$, p=1,000] and Deviance chi-square test [$\chi^2(891) = 233,597$, p=1.000] are non-significant (p-value > 0.05). These results suggest a good model fit.

Table 9. Ordinal Regression- Goodness-of-Fit.

	Chi-Square	df	Sig.
Pearson	607,758	891	1,000
Deviance	233,597	891	1,000

Finally, a last test to ascertain the goodness of fit of the model is the one shown in the table below: the parallel lines test. In fact, ordinal logistic regression assumes that the relationship between the independent variables is the same across all possible levels/categories of the independent variable,

i.e., an assumption referred to as Proportional Odds. Therefore, the regression coefficients, called 'location parameters', are the same across the different levels of the dependent variable.
The null hypothesis states that the location parameters are the same across response categories, i.e., they are parallel.
When the results of the test of Parallel lines (assumption of Proportional odds) indicate non-significance (p-value=1.000), as in the results showed in Table 10, it means that the we can retain the null hypothesis and thus the assumption is satisfied.
This means that that the independent variables have the same effect on the odds of the dependent variable regardless of its thresholds. Therefore, the model seems to be a good one.

Table 10. Ordinal Regression - Test of Parallel Lines.

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	233,597			
General	221,581[b]	12,017[c]	105	1,000

We now turn to the table of Estimated Parameters, in this case divided into two tables: Threshold (Appendix 13) and Location coefficients. In the Parameter Estimates table we see the coefficients, their standard errors, the Wald test and the associated p-values (Sig.).
The table below shows the *regression coefficients* and the significance test for each independent variables in the model (Table 12).
The interpretation of regression coefficients involves the predicted change in log odds of being in a higher category on the dependent variable for every unit increase on the independent variable, while keeping the other predictors constant. Positive estimates suggest that an increase in the independent variable is associated with a predicted increase in the log odds of falling at a higher level of the dependent variable. This implies that as the scores on the independent variable increase, the probability of falling at a higher level on the dependent variable also increases.
Whereas, for what concern negative estimates, for every unit increase on an independent variable, there is a predicted decrease in the log odds of falling at a higher level of the dependent variable, namely, this indicates that as scores increase in an IV, there is a decreased probability of falling at a higher level in the DV.
Table 12 shows that EASEofUse, IMMERSION, TRYbeforeBUY, and CUSTOMIZATION are significant positive predictors of WILLINGNESStoTRY (p-value< 0.05), while TRACEABILITY appears to be statistically non-significant (p-value > 0.05) predictor.

Table 11. Ordinal Regression - Coefficients estimates.

		Estimate	Std. Error	Wald	df	Sig.
Location	EASEofUSE	1,177	,242	23,563	1	<,001
	IMMERSION	1,232	,232	28,228	1	<,001
	TRYbeforeBUY	,557	,208	7,133	1	,008
	CUSTOMIZATION	1,121	,217	26,604	1	<,001
	TRACEABILITY	-,180	,168	1,136	1	,286

The regression coefficients for the control variables show the predicted change in the log odds of being in a higher category of WILLINGNESStoTRY compared to the reference category (Table 13). In this case, only one coefficient is statistically significant, the one of the variable gender, male. All the others are non-significant.

To explain something more about these values, if we look at AGE, a coefficient of -0.554 indicates that Gen Y is less likely to fall into a higher category of WILLINGNESStoTRY than Gen Z. In a similar way, considering the level of education's value [education=5], the slope coefficients of all the other level of education are negative, which means that the probability that a person without the PhD will belong to a higher level of WILLINGNESStoTRY lower if compared to the reference category.

Table 12. Ordinal Regression – Control variables.

Estimate			Std. Error	Wald	df	Sig.
Location	[AGE=1]	,144	,631	,052	1	,819
	[AGE=2]	-,554	,697	,631	1	,427
	[AGE=3]	-,027	,685	,002	1	,969
	[AGE=4]	0[a]	.	.	0	.
	[GENDER=1]	-1,516	,445	11,585	1	<,001
	[GENDER=2]	0[a]	.	.	0	.
	[EDUCATION=1]	-1,140	1,611	,501	1	,479
	[EDUCATION=2]	-1,341	1,246	1,159	1	,282
	[EDUCATION=3]	-1,200	1,238	,940	1	,332
	[EDUCATION=4]	-,957	1,221	,614	1	,433
	[EDUCATION=5]	0[a]	.	.	0	.
	[FREQUENCY=1]	-,116	,846	,019	1	,891
	[FREQUENCY=2]	-,144	,885	,026	1	,871
	[FREQUENCY=3]	,120	,915	,017	1	,896
	[FREQUENCY=4]	-,160	,886	,033	1	,857
	[FREQUENCY=5]	,416	1,029	,163	1	,686
	[FREQUENCY=6]	1,086	1,025	1,123	1	,289

	[FREQUENCY=7]	0[a]	.	.	0	.
	[KNOWLEDGE=1]	-,191	,455	,175	1	,675
	[KNOWLEDGE=2]	0[a]	.	.	0	.
	[EXPERIENCE=1]	,417	,422	,977	1	,323
	[EXPERIENCE=2]	0[a]	.	.	0	.

Finally, to correctly interpret the coefficients of the model just seen, the analysis continued with the calculation of the odd ratios for each coefficient of the independent variables using the following formula: $OR = e^{b_k}$.

The odds ratio indicates the change in the odds that a person will fall into a higher category of the dependent variable for every one unit increase of the independent variable k (holding the other independent variables constant).

An OR = 1 means that there is no relationship. In other words, an OR = 1 means that the risk of an event occurring does not depend on the specific risk factor.

An OR > 1 o OR < 1 respectively indicates an increasing/decreasing probability of being in a higher category of the dependent variable per unit increase on predictor k (i.e., it is mor/less likely to happen).

In other words:

- If OR > 1, then the risk of a certain event happening is higher among exposed individuals.
- If OR < 1, then the risk of the event happening is lower among exposed individuals.

Table 14 shows the estimates of the regression coefficients for each independent variable (the log odds) and the exponentiated estimates (odds ratios).

The odds ratios also need to be assessed for significance. P-values and confidence intervals are necessary companions to assess the significance of the association.

Table 13. Ordinal Regression - Log odds and Odds ratios of predictors.

		B = Log odds ratio	EXP(B) = OR (Odds ratio)
Location	EASEofUSE	1,177	3.245
	IMMERSION	1,232	3,428
	TRYbeforeBUY	,557	1,745
	CUSTOMIZATION	1,121	3,068
	TRACEABILITY	-,180	0,835

Looking at some of the results in Table 14 we can state that the positive coefficient for the predictor *TRYbeforeBUY* (B=0,557) shows that for every unit increase in this value, there is a predicted increase

of 0,557 in the log odds of being in a higher level of the independent variable (while the other variables are constant). Moreover, given that the odds ratio is greater than 1 (OR=1,745), the odds of a person being in a higher category of WILLINGNESStoTRY increases by a factor of 1,745 when the TRYbeforeBUY value increases by one unit. In other words, people are more willing to try the Metaverse services and products of luxury brands as the possibility of try before buying the product increase.

On the contrary if we look at a negative coefficient, i.e., TRACEABILITY (-0,180), the odds ratio is less than 1 (OR =0,835), which indicates that the probability of person being a higher category of WILLINGNESStoTRY decreases by a factor of 0,835 when TRACEABILITY increases by one unit. In other words, people are less likely to try the Metaverse services and products of luxury brands when their perception of product's traceability increase.

Instead, all the other values (*EASEofUSE,* IMMERSION and CUSTOMIZATION) are significant positive predictor of the model (B >1, OR > 3). For each one-unit increase of these independent variables, the odds of a person falling into a higher level of WILLINGNESStoTRY increase by a factor higher than 3. This means that people that give more importance to the ease of use of the metaverse technology, that feel more immersed in it and that consider the opportunity of customization present in this virtual world as important, are more likely to fall into a higher category of the dependent variable.

These three values together seem the most influential predictors of the willingness to try the Metaverse.

3.5 Findings

This model was not created from previous models from other studies, partly because since this is a new topic whose discussion has only opened up in the last three years, the present literature did not allow for it.

What was used as a starting point, however, were a number of hypotheses formulated on studies on virtual and augmented reality.

For example, the first hypothesis (The perceived user-friendliness of the technology necessary to connect with the metaverse affects customer attitudes of luxury goods positively.) is based on a study concerning the use of 3D virtual reality systems in online shops of luxury brands (Altarteer & Charissis, 2019).

The same applies to the second hypothesis (The strong feeling of presence and the high degree of immersion within the metaverse affects customer attitudes of luxury goods positively.) which was

formulated following a study by Altarteer and Charissis (2019) who tested another important factor related to the use of virtual reality technologies in online shops of luxury brands, namely the perceived presence within the 3D systems.
Proceeding also for the other hypotheses by taking cues from other studies and reshaping the model to the matter dealt with in this research, the model presented in Chapter 2 was used to test the 5 hypotheses.

Proceeding in order between the hypotheses and taking the results of the ordinal regression as reference, table nº 14 was constructed, on which the following observations can be made:

1. The results obtained from the ordinal regression analysis are consistent with the first hypothesis (H1), showing that the *EASEofUSE (EofU)* is positively and significantly related to WILLINGNESStoTRY (B= 1,177; OR=3,245: p-value<0,001). This means that consumers are more willing to try the service and products of luxury brands in the metaverse as their perception of ease of use of the technology required to connect to this virtual world increases. Furthermore, this result confirms what was found in a previous study, namely that the perceived ease of use of 3D virtual reality systems positively influences user behaviour. In other words, it can be said that the perceived ease of use of metaverse technologies is a very important factor that luxury brands must keep in mind if they want their consumers to positively accept the new services and products they will offer on this platform.

2. The second hypothesis (H2) is also supported by the regression results which in fact indicate that the value of IMMERSION (IMM) is significantly positively related to the dependent variable (B= 1.232; OR=3.428; p-value<0.001). As mentioned above for hypothesis 1 this means that consumers are more likely to positively accept the use of the metaverse by luxury brands if the sense of immersion and presence within the metaverse is strong. This further confirms what Altarteer and Charissis (2019) had tested for 3D technologies, namely that this feeling of presence positively influenced both consumer behaviour and the perceived value of the experience.

3. Then, the results of the regression partially support the third hypothesis (H3) indicating that the TRYbeforeBUY value (TbB) is significantly positively related to the WILLINGNESStoTRY (W) but in a very moderate way (B=0,557; OR=1.745; p-value=0.008). This is an indication of the fact that having the opportunity, thanks to the

metaverse, to try out products and services of luxury brands before purchasing them makes consumers positively welcome the use of such technology, but to a lesser extent than the factors analysed above.

4. The fourth hypothesis is also supported, CUSTOMIZATION (CUSTOM) being a significant positive predictor of the probability that a customer is willing to try the experiences made available to the metaverse by luxury brands and therefore to welcome this initiative in a positive manner. In fact, this hypothesis presents values of B, OR and p-value in line with those of the first and second hypotheses: B=1.121; OR=3.068; p-value<0.001.
   This leads to the conclusion that the possibility of customising products entices consumers to try the virtual world, thus reacting positively to the idea that many luxury brands are having of using this new platform to make their services more and more tailor-made, putting the customer at the centre of the process right from the embryonic phase of product creation.

5. Arriving at the last hypothesis we also arrive at the only one that was not supported by the regression results. In fact, a non-significant effect of TRACEABILITY (TRACE) on the WILLINGNESStoTRY (B= -.180; OR= 0.835; p-value= .286) can be observed from Table 14. This means that it is not possible to predict consumers' willingness to experience the metaverse and therefore whether they would positively accept the use of this by luxury brands, based on the perceived importance of tracking the provenance and authenticity of the products these brands sell. Thus, the fact that these technologies allow for tracking the provenance of products is not an incentive for consumers to try them.

Finally, as we wanted to explore whether there is a closer correlation between the acceptance of it and personal factors such as feeling present and immersed in this world (H2), or with more practical factors such as the ease of use of the technology (H1), the possibility of trying out the products and customising them (H3, H4) and the possibility of tracing the origin and authenticity of the products (H5), observing the values in table 14 and reconnecting with what was previously said, the IMMERSION factor, i.e. the only one measuring personal factors, seems to have the most impactful and significant relationship with the dependent variable.

Table 14. Hypothesis testing results.

	Hypothesis	Supported	B (Log odd)	EXP(B)= Odds ratio	p-value
H1	EofU → W	YES	1,177	3.245	<,001
H2	IMM → W	YES	1,232	3,428	<,001
H3	TbB → W	YES	,557	1,745	,008
H4	CUSTOM→ W	YES	1,121	3,068	<,001
H5	TRACE → W	NO	-,180	0,835	,286

3.6 Theoretical contributions & Managerial Implications

Being a recently developed technology, the metaverse and its application in businesses, are at an embryonic stage, especially if we look at the luxury industry. This industry, in fact, is known for its distrust of anything that could make it mainstream and accessible to the masses instead of remaining a privilege for the few, with unique products and experiences.

It is also true, however, that in the last decade this world has revolutionised, becoming more inclusive and less reluctant to use platforms and channels for sales and customer contact other than the traditional ones.

It is precisely for this reason that I felt it appropriate to analyse the Metaverse phenomenon in the luxury industry, as I believe that its applications in such a particular sector can be multiple and have a positive impact, both economically for the company and on the customer experience.

In addition, the scarce literature on the subject on the one hand was a limitation to this study, but on the other hand it allowed me to investigate the subject in total freedom without being influenced by previous research.

I believe this study could have several theoretical contributions, both general and more specific about the luxury industry. For example, it can help advance the understanding of the metaverse and explore consumer behaviour in virtual environments. Moreover, it might contribute to investigate the impact of emerging technologies on traditional industries, such as the luxury one, and to examine the potential of the metaverse for luxury brands.

This research could shed light on how this new virtual world is affecting the entire production, marketing and sales process by luxury companies, but also the relationship between them and their current and future customers.

Indeed, the luxury industry has traditionally been defined by its exclusivity and its focus on physical experiences. However, the rise of the metaverse could disrupt this model.

Luxury brands are always looking for new ways to engage with their customers creating unique experiences and the metaverse allows these brands to connect with them in innovative ways, in a world completely different from the physical one, in which they behave differently. For this reason, this study could help understand these new ways of behaving, enabling industries to adapt their offers.

More specifically, this research investigated which drivers led consumers to positively accept the use of the metaverse by luxury brands and whether this translated into an increase in their propensity to purchase.

The drivers that were analysed concerned the ease of use of the technologies required to connect to the virtual world, the feeling of immersion and presence within it, the possibility of trying on products and personalising them before purchasing them, and finally the opportunity provided by these technologies to trace their provenance and certify their authenticity.

In other words, what this study set out to show is that these factors can have a positive effect on the willingness of consumers to try the metaverse's platform, but not for the mere purpose of play, but as a channel through which to purchase and interact with the brand.

The results presented in the previous paragraph show that overall, these drivers as an impact on customer’s willingness to try the metaverse’s services offered by luxury brand and so that they will positively accept this technology.

The only factor that does not seem to positively influence consumers' propensity to use the metaverse to purchase or use luxury goods and services is the possibility this technology provides to trace the provenance and certify the authenticity of products.

It is also true that this function, when compared with others, may not seem like an added value that only the metaverse provides.

In other words, when one goes to buy a Louis Vuitton bag in one of their shops, he/she does not question whether it is a fake, because he/she takes it for granted that since it is sold in their shop, it is. Similarly, if one buys through their website. This is why a consumer does not think he needs a tool to certify its provenance and authenticity even if the purchase is made through the metaverse.

Furthermore, as much as I believe this study can be used for a general study by all brands that want to approach this world, I believe that a manager needs to understand when and if it is time to bring their brand onto this platform. Indeed, while it is true that following the wave and keeping up with the times is of paramount importance, so is acting consistently and congruently with the existing strategy.

For some brands, in fact, it may not be the winning choice to land on the metaverse, perhaps because their audience is characterized by older people who are not used to using such technologies, perhaps because it is a big investment for the company's economic balance and it is not the right time, and for many other reasons, financial and otherwise.
Having said that, I believe that the use of this study may come in handy as a starting point for other more in-depth research on the relationship between customers and luxury brands in the virtual world, a relationship which, as mentioned earlier, is quite different from the one existing in today's world and therefore needs a special investigation.

3.7 Limitations and suggestion for future research

In spite of what was said in the previous section, this study has several limitations that represent insights for future research on the subject.
Firstly, the sample that was used is small and this may not provide a fair representation of the population's thoughts on the subject. Furthermore, as the study was carried out to investigate whether or not consumers of luxury brands accept the use of the metaverse, it would be interesting to involve more people who actually buy frequently these brands as it would give a more meaningful response and the brands could really understand if their audience is ready for this type of innovation.
This could be solved if a larger sample size were filtered keeping only the responses of those who answered often or very often to the question: "How frequently do you buy luxury goods/services?".
Furthermore, another limitation was the lack of specific studies on the metaverse and its application in the luxury sector. While this, as mentioned above, helped to make my analysis unbiased and free from influences of existing research, it also made the formulation of the questionnaire more difficult and perhaps less precise, as there were not many examples to draw from and to link to in order to better investigate a particular aspect.
I believe that this problem will only be solved when the opportunities that the use of such a platform offers begin to be understood, generating a strand of studies dedicated to it.

To conclude, as I believe this study could be a significant contribution to the literature on the effects of the metaverse on consumers, I also think it has raised questions that require further research to enhance the understanding of a tool that, if used correctly, can help achieve important goals.

Conclusions

In 2021, the Metaverse has become a popular topic and is experiencing a long-term revolution. This study offers a comprehensive analysis of how the Metaverse is influencing the luxury industry.

The first and second section briefly introduces the key concepts of the Metaverse, virtual and augmented reality technologies, as well as their benefits and drawbacks. Furthermore, these two sections examine how these technologies are being implemented in the luxury industry and their impact on the customer experience.

The third section consists of the analysis of a questionnaire that was administered to understand the reaction that consumers might have to the use of the metaverse by luxury brands. The aim of this quantitative research was to study the response of consumers to certain opportunities provided by metaverse technologies to observe if and how luxury brands can integrate this new platform into their sales and marketing strategies.

Finally, important findings and potential opportunities are discussed in detail in the last section.

What can certainly be stated after this study is that the metaverse is revolutionizing marketing by providing firms with a new channel for delivering omnichannel strategies, following web, mobile, search, social, and email.

The opportunities provided by this technology, such as the high possibility customizing products and services like never before, the feeling of being present in a new world where one can interact with people from the comfort of their own home, positively influence consumer behaviour towards the use of this platform. In other words, what emerges from this study is that to encourage customers to use the metaverse, as well as to shift the point of contact with the brand from physical to virtual, incentives must be given, whether they are related to the technology, such as ease of use, or related to the possibilities that it offers, which cannot be found in traditional physical stores.

In conclusion, based on what has been discussed thus far, I believe that this study has effectively investigated the research question of whether luxury brands' use of the metaverse will be well-received by consumers. As a result, the research objective has been met by shedding light on how consumers might react to the virtual world, the approaches that brands should utilize to capture their interest on this platform, and ultimately, how to ensure that they respond positively.

Appendix

Appendix 1. Survey design created with Qualtrics.

1. Consenso informato.
   Progetto tesi in Luxury, Fashion and Made in Italy Management, Università Luiss Guido Carli.
   Questa indagine ha lo scopo di studiare come i consumatori reagiscono all'utilizzo delle tecnologie, quali il Metaverso, da parte di marchi di lusso, analizzandone i fattori che potrebbero influenzare positivamente la loro propensione all'acquisto.
   La compilazione richiederà circa 2 minuti. Vi ringrazio anticipatamente per il tempo che gli dedicherete.

2. Il questionario è anonimo e le sue risposte verranno gestite con la massima riservatezza ai soli fini di ricerca. Nel presentare i risultati dello studio, l'identificazione dei partecipanti sarà resa impossibile in accordo con il Regolamento UE 2016/679 sulla tutela dei dati personali.

Q3. Quanti anni hai?
- 18-26
- 27-42
- 43-58
- 59 o più

Q4. Quale è il tuo genere?
- Donna
- Uomo
- Preferisco non dirlo

Q5. Quale è il livello di istruzione più alto che hai ottenuto?
- Diploma di scuola media
- Diploma di scuola superiore
- Laurea triennale
- Laurea magistrale
- PhD

Q6. Quanto spesso acquisti prodotti o utilizzi servizi di lusso? (Moda, Gioielli, Cosmetici, Hotel, Arredamento, Automobili, Orologi…)
- 1 Raramente
- 2
- 3
- 4
- 5
- 6
- 7 Molto spesso

Q7. Sai cosa è il metaverso?
- Sì
- No

Q8. Hai mai fatto esperienze di realtà virtuale/aumentata o nel Metaverso?

- Sì
- No

Q9. Se le tecnologie necessarie per connettersi al Metaverso fossero di facile utilizzo, saresti più propenso a fare questa esperienza?

- 1 Fortemente in disaccordo
- 2
- 3
- 4 Neutrale
- 5
- 6
- 7 Fortemente d'accordo

Q10. Sentirti immerso e presente all'interno del nuovo mondo virtuale (possibilità di toccare gli oggetti – interagire direttamente con altri avatar e con i brand), invece che vederlo solo tramite uno schermo, renderebbe l'esperienza più piacevole?

- 1 Fortemente in disaccordo
- 2
- 3
- 4 Neutrale
- 5
- 6
- 7 Fortemente d'accordo

Q11. Se i brand di lusso rendessero disponibili alcuni servizi o prodotti solo/anche nel Metaverso, saresti disposto a provare questa tecnologia? (Partecipare alle sfilate, visitare hotel/ristoranti prima di andarci, vedere i cataloghi dei brand).

- 1 Per nulla
- 2
- 3
- 4 Neutrale
- 5
- 6
- 7 Moltissim0

Q.12 Avere l'opportunità, tramite il Metaverso, di provare prodotti o usufruire di servizi prima di acquistarli, aumenterebbe la tua propensione all'acquisto di beni di lusso?

- 1 Fortemente in disaccordo
- 2
- 3
- 4 Neutrale
- 5
- 6
- 7 Fortemente d'accordo

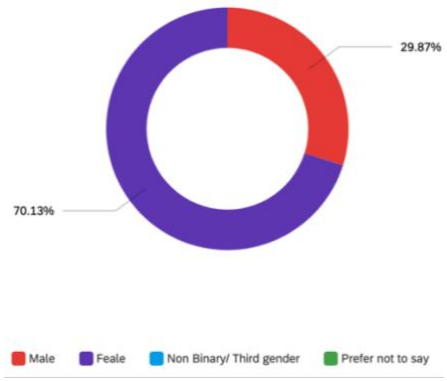
Q.13 Avere la possibilità, tramite il Metaverso, di personalizzare prodotti o servizi prima di acquistarli, aumenterebbe il tuo consumo di beni di lusso?

- 1 Fortemente in disaccordo
- 2
- 3
- 4 Neutrale
- 5
- 6
- 7 Fortemente d'accordo

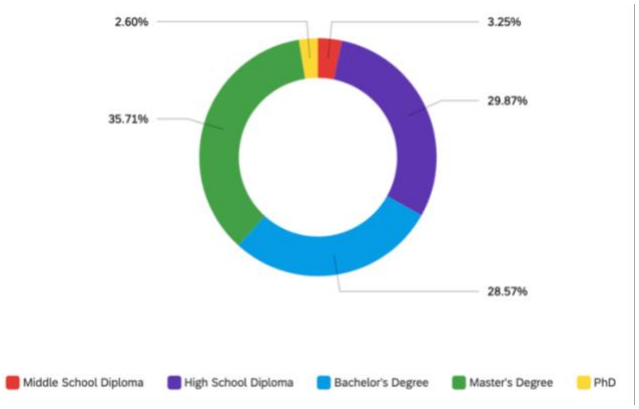
Q.14 L'abilità di tracciare la provenienza e l'autenticità di un prodotto di lusso, peculiarità che hanno le tecnologie incluse nel Metaverso, influenzerebbe la tua scelta di acquisto?

- Fortemente in disaccordo
- 2
- 3
- 4 Neutrale
- 5
- 6
- 7 Fortemente d'accordo

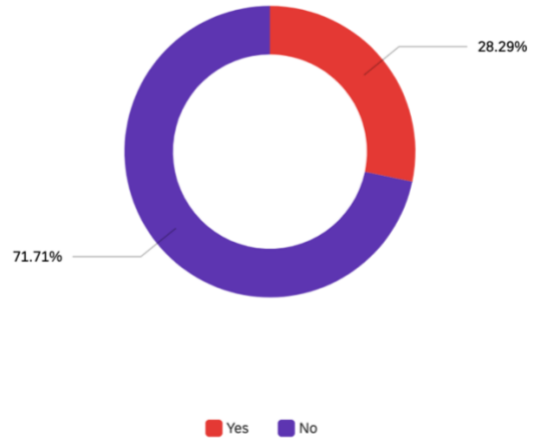
Appendix 2. Survey results- Gender.



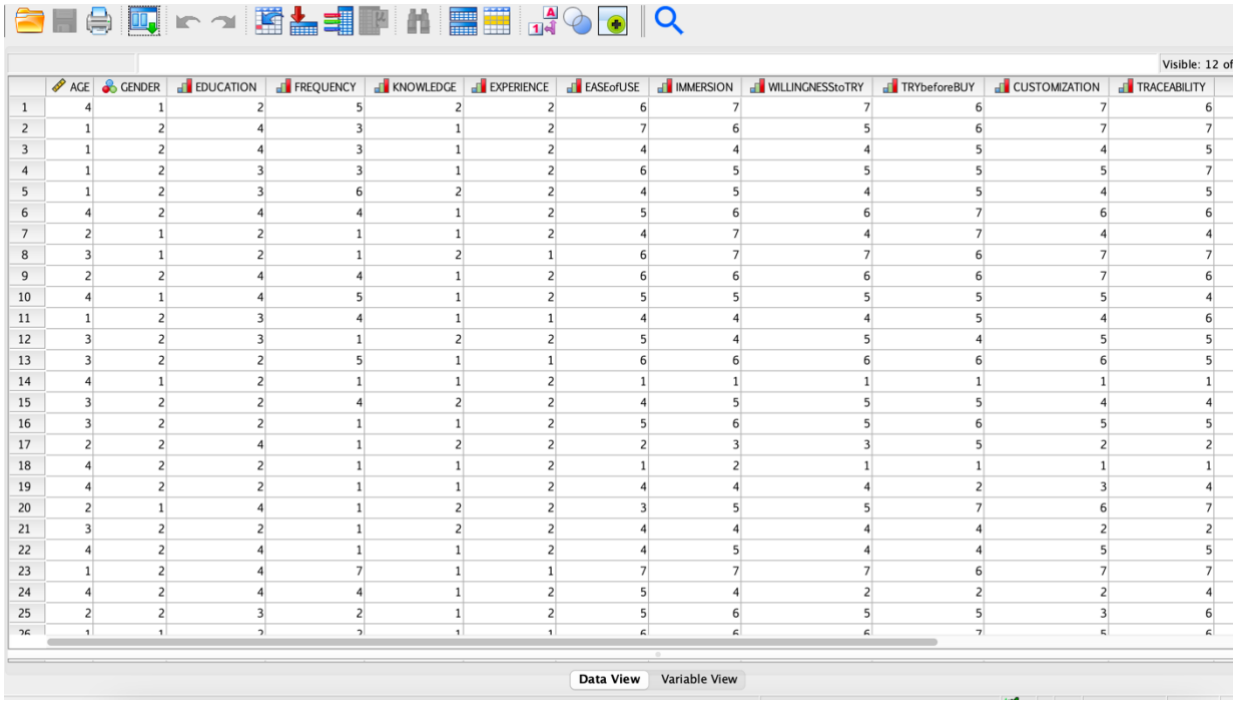
Appendix 3. Survey results – Education Level.



Appendix 4. Survey results – Experience with VR/AR or in the Metaverse.



Appendix 5. SPSS Database.



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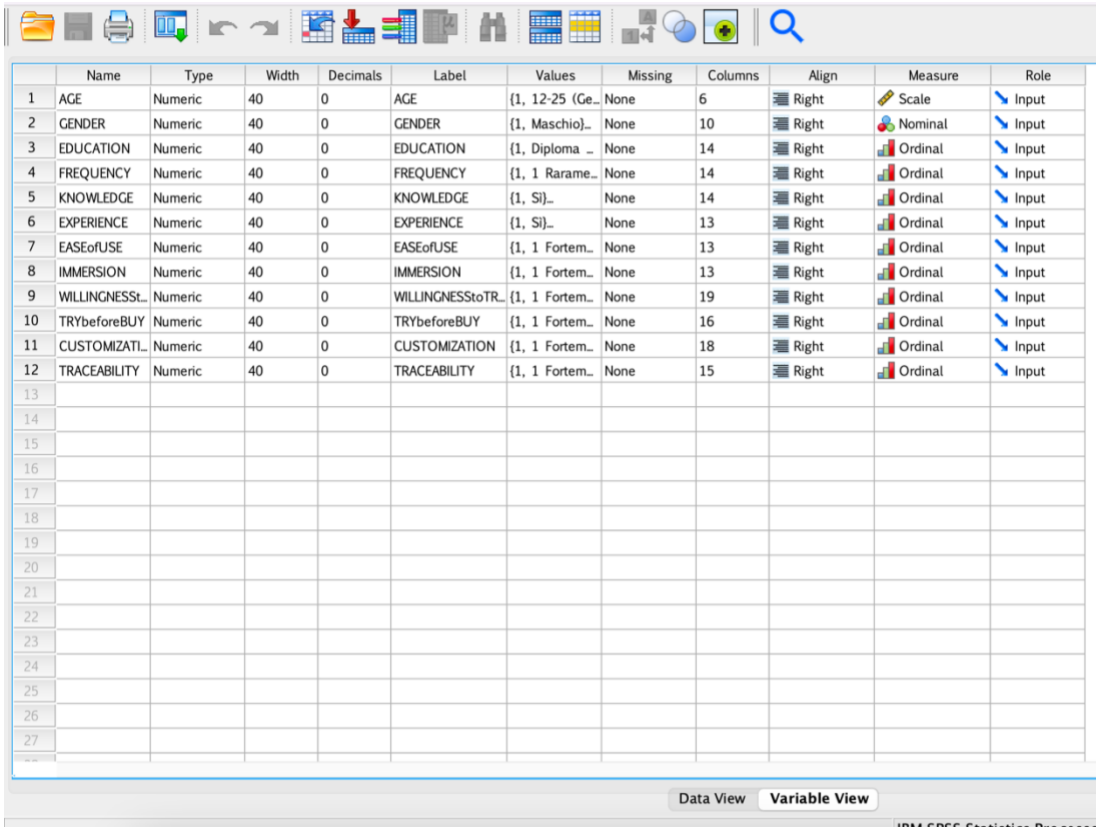
	AGE	GENDER	EDUCATION	FREQUENCY	KNOWLEDGE	EXPERIENCE	EASEofUSE	IMMERSION	WILLINGNESStoTRY	TRYbeforeBUY	CUSTOMIZATION	TRACEABILITY
1	4	1	2	5	2	2	6	7	7	6	7	6
2	1	2	4	3	1	2	7	6	5	6	7	7
3	1	2	4	3	1	2	4	4	4	5	4	5
4	1	2	3	3	1	2	6	5	5	5	5	7
5	1	2	3	6	2	2	4	5	4	5	4	5
6	4	2	4	4	1	2	5	6	6	7	6	6
7	2	1	2	1	1	2	4	7	4	7	4	4
8	3	1	2	1	2	1	6	7	7	6	7	7
9	2	2	4	4	1	2	6	6	6	6	7	6
10	4	1	4	5	1	2	5	5	5	5	5	4
11	1	2	3	4	1	1	4	4	4	5	4	6
12	3	2	3	1	2	2	5	4	5	4	5	5
13	3	2	2	5	1	1	6	6	6	6	6	5
14	4	1	2	1	1	2	1	1	1	1	1	1
15	3	2	2	4	2	2	4	5	5	5	4	4
16	3	2	2	1	1	2	5	6	5	6	5	5
17	2	2	4	1	2	2	2	3	3	5	2	2
18	4	2	2	1	1	2	1	2	1	1	1	1
19	4	2	2	1	1	2	4	4	4	2	3	4
20	2	1	4	1	2	2	3	5	5	7	6	7
21	3	2	2	1	2	2	4	4	4	4	2	2
22	4	2	4	1	1	2	4	5	4	4	5	5
23	1	2	4	7	1	1	7	7	7	6	7	7
24	4	2	4	4	1	2	5	4	2	2	2	4
25	2	2	3	2	1	2	5	6	5	5	3	6
26	1	1	2	2	1	1	6	6	6	7	5	6

Data View | Variable View



	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	AGE	Numeric	40	0	AGE	{1, 12-25 (Ge...	None	6	Right	Scale	Input
2	GENDER	Numeric	40	0	GENDER	{1, Maschio}...	None	10	Right	Nominal	Input
3	EDUCATION	Numeric	40	0	EDUCATION	{1, Diploma ...	None	14	Right	Ordinal	Input
4	FREQUENCY	Numeric	40	0	FREQUENCY	{1, 1 Rarame...	None	14	Right	Ordinal	Input
5	KNOWLEDGE	Numeric	40	0	KNOWLEDGE	{1, Si}...	None	14	Right	Ordinal	Input
6	EXPERIENCE	Numeric	40	0	EXPERIENCE	{1, Si}...	None	13	Right	Ordinal	Input
7	EASEofUSE	Numeric	40	0	EASEofUSE	{1, 1 Fortem...	None	13	Right	Ordinal	Input
8	IMMERSION	Numeric	40	0	IMMERSION	{1, 1 Fortem...	None	13	Right	Ordinal	Input
9	WILLINGNESSt...	Numeric	40	0	WILLINGNESStoTR...	{1, 1 Fortem...	None	19	Right	Ordinal	Input
10	TRYbeforeBUY	Numeric	40	0	TRYbeforeBUY	{1, 1 Fortem...	None	16	Right	Ordinal	Input
11	CUSTOMIZATI...	Numeric	40	0	CUSTOMIZATION	{1, 1 Fortem...	None	18	Right	Ordinal	Input
12	TRACEABILITY	Numeric	40	0	TRACEABILITY	{1, 1 Fortem...	None	15	Right	Ordinal	Input
13											
14											
15											
16											
17											
18											
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21											
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25											
26											
27											

Data View | Variable View

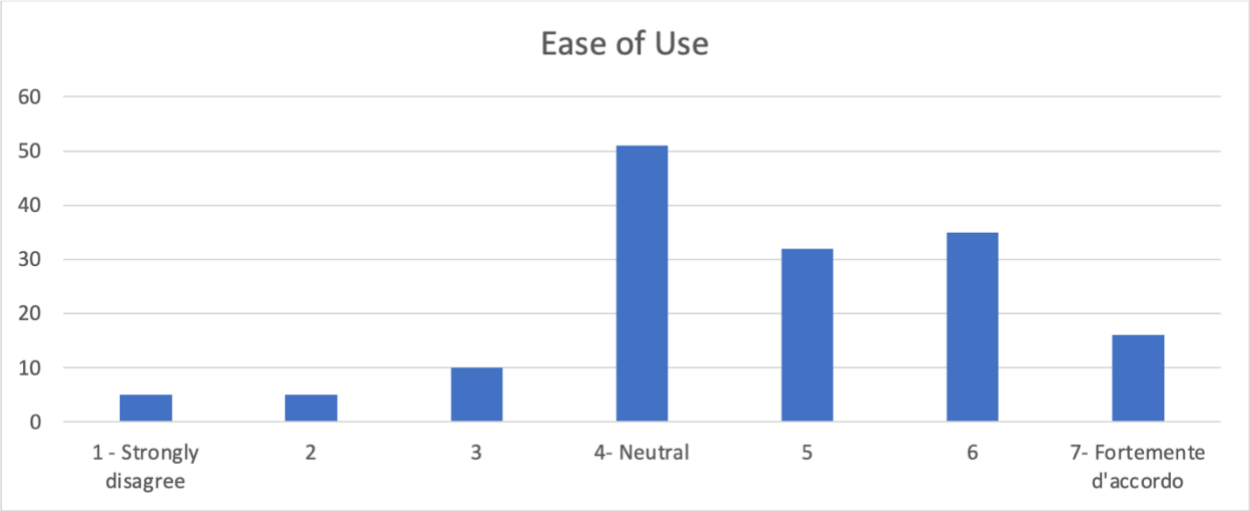
Appendix 6.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
WILLINGNESStoTRY	,160	154	<,001	,926	154	<,001

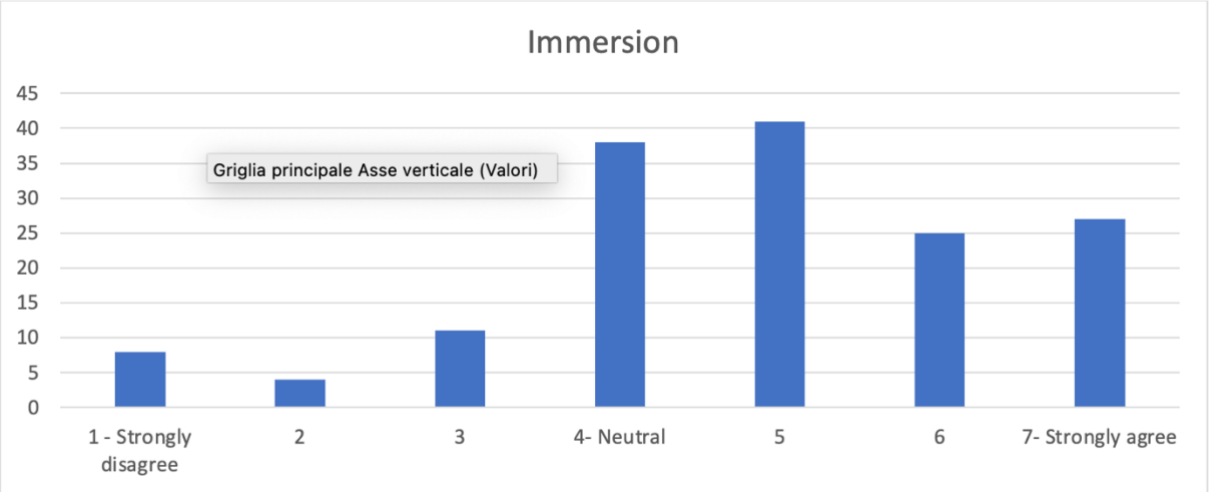
a. Lilliefors Significance Correction

	N.	Mean	Std. Deviation	Skewness	Kurtosis
WILLINGNESStoTRY	154	4.62	1.530	-.475	,092

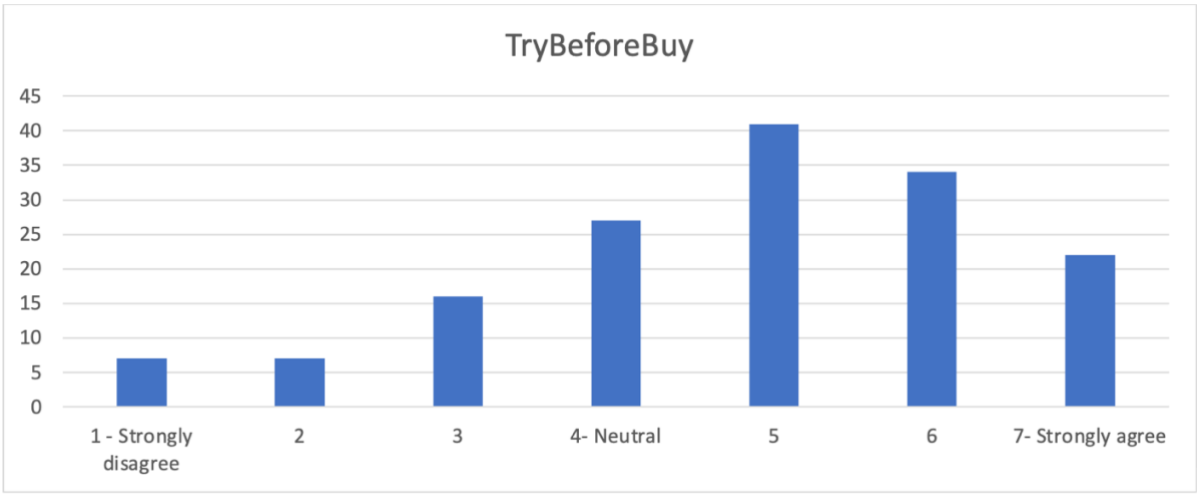
Appendix 7. Survey Results – Ease of Use.



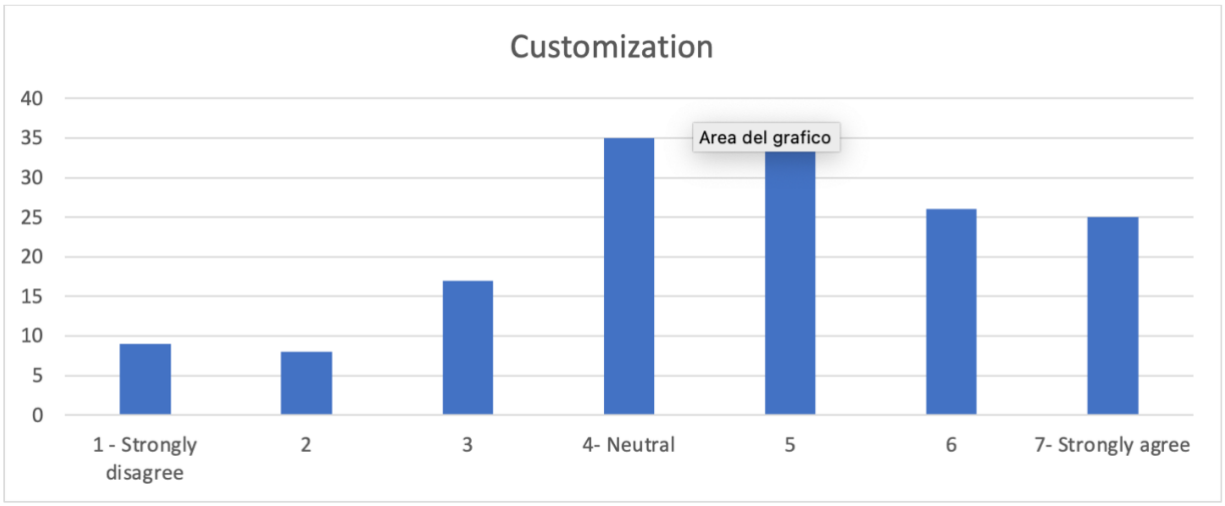
Appendix 8. Survey Results – Immersion.



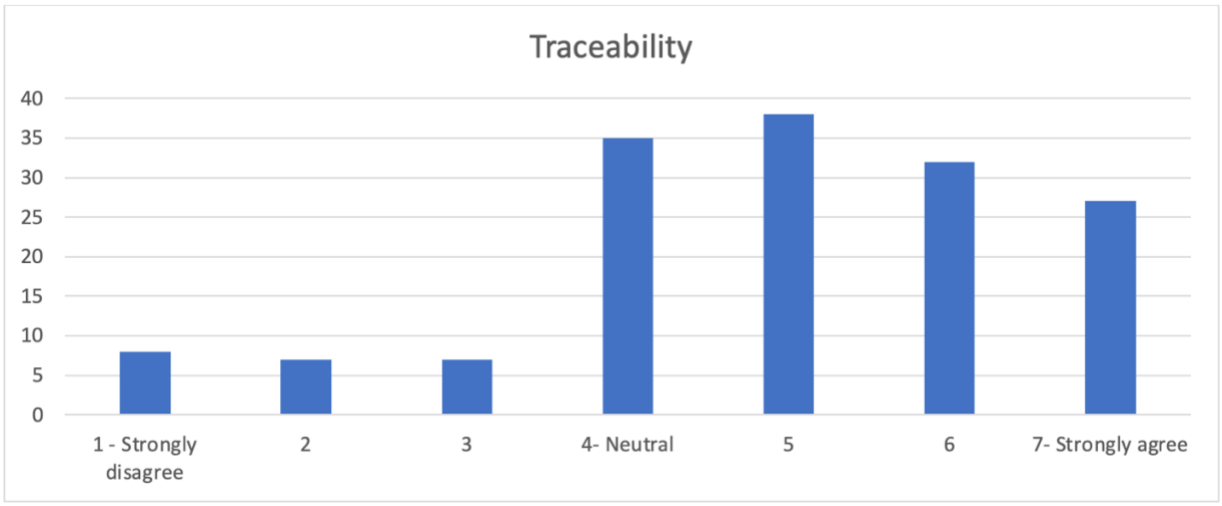
Appendix 9. Survey Results – Try Before Buy.



Appendix 10. Survey Results – Customization.



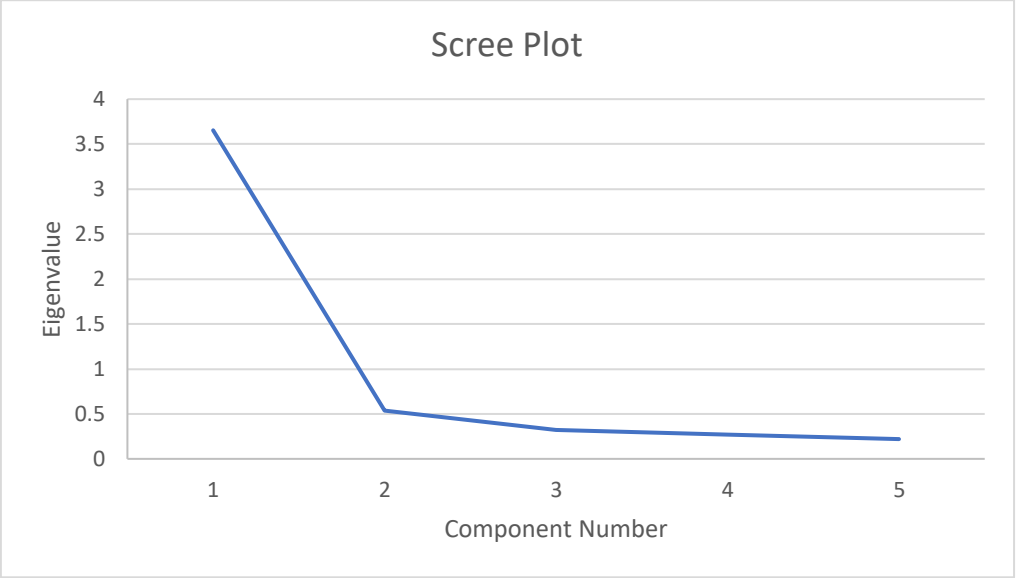
Appendix 11. Survey Results – Traceability.



Appendix 12.

Cronbach's Alpha	N of Items
,906	5

Appendix 13. Factor Analysis output - Scree Plot.



Appendix 14. Ordinal Regression – Thresholds

		Estimate	Std. Error	Wald	df	Sig.
Threshold	[WILLINGNESStoTRY = 1]	6,679	1,954	11,680	1	<,001
	[WILLINGNESStoTRY = 2]	8,792	1,981	19,701	1	<,001
	[WILLINGNESStoTRY = 3]	12,065	2,117	32,480	1	<,001
	[WILLINGNESStoTRY = 4]	16,450	2,369	48,227	1	<,001
	[WILLINGNESStoTRY = 5]	20,595	2,651	60,362	1	<,001
	[WILLINGNESStoTRY = 6]	23,758	2,852	69,392	1	<,001

Appendix 15. Ordinal Regression - Log odds and Odds ratios of control variables.

		B = Log odds ratio	EXP(B) = OR (Odds ratio)
Location	[AGE=1]	,144	1,155
	[AGE=2]	-,554	0,575
	[AGE=3]	-,027	0,973
	[AGE=4]	0[a]	
	[GENDER=1]	-1,516	0,220
	[GENDER=2]	0[a]	
	[EDUCATION=1]	-1,140	0,320
	[EDUCATION=2]	-1,341	0,262
	[EDUCATION=3]	-1,200	0,301
	[EDUCATION=4]	-,957	0,384
	[EDUCATION=5]	0[a]	
	[FREQUENCY=1]	-,116	0,890
	[FREQUENCY=2]	-,144	0,866
	[FREQUENCY=3]	,120	1,127
	[FREQUENCY=4]	-,160	0,852
	[FREQUENCY=5]	,416	1,516
	[FREQUENCY=6]	1,086	2,962
	[FREQUENCY=7]	0[a]	
	[KNOWLEDGE=1]	-,191	0,826
	[KNOWLEDGE=2]	0[a]	
	[EXPERIENCE=1]	,417	1,517
	[EXPERIENCE=2]	0[a]	

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EXECUTIVE SUMMARY

CHAPTER 1 INTRODUCTION

The concept of Industry 4.0 emerged in 2011 as a strategic plan to enhance Germany's global manufacturing competitiveness. It involves technologies that blur the line between the physical and digital worlds.
The COVID-19 pandemic accelerated the shift to online activities, highlighting the importance of virtual and augmented reality (VR/AR) technologies.

Virtual reality (VR) creates immersive environments simulating the real world, benefiting marketing, collaboration, storytelling, and product presentation. VR experiences can increase consumer interest, purchase intentions, and post-purchase outcomes.
Augmented reality (AR) overlays computer-generated information onto the real world, enhancing productivity, decision-making, and consumer experiences; moreover, AR improves sales volumes and margins in e-commerce.
The metaverse, inspired by Neal Stephenson's novel Snow Crash, is an interconnected virtual world merging physical and digital realities using VR, AR, and AI. It offers applications in video games, art, and business. This technology requires network infrastructure, management technology, common technologies like AI and security, virtual reality object connection, and space convergence.
For businesses, the metaverse is a new sales and communication channel, enabling unique customer experiences, virtual events, support, communities, and advertising. However, legal issues and privacy concerns arise, requiring collaboration between companies, governments, and users.

Looking at the luxury industry, it can be noticed that, in the last decade, it has undergone a technological revolution, integrating new technologies into various aspects of the industry. Key advancements include 3D printing, artificial intelligence (AI), augmented reality, blockchain, and mobile e-commerce. These technologies have brought efficiency, personalization, transparency, and a seamless shopping experience to the luxury sector.
Luxury brands now use 3D printing for intricate designs, enabling faster product development and reduced costs. AI is utilized for personalized marketing and supply chain optimization. Augmented reality creates immersive shopping experiences, allowing customers to try products virtually. Blockchain technology enhances transparency, verifies authenticity, and ensures ethical practices.

Mobile e-commerce has expanded brand reach and improved customer interaction. The Internet of Things (IoT) is also being used to create smart luxury products.

In conclusion, the luxury industry has embraced state-of-the-art technologies, integrating digital and sustainable practices. Continuous innovation is expected as technology evolves, leading to new and exciting experiences for luxury consumers.

CHAPTER 2 THEORETICAL LITERATURE REVIEW

The early 21st century witnessed significant advancements in virtual reality and computer graphics, setting the stage for the emergence of the metaverse.
This research analyzes previous studies on the metaverse using the Web of Knowledge database, with 740 publications and 1333 citations as of January 22, 2023.

In the literature review, it is highlighted that the metaverse has gained significant attention in the early 21st century, with advancements in virtual reality and computer graphics setting the stage for its development. The market size of the metaverse was estimated to be US$48 billion in 2020 and is projected to reach US$829 billion by 2028.
The chapter focuses on analyzing the metaverse's development and its applications, particularly in marketing and customer experience.
The economic system of the metaverse is discussed, with the recognition that it could have a significant impact on the global economy and the token economy based on blockchain technology is seen as a crucial aspect of the metaverse's economic system.
The review also explores the monetary systems in this new world, emphasizing the shift from traditional payment methods to crypto wallets and digital assets, including non-fungible tokens (NFTs). Various types of digital assets, such as user-generated content, professional-generated content, and artificial intelligence-generated content, are discussed, along with their role in incentivizing contributions and driving the economy of the metaverse. The importance of cryptocurrencies and decentralized finance (DeFi) is highlighted in providing liquidity and enabling transactions within the digital asset market.
The chapter further examines the applications of the metaverse. It is seen as a tool to address real-world challenges in areas such as the workplace, education, healthcare, and social life. Additionally,

the metaverse itself can be a target for various activities, including business, real estate, gaming, entertainment, architecture, and the fashion industry. The potential of this new platform to transform supply chain processes, manufacturing, logistics, and operations management is also discussed, emphasizing benefits such as cost reduction, waste management, environmental sustainability, improved communication, transparency, and optimization.

The chapter continues with the analysis of the impact that the metaverse has on humans and on customer experience, by saying that it can be both positive and negative. On the positive side, the metaverse provides opportunities for enhanced communication between people and businesses, offering fresh opportunities for enterprises to interact directly with customers through avatars. It also has potential benefits for retail and e-commerce, allowing users to test products in virtual worlds and providing valuable feedback for retailers.
However, there are also concerns about the negative impact of the metaverse. People may create idealized avatars that deviate from reality, potentially leading to negative effects on self-esteem and confidence if individuals prefer the virtual world over reality. Addiction is also a concern, as virtual reality gaming and the immersive nature of the metaverse can be highly addictive.
Therefore, it is important for managers and policymakers to be aware of the cultural narratives surrounding virtual reality consumption and to promote positive associations with empowerment and liberation.
From a customer experience perspective, the metaverse offers opportunities for immersive experiences and personalized environments, giving customers a sense of control and empowerment. This can lead to increased satisfaction and loyalty. However, implementing metaverse technology may not be accessible to all firms, and managers need to carefully consider the costs and benefits.
Understanding customer preferences and designing effective customer journeys in the metaverse is crucial.

For what concern the marketing, the shift from Industry 1.0 to Industry 4.0 has significantly impacted marketing strategies. Marketing 4.0 focuses on personalizing services and products through big data analysis, unlike the earlier approach of selling products without considering customer preferences. The metaverse has the potential to revolutionize advertising and consumer reactions to it. Companies are actively exploring advertising opportunities in the metaverse, especially in sectors like sports, tourism, luxury, fashion, entertainment, automotive, and gaming.

Metaverse marketing allows brands to maintain or change their real-world positioning. The metaverse brings changes in advertising practices, as users have greater control over the content they are exposed to.

A triadic relationship exists between consumers, engagement factors, and media features in the metaverse, influencing human behavior in both the virtual and physical worlds. The degree of immersion, embodiment, and presence are important factors in advertising effectiveness, as well as the interoperability and continuity between virtual and physical worlds.

In this chapter, the evolution of the luxury industry and its uses of the metaverse are also analyzed. Technological advances have had a significant impact on the luxury industry. The Personal Luxury Goods market experienced growth from 2015 to 2019 but faced a decline in 2020 due to the COVID-19 pandemic, particularly in tourism and hospitality. However, in 2022, the industry saw a return to pre-pandemic growth rates, driven by digital age advancements and technology adoption.

Luxury brands are embracing technologies like augmented reality (AR) and virtual reality (VR) to enhance customer experiences. As said before, AR technology, in particular, has been found to improve authenticity, service quality, exclusivity, and aesthetics throughout the customer journey.

To create a unified customer experience and adapt to changing consumer demands, luxury retailers are incorporating disruptive technologies and transforming their stores into experience hubs. They are utilizing VR and AR tools to immerse customers in virtual settings, providing a unique and personalized shopping experience without the need for physical infrastructure.

The future of luxury retail is seen in the concept of "augmented retail," which combines online, offline, and mobile channels. Leading luxury brands are deploying artificial intelligence (AI) to design seamless customer interactions and incorporating blockchain technology and non-fungible tokens (NFTs) to ensure authenticity and track product history.

The emergence of the metaverse is expected to reshape luxury brands. Younger generations perceive the virtual world as an extension of their daily lives. However, questions arise about the appeal of virtual luxury goods when sensory experiences are missing. Creating functional web applications with clear information and high interactivity is essential to compensate for the lack of physical presence in online luxury stores.

Knowledge gap and research framework

The passage discusses the knowledge gap surrounding the use of the metaverse in the luxury industry and the need for further research in this area. While there have been some studies on the metaverse's impact on the fashion industry, there is a lack of research on its applications in other luxury sectors

such as hospitality, architecture, and automotive. Many companies, including luxury brands, are uncertain about implementing the metaverse due to the need for significant financial investments and the need for consumers to accept this new technology.

The passage also highlights the importance of the younger generation in the luxury sector, as they are more familiar with technologies like the metaverse and expect brands to offer innovative experiences. Research shows that a brand's focus on innovation and new technologies influences luxury consumers' purchase decisions. The passage mentions statistics indicating that a significant percentage of luxury consumers are interested in buying luxury products in the metaverse.

To address the knowledge gap, this study proposes the following research question:

"*Will the use of the metaverse by luxury brands be positively accepted by consumers?"*

Then, it suggests five independent variables that will be tested to understand consumer attitudes towards the adoption of the metaverse by luxury brands. These variables include the perceived user-friendliness of the technology (*H1: The perceived user-friendliness of the technology necessary to connect with the metaverse affects customer attitudes of luxury goods positively.)*, feeling of presence and immersion within the metaverse (*H2: The strong feeling of presence and the high degree of immersion within the metaverse affects customer attitudes of luxury goods positively.)*, the opportunity to try and experience products or services in the metaverse (*H3: The opportunity to try and experience the product or service in the metaverse before buying it in the real world affects customer attitudes of luxury goods positively.)*, the object customization capacity (*H4: Object customization capacity in the metaverse affects customer attitudes of luxury goods positively.)*, and the ability to trace the provenance and authenticity of products in the metaverse (*H5: The ability to trace the provenance and authenticity of the product thanks to technologies in the metaverse affects customer attitudes of luxury goods positively.)*.

The dependent variable in the study is customer attitudes towards the adoption of the metaverse by luxury brands, specifically their willingness to try metaverse technology.

The study aims to identify which of the independent variables most positively affect customer attitudes.

Control variables are included in the study to account for socio-demographic factors (age, gender, education), frequency of luxury purchases, and consumers' knowledge of the metaverse.

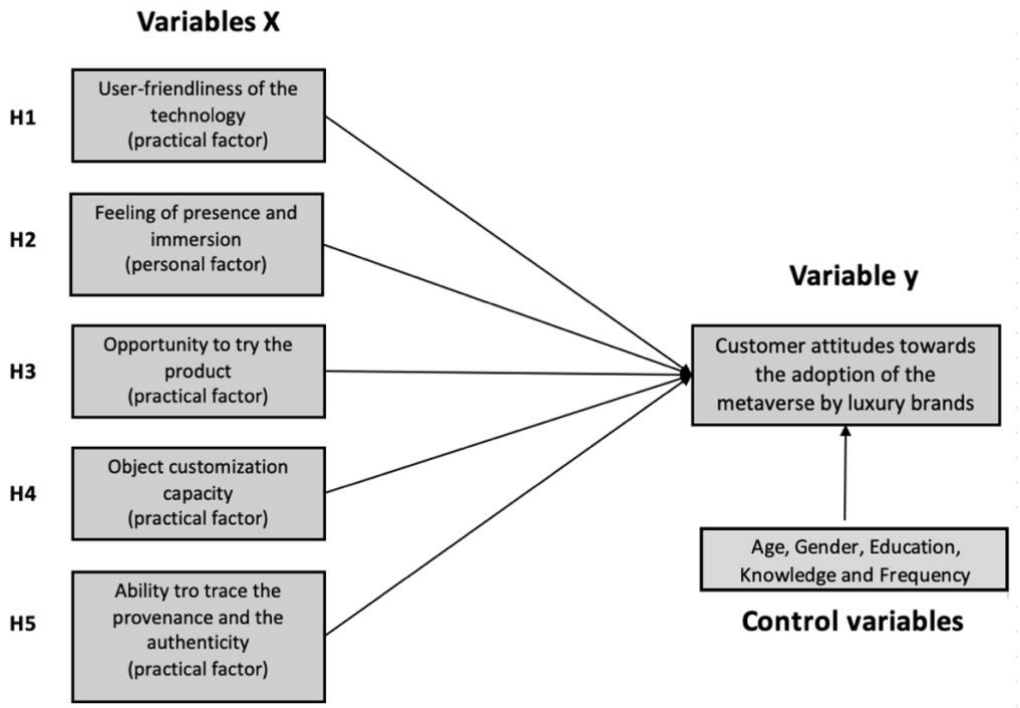

Fig. 1 – Research Framework: personal and practical factors that influence the customer attitudes of luxury goods.

CHAPTER 3 METHODOLOGY, ANALYSIS AMD FINDINGS

The study is focused on the effect of the metaverse on consumers of luxury goods and services using quantitative research methods. The aim is to investigate the impact of independent variables on the dependent variable and determine whether consumer behavior is influenced more by personal factors (H2) or technical/practical factors (H1-H3-H4-H5).

Data collection was done through an online questionnaire created using Qualtrics, and it was distributed via personal messages and Instagram stories. The questionnaire consisted of 12 questions, including demographic information and questions related to the hypotheses being tested. A total of 171 responses were collected during the period of 4 to 15 April 2022, but only 154 have been subsequently used for the analysis, because the other were incomplete.

The data analysis process began with the creation of a database by exporting the collected answers to IBM SPSS software. Descriptive statistics, reliability analysis and factor analysis were performed on the data and then the hypotheses have been tested using ordinal logistic regression.

The study aimed to present the results, discuss theoretical and managerial implications, highlight the study's limitations, and provide directions for further research based on the interpreted data.

In the conducted study, a descriptive analysis was performed to obtain an overview of the study variables. The age distribution of the respondents indicated that around 70% were aged between 18 and 41, with only 30% being over 42. The gender distribution showed a significant difference, with 70.13% of respondents being women and only 29.87% being men. In terms of education, 66.88% of the respondents had a university degree, followed by 30% with a high school diploma, and only a few with a middle school diploma.

Descriptive statistics were provided for the independent variables, which were categorized as technical and personal factors. All five variables were measured using a Likert scale, with values ranging from 1 (strongly disagree) to 7 (strongly agree). The average responses for all variables were close to 5, indicating a tendency towards neutrality and agreement with the hypotheses. For example, a significant percentage of respondents agreed that the opportunity to try products in the metaverse before purchasing would entice them to buy more luxury products.

The analysis also examined the frequency of purchasing luxury goods/services. The data revealed an asymmetric distribution, with a tendency towards "rarely" to "neutral" responses. This could be attributed to the majority of participants being under 25 years old and primarily students, suggesting limited economic availability for purchasing luxury items.

The research also investigates participants' knowledge of the metaverse and their experience with virtual/augmented reality. Over 70% of respondents were aware of the metaverse, while less than 30% had experienced it or virtual/augmented reality.

Moreover, a normality test on the dependent variable found that it was not normally distributed.

Factor analysis was conducted to identify underlying variables or factors that explain the correlations among the observed variables. It was also used to check for collinearity between variables. The correlation matrix showed no values higher than 0.8, indicating no significant multicollinearity.

Moreover, the Kaiser-Meyer-Olkin (KMO) test indicated sampling adequacy for the model constructs. Then, the scree plot and total variance matrix were examined to determine the number of factors to extract: only one factor had an eigenvalue greater than 1, explaining 73% of the total variance.

Thereafter, a reliability analysis was performed to assess the internal consistency of the questionnaire items. Cronbach's Alpha, a measure of internal reliability, was calculated and yielded a value of .906, indicating good internal reliability.

The study then proceeded to test the hypotheses using ordinal logistic regression. The aim was to investigate consumers' willingness to try metaverse's services and products made available by luxury brands.

The regression model included independent variables related to technical and personal factors, as well as control variables such as age, gender, education, frequency of luxury goods/services purchase, and knowledge and experience of the Metaverse.

Results

The results of the ordinal logistic regression analysis are expressed as odds ratios, representing the probability of an event occurring given a specific exposure and have been summarized in Table 1.

Table 1. Hypothesis testing results.

	Hypothesis	**Supported**	**B (Log odd)**	**EXP(B)= Odds ratio**	**p-value**
H1	EofU → W	YES	1,177	3.245	<,001
H2	IMM → W	YES	1,232	3,428	<,001
H3	TbB → W	YES	,557	1,745	,008
H4	CUSTOM→ W	YES	1,121	3,068	<,001
H5	TRACE → W	NO	-,180	0,835	,286

Here are the key observations:

- The results supported the first hypothesis, showing a positive and significant relationship between the perceived ease of use of metaverse technology (EASEofUSE) and customers' willingness to try luxury brand products and services in the metaverse (WILLINGNESStoTRY). This finding aligns with previous research indicating that the ease of use of 3D virtual reality systems positively influences user behavior. Thus, luxury brands should consider the perceived ease of use of metaverse technologies as an important factor in fostering positive acceptance of their offerings on this platform.

- The second hypothesis, which focused on the impact of immersion within the metaverse (IMMERSION), was also supported. The regression results indicated a significant and positive relationship between immersion and customer attitudes towards luxury goods. This confirms that a strong sense of presence and immersion positively influence consumer behavior and perceived value, consistent with the findings of a previous study.

- The third hypothesis, concerning the value of trying products before buying (TRYbeforeBUY), was partially supported. The regression results showed a moderate, yet significant, positive relationship between this factor and customers' willingness to try luxury brand experiences in the metaverse. Although trying out products before purchase positively influenced customer acceptance, it had a lesser impact compared to the factors examined in the previous hypotheses.

- The fourth hypothesis, focusing on customization (CUSTOMIZATION), was supported by the regression results. Customization was found to be a significant positive predictor of customers' willingness to try metaverse experiences offered by luxury brands. The possibility of customizing products entices consumers to explore the virtual world and positively embrace the idea of luxury brands using the metaverse to provide tailored services. The values associated with this hypothesis were similar to those of the first and second hypotheses.

- The fifth and final hypothesis, which examined the impact of traceability (TRACEABILITY), did not receive support from the regression results. The relationship between traceability and customers' willingness to try the metaverse experiences by luxury brands was found to be non-significant. The ability to track the origin and authenticity of products did not influence consumers to explore the metaverse or positively accept its use by luxury brands.

To sum up, the findings suggest that Ease of Use, Immersion, Try before Buy, and Customization are significant positive predictors of Willingness to Try in the metaverse, while Traceability has no significant impact. The control variables showed limited significance, with only gender being a significant predictor.