

Metaverses and E-Commerce: a Systematic Literature Review

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Abstract

The expansion of the digital environment provided by metaverses raised questions about how these spaces shape firms' operations, including e-commerce. Market prospects prompted scholars to investigate how the metaverses could support retailers in pushing their offerings to consumers. Nevertheless, given the absence of a literature review on metaverses as places to conduct online shopping, the findings appear fragmented, making any unified understanding challenging. To fill the gap identified, this paper presents a systematic review of the literature published over the last ten years on the impact of the metaverses on e-commerce. Through a quantitative approach applying the Latent Dirichlet Allocation (LDA) method on 116 articles, 15 themes were identified and grouped into four higher-order themes. The identification of the underlying themes guided the mapping of the knowledge emerging from the most recent studies on meta-commerce and future research avenues, thus contributing to theoretical advances on the topic.

Track: eBusiness and Information Systems Management Track

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1. Introduction

While the first discussions about it in the academic literature started with the rise of virtual worlds such as Second Life during the 2000s, the metaverse has been defined in recent years by Ball (2022) as “*a massively scaled and interoperable network of real-time 3D virtual worlds in which users can experience synchronously and persistently with unlimited numbers of other users, and with continuity of data such as identity, entitlements, objects, communications and payments*”. Even though a single and interoperable metaverse is still unavailable, a network of several “*metaverses*” is being formed due to the evolution of both digital technologies and consumption.

Forecasts indicate a global market value of the metaverses environment of USD 507.8 billion at the end of the current decade (Statista, 2024), with e-commerce activities representing a meaningful share, with a value of USD 210.3 billion (Statista, 2024). As a matter of fact, the metaverses offer an opportunity for the extension of the digital space for e-commerce operations, where retailers and brands can leverage new touchpoints to reach new customers, maintain relationships with existing ones, and provide new online shopping experiences (Eggenschwiler et al., 2024). In this respect, omnichannel strategies are no longer limited to integrating physical and digital dimensions but find new areas of application where “*traditional*” digital platforms can be integrated with new digital and immersive environments (Yoo et al., 2023). As an example, the integration of the online shopping platform Shopify with the Roblox metaverse will allow users to purchase physical products directly during the gaming experience, without leaving the virtual world. The possibility of developing “*twinning*” items can thus strengthen the interconnection between the digital and real worlds. That is, online retailing can move in new directions through an innovative and strategic approach to the firms’ online presence. Accordingly, metaverses appear as spaces that could profoundly transform e-commerce in the near future (Bilquise et al., 2024).

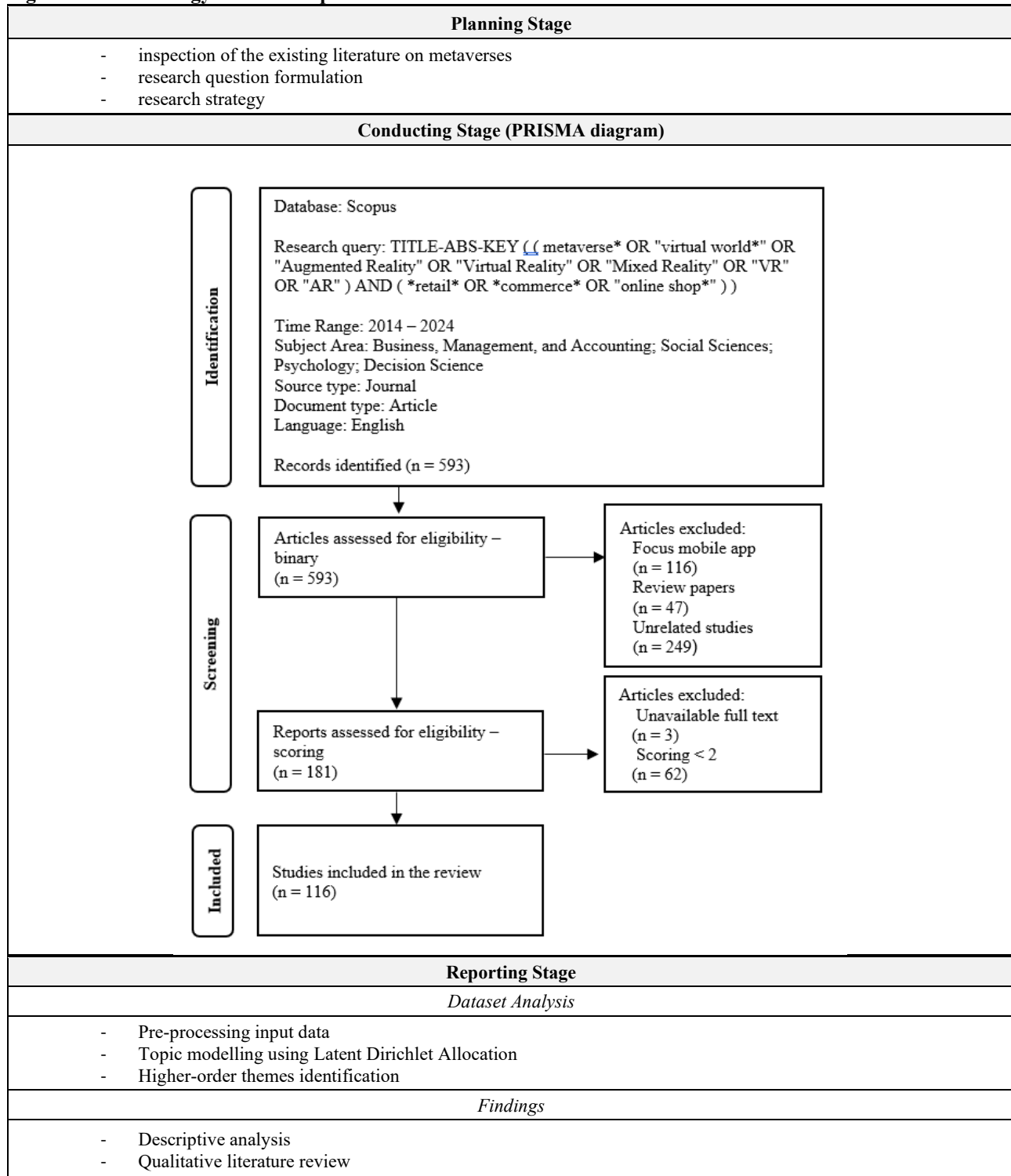
Recognising the potential of the metaverses to impact online retailing activities through new channels, touchpoints, and technologies, scholars have been motivated to gain further knowledge and understanding of how the interaction with products, others, and the self is evolving within virtual contexts (Yoo et al., 2023). However, the literature appears highly fragmented in the results produced, making it difficult to concretely capture how metaverses are impacting e-commerce activities as well as online shopping behaviour. Although domain-specific literature reviews have already been conducted with the aim of identifying the impact and features of the metaverses, to date, none have delineated how these spaces are affecting online shopping. For instance, Wasiq et al. (2024) focused on identifying the immersive environment features that make the metaverses capable of impacting customer engagement. Similarly, the characteristics of the metaverses in relation to the customer experience were analysed, proposing theoretical frameworks useful for understanding the key elements of the “*metaverse experience*” (Mehrotra et al., 2024). Another review summarised empirical evidence that emerged from the studies on the use of immersive technologies during online shopping experiences, proposing a taxonomy of virtual commerce attributes that can influence the engagement of online shoppers (Bilquise et al., 2024). In addition, a review focused on the fashion industry to understand how solutions offered by the metaverses could represent an evolution and an alternative to the traditional ones offered by e-commerce (Molina-Prados et al., 2024). Indeed, the currently available studies have either extensively investigated the topic of metaverses without any distinction between online and offline settings or focused the investigation on specific industries and technologies. Thus, there is a lack of reviews of the literature on metaverses as spaces for enabling online shopping.

To address the above gap, this study conducts a review of the literature published over the last ten years on the impact of the metaverses and their related technologies on e-commerce. The aim is to comprehensively analyse the scientific literature on the topic by identifying its underlying themes and synthesising the knowledge that has emerged from recent studies on meta-commerce. Thus, bridging the aforementioned research gap, the paper contributes to the literature by providing a complete

overview of the existing research and proposing future research perspectives on online commerce within the metaverses.

2. Methodology

Figure 1: Methodology and review process



Following the guidelines for conducting a systematic literature review proposed by Tranfield et al. (2003), the present study is structured into three stages: planning, conducting, and reporting. The use of this framework allows for an effective integration of academic results from different ontological

perspectives (Tranfield et al., 2003). Figure 1 shows and summarises the methodology and review process.

During the planning phase, an in-depth exploration of the metaverse literature was conducted to inform the decision on the research direction and question. This process revealed the lack of a systematic review of the phenomenon's impact on e-commerce. The terms, taxonomies and interpretations that guided the definition of the search strategy, the construction of the query and the entire search protocol were taken into consideration. The Scopus database was chosen as the source, given the availability of access to both high-quality (Bar-Ilan, 2008) and multidisciplinary (Siguenza-Guzman et al., 2015) academic works.

All the necessary steps for constructing the final dataset were implemented during the conducting phase. To capture the characterising elements of e-commerce activities within the metaverse and to ensure that metaverse-related studies were included, the terms identified in the previous planning phase were used in the query, such as “*virtual world*”, “*augmented reality*”, and “*virtual reality*”. Given the growing interest in this research topic in recent years, the inclusion was limited to articles published from 2014 onwards. This choice made it possible to focus exclusively on the most recent developments and to avoid comparisons with outdated results (Büchel and Spinler, 2024; Dwivedi et al., 2022). Furthermore, to ensure multidisciplinary perspectives were included in the review, the search was extended to the Scopus Subject Areas “*Business, Management and Accounting*”, “*Social Sciences*”, “*Psychology*”, and “*Decision Science*”. The results were limited to English-language journal articles. Thus, the initial dataset included 593 papers.

The panel, formed by the research authors, performed a two-step scoring process to assess the relevance and validity of the studies within the dataset (Thomé et al., 2016). To minimise bias and ensure independent scoring, each panel member performed the scoring individually using a copy of the spreadsheet containing the details of each paper. In the first evaluation round, papers were assessed in a binary (yes/no) way. Review papers, papers focused on mobile applications, and papers not directly related to online commerce within metaverses and related technologies were excluded. The remaining papers were scored on a scale from 0 to 3 in the second evaluation round. Papers receiving a score of 2 or higher were included in the final dataset. Three papers were excluded as the publication's full text was unavailable. The process generated a dataset of 116 articles eligible for analysis.

The purpose of the reporting phase was finally to proceed with the analysis, review and presentation of the results. To perform the analysis, the relevant topics were extracted using a three-stage process (Asmussen and Møller, 2019): pre-processing input data, applying text-mining techniques, and performing topic modelling. Data normalisation was ensured during pre-processing through common word filtering using custom and Natural Language Toolkit stopwords, substitutions and lemmatisation. Additionally, web links, parentheses, non-alphabetic characters, numbers, single-character terms, redundant whitespaces and terms with a frequency of less than 10 were removed.

From the analysis of the pre-processed material (128,137 words and 56,716 unique terms), it was possible to obtain an initial overview of the contents through a word frequency analysis limited to the first 200 terms. In order to assess the frequency and distinctiveness of the terms in the corpus, the term frequency-inverse document frequency (TF*IDF) was calculated, resulting in a weighted score when commonly present.

A quantitative approach was adopted for topic modelling by applying the Latent Dirichlet Allocation (LDA) method. LDA is an unsupervised, probabilistic model that makes it possible to extract underlying topic information from large-scale documents using a 3-layer Bayesian probability model (Blei et al., 2003). This method was chosen for its proven applicability and reliable results in prior systematic literature reviews (Asmussen and Møller, 2019). LDA assumes each document is represented as a random mixture of K latent topics, and a distribution over words characterises each topic; it allows inference of article categorisation in a k th topic, with a vector assigning probabilities to each vocabulary term. To ensure an optimal balance between thematic coherence and differentiation according to the final sample obtained, a model with 15 topics was chosen. Afterwards,

the individual topics were labelled and manually grouped into higher-order themes with similar content (Table 1).

Table 1: Topic Modelling

Theme	Label (frequency)	
Retail innovation	digital retail (9)	customer, digital, metaverse, technology, experience, retailer, consumer, shopping, service, brand
	metaverse adoption (5)	metaverse, technology, adoption, marketing, retail, intention, smes, flow, virtual, customer
	metaverse integration (10)	metaverse, virtual, store, experience, digital, retail, application, shopping, criterion, company
	digital fashion (5)	fashion, consumer, digital, information, virtual, interaction, human, maven, technology, world
Shopping experiences	product virtual sampling (7)	metaverse, product, experience, virtual, customer, presence, social, vfr, purchase, intention
	user-avatar commerce (4)	metaverse, virtual, avatar, child, game, weight, social, fit, message, framing
	immersive XR experience (8)	consumer, information, product, virtual, experience, augmentedrealityretailing, technology, commerce, showroom, effect
	mental imagery (3)	product, mental, food, sensory, effect, process, purchase, intention, participant, eating
	virtual merchandising (14)	product, shopping, avatar, store, participant, attention, virtual, consumer, retail, information
Decision-making and behaviour	virtual store environment (12)	shopping, store, consumer, virtual, experience, touch, purchase, environment, product, retail
	shopping value (13)	perceived, shopping, virtual, intention, consumer, information, experience, purchase, technology, trust
	embodied responses (10)	product, virtual, store, consumer, sensory, experience, technology, player, marketing, purchase
	product interaction (4)	product, consumer, shopping, imagery, knowledge, mental, presentation, effect, information, participant
	experience design (5)	metaverse, virtual, store, avatar, layout, product, user, item, shopping, digital
Customer-brand relationship	brand engagement (7)	brand, presence, purchase, virtual, shopper, experience, shopping, intention, platform, consumer

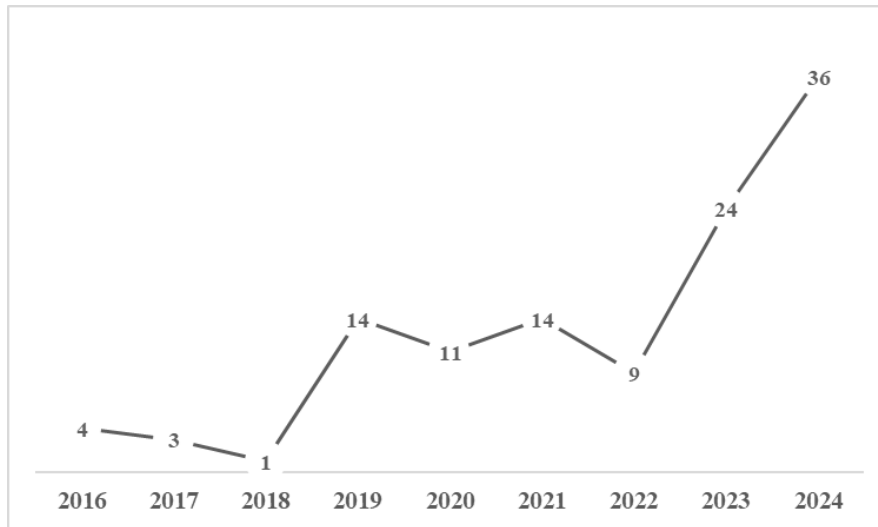
The following paragraphs present the final part of the reporting phase, including the descriptive statistics of the analysed corpus and the qualitative literature review.

3. Descriptive analysis

For the first part of the reporting phase, the Theory-Context-Characteristics-Methodology (TCCM) framework (Paul and Rosado-Serrano, 2019) was used as the basis for conducting the descriptive analyses of the papers.

The first articles in the dataset were published in 2016, confirming the appropriateness of limiting the search to publications from the last 10 years. Following an initial interest in the literature, there was a marked increase after 2022. The “*Journal of Retailing and Consumer Services*” emerged as the journal with the highest number of publications (Table 2). The “*Technology Acceptance Model*” emerged as the theory most frequently used in the studies (Table 3).

Quantitative research methods – surveys and experiments – were the most commonly used, while the interview was the most common qualitative methodology. Fashion and apparel were the first product categories the studies focused on (Table 4). As far as technologies are concerned, virtual reality in immersive environments (i.e., using tools such as head-mounted displays) was the most investigated.

Figure 2: Number of publications per year

Table 2: Number of publications per journal

Name	Frequency
Journal of Retailing and Consumer Services	15
International Journal of Human-Computer Interaction	7
Journal of Business Research	6
International Journal of Retail and Distribution Management	6
Journal of Retailing	5
Computers in Human Behavior	5
Internet Research	4
Journal of Consumer Behaviour	4
International Journal of Information Management	3
Technological Forecasting and Social Change	3
Journal of Services Marketing	3
<i>Journals with 2 publications</i>	24
<i>Journals with 1 publication</i>	31

Table 3: Theories used

Theory	Frequency
Technology Acceptance Model (TAM)	17
Stimulus-Organism-Response (SOR)	14
Flow Theory	10
Media Richness Theory	5
Telepresence Theory	5
Construal Level Theory (CLT)	4
Uses and Gratification Theory (U>)	4
Elaboration Likelihood Model (ELM)	3
Regulatory Focus Theory	3
Social Presence Theory	3
<i>Other theories used twice</i>	30
<i>Other theories used once</i>	70

Table 4: Products

Product categories	Frequency
Fashion and apparel	42
Fast moving goods	17
Home and living	15
Virtual goods	13
Electronics	9

4. Literature review

4.1 Retail innovation

4.1.1 Digital Retail

The evolution of the online space, together with digital technologies, has led to a better understanding of how retailers can create value by enabling interactive and innovative shopping experiences (Singh and Thirumoorthi, 2019; Grewal et al., 2017; Parise et al., 2016). With the advent of metaverses “*extended touchpoints*” emerged, enriching and transforming the online space both in width, making new platforms and virtual worlds available, and in depth, enabling immersive interaction through Extended Reality (XR) technologies.

XR technologies – a term used to group Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR) – were quickly recognised as tools with great potential to support retail activities (Grewal et al., 2017). These include the possibility of exploiting AR systems as tools to support customers' information needs alongside the availability of remote product experts (Parise et al., 2016). More specifically: AR, by overlaying digital elements in physical space, provides an environment-integrated interface for information processing (Romano et al., 2022); VR brings the user to interact with an entirely virtual space (Hollebeek et al., 2020; Xue et al., 2020; Lombart et al., 2019); MR merges virtual and real spaces, providing a seamless experience where it is possible to interact with virtual elements in the physical dimension (Sharma et al., 2023). Through these technologies, consumers can virtually interact with products during online shopping, which can help gather additional sensory information (Cowan et al., 2023) and reduce cognitive dissonance (Pillai et al., 2023). Thus, their implementation can bring online experiences closer to physical ones (Xue et al., 2020).

Metaverses also become spaces that host online communities and promote virtual social consumption (Barnes and Pressey, 2016), where users can engage in social activities through personalised avatars (Pillai et al., 2023). However, it has emerged that retailers have to strategically define their presence in metaverses within the customer journey (Yoo et al., 2023), considering both the depth and breadth of their adoption.

4.1.2 Metaverse Adoption

Retailers' adoption of metaverses depends on internal and external drivers. Internally, compatibility with existing marketing tools is a key enabler (Rehman et al., 2024), while proactive management supports integration within the organisation (Rehman et al., 2024; Serravalle et al., 2021). External drivers promoting adoption include competitive pressure, opportunities for differentiation and alignment with competitor strategies due to the need to maintain competitiveness and partnerships (Rehman et al., 2024). On the other hand, barriers to adoption include the perception of metaverses as particularly complex systems that require cognitive effort and a learning process, hence the perceived need to acquire high investments to acquire technological know-how and infrastructure access (Abumalloh et al., 2024), as well as security protocols and data management (Gupta et al., 2024).

From a consumer perspective, immersive technologies help build product knowledge, assuming the system remains intuitive and requires minimal effort (Al-Adwan et al., 2024; Chakraborty, Polisetty, and Rana, 2024; Lai et al., 2024; Luna-Nevarez and McGovern, 2021). By facilitating processing fluency, these technologies enable consumers to evaluate products more effectively, while complex systems may undermine convenience (Peukert et al., 2019; Singh and Thirumoorthi, 2019). Meanwhile, metaverses' ability to create an interactive and entertaining shopping environment positively influences consumer attitudes and adoption intentions (Luna-Nevarez and McGovern, 2024; Al-Adwan et al., 2024). Integrating playfulness and media-rich experiences facilitates

purchasing and encourages exploration beyond transactions (Chakraborty, Polisetty, and Rana, 2024). Moreover, consumer innovativeness determines the inclination to adopt alternative shopping formats (Jafar et al., 2024; Lai et al., 2024; Romano et al., 2022), while social commerce dynamics within the metaverses can drive adoption through social influences (Al-Adwan et al., 2024). Cybersecurity and data privacy concerns have emerged as significant barriers from the consumer side as well (Abumalloh et al., 2024; Rehman et al., 2024), highlighting the importance of actions in favour of trust and security building (Murugaiah et al., 2023).

4.1.3 Metaverse Integration

Despite metaverses being recognised as a potential paradigm shift in retail dynamics (Alshurideh et al., 2024; Klaus and Manthiou, 2024), it remains unclear how to integrate them across the customer journey and which products are best suited for sale through these channels (Klaus and Manthiou, 2024; Zhang et al., 2023). One potential option includes identifying and dividing the long-term and short-term objectives, thus implementing dual temporal planning (Eggenschwiler et al., 2024).

The initial exploration phases would be finalised to acquire the necessary know-how through a learning-by-doing approach, supported by outsourcing and external collaborations (Eggenschwiler et al., 2024; Mele et al., 2024; Yoo et al., 2023; Zhang et al., 2023). At this stage, the activities to be integrated employing metaverses may concern selling digital products and testing products as informational support during the pre-purchase phase. As such, metaverses can represent a profitable touchpoint, acting as virtual stores for online-only retailers, offering a space that can aim for greater engagement than web-based e-commerce for exploring online catalogues.

Progressively, metaverses can be integrated with an omnichannel approach via a phygital strategy, which combines physical and digital elements (Chakraborty, Jain, and Belk, 2024; Bilquise et al., 2024; Alshurideh et al., 2024; Murugaiah et al., 2023). Thus, they could also facilitate the sale of phygital products, meaning physical items with a digital equivalent, and, as technology progresses, they may enable direct sales of physical goods (Eggenschwiler et al., 2024). Furthermore, advancements in payment systems within metaverses might move away from traditional monetary methods towards alternative value exchanges, like data or virtual assets, or could operate solely on digital currencies and non-cash transactions (Melnychenko, 2021).

4.1.4 Digital Fashion

Thanks to the availability of virtual spaces (where events can be hosted or showrooms created), fashion retailers can leverage new touchpoints and marketing tools to strengthen their online presence and online channel coverage (Silva and Bonetti, 2021; Hajahmadi et al., 2024). In addition, XR technologies have enormous potential in shopping for apparel and wearable goods.

Among the AR-based solutions, Virtual Try-Ons (VTOs) and Virtual Fitting Rooms (VFRs) allow consumers to mimic the in-store experience, visualising and "*wearing*" products virtually (Lavoye et al., 2023; Xue et al., 2024), thanks to the advances in Human-Computer Interaction (HCI) in incorporating speech, touch, and gestures (Silva and Bonetti, 2021). Improving precision in guiding online fit and size decision-making, these technologies have revealed their potential to reduce return rates (Miell et al., 2018; Yang and Xiong, 2019, fostering responsible consumption and pro-environmental corporate communication (Luong et al., 2024; Won et al., 2024).

Metaverses are also becoming places where the virtual fashion market can be stimulated through the sale of digital products (Barnes and Pressey, 2016; Prashar and Prashar, 2024) for the adornment of users' avatars (e.g., skin, clothes, accessories). Indeed, consumers form their virtual identity by personalising their avatars, highlighting how digital fashion impacts their online behaviour and preferences (Peng et al., 2024; Hajahmadi, 2024). However, while there is an openness towards the consumption of virtual goods, there is also hesitation, driven by the resistance to recognising the value of intangible goods and, therefore, the willingness to pay for them (Luong et al., 2024).

4.2 Shopping experiences

4.2.1 Product virtual sampling

The potential for consumers to engage with digital replicas enhances the ability to visualise products before purchase (Yang and Xiong, 2019). In the apparel and fashion industry, two primary types of VFRs have been identified: (1) AR-based systems that overlay virtual elements onto the user's real image and (2) three-dimensional systems that allow customers to try on virtual goods using a customisable avatar, enabling interaction to assess fit and appearance (Moroz, 2019). While this technology improves engagement and shopping satisfaction, its limitations have also been noted. Yang and Xiong (2019) showed how the joint use of VFRs and traditional promotional images can cause self-discrepancy, caused by directly comparing the self-image with those used for marketing communication. Furthermore, using an avatar incapable of representing the user's real characteristics can contribute to a negative perception of VFRs (Moroz, 2019).

VR environments enable two modes of product virtual sampling: pure VR and situational VR (Wang et al., 2019). In the first case, direct interaction with products takes place in a virtual environment; in the second case, products are represented within a specific consumer context. In both cases, they have proved to be more effective than static images in terms of product knowledge (Wang et al., 2019).

Through avatar-based interactions, the metaverses allow the extension of product virtual sampling through active exploration of virtual products (Balakrishnan et al., 2024; Park and Kim, 2024). Virtual experimentation with brands and products can generate a spillover effect, influencing real-world purchasing behaviour across multiple channels (Mansoor et al., 2024). Indeed, correlations have been found between the intention to buy virtual products on platforms like Zepeto and the likelihood of purchasing their physical counterparts (Park and Kim, 2024).

4.2.2 User-Avatar Commerce

Avatars are a fundamental pillar forming the entire metaverse infrastructure (Yoo et al., 2023). These mediums, used for virtual interaction, become an extension of the self within the virtual space for user-consumers, shaping their interaction with the environment and products (Taylor et al., 2024). On the one hand, avatars can represent instruments of self-verification, through which consumers “reproduce” their real-world attitudes and preferences. Still, on the other hand, they can also act as projections of their own ambitions, becoming a motivation for alignment with those behaviours and choices aimed at self-improvement (Park and Kim, 2023; Balakrishnan et al., 2024; Jin, 2024).

Analysing avatar behaviour can also yield insights into the motivations driving choices within the metaverses. Accordingly, Hota and Derbaix (2016) found that young consumers' virtual purchases are driven by gender-specific motivations, with males aiming to improve avatar performance and females prioritising social status enhancement.

Finally, during online clothing shopping, the development of avatars that can faithfully represent users becomes essential for fit visualisation and personalised recommendations (Miell et al., 2018). However, body scanning technologies, which are not yet widespread although they would represent a significant step forward in user-avatar interaction and e-commerce, are becoming necessary for this purpose (Miell et al., 2018).

4.2.3 Immersive XR experience

The lower availability of sensory information that characterises online shopping experiences compared to in-store shopping experiences has led to investigating how XR devices can guide consumers' purchase choices (Xu et al., 2024). The reviewed articles revealed that these technologies

affect consumers differently (Chen, Xi, et al., 2023), while their implementation needs to balance cost-effectiveness, product-specific features, and consumer needs (Zhang et al., 2023; Al-Adwan et al., 2024).

AR enhances self-referencing, allowing users to experiment with a product and imagine its application by supporting rehearsability and somatosensory ownership (Huang, 2019). The real-time sense of ownership control facilitated by AR promotes self-enhancement by providing somatosensory experiences, which empower users to assess purchases independently via interactive try-on systems (Huang et al., 2019). The cognitive processing and emotional involvement resulting from AR shopping experiences make this tool capable of motivating consumers to gather more information about a product (Xu et al., 2024)

In the comparison in VR between low-immersion (desktop-based) and high-immersion (HMDs-based) shelves, it was found that a higher degree of immersion leads to a greater exploration, both in depth and breadth, of product categories, as well as to reduced price sensitivity, although without significant differences in terms of customer satisfaction (Meißner et al., 2020). Additionally, in cases where shopping is task-oriented, the VR experience may make it challenging to manage multiple information sources, making a single-channel rather than an omnichannel approach preferable (Ben Mimoun et al., 2022)

4.2.4 Mental imagery

XR technologies enable the stimulation of mental imagery in different ways: AR is more effective for visualising a specific product, while VR is superior in replicating the context of the product's use (Hilken et al., 2022). Similarly, AR's ability to enable customers to test and visualise products before purchase helps reduce cognitive dissonance in the pre-purchase phase, lowering perceived similarity among choices and mitigating decision-making overload (Barta et al., 2023). When shopping online, consumers exert cognitive effort to imagine how a physical product would look or function, such as how furniture would fit in a room. Visualising a product through AR reduces the cognitive load associated with the imagery process, leaving more availability for increasing mental imagery capacity (Barta et al., 2023).

Mental imagery contributes to generating mental consumption simulation for those product categories whose value is highly dependent on the sensory stimuli it can arouse in consumers, but which are challenging to transfer digitally. For food products, mental simulation helps consumers evaluate items online, with AR proving more effective than VR in stimulating the mental simulation of the eating process and evoking sensory properties. However, VR visualisation may be better suited to promoting packaged food products, mainly when the packaging is transparent (Petit et al., 2022).

4.2.5 Virtual merchandising

Due to different attention dynamics, traditional brick-and-mortar display strategies may prove ineffective in virtual environments (Chen, Xi, et al., 2023). Nevertheless, some studies have treated virtual shopping activities as replications of physical ones (Dehghani et al., 2020; N. Kim and Lee, 2021).

Consistent with other domains, visual attention tends to dominate over other sensory stimuli in VR environments (Kang et al., 2020). However, this dominance may be attributed to the lack of tactile interaction with remote products (Bigne, Simonetti, et al., 2024). Technological constraints limit product diagnosticity, confining VR's function mainly to hedonic browsing experiences (Chen, Ha, and Vu, 2023; Peukert et al., 2019). It is essential to consider how consumers allocate their cognitive resources to achieve effective visual merchandising in immersive settings. For instance, an "*inattention effect*" in VR and AR can divert attention from products to the surrounding space (Chen, Xi, et al., 2023); processing information in VR can be faster due to an increased germane cognitive

load, known as the "*acceleration effect*" (Chen, Xi, et al., 2023), while in AR an "*imbalance effect*" can lead to disproportionate focus on specific areas (Chen, Xi, et al., 2023).

Studies on visual resolution in virtual settings have found no significant impact on task performance during shopping (Frank, Peschel, et al., 2024; Kang et al., 2020). However, female participants preferred high-quality visuals, while male participants favoured lower-quality ones (Frank et al., 2024). Additionally, design features like cool lighting paired with greenery drive arousal and the perceived quality of merchandising compared to warm lighting without greenery (Sina and Wu 2023).

No difference was found when comparing navigation in virtual stores for teleportation versus motion-tracked walking, which simulates physical browsing but necessitates more space (Schnack, Wright, and Holdershaw, 2021). Visual attention in virtual environments can also be affected by the presence of avatars, similar to how employees affect attention in traditional retail (Frank, Peschel, et al., 2024). For instance, avatars acting as voice assistants in VR have been found to enhance arousal and visual attention (Bigne, Ruiz, and Curras-Perez, 2024). Nonetheless, for products that may induce embarrassment, even the digital presence of avatars can detrimentally affect customer experiences (Frank, Dipalma, et al., 2024).

4.3 Decision-making and behaviour

4.3.1 Virtual store environment

Consumer immersion is strongly connected to telepresence, which reflects how much a user feels "*present*" in a virtual environment. When related to a digital store, this feeling of being "*teleported*" significantly influences purchase intentions (Hsiao et al., 2023; Papagiannidis et al., 2017). Telepresence fosters a state of flow (Hsiao et al., 2020), supplying a deep sense of engagement with shopping. Inducing flow is significant for retailers, as it can increase shopping time, basket sizes, impulsive buying, and stronger purchase intentions (Hsiao et al., 2023; Jang and Kim, 2024; B. Jin et al., 2021).

When comparing web-based e-commerce to virtual stores, it emerges that the latter provide a more engaging and entertaining experience (Alzayat and Lee, 2021; Hsu et al., 2020), enhancing arousal and pleasure (Jin et al., 2021). Consumer immersion further improves online shopping's hedonic dimension (Papagiannidis et al., 2017), and it is supported by devices that create a more immersive experience. Unlike conventional e-commerce, virtual stores can move beyond the visual dimension delivering multisensory interactions, such as auditory cues, vicarious touch, touch control, and voice commands (Heller et al., 2019; Luangrath et al., 2022; Pizzi et al., 2019). Consequently, by reducing the perceived intangibility of online shopping and increasing decision comfort and informativeness, virtual stores can highlight their practical advantages and positively impact consumer satisfaction (Pizzi et al., 2019; Hsu et al., 2020). Notably, Alzayat and Lee (2021) argue that shoppers value immersive experiences more when buying items viewed as extensions of their body (e.g., tools) instead of those seen as representations of their body (e.g., clothing).

4.3.2 Shopping value

The entertaining shopping experience that metaverses offer reflects their hedonic value, counterbalanced by their ability to deliver utilitarian benefits through advanced features and technologies. While discussions on XR service design highlight the need to balance hedonic and utilitarian aspects (Vaidyanathan and Henningsson, 2023; Xi et al., 2024), findings in the literature vary depending on the specific settings/technologies investigated.

The richness of information within metaverses enhances user engagement and trust, shaping perceived usefulness and enjoyment (Chesney et al., 2017; Baker et al., 2019). However, Fici et al. (2024) suggest that metaverses do not necessarily offer more value than traditional e-commerce.

While increased cognitive demand in these environments may enhance retention and memorisation, it can also negatively impact emotional states (Fici et al., 2024).

Metaverses' ability to replicate brick-and-mortar store interactions remotely makes them a promising tool for delivering hedonic and utilitarian benefits (Luna-Nevarez and McGovern, 2021). The findings from Xi et al. (2024) indicate that while VR improves enjoyment, it does not significantly affect utilitarian value. Nonetheless, compared to traditional e-commerce, VR provides a more realistic product representation in a naturalistic environment, where vividness positively influences usefulness and enjoyment (Kim et al., 2021). However, the latter tends to have a stronger influence, reinforcing metaverses' underlying hedonic nature (Hsiao et al., 2023; Kim et al., 2021). Notably, case studies by Hajahmadi et al. (2024) indicate that VR fashion showrooms replicate real-world interactions, integrating purchasing platforms that allow seamless transitions from exploration to purchasing.

Shopping through AR enables more detailed product evaluation due to increased perceived proximity, measurement feedback, and immersion (Erdmann et al., 2023; Poushneh, 2021). Accordingly, De Amorim et al. (2022) emphasise media richness in AR systems in fostering purchase intentions. The utilitarian benefits of AR shopping contribute to a positive evaluation, mainly when personalisation features are activated (Lai et al., 2024). This is relevant for younger generations, who are more inclined to recognise AR's value in online shopping (Erdmann et al., 2021). Interestingly, Erdmann et al. (2021) highlight the point that AR's technological complexity can be perceived as innovative, enhancing its value. However, this complexity can also diminish consumers' perceived economic benefits (Erdmann et al., 2021). Conversely, Xi et al. (2024) found that AR negatively affects perceived ease of use and does not significantly impact perceived enjoyment or usefulness.

4.3.3 Embodied responses

Compared to traditional e-commerce, multisensory interfaces elicit stronger emotional arousal (Mishra et al., 2021), shaping consumption attitudes through the emotional intelligence generated by empathy toward a stimulus (Laukkanen et al., 2022). Integrating multimodal and multisensory stimuli makes metaverses a modular environment designed to enhance personalisation in shopping experiences (Wu et al., 2021, 2022). Sensory richness impacts the creation of vivid memories, which leaves a lasting impression of product attributes in consumers' minds and influences their purchasing decisions (Huang et al., 2023). When immersive shopping relies on single sensory feedback, it may not deliver effective results (Huang et al., 2023). Combining kinesthetic, haptic, and visual stimuli reduces product uncertainty and cognitive overload, encouraging purchase intent (Chen et al., 2024). This effect may be attributed to a cognitive phenomenon known as self-imagery, which creates a sense of presence, enabling consumers to envision themselves in the consumption experience, thus promoting shopping enjoyment and impulsive buying behaviours (Chen, Ha, and Vu, 2023; Jang and Kim, 2024).

Additionally, consumers' connection with avatars shapes shopping behaviour through the Proteus effect – a phenomenon explaining how the embodiment of a user in a digital persona influences actions – amplifying avatar identification, fostering greater personalisation, and increasing the desire to purchase virtual items (Yildiz et al., 2024).

Moreover, evidence from Rauschnabel (2021) reveals that when virtual products are overlaid on the physical world (e.g., AR-generated holograms), consumers may consider them as a new, distinct product category whose acceptance is influenced by their specific features.

4.3.4 Product interaction

Immersive technologies provide consumers with an engaging and immediate way to access information, particularly in scenarios of choice overload (Márquez and Ziegler, 2024). They stimulate

perceptual curiosity, encouraging consumers to generate innovative ideas regarding product use and consumption, thus enhancing creativity and positive shopping outcomes (Kim and Choo, 2023).

However, the level of involvement with the product is relevant in defining how consumers would interact with it. In high-involvement situations, immersive technologies deliver sensory cues that generate mental imagery and enhance product knowledge, effectively managing stimulation to avoid under- and over-exposure (Cowan and Ketron, 2019). Even task-oriented and well-informed consumers, who may initially view VR as less effective compared to traditional 2D formats, can still gain advantages in shopping decisions in VR thanks to the stimulation of cognitive processing (Zhang et al., 2024). Conversely, metaverses should prioritise interactivity over the abundance of sensory inputs in low-involvement scenarios. Here, consumers typically avoid deep dives into complex product information, opting for entertaining experiences where the goal may not necessarily be a purchase (Cowan and Ketron, 2019).

4.3.5 Experience design

Defining the shopping experience in metaverses concerning content, design, and navigation positively impacts affective trust and related shopping outcomes such as impulse purchases (Quan et al., 2024). As shown in the study by Ijaz et al. (2016), combining layouts that favour navigation and usability with solutions that favour entertainment and prolonged engagement becomes necessary to generate positive consumer responses. Similarly, Zhong and Hamouda (2024) stress the importance of designing platforms that promote seamless navigation, user-friendly interfaces, and interoperability with other systems. Guaranteeing smooth interaction while shopping in the metaverses is fundamental to inducing a flow state in the consumer experience (Zhong and Hamouda, 2024).

An optimal design configuration requires understanding emerging shopping behaviours in virtual retail environments. Pfeiffer et al. (2020) propose an eye-tracking-based classification system distinguishing between two fundamental search motives: goal-directed and exploratory search. This provides insights into how users navigate and interact within immersive shopping settings. Furthermore, the design of the virtual shopping experience has to consider the psychological relationship between users and avatars, given its active valence in inducing positive shopping outcomes (Oh et al., 2024).

4.4 Customer-Brand Relationship

4.4.1 Brand Engagement

Including metaverses within shopping experiences creates new dynamics within customer-brand relationships (Cowan and Ketron, 2019). When brands aim to offer exclusive and enjoyable experiences, it becomes more likely that consumers will attribute innovative attributes to them that strengthen customer-based brand equity (Zhu and Chao, 2023). Immersive experiences, by allowing consumers greater engagement and interactivity with products, can positively impact customer satisfaction and conversion rates (Hilken et al., 2022; Lavoye et al., 2023; Park and Lee, 2024; Zhu and Chao, 2023). Again, metaverses enable the implementation of innovative storytelling that can generate a competitive advantage by exploiting brand heritage and emotional connection with consumers (Hajahmadi et al., 2024; Lavoye et al., 2023).

Evolving consumer behaviour patterns in metaverses are reshaping customer-brand dynamics compared to traditional shopping. Accordingly, private label customers – who typically have lower basket values, prioritise efficiency, and derive less enjoyment from shopping – do not show the same real-world responses in metaverses (Schnack, Wright, and Elms, 2021).

Additionally, the relationship between users and avatars introduces a new dimension of brand interaction, extending brand value beyond the virtual environment. Customisable avatars offer

opportunities for self-exploration, identity expression, and community engagement, with branded virtual items as tools to strengthen emotional connections (Lavoye et al., 2023; Prashar and Prashar, 2024).

5. Discussion and further research avenues

The four macro dimensions identified, grouping the underlying themes from the literature, guided the drafting of the discussion, following the online customer journey within its three phases – pre-purchase, purchase, and post-purchase. It emerged that the metaverses, together with immersive technologies, can provide enrichment options for the entire online shopping experience and, therefore, the results helped to define their impact differently depending on the specific phase considered. Thus, implementing innovations in online retailing activities through the metaverses leads to new shopping experiences, from which new consumer behaviours and decision-making patterns emerge, leading to new considerations on how to implement the relationship between brands and consumers in these digital spaces.

5.1 Pre-purchase phase

During the pre-purchase phase, the metaverses can serve as tools supporting the learning process and first contact with products. To this end, consumers need to be able to switch between platforms while exploring products and searching for information, maintaining a seamless experience. Therefore, choosing a proprietary platform or a metaverse-as-a-service one has to be weighed, considering the know-how available and the possibility of guaranteeing functional integration with other online channels. Indeed, the meta-experiences are not necessarily intended for user conversion, but rather to drive both online and offline customer journey funnels. For high-involvement products, the perspective to bring online product exploration closer to physical ones through immersive technologies and sensory feedback tools is being nurtured, as long as adequate levels of device usability are maintained. In contrast, low-involvement products may benefit from new frontiers for awareness building.

Consequently, new theoretical advances could be directed towards identifying the metaverses that can facilitate product interaction. More investigations are needed to define the capacity of XR technologies—especially those less investigated, such as MR—to support products' learning process, mental imagery, and flow state generation, also through the integration of AI and more sensory stimuli. Finally it is important to understand which choices, designs, and communications strategies can drive trust-building activities towards metaverses to support their adoption.

5.2 Purchase phase

In the purchasing phase, consumers' shopping value can become informative in defining the experience in the metaverses. While a higher degree of virtuality may exalt the experiential dimension, a lower degree would be preferable for utilitarian shopping, thus preferring technological solutions such as AR and MR. When present, a further element of influence is dictated by the interaction between user and avatar, declined in three forms: as an extension of the self, derived from the interaction with an interlocutor, and due to the presence of other subjects. The spaces where the interaction takes place may be emulations, if not digital twins, of physical stores, which, however, do not always reflect the effects observable in the physical world, since they depend on features such as navigation method, visual quality and the presence of sensory feedback. Again, any solution has to ensure that an adequate level of user-friendliness is maintained in order to maintain the simplicity and convenience of online shopping.

Future research possibilities include the identification of trade marketing strategies that brands and retailers could implement to drive conversions in metaverses. In addition, there is a lack of

understanding of which products are best suited to being sold through metaverses and which, more specifically, can benefit from a “*phygital*” version, also focusing on strategies that can increase the perceived value of virtual counterparts. For a better understanding of the most suitable environments to stimulate purchase, the investigation of the metaverses’ merchandising and environment design strategies could be extended, delineating which ones can be effectively drawn from brick-and-mortar solutions, as well as which ones are more in line with consumer shopping values. In addition, the investigation could further identify which combinations of sensory feedback and XR technologies are most likely to stimulate purchase intent. Lastly, investigating the impact of metaverses on customer-based brand equity can help with understanding the different relational dynamics between consumer and brand that may occur in these environments during shopping.

5.3 Post-purchase phase

The social dimension that can characterise a metaverse has highlighted how these spaces can become relevant reference points for community building and, thus, for the post-purchase phase. Similar to the dynamics already present in social media, as well as considering the possible role of the metaverses as their future iteration and evolution, new interaction models can contribute to the generation of new types of data. That is, it would be possible to gain additional insights into consumers, especially concerning their online purchasing behaviour. The use of avatars to interact with communities within the metaverse also offers new insights regarding brand-customer relationship development, due to the personalisation possibilities provided by virtual product offerings. On the other hand, XR technologies open new scenarios for extending after-sales services into a more immersive and interactive dimension, where high-involvement products can benefit more from the need to feed their service component.

Compared to the other phases, the post-purchase phase has received fewer contributions and, hence, needs more investigation in the future to better define the effects and possibilities resulting from the use of the metaverses. Firstly, there is a lack of evidence on which XR technology is best suited to offer customer assistance and how and which types of consumer data from the metaverses could be effectively integrated with traditional digital data. Deepening and clarifying what dynamics underlie the relationship between consumers and their avatars could also help understand their relationship with digital products, in order to clarify how these products can be linked with physical and phygital ones. Finally, the metaverses can stimulate the dialogue on their functionality in developing and integrating loyalty programmes, thus on their role in contributing to customer retention.

6. Conclusion

The expansion of everyday activities online has highlighted the extent to which the consumer shopping journey can be further integrated into the digital space. The rise of metaverses, enabled by technological advancements and digital platforms, has introduced new opportunities for innovative e-commerce solutions, reshaping consumer shopping experiences and competitive dynamics. Accordingly, academic interest has led to a growing body of literature in recent years. Nonetheless, existing knowledge appears to be fragmented due to the variety of technologies, digital retail solutions, and decision-making processes involved. This systematic literature review has helped synthesise and unify this fragmented body of research by identifying the underlying themes emerging from the literature. In doing so, it provides a clearer and more cohesive understanding of how metaverses and immersive shopping experiences affect online consumer decision-making, firms' activities, and the overall customer journey.

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