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# **Integrating AI and Metaverse in Value Creation of Customer Experience: A Systematic Review and Future Research Agenda**

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## **Abstract**

**Purpose-** The study aims to contribute to the body of knowledge by characterising the integration of AI and the metaverse from the perspective of the TCCM and ESG frameworks, focusing on their role in value creation for customer experience.

**Design/methodology/approach-** This study employed a systematic literature review method based on the PRISMA 2020 protocol, and 42 articles were selected as the final sample size related to the AI and metaverse literature. Further, the TCCM and ESG frameworks were used to present the theoretical perspectives.

**Findings-** This study found that little investigation has been performed in the context of how AI and the metaverse contribute to the value creation of customer experience. The environmental, social, and governance perspectives have been discovered, which further confirms the need for employing innovative immersive technology for social and environmental sustainability. Prior studies were centred on either AI or the metaverse and were primarily related to general themes rather than E-Commerce Customer Experience.

China (eight studies) was the leading country that performed research related to this domain, followed by other countries such as Singapore (four studies), India (three studies), South Korea (three studies), and the United Kingdom (three studies), etc.

**Originality/value**– The present study contributes to the existing body of knowledge by shedding light on integrating AI and the metaverse, considering the perspectives of the TCCM and ESG frameworks to investigate the value creation of customer experience by enriching the knowledge economy.

**Research limitations/implications**– The present study extends theoretical knowledge in the extant literature on AI and the metaverse. This can further support scholars and researchers in their academic and research initiatives in the context of their respective studies. This study is based on a systematic literature review approach and employed solely the Web of Science electronic database. Future research must study and design concepts considering scenarios of what would happen if AI and the metaverse were implemented in diverse industries and contextual settings.

**Keywords**- Artificial Intelligence, Customer Experience, ESG framework, Knowledge economy, Metaverse, Systematic Literature Review, TCCM framework.

**Paper type**- Literature review

## **1. Introduction**

In the early 1960s, the term "Knowledge economy" was conceptualised (Godin, 2006). Knowledge economy, as a term, has been defined by the United Kingdom's Economic and Social Research Council (ESRC) as the evolving economic structure in the global information society by deploying intangible assets like knowledge, pioneering potential, resources, and skills (Roberts, 2009). Furthermore, the resurgence and development of the so-called "Knowledge economy" have indicated the way knowledge has been replicated as a vibrant production element to accomplish a prominent value-addition level for organisations and countries (Sukharev, 2021; Choong and Leung, 2022). Remarkably, even though information and communication technology (ICT) has always been reflected as an architect for the knowledge generation process, particularly, an innovative research instinct of studies has evolved (De Bem Machado et al., 2022). For instance, Artificial Intelligence (AI) has arisen as a transformative force in redesigning exactly how

knowledge is curated, administered, and employed within traditional management processes and strategies over the past years (Liebowitz, 2001).

Metaverse as an immersive technology supports users to create vast amounts of digital content exclusively or with AI support, leading to knowledge generation (Calandra et al., 2023a; Huawei et al., 2023). Concurrently, the metaverse can be employed to teach users, customers, and professionals through knowledge sharing as it facilitates exchanges of diverse experiences and novel knowledge among users (Papagiannidis and Bourlakis, 2010; Dwivedi et al., 2022; Papamichael et al., 2023). Metaverse and Artificial Intelligence (AI) are two fast-developing technologies that are expected to revolutionise the way people live, function, and interact with each other (Calandra et al., 2023a; Herath et al., 2024; Soliman et al., 2024; Wang et al., 2024). The term "Metaverse" is a fusion of "meta," which signifies beyond, and "verse," which is a compact rendition of the universe that Neil Stephenson first presented in his science fiction novel *Snow Crash*, published in 1992 (Hackl, 2021; Mourtzis et al., 2022; Huynh-The et al., 2023; Maden and Yücenur, 2024). The metaverse has witnessed the lookout of some of the world's largest technology giants, such as Microsoft and Facebook, which are funding billions of dollars in the metaverse ecosystem (Hennig-Thurau et al., 2023; Soliman et al., 2024). Since Facebook rebranded itself as "Meta," as declared by Mark Zuckerberg in October 2021, the magnificent idea of the new term has evolved into a sizzling craze on social media and has obtained tremendous attention.

Metaverse has been described as a shared digital three-dimensional (3D) or multi-verse (multi-universe) world that can equip people with a thoroughly immersive digital experience. This incorporates interactive engagement and harmonious actions between companies and customers (Park and Kim, 2022). However, this term has not been a reinvigorated idea for decades because it has been disseminated along with the evolution of emerging technologies and the Internet (Barrera and Shah, 2023). In contemporary years, advancements in emerging technologies such as Augmented Reality (AR), Extended Reality (XR), and blockchain, etc., have driven the metaverse from reel to reality (Wang, 2021; Maden and Yücenur, 2024; Otoum et al., 2024; Singh, 2024). Furthermore, due to instantaneous disruptive technological transformations, the metaverse and AI have quickly garnered awareness from all forms of retailing. Even though prior studies have investigated

the intricate substances of the metaverse and AI, extant literature appears to have presented an implications-based outlook on considerable characteristics (Wang, 2021; Yoo, K. et al., 2023; Maden and Yücenur, 2024; Otoum et al., 2024).

Moreover, AI's integration offers unprecedented opportunities to enhance decision-making (Oppioli et al., 2023), boost service delivery, innovate in product development, and change supply chain practices (Min, 2009), all while aligning with the Environmental, Social, and Governance (ESG) framework. However, the ESG framework's vital role in regulating economic sustainability was explored within distinct regulatory environments, inspiring businesses to implement responsible business practices eventually (Lanzalonga et al., 2024). By leveraging AI, businesses can transform their knowledge repositories into dynamic assets, improving their business models (Bagnoli et al., 2019) and innovative problem-solving (Joksimovic et al., 2023). Likewise, the deployment of knowledge resources results in originating value creation, assessment of business risk, and assisting business strategic planning. Conversely, incorporating AI into business strategic planning and knowledge approaches withdraws substantial business-related concerns, such as addressing the balance between technology and human insight (Yousuf Al-Aama, 2014; Jarrahi, 2018), ensuring the ethical use of data (Munoko, 2020), and understanding the implications of AI on organisational knowledge and culture (Loureiro et al., 2021). AI's impact on knowledge management extends to employee skills development, as businesses must navigate the balance between the possible substitution or complementarity of human work with AI, necessitating a focus on strategic re-skilling and knowledge sharing (Secinaro et al., 2023). Hence, considering key concerns concentrating on AI, it becomes vital to shed light on the way AI can augment ESG practices of businesses administering the knowledge economy.

This requires a multidisciplinary approach considering technological capabilities, strategic alignment, ethical frameworks, and the global impact of AI-driven strategies on knowledge creation and dissemination (Gabriel, 2020). On the other hand, after introducing metaverse technology, a triple bottom-line analysis was conducted by evaluating the economic, environmental, and social impact of the metaverse, which provided a general framework for future research and practitioners in evaluating the adoption of the metaverse by highlighting the emerging trade-offs (De Giovanni, 2023). Furthermore, the contemporary

developments in metaverse-based immersive technologies empower organizations to employ and communicate their environmental, social, and governance practices via digital platforms. Moreover, the metaverse can be used for ESG teaching systems to help stimulate students' curiosity in learning by shaping their overall experiences (Weng et al., 2023).

This study acknowledges this research gap and endeavours to fill it by framing these three stated research questions:

- RQ1: What are the key themes, context, characteristics, and methodologies investigated in the metaverse and artificial intelligence literature?
- RQ2: In what way does the integration of AI and the metaverse augment the value creation of customer experiences in the E-Commerce industry?
- RQ3: How does studying the integration of AI and the metaverse in augmenting the value creation of customer experiences, through the perspectives of ESG and TCCM frameworks, contribute to the body of knowledge?

Furthermore, a systematic literature review has been performed to address these stated RQs for augmenting academic and business communities' theoretical and practical insights. The study attempts to contribute to the existing literature by advancing the theoretical insights using the perspectives of the TCCM and ESG frameworks to depict value creation in customer experiences in the digital worlds of AI and the metaverse.

The study's layout follows: The article is structured into eight sections. Section 1 presents an overview of this study and its aim and flow under the introduction. Section 2 discusses the literature review and theoretical grounding. Section 3 explains the methodology used for the study. Section 4 discusses results and discussions. Section 5 states the proposed conceptual framework and its qualitative assessment using the ESG framework. Section 6 offers the future research agenda. Section 7 proposes the implications, limitations, and future research directions. The closing section summarises critical reflections of the study, followed by references and an appendix table.

## **2. Literature Review and Theoretical Grounding**

The metaverse is a digital world that integrates the physical and digital worlds and is anticipated to deliver immersive experiences and a unique digital platform for digital dialogues between companies and customers (Davis et al., 2009; Bojic, 2022; Hennig-Thurau et al., 2023; Huynh-The et al., 2023). Despite substantial talk about the metaverse term, retailers remain unclear about their next move, whether and how they should embody this idea into their existing business, and the E Commerce industry is no exception to this disruption and dilemma (Eggenschwiler et al., 2024). Consequently, there is a necessity for a more profound study to augment the awareness of the metaverse concept to further support businesses in long-term planning and the vigorous transformation of business models in closely interconnected industries (Büchel and Spinler, 2024).

On the other hand, Artificial Intelligence (AI) is related to the proficiency of devices to execute assignments that typically demand human expertise, such as idea screening, sapient discourse, and navigating decisions (Wang, 2021; Maden and Yücenur, 2024; Otoum et al., 2024). However, many more AI-related dialogues exist between myriad communities, including academia and industry, discussing its application in practice (Huynh-The et al., 2023). Moreover, AI can be used to plan inclusive digital interfaces that will navigate the customer's digital journeys conveniently. Hence, AI can assist in making the metaverse an easy-to-use digital platform and user-friendly digital ecosystem for the E-Commerce industry to augment the overall customer experiences (Huynh-The et al., 2023; Qayyum et al., 2023; Soliman et al., 2024).

## **2.1 Integrating AI and Metaverse in Value Creation of Customer Experience**

Metaverse and AI may augment customer experience and provide businesses with a competitive advantage in the dynamic marketplace (Huynh-The et al., 2023; Ning et al., 2023). Regardless, consumer behaviours are fundamentally transforming and increasingly gravitating toward digital consumption in the digital world. Digital avatars are another pathway to use AI to connect with the metaverse (Shah and Murthi, 2021). The metaverse is an emerging technology that is expected to bring users unprecedented service experiences, as it is supported by the latest computing and communication technologies (Davis et al., 2009; Bojic, 2022). Through consumer-ready mind-control systems, brain-

computer interfaces will enable the ultimate immersive experience between reality and the metaverse (Singh, 2024). It is worth noting, however, that the growth in the number of metaverse users places a heavy burden on network resources, especially for metaverse services that are based on graphical extended reality and require the rendering of a multitude of virtual objects (Davis et al., 2009; Bojic, 2022). Using metaverse technology, marketers can reach consumers in a whole new way, providing them with experiences that transcend physical boundaries and engage them in novel ways (Singh, 2024). For example, customers could virtually try on clothes or drive cars before deciding to buy them.

Furthermore, AI is a powerful tool to address many challenging issues associated with ultra-reliable and low-latency communications in future wireless networks, allowing users to enjoy high-quality integrated services in the metaverse with guarantees of high throughput and low latency (Bojic, 2022; Ning et al., 2023; Singh, 2024). Metaverse and AI have the potential to create new prospects and drive the transformation of the E-Commerce industry in the coming decades, which may lead to more augmented customer experiences in this metaverse-based commerce backed by AI (Al Khaldy et al., 2023). Despite noteworthy progress in previous years, more research is required in the context of the metaverse and AI to support the academic and business communities and develop innovative theories to enrich theoretical understanding of how the metaverse and Artificial Intelligence help augment E-Commerce customer experience (Bojic, 2022; Ning et al., 2023; Singh, 2024).

## **2.2 Real-world Scenarios of Metaverse and Artificial Intelligence Applications**

A limited study was conducted investigating the way the metaverse and AI supplement customer experiences in the E-commerce industry (Dwivedi et al., 2022; Shin, 2022; Hennig-Thurau et al., 2023; Xi et al., 2023; Maden and Yücenur, 2024; Otoum et al., 2024). It was also evident that the metaverse has the potential to transform the E-commerce industry. AI can support the metaverse in living up to its commitments by devising true-to-life digital avatars, materializing new digital products and services, and facilitating remote work and digital collaboration. Businesses should view the metaverse as a platform

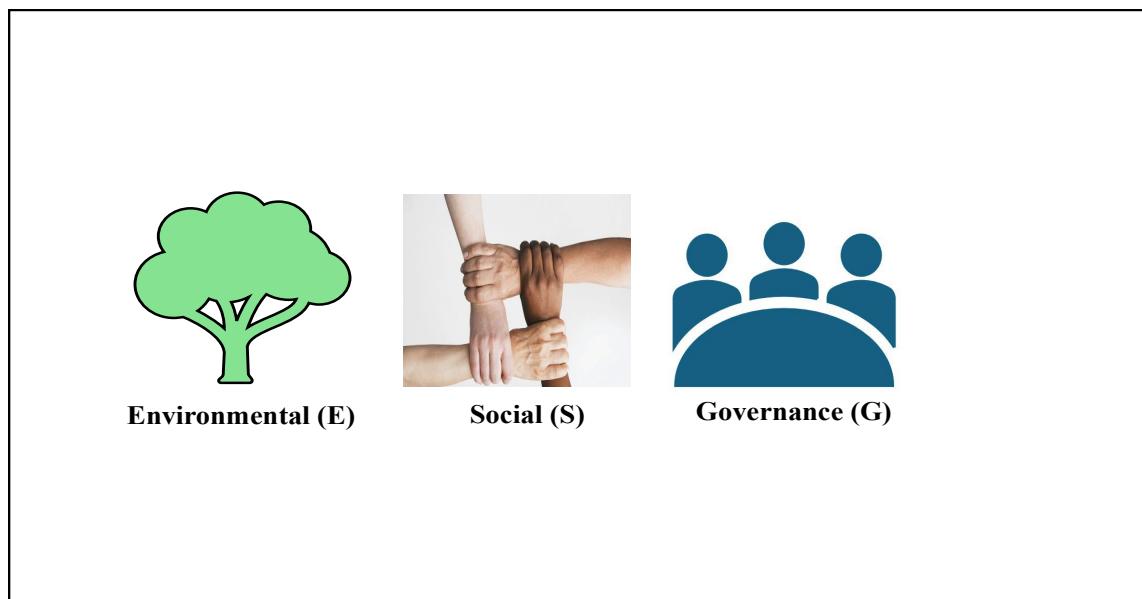
for innovation and creativity and harness the strength of AI to devise unique digital products and services.

Consumer behaviours have shifted enormously, with a growing inclination toward digital consumption across different platforms, and this trend streamlines the digital customer experience in the context of the metaverse and AI applications in practice (Paul et al., 2024). Furthermore, the acceptance, adoption, and significance of the metaverse and AI in the E-commerce industry may differ across diverse continents due to disparities in socio-cultural, technological, and economic contexts. Therefore, research based on geographical context is vital to gain more nuanced insights into the influence of these immersive technologies on the E-commerce industry and customer engagement (Huynh-The et al., 2023; Qayyum et al., 2023; Singh, 2024; Soliman et al., 2024).

### **2.3 Theoretical Grounding using Environmental, Social, and Governance (ESG) Framework**

The environmental, social, and governance (ESG) framework is progressively becoming a key indicator in the decision-making process and overall performance assessment of businesses, ensuring sustainable development. Subsequently, it emerged as a subtle matter, attracting the attention of most people and could not be overlooked (Khamisu et al., 2024; Yu et al., 2024). In 2004, the United Nations published a book titled *"Who Cares Wins,"* in which the term ESG was first mentioned. Figure 1 depicts the ESG framework.

Figure 1: Theoretical grounding using the ESG framework.



**Source:** *Developed by authors*

In the ESG framework, the environmental perspective focuses on a business's environmental influence and recommends improving business performance by employing environmentally friendly practices (Brooks and Oikonomou, 2018). The social perspective in the ESG framework indicates that businesses must consider the impact of their operations on employees, society, and the community, and take social responsibility for maintaining engagement and social welfare (Lee et al., 2016). Moreover, the governance perspective in the ESG framework relates to the suitable enactment of organizational strategies and ethical matters in their vital governance arrangements (Khan, 2022). This study applies the ESG framework to exhibit the environmental, social, and governance perspectives in the context of integrating AI and the metaverse in the value creation of customer experience.

### **3. Methodology Used**

#### **3.1. Research Approach Selection and Justification**

To resolve framed problems and research gaps, scholars and researchers are endowed with a number of approaches to conduct research, such as systematic literature reviews (SLR) (Tranfield et al., 2003). With available procedures, such as meta-analyses (Liberati et al., 2009; Davis et al., 2014) and the SLR approach (Snyder, 2019; Tranfield et al., 2003), scholars and researchers are capable of discovering gaps within prior literature (Baumeister and Leary, 1997), highlighting areas of subsequent inquiry, and thus contributing to expanding academic understanding within various areas. Conducting the PRISMA 2020 protocol assisted in confirming the openness and precision of the provided reviews. This further rendered the SLR method suitable for attaining the aims of this research work (Liberati et al., 2009; Rehman et al., 2020; Tsiotsou and Boukis, 2022). From existing reviews of literature, research methodologies approach the theoretical understanding of various subjects (Tranfield et al., 2003). By reviewing a limited number of papers on digital entrepreneurship and digital innovation within the context of enhancing E-commerce customer experiences (Cubric, 2020; Williams et al., 2021; Paul et al., 2023), this work contributes to the expanded understanding of scholars and business communities through an integration of the SLR approach and the PRISMA 2020 protocol.

### **3.2. Electronic Database Selection and Justification**

Scholars and researchers can choose suitable articles from well-known electronic databases, including IEEE, Emerald, ScienceDirect, EBSCO, Web of Science (WoS), Google Scholar, and Scopus. WoS and Scopus electronic databases are extremely useful in various fields and are frequently used to search, extract, and review existing studies (Guz et al., 2009). In contrast, the WoS database has assimilated a high number of journals with a high impact factor, whereas the Scopus database has a high quantity of journals with a lower impact factor (Singh et al., 2021). Considering the stated justification, it was decided that the WoS electronic database would be the most appropriate for this study.

Consequently, this study employed solely the Web of Science electronic database because it retrieves the foremost academic journals from numerous disciplines and is acknowledged for its comprehensive and high-quality journal coverage. Furthermore, WOS (Web of Science) has four main journal categories in its core collection, namely, the Science Citation Index Expanded (SCIE), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (AHCI), and Emerging Sources Citation Index (ESCI). These four core collection categories cover diverse disciplines and have unique evaluation criteria. Therefore, even though this study used a single database, it does not limit the scope of the literature coverage, as the study still captures a broad and representative base of high-quality journals indexed under the Web of Science electronic database.

### **3.3. Temporal Boundary, Review Protocol, and Data Screening**

This study covered all relevant articles published up to 31st March 2024. Firstly, to obtain the most appropriate search results, a search using exact keywords, i.e., “Metaverse” AND (“E-commerce” OR “electronic commerce” OR “online shopping” OR “Internet shopping” OR “Online platform\*” OR “Digital platform\*” OR “personalisation” OR “customisation” OR “recommendation system\*” OR "Artificial Intelligence" OR "AI" OR “chatbot interaction” OR “Service experience” OR “Customer experience” OR “Consumer experience” OR “customer service engagement” OR “Customer feedback” OR “consumer service engagement” OR “consumer feedback” OR “immersive shopping” OR “Virtual Try on” OR “Digital Try on” OR “Virtual Try-on” OR “Digital Try-on”) was used in the “Topic” search field. This field contains “Title, Abstract, and Keywords.” After this step, 531 articles were found as a search result. Secondly, inclusion criteria (i.e., Document type:

Article and Review Article, Language: English, Web of Science categories: Management or Business, and Web of Science index included, i.e., SCIE and SSCI categories) were applied, and 113 articles were found as a search result. Thirdly, full-text articles were evaluated using exclusion criteria (i.e., articles not available under the open access option), and irrelevant articles were excluded. This led to a final eligible sample size of 59 articles, and the PRISMA 2020 protocol was employed for the full-text review of these 59 articles to determine the final sample size. Based on the full-text review, this study included 42 eligible articles. Figure 2 depicts the PRISMA-based article selection protocol.

### **3.4. Justification of Sample Size**

This study performed the SLR technique to capture the current digital innovation and entrepreneurship works and was provided with 42 eligible articles as the final sample size. Even though this final sample size comprises a total of just 42 articles, it is reasonable given that it meets the minimum number of articles needed to perform a systematic literature study. This study complied with the thumb rule and shortlisted a final sample size of 42 eligible articles (Paul et al., 2023). Moreover, a previous study published in the *Journal of Business Research* complied with the thumb rule and evaluated 40 articles using the SLR technique (Paul et al., 2023). The thumb rule thus allows this study to make a valuable contribution to the field using the SLR technique (Paul and Criado, 2020). This study is multidisciplinary, and this final sample size is sufficient enough to be analyzed since it has reached the maturity level needed to perform an SLR-based study.

### **3.5. Data Extraction and Analysis**

The study's data were extracted from 42 eligible articles and transferred into a Microsoft Excel spreadsheet in a tabular arrangement that included the article title, author details, name of the journal, year of publication, theories, themes, geographical contexts, characteristics, and methodologies. According to the systematic review objectives, the content analysis followed a structured and transparent process. For organizing, interpreting, and synthesizing the findings, the ESG (Environmental, Social, and Governance) framework served as the pre-existing theoretical lens. This framework was selected because it offers a comprehensive framework for evaluating how AI and

Metaverse technologies contribute to customer experience across environmental, social, and governance dimensions. All included studies were imported into an analysis matrix after the systematic search and screening stages. Data was coded deductively, mapping relevant concepts, themes, and insights to ESG categories (Creswell and Poth, 2016; Ishtiaq, 2016). The ESG framework guided the primary coding process, but the procedure allowed for the emergence of supplementary inductive subthemes when the data offered new insights not fully captured by the predefined categories (Creswell and Poth, 2016; Ishtiaq, 2016). This approach ensured both theoretical grounding and openness to new patterns. Inductive refinement enhanced the depth and nuance of the thematic synthesis while deductive use of the ESG framework strengthened analytical coherence. In order to enhance the rigor and credibility of the analysis, two subject-matter experts independently reviewed the preliminary themes and subthemes. The thematic structure was evaluated for clarity, coherence, and relevance. The final thematic framework was refined and verified based on their feedback (Creswell and Poth, 2016).

Table 1 depicts steps used in selecting the articles for the final review

Table 1: Stepwise Description of Research Protocol

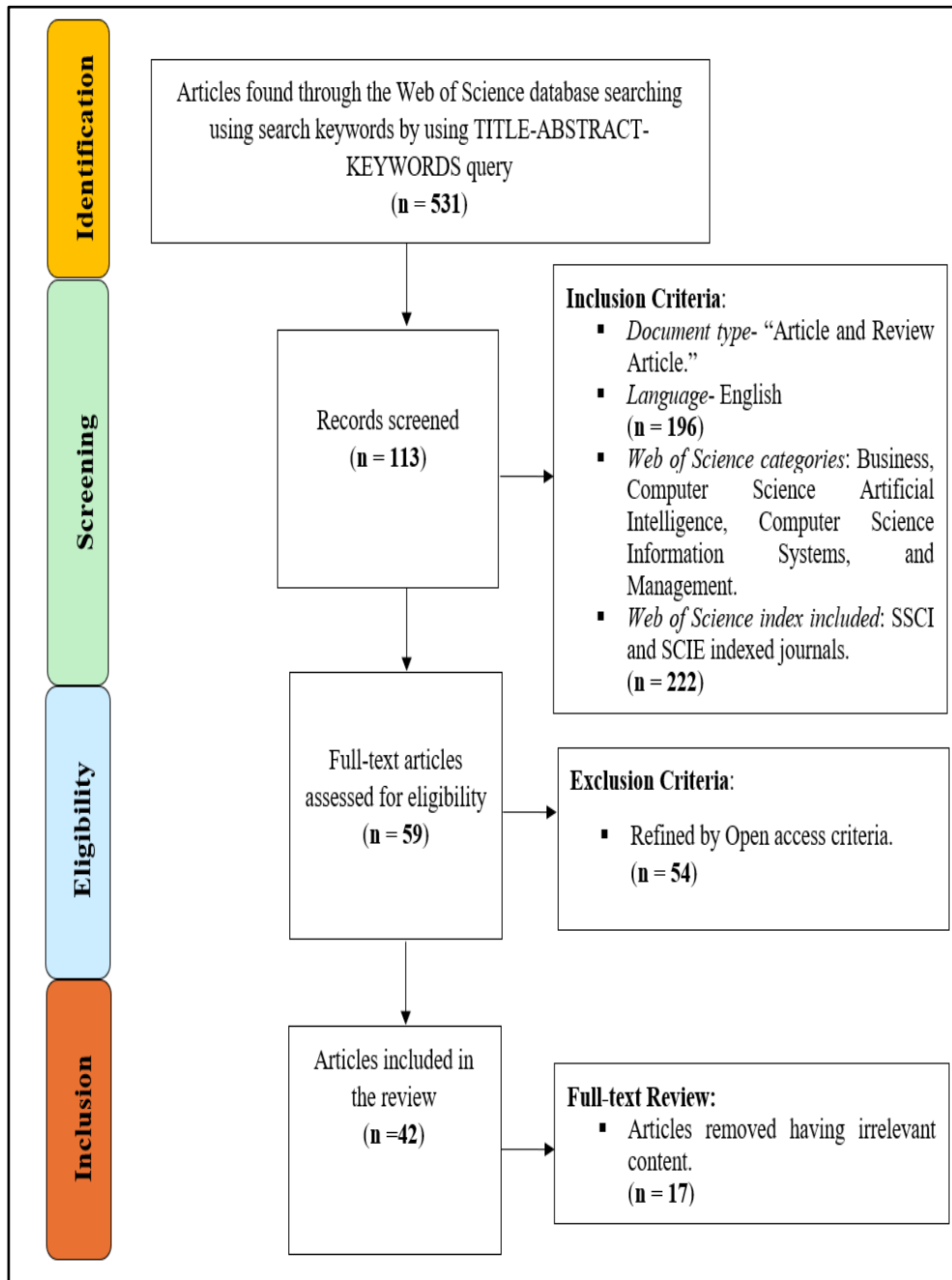
Steps followed	Descriptions of Research Protocol
Step 1: Definitions of the Study	A PRISMA 2020 protocol flow chart detailing how to select pertinent articles is shown in <b>Figure 2</b> .
Step 2: Database Selection	Thoroughly searched pertinent articles using the Web of Science electronic database. To achieve this, a TITLE-ABSTRACT-KEYWORDS query was utilized, and a temporal boundary was set that covered articles published until March 31 <sup>st</sup> , 2024.
Step 3: Adjustment of Search Criteria	<p>The search keyword strings used for searching pertinent articles are as follows:            “Metaverse” AND (“E-commerce” OR “electronic commerce” OR “online shopping” OR “Internet shopping” OR “Online platform*” OR “Digital platform*” OR “personalization” OR “customization” OR “recommendation system*” OR "Artificial Intelligence" OR "AI" OR “chatbot interaction” OR “Service experience” OR “Customer experience” OR “Consumer experience” OR “customer service engagement” OR “Customer feedback” OR “consumer service engagement” OR “consumer feedback” OR “immersive shopping” OR “Virtual Try on” OR “Digital Try on” OR “Virtual Try-on” OR “Digital Try-on”)</p> <p><b>Search result 1:</b> 531 articles  <b>Inclusion Criteria:</b></p>

	<ol style="list-style-type: none"> <li>1. “Review Article” as the document type, and articles in English were included. <b>Search result 2:</b> 335 articles</li> <li>2. <b>Web of Science categories included:</b> Business, Computer Science Artificial Intelligence, Computer Science Information Systems, and Management. <b>Web of Science index included:</b> SCIE and SSCI. <b>Search result 3:</b> 113 articles</li> </ol> <p><b>Exclusion Criteria-</b></p> <ol style="list-style-type: none"> <li>1. Articles other than the Open-access option were excluded. <b>Search result 4:</b> 59 articles</li> </ol>
Step 4: Extraction of Final Data	Successfully exported the final data list of 59 eligible articles to CSV format. Afterwards, all 59 articles were downloaded, and the PRISMA 2020 protocol was performed. A full-text review of all 59 articles was conducted. After meticulous review, forty-two relevant articles that fully met the criteria were selected for final review
Step 5: Analysis of Data/Information	The TCCM framework was employed to present the results of the study

**Source:** *Developed by authors*

The Figure 2 further demonstrates the article filtering chart.

**Figure 2:** A PRISMA 2020 Protocol Flowchart Detailing How to Select Pertinent Articles



**Source:** Developed by authors

Table 2 provides a list of journals selected based on indexing in the Web of Science SSCI and SCIE categories.

Table 2: List of journals selected based on indexing in the Web of Science SSCI and SCIE categories

List of Journals selected for review	Number of the article (s) selected
Artificial Intelligence Review	2
Business Horizons	1

CMC-Computers Materials & Continua	1
Electronic Markets	2
Electronics	3
Engineering Applications of Artificial Intelligence	1
IEEE Access	11
IEEE Communications Surveys and Tutorials	2
IEEE Internet of Things Journal	3
IEEE Network	2
IEEE Transactions on Network and Service Management	1
IEEE Wireless Communications	1
IEICE Transactions on Information and Systems	1
International Journal of Consumer Studies	1
International Journal of Contemporary Hospitality Management	1
International Journal on Semantic Web and Information Systems	1
Journal of King Saud University-Computer and Information Sciences	1
Journal of Organizational and End User Computing	1
Journal of Service Management	1
Journal of Theoretical and Applied Electronic Commerce Research	2
Marketing Letters	1
Nature Machine Intelligence	1
Service Industries Journal	

**Source:** *Developed by authors*

Table 1 presents the list of journals selected for the study's analysis and interpretation, while Figure 2 illustrates the process of selecting relevant articles using the PRISMA 2020 protocol. WoS analytics and Microsoft Excel (Version 2010) were employed to address the study's research questions (RQs). Table 2 provides the list of 23 journals included in the final review, comprising a total sample of 42 eligible articles.

### **3.6. Methodological Quality and Risk of Bias Assessment**

The methodology of this study incorporated the PRISMA 2020 protocol to ensure transparency and minimize selection bias. The Web of Science (WoS), recognized for its rigorously curated and multidisciplinary journal coverage, was selected as the primary database. WoS maintains high quality through impact factor-based rankings and

categorizes journals into four tiers, making it the most suitable electronic database for conducting a systematic literature review. To further reduce bias, inclusion and exclusion criteria were clearly defined during the article selection process. The final sample of 42 articles aligns with standards in existing systematic literature reviews and provides a robust basis for meaningful analysis. Accordingly, the systematic literature search, use of WoS, and rigorous screening procedures ensured methodological quality and a consistent dataset, even though only a single database was used. In addition, several factors were considered in evaluating the risk of bias in the included studies, such as publication quality, journal ranking, and relevance to the research objectives. Since the selected studies were published in high-impact journals, the risk of methodological flaws or unreliable results was minimized.

### ***Identification of Analytical Categories and Thematic Relationships***

The ESG framework was used to identify analytical categories and thematic relationships. Data segments were assigned to the predefined Environmental, Social, and Governance categories after organizing all included studies in the analysis matrix (Ishtiaq, 2016). The researchers examined patterns, recurring concepts, and conceptual overlaps within each category. Whenever data did not fit neatly into the initial categories, inductive open coding was applied to capture emerging insights. By comparing coded segments across sources, clustering similar concepts, and examining how different ESG dimensions intersect, we identified themes (Creswell and Poth, 2016; Ishtiaq, 2016). The process involved iterative memo writing, cross-checking coded data, and mapping concept linkages. Two independent experts reviewed the categories and thematic relationships for clarity, logical consistency, and alignment with the evidence. Their feedback informed the final refinement of the analytical framework, enhancing transparency and reproducibility. Any discrepancies or disagreements between reviewers were resolved using a third independent reviewer. For example, discrepancies such as accurate study selection and the eligibility criteria for studies such as Maeng et al., (2023) and Peñaherrera-Pulla et al., (2022) which discussed about VR services.

## **4. Results and Discussion**

### **4.1 Theories Investigated**

The studies on how the metaverse and AI enhance customer experience in the e-commerce industry are valuable for both academics and practitioners in advancing theoretical understanding. Please refer to Appendix Table 1A for a summary of the notable findings of this study.

**Table 3:** Extensively used theories in the field

Source (s)	Theory
Wang et al. (2023)	Activity theory
Kowalkowski et al. (2024)	Conventional product innovation
Gursoy et al. (2023)	Dual coding theory
Jim et al. (2023), Maeng et al. (2023), Wang et al. (2023), Zhang et al. (2023)	Game theory
Xu et al. (2023)	Multi-attribute utility theory model
Truong et al. (2023)	Prospect Theory
Wu et al. (2023)	Proteus effect theory
Chohan and Schmidt-Devlin (2024)	Social identity theory
Park and Kim (2022)	Theory of Mind
Buhalis et al. (2023)	Technology Acceptance Model (TAM)
Buhalis et al. (2023)	Theory of planned behavior
Bansal et al. (2022)	Theory of the reality-virtuality continuum

**Source:** *Developed by authors*

**Note:** *The widely used theories were selected from notable articles in the final sample of 42 articles*

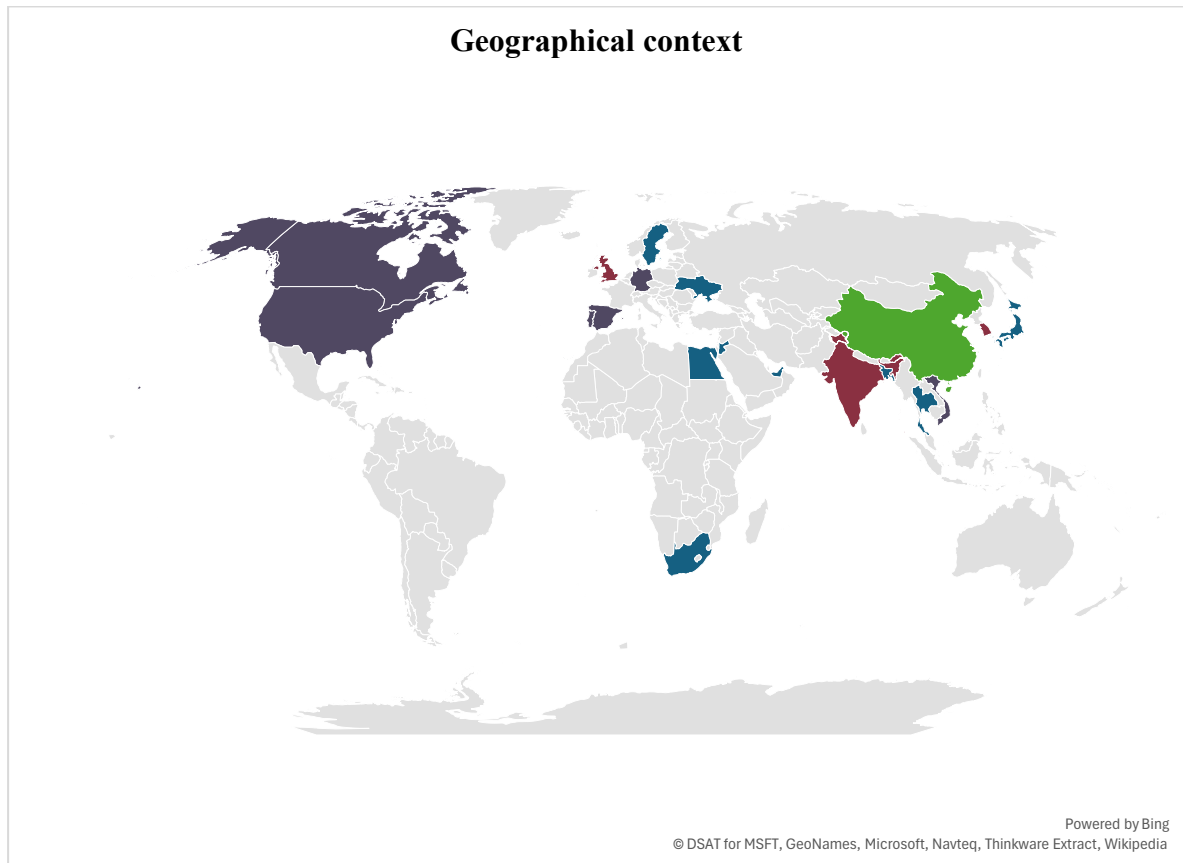
Previous research has drawn on a variety of theoretical perspectives, including Activity Theory (Wang et al., 2023), Conventional Product Innovation (Kowalkowski et al., 2024), Dual Coding Theory (Gursoy et al., 2023), Game Theory (Jim et al., 2023; Maeng et al., 2023; Wang et al., 2023; Zhang et al., 2023), the Multi-Attribute Utility Theory Model (Xu et al., 2023), Prospect Theory (Truong et al., 2023), the Proteus Effect (Wu et al., 2023), Social Identity Theory (Chohan and Schmidt-Devlin, 2024), the Technology Acceptance

Model (Buhalis et al., 2023), Theory of Mind (Park and Kim, 2022), the Theory of Planned Behaviour (Barta et al., 2023), and the Reality–Virtuality Continuum (Bansal et al., 2022), as summarized in Table 3. Among these, **Game Theory** has been most widely applied in metaverse and AI-related research. Originally proposed by mathematician John von Neumann and economist Oskar Morgenstern in the 1940s, Game Theory has since been applied across diverse disciplines, including business, political science, finance, economics, and psychology. Its application within e-commerce highlights how metaverse and AI technologies can be strategically employed to augment customer experiences in the most effective and feasible ways.

#### **4.2 Context Investigated: Geographical**

The studies examining how the metaverse and AI enhance customer experience in the e-commerce industry have predominantly been conducted in developed countries, including China (eight studies), Singapore (four studies), India (three studies), South Korea (three studies), the United Kingdom (three studies), Germany (two studies), and the United States (two studies). In contrast, there remains a clear research gap in developing countries, with limited studies identified in Bangladesh (one study), Jordan (one study), Thailand (one study), and Vietnam (two studies), where the e-commerce sector is still in its early or growth stages. Figure 3 illustrates the geographical distribution of the studies analysed. Furthermore, only a small number of articles address this theme in regions such as Africa and South America, highlighting the need for further research in these contexts. Figure 3 further demonstrates the Geographical context investigated within the field.

#### **Figure 3: Geographical context investigated**



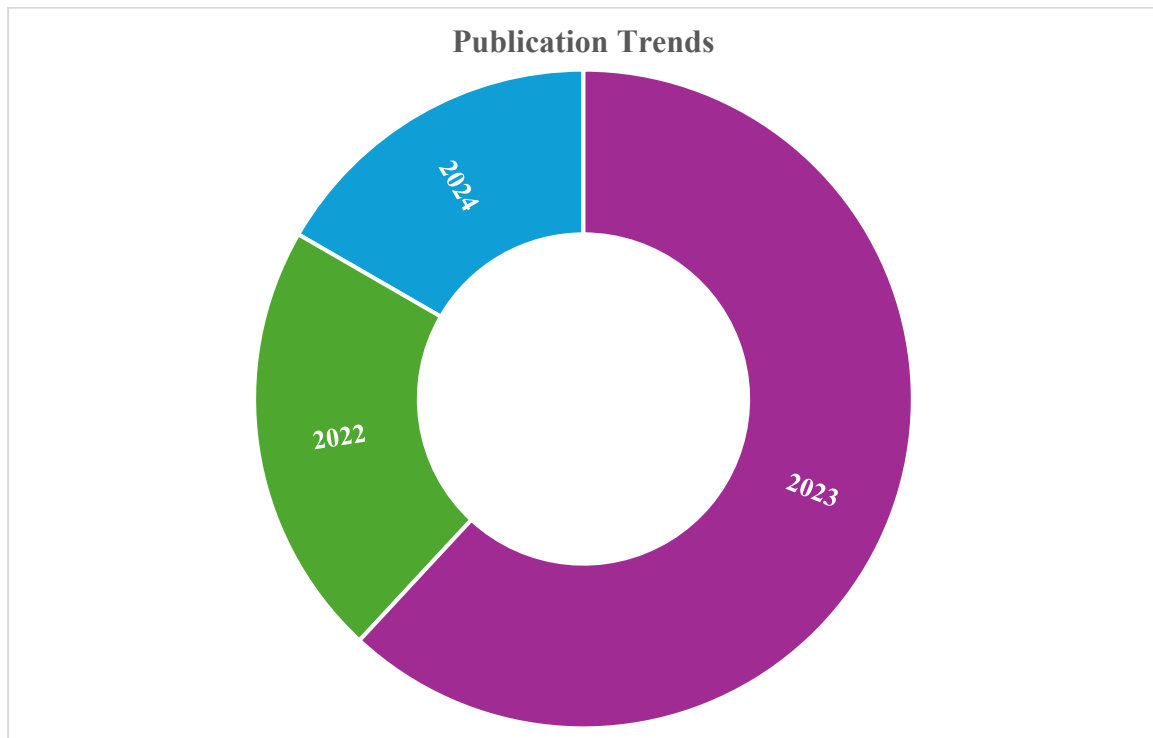
**Source:** *Developed by authors*

The Indian e-commerce industry has undergone a substantial transformation over the past decades; however, a research gap remains in understanding the role of the metaverse and AI in enhancing customer experience within this context. Therefore, further studies are required in India and similar countries to develop a comprehensive understanding of how these technologies can enrich customer experience in the e-commerce industry.

#### **4.3 Characteristics Investigated: Publication Trend**

The surging plurality of metaverse and AI technologies in recent years has led to an increase in articles studying how they can augment customer experience, enhance business efficiency, and boost revenue in the E-commerce industry. As more consumers turn to E-commerce, companies are striving for ingenious methods to fulfil their needs and wants, and the metaverse and AI are emerging as promising keys to uncover this. Figure 4 shows the publication trends investigated in the study.

**Figure 4: Publication trends investigated**



**Source:** *Developed by authors*

The findings of this study indicate that research on the role of the metaverse and AI in enhancing customer experience in e-commerce has reached its peak in recent years, with nine articles published in 2022, 26 in 2023, and seven in 2024 (and continuing to grow). Figure 4 illustrates these publication trends. The rise in publications can be attributed to factors such as increasing scholarly interest, the growing adoption of these technologies by e-commerce companies, and disruptive market dynamics. Prior to 2022, awareness of the metaverse and AI among academic and business communities was still emerging and had not significantly influenced e-commerce or customer experiences. However, with rapid technological advancement—particularly in the post-COVID-19 era—demand for research on these immersive technologies has substantially increased.

#### **4.4 Methodologies Investigated**

Data collected from the final sample size of this survey indicate that approximately 50.00% of studies used the literature review. Approximately 19.05% of the studies employed a

qualitative method, while 16.67% employed a conceptual methodology. A small percentage, 07.14%, employed mixed and quantitative methods, respectively. Table 4 demonstrates the methods used in this study.

**Table 4: Methodology investigated**

Number of articles	Methodology	Exemplary studies
07	Conceptual	Golf-Papez et al. (2022), Gursoy et al. (2023), Kowalkowski et al. (2024)
21	Literature Review	Bansal et al. (2022), Buhalis et al. (2023), Cui and Liu (2023), Jim et al. (2023), Nguyen and Voznak (2024), Paul et al. (2024)
03	Mixed Methods	Pyae et al. (2023)
08	Qualitative	Wang et al. (2022), Nagao (2023), Chen et al. (2024)
03	Quantitative	Barta et al. (2023)

Note: The frequencies were based on 42 articles with the final sample size

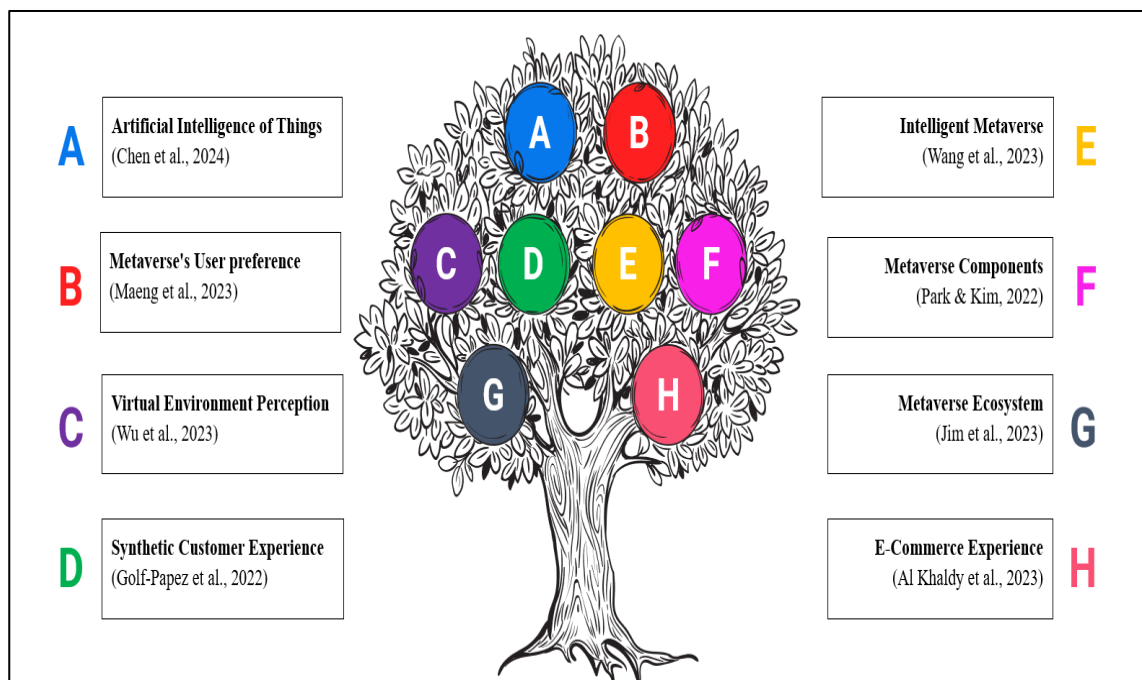
**Source:** *Developed by authors*

It is noteworthy that diverse methodologies have been employed in studies on metaverse- and AI-related themes. These approaches provide valuable insights for future scholars and researchers, offering methodological guidance to further contribute to the growing body of knowledge in this domain. They also support the business community in developing a deeper understanding of how metaverse and AI can be leveraged to enhance customer experiences. The methodologies identified in the reviewed literature are summarized in Table 4. The following section presents a detailed discussion of the study's findings.

#### **4.5 Thematic Analysis using the ESG Framework Perspective**

Through thematic analysis, eight themes were identified, as illustrated in Figure 5: Artificial Intelligence of Things, metaverse user preferences, virtual environment perception, synthetic customer experience, intelligent metaverse, metaverse components, metaverse ecosystem, and e-commerce experience. In addition, Figure 6 presents the thematic analysis from the perspective of the ESG framework.

Figure 5: Notable themes investigated



*Source: Developed by authors*

#### ***4.5.1 Environmental Perspective of the ESG Framework- Artificial Intelligence of Things***

Three key themes—metaverse user preferences, synthetic customer experience, and e-commerce experience—are examined through the social dimension of the ESG framework. The **Artificial Intelligence of Things (AIoT)** is linked to the environmental perspective within the ESG framework. AIoT emerges from the integration of AI and IoT technologies, offering significant potential for promoting environmental sustainability (Koswatte et al., 2023; Pereira et al., 2024). For example, IoT devices such as security cameras, lighting systems, and smart thermostats can be enhanced with AI to monitor energy consumption, adjust settings, and adapt to user behavior. This results in substantial reductions in energy use, improved environmental outcomes, and enhanced security through anomaly detection (Wang, 2021; Maden and Yücenur, 2024).

Similarly, in healthcare, AI-powered wearable devices monitor vital signs and issue alerts for health irregularities, enabling timely interventions and reducing the need for travel, thereby supporting more sustainable business practices (Wang, 2021; Maden and Yücenur, 2024). In manufacturing, AI-enabled equipment can predict machinery failures and

optimize operational parameters in real-time, lowering energy consumption, operational costs, and environmental footprint (Hennig-Thurau et al., 2023; Huynh-The et al., 2023). However, questions remain regarding the net environmental benefit of AIoT. While efficiency gains are highlighted by proponents, these improvements may be partially offset by **rebound effects**, where cost savings or increased efficiency led to higher consumption elsewhere, potentially diminishing the overall environmental impact.

#### ***4.5.2 Environmental Perspective of the ESG Framework- Intelligent metaverse***

The intelligent metaverse, powered by AI, contributes to environmental sustainability by providing virtual spaces that reduce the need for physical travel, thereby lowering carbon emissions. For example, virtual tourism experiences and online meetings offer resource-efficient alternatives to traditional travel and in-person interactions, supporting sustainable practices (Dwivedi et al., 2022, 2023; Koochang et al., 2023; Singh, 2024). Similarly, in manufacturing, AI-enabled equipment can predict machinery failures and optimize operational parameters in real-time, reducing energy consumption and operational environmental footprints (Hennig-Thurau et al., 2023; Huynh-The et al., 2023). However, some studies caution that these virtual spaces consume significant energy, and if powered by nonrenewable sources, their environmental benefits may be reduced or even negated (Hennig-Thurau et al., 2023; Huynh-The et al., 2023).

#### ***4.5.3 Environmental Perspective of the ESG Framework- Perception on Virtual Environment***

Perceptions of the virtual environment motivate users to enhance their experiences on AI- and metaverse-based immersive platforms, mimicking physical interactions and thereby reducing the need for physical travel, which contributes to lower emissions (Lacey and Jackson, 2022). Additionally, virtual environment perception acts as a catalyst between users and avatars, increasing real-time engagement within the metaverse (Singh, 2024). However, the metaverse does not inherently promote environmental sustainability (Mubarak et al., 2024). The creation, operation, and maintenance of digital infrastructure require substantial energy, much of which is derived from non-renewable, carbon-intensive sources, potentially offsetting any environmental benefits (Allam et al., 2022; Owojori and Erasmus, 2025; Hennig-Thurau et al., 2023; Huynh-The et al., 2023).

#### ***4.5.4 Social Perspective of the ESG Framework- The user preference for metaverse***

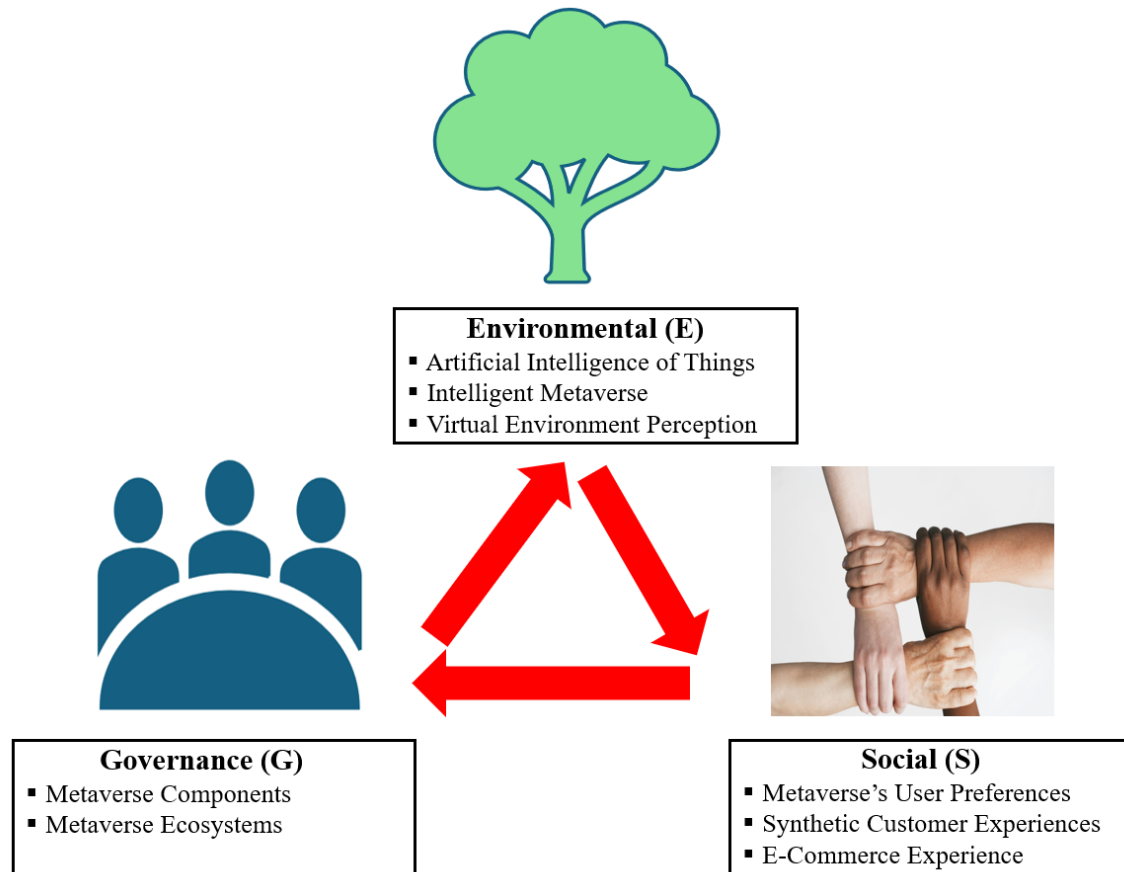
Three key themes were considered—metaverse user preferences, synthetic customer experience, and e-commerce experience—which are further analyzed through the social dimension of the ESG framework.

The **metaverse user preference** theme highlights significant changes in how customers engage virtually, particularly in the context of social interaction and virtual reality (VR). Many traditional VR platforms have failed to meet evolving user expectations, leading to dissatisfaction in certain cases (Hennig-Thurau et al., 2023; Huynh-The et al., 2023). User preferences also vary across different contexts, such as immersive multiplayer games and interactive storytelling, demonstrating how the metaverse can support diverse social engagement needs and enhance virtual experiences, thereby presenting a valuable platform for businesses (Singh, 2024). However, businesses remain uncertain about whether the metaverse can consistently meet their objectives, particularly in terms of boosting sales through interactive virtual customer experiences. This uncertainty poses a significant challenge for organizations considering investment in metaverse-based initiatives (Lacey and Jackson, 2022; Proulx, 2022).

#### ***4.5.5 Social Perspective of the ESG Framework- Synthetic customer experience***

The synthetic customer experience theme has highlighted increased opportunities to create immersive and personalized interactions, enhancing customer experiences through innovative technologies such as AI and the metaverse (Hennig-Thurau et al., 2023; Huynh-The et al., 2023). Figure 6 demonstrates the thematic analysis using the ESG framework perspective

**Figure 6: Thematic Analysis using the ESG Framework Perspective**



**Source:** *Developed by authors*

The growing number of metaverse users has increased demand for network resources, posing challenges for meeting social engagement needs (Maden and Yücenur, 2024). To create meaningful **synthetic customer experiences**, brands and companies must understand the social preferences and expectations of their customers (Scharp, 2010). This enables the development of deep and engaging customer relationships, aligning with the social dimension of the ESG framework.

While the metaverse demonstrates strong potential to fulfill diverse social engagement needs through immersive games and storytelling (Singh, 2024), some VR platforms have struggled to meet user expectations, resulting in dissatisfaction (Dewasiri et al., 2025; Jayawardena et al., 2025). Additionally, the metaverse presents exciting opportunities for e-commerce by delivering personalized and interactive shopping experiences. Virtual storefronts and showrooms allow customers to explore products in immersive

environments, enhancing engagement and social interaction within the shopping experience (Bojic, 2022; Ning et al., 2023; Singh, 2024).

#### ***4.5.6 Social Perspective of the ESG Framework- The virtual shopping experience***

The virtual shopping experience mimics the look of a physical store and synthesizes the feel of a real store while nurturing virtual customer interaction. For instance, augmented reality (AR) adoption in e-commerce allows customers to try on goods such as accessories and clothing virtually, igniting the decision to buy through real-time virtual interactions and enabling more informed purchase decisions by sharing other customers' opinions in real time (Al Khaldy et al., 2023; Ning et al., 2023). Likewise, by using avatars, e-commerce companies create an emotional bond between avatars and customers, building trust toward e-commerce platforms through virtual engagement (Bojic, 2022; Al Khaldy et al., 2023; Ning et al., 2023; Otoum et al., 2024). Moreover, the integration of AI and the metaverse has immense potential to augment customer experience by promoting social engagement and personalized immersive virtual interactions. The metaverse's potential to transform the way people work, connect, learn, and conduct business may also introduce new technical, social, and economic challenges (Giacalone et al., 2025; Jayawardena et al., 2023). Hence, integrating AI and the metaverse supports brands and companies in building sustainable and stronger customer relationships and consequently aligns with the social perspective in the context of the ESG framework.

#### ***4.5.7 Governance Perspective of the ESG Framework- Metaverse components***

Based on the thematic analysis using the ESG framework, two themes—namely, metaverse components and the metaverse ecosystem—are presented in the context of the governance perspective. Metaverse components play a significant role in enhancing the customer experience in e-commerce by generating immersive virtual environments. For instance, brands mimic their physical stores in virtual spaces by developing virtual storefronts that allow customers to search for goods and services and make purchases using real money or virtual currency (Dwivedi et al., 2022). Furthermore, the metaverse ecosystem, which is supported by metaverse components, plays a central role in how brands connect with customers in these immersive environments. By placing signage, showcasing products, or sponsoring virtual events, brands can increase visibility and engagement, directly

influencing consumer behavior. Prior studies reveal that customers are more likely to make purchases in virtual environments than on traditional websites, reflecting the competencies of immersive platforms (Dogadkina, 2022; Maden and Yücenur, 2024). As brands expand their presence in the metaverse, it is essential that they do so with proper governance (Singh, 2024). To ensure that virtual advertising and sponsorship do not exploit consumers, ethical considerations should guide their integration (Singh, 2024).

#### ***4.5.8 Governance Perspective of the ESG Framework- Metaverse Ecosystem***

High immersion, achieved through technologies like VR and AR, allows consumers to interact with brands and their goods and services in an immersive way, blurring the lines between the physical and digital worlds (Maden and Yücenur, 2024; Singh, 2024). This governance perspective not only protects consumer interests but also helps brands foster sustainable customer relationships by nurturing trust and adhering to the accountability principles outlined in the ESG framework's governance dimension. Moreover, with the surge in e-commerce platforms, businesses must implement transparent policies regarding data privacy, consumer rights, and transaction security to build customer trust and maintain brand reputation. Consequently, integrating AI and the metaverse for value creation in shaping the customer experience must be done with a clear emphasis on governance. Likewise, AI-driven personalized customer experiences, product and service recommendations, and overall immersive customer interactions supported by the metaverse must adhere to industry regulatory standards and ethical principles to protect consumer data privacy and ensure fair treatment. However, a major ESG concern regarding the social and governance dimensions is that access to the metaverse remains limited (Moro-Visconti et al., 2025). Hence, it can be concluded that the integration of AI and the metaverse, when aligned with the governance perspective of the ESG framework, may support the creation of long-term value for both brands and customers.

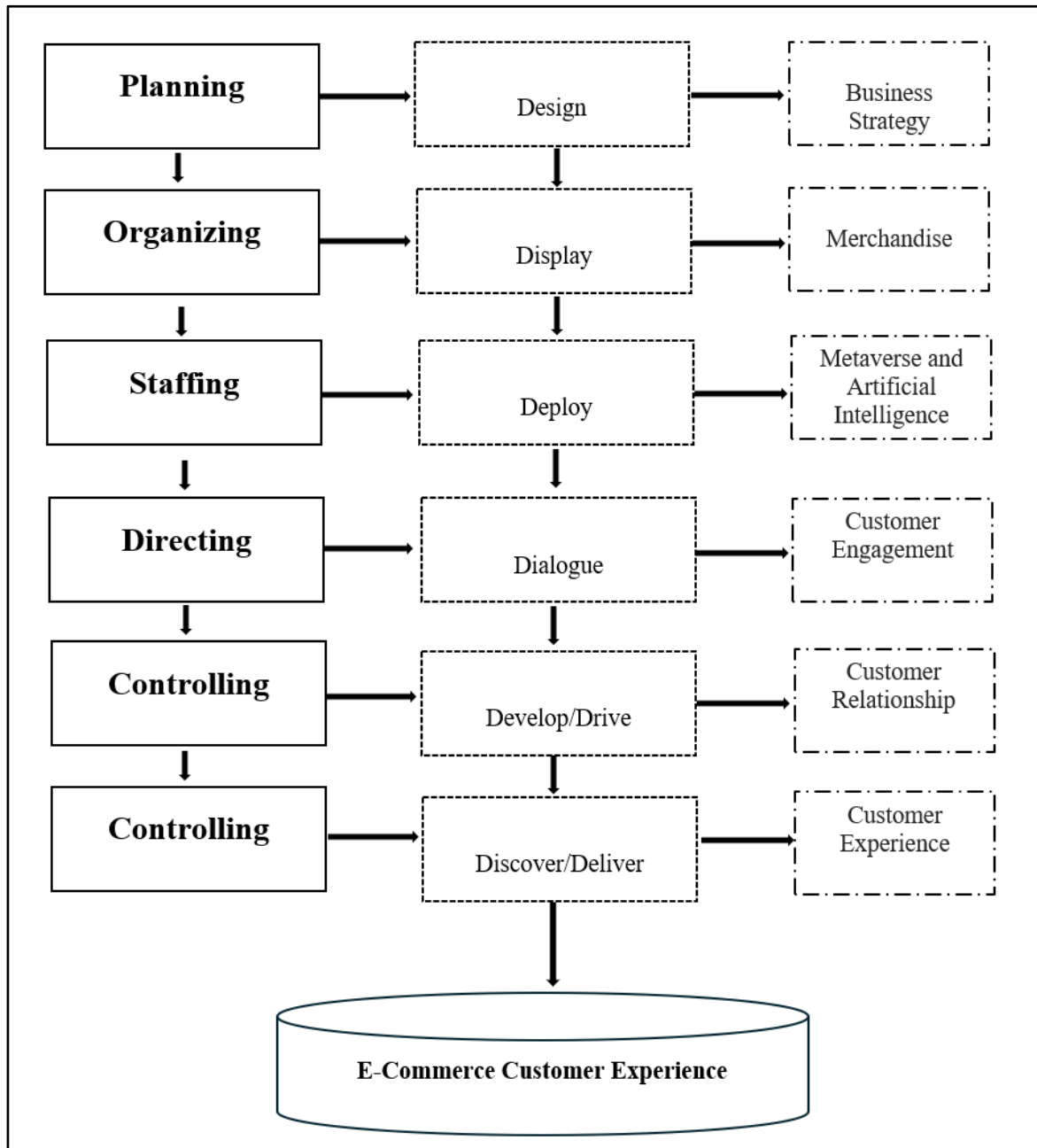
### ***5. Proposed Conceptual Framework***

The AI of Things involves integrating artificial intelligence capabilities into Internet of Things (IoT) devices and systems so that they can make intelligent decisions, perform tasks autonomously, and adapt to changing environments without human intervention. The specification and utility gaps between holographic devices and immersive devices should

be minimized in future devices to enhance users' visual-interactive experiences in the metaverse (Otoutum et al., 2024; Singh, 2024). In summary, with machine learning and deep learning architectures, AI is a powerful tool to address many challenging issues associated with ultra-reliable and low-latency communications in future wireless networks, allowing users to enjoy high-quality integrated services in the metaverse with guaranteed high throughput and low latency. Through consumer-ready mind-control systems, brain-computer interfaces will enable the ultimate immersive experience between reality and the metaverse. Metaverse Service Providers (MSPs) must ensure that they adhere to exacting standards of sensing, transmitting, and rendering to give users the feeling of being fully immersed. Users commonly enjoy personalizing their avatars to reflect their personalities, styles, and identities, including customising appearance, clothing, accessories, and virtual properties in various ways.

Academics from different disciplines work closely together to define, structure, organize, and visualize the future of the metaverse in a collaborative environment (Dwivedi et al., 2022, 2023; Koohang et al., 2023). Currently, users can create avatars and explore various resources on digital platforms through the current iteration of the metaverse. However, there is significant potential for digital environments to enable highly realistic virtual conversations, experiences, and transactions. In the future, the metaverse is expected to stimulate increased interest and awareness, potentially leading to a rise in physical travel. Figure 7 shows the proposed conceptual framework.

### **Figure 7: Proposed Conceptual Framework**



**Source:** *Developed by authors*

Additionally, it can replace the need for users to travel when personal circumstances or environmental conditions prevent them from doing so. Brands can leverage virtual advertising and sponsorships within virtual worlds, games, and experiences to reach target audiences. This may include placing branded signage, product placements, or sponsoring virtual events and experiences to increase brand visibility and engagement. Figure 7 depicts the proposed integrative framework based on the review of 42 articles in this study. Using this technology, marketers can engage consumers in entirely new ways, providing

experiences that transcend physical boundaries. For example, customers could virtually try on clothes or test-drive cars before deciding to purchase them.

A significant challenge to the success of the metaverse arises if falsity is conceptualized as something that lacks any attributes rather than defining its attributes. This presents a major obstacle to creating value for both firms and customers. Consequently, businesses need to develop a deeper understanding not only of what the metaverse is but also of how it influences the concept of falsity in this emerging digital world.

### 5.1 Qualitative assessment of the proposed conceptual framework

The Table 5 presents a qualitative assessment of the proposed conceptual framework (See Figure 7) was incorporated by aligning it with the ESG framework to heighten the theoretical and practical insights on the way metaverse and AI integration’s relevant contributions to value creation of customer experience.

Table 5: Qualitative assessment of the proposed conceptual framework

Managerial function	Conceptual Framework Element	ESG Dimensions	Relevant contributions
Planning	Design → Business Strategy	Governance	Strategic Alignment
Organizing	Display → Merchandise	Environmental	Operational Sustainability
Staffing	Deploy → Metaverse & Artificial Intelligence	Social	Human Sustainability
Directing	Dialogue → Customer Engagement	Social	Shared Value Creation
Controlling	Develop/Drive → Customer Relationship	Governance	Responsible Governance
Controlling	Discover/Deliver → Customer Experience	Social + Environmental	Sustainable Digital Experience

Source: Developed by authors

This qualitative assessment attempts to link managerial functions with conceptual framework elements, addressing the three dimensions of the ESG framework to propose relevant contributions. Firstly, under the planning phase, this qualitative assessment emphasises the strategic alignment business strategy with the governance dimension. Afterwards, under the organizing phase, this qualitative assessment proposes to focus on utilizing digital spaces to attain operational sustainability following environmental concerns, to incorporate the environmental dimension. Moreover, in the staffing phase, this qualitative assessment suggests the deployment of metaverse and AI to attain human sustainability, underscoring organizational commitment towards an employee-centric approach to incorporate the social dimension. In the directing phase, the business-customer engagement fosters shared value creation by aligning the social dimension. Finally, under the controlling phase, this qualitative assessment states that for driving customer relationship management to augment customer experience, responsible governance will act as a catalyst to reinforce customer relationships for the smooth delivery of sustainable digital experiences, linking it with the social and governance dimensions of the ESG framework. Therefore, this proposed framework contributes to innovating responsible customer relationship management through the augmentation of customer experiences.

## **6. Future research agenda**

This section demonstrates the future research agenda of this study using the TCCM (theory, characteristics, context, and methodology) approach (Paul and Criado, 2020; Paul et al., 2023).

### **6.1 Future research agenda based on the theory**

There is no doubt that the metaverse and artificial intelligence (AI) are revolutionizing e-commerce by creating more immersive and personalized shopping experiences for consumers (Korbel et al., 2022; Li et al., 2023). A growing body of literature recognizes the importance of antecedents that affect customer evaluations of various tools and platforms facilitating metaverse experiences, such as head-mounted displays and VR devices, often analysed through text mining and deep neural networks (Maeng et al., 2023). With similar subjective perceptions of information and communication technologies, these platforms can bridge the deployment of technology across generations, from new to old (Barta et al., 2023; Kowalkowski et al., 2024).

To better understand how consumer behaviour is influenced by factors affecting users' intentions and purchase decisions (Secinaro et al., 2022), consumer behavioural and social psychology theories have been applied in digital consumer interaction research only to a limited extent—primarily through the Theory of Planned Behaviour (Barta et al., 2023), Activity Theory (Wang et al., 2023), and the Technology Acceptance Model (Buhalis et al., 2023). Beyond providing opportunities for younger generations to engage with older generations, platforms should enable older generations to act as curators as well as users (Schöbel and Leimeister, 2023).

The metaverse offers retailers the opportunity to create virtual shops where customers can navigate and interact with products in the same way they would in a physical store, enhancing the “try-before-you-buy” experience. This is particularly valuable in fashion, where customers can use avatars to try on virtual clothing or accessories. To make personalized product recommendations, AI algorithms analyse user behaviour, preferences, and purchase history (Schöbel and Leimeister, 2023; Korbel et al., 2022; Li et al., 2023). As a result, customers can find relevant products more quickly, increasing satisfaction and potentially boosting overall sales.

It is also important to develop interventions for behaviour change based on consumer behavioural theories, which can inform future digital campaign planning (Li et al., 2023; Yang et al., 2022). Current research indicates a need to close the digital divide to ensure equitable access to these immersive e-commerce experiences (Kowalkowski et al., 2024; Nguyen and Voznak, 2024).

## **6.2 Context: Perspectives on the Future of Research**

Research from the Asian context, including but not limited to China and Korea, has shown that the primary focus is on the effectiveness of digital platforms and metaverse-based consumer adaptability (Yang et al., 2022; Wang et al., 2023; Zhang et al., 2023). Researchers in developed countries have studied how the metaverse and AI enhance e-commerce customer experiences. Among the reviewed studies, eight were conducted in China, four in Singapore, three in India, three in South Korea, three in the United Kingdom, two in Germany, and two in the United States.

A clear research gap exists in understanding the impact of these immersive technologies in developing countries, where e-commerce is still a relatively young industry and in its early stages of growth (Chohan et al., 2024; Maksymyuk et al., 2022; Jim et al., 2023). Since most research has been conducted in Europe, few studies have focused on Asian and African regions. Notably, the majority of Asian studies have examined a variety of topics, including factors contributing to online engagement, types of internet users among older populations, their digital proficiency, and the use of digital technology in rural areas by older adults (Mu et al., 2024; Park et al., 2022).

### **6.3 Characteristics: Opportunities for further research in the future**

Business and marketing have undergone a technological revolution with the development of information technology. Most of the papers included in this research were published in 2022 and 2023, indicating a sustained focus on metaverse-based consumer engagement over recent years. E-commerce has become an indispensable practice for companies since around 1990, as it involves conducting commerce electronically (Kolotylo-Kulkarni et al., 2021; Kakaria, 2023). It is considered to offer more advantages than shopping in brick-and-mortar stores, particularly in terms of convenience, cost, time, and physical effort (Kolotylo-Kulkarni et al., 2021; Kakaria, 2023). There remains a need for the research community to explore new topics, scenarios, and features to gain a deeper understanding of the digital customer engagement process. Consequently, these developments will enable a better understanding of consumer behaviour in the future (Wang, 2021; Maden and Yücenur, 2024; Otoum et al., 2024).

### **6.4 Methodology: Perspectives on the course of future research**

Among the various approaches investigated, qualitative research methodology was used most frequently, with a total of eight articles. There is also a growing use of quantitative research methods in marketing and consumer behaviour studies, reflecting the widespread adoption of quantitative approaches. Additionally, there is a strong trend toward using conceptual research methodologies and literature review approaches. It is increasingly common for marketing researchers to employ multiple methodologies to triangulate findings and generate a more comprehensive understanding of the phenomenon under study, indicating a positive trend in methodological rigor. A wide variety of methods are

used in digital consumer interaction research, including focus groups, observations, experimental methods, and surveys. This diversity in methodology can lead to a more sophisticated and holistic understanding of the phenomena being investigated.

## **7. Implications, Limitations, and Future Research Directions**

### **7.1 Theoretical and Practical Implications**

By providing both theoretical insights and practical implications, this study extends existing knowledge of the metaverse and AI. In this paper, a conceptual framework is developed to help academics, business leaders, and practitioners understand the integration of these technologies within e-commerce. The study provides actionable insights for businesses and marketers seeking to enhance customer experiences and drive engagement by highlighting the rapidly evolving applications of the metaverse and AI in the e-commerce industry. Using these findings, e-commerce companies can prepare for the adoption of metaverse and AI technologies by revising their business strategies, systems, processes, and market offerings. Additionally, researchers can use the results to identify research gaps, generate future research questions, and explore innovative ways to apply the metaverse and AI for practical, customer-centric e-commerce solutions.

### **7.2 Limitations and Future Research Directions**

This study has several limitations. First, it selected a single electronic database, the Web of Science, due to its prominence in providing comprehensive coverage of academic literature on the metaverse, AI, and e-commerce. Future analyses could include other electronic databases to broaden the scope. Since articles were selected from only one source, some significant studies may have been excluded, which could further limit the research's coverage. Second, the study is based on a systematic literature review approach. Third, only 42 articles were considered for the review; future studies could increase the sample size and employ diverse methodologies to enhance the scope and robustness of their analyses. Fourth, this study focuses exclusively on the role of the metaverse and AI in enhancing e-commerce customer experiences. Future research should examine the potential applications of the metaverse and AI across different geographical and industry

contexts, using various research approaches. Additionally, studies could investigate other emerging technologies, such as machine learning, blockchain, and the Internet of Things. Future research should also explore and design scenarios assessing the implementation of the metaverse and AI in different industries. Potential research directions include themes such as intelligent metaverse, metaverse components, metaverse ecosystem, Artificial Intelligence of Things, virtual environment perceptions, and synthetic customer experiences, among others.

## **8. Conclusion**

The world of digital technology is highly disruptive, and various emerging technologies have drawn considerable attention in both academia and industry, particularly regarding the integration of AI and the metaverse. These technologies are seamlessly blending the physical and digital worlds, enhancing overall customer experiences across diverse industries and research disciplines (Al Khaldy et al., 2023; Gursoy et al., 2023; Pyae et al., 2023; Soliman et al., 2024). Scholars and researchers are exploring the numerous potential applications of the metaverse, alongside the rapid evolution of emerging technologies such as artificial intelligence, blockchain, and digital twins (Al Khaldy et al., 2023; Calandra et al., 2023b; Zhang et al., 2023; Soliman et al., 2024). With the metaverse's support, companies can interact seamlessly with customers in this disruptive digital environment by blending physical and virtual worlds using AI capabilities (Buhalis et al., 2023).

While challenges remain regarding technological limitations, customer digital adoption, and integration complexity, progress is being made rapidly. Despite its early stage, the metaverse is poised to revolutionize the service industry, particularly e-commerce. This shift has driven the digital transformation of business strategies, processes, business models, consumer norms, and marketing practices. Moreover, this study proposes a conceptual framework illustrating how and why the metaverse can significantly enhance e-commerce customer experiences, recommending that businesses and marketers explore emerging technologies such as the metaverse and AI to engage customers throughout digital journeys.

However, most prior research has focused on co-creating metaverse-based digital customer experiences in terms of engagement, rather than examining post-purchase experiences across diverse products and services (Gursoy et al., 2023). Future studies should investigate how the metaverse and AI influence customer experiences across different industries and geographical contexts.

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## Appendix

**Table 1A.** *Summary of the selected articles for the review.*

<b>S. No.</b>	<b>Source</b>	<b>Key constructs</b>	<b>Source Title</b>	<b>Theories (T)</b>	<b>Characteristics (C)-Research Theme</b>	<b>Context (C)-Geography</b>	<b>Methodology (M)</b>
<b>Environmental Category</b>							
1	Barta et al., (2023)	Telepresence in live-stream shopping	Electronic Markets	Theory of planned behaviour	Live-stream shopping	Spain	Quantitative
2	Kowalkowski et al., (2024)	Digital service innovation in B2B markets	Journal of Service Management	Conventional product innovation	Digital service innovation	Sweden	Conceptual
3	Wang et al., (023)	Fundamentals, Security, and Privacy of metaverse marketing	IEEE Communications Surveys and Tutorials	Game theory	Fundamentals, security, and privacy of metaverse	Chin	Literature Review

4	Yang et al., (2022)	Intelligent Healthcare Systems in the Metaverse, Artificial Intelligence, and Data Science Era	Journal of Organizational and End User Computing	N.A	Smart Health	China	Mixed Methods
5	Li et al., (2023)	Convergence of Physical and Cyber Worlds	IEEE Internet of Things Journal	N.A	Internet of Things meets Metaverse	Portugal	Literature Review
6	Huynh-The et al., (2023)	Artificial intelligence for the metaverse	Engineering Applications of Artificial Intelligence	N.A	Artificial Intelligence for the Metaverse	Vietnam	Literature Review
7	Wang et al., (2023)	Intelligent Metaverse Scene Content Construction	IEEE Access	Activity theory	Intelligent Metaverse	China	Literature Review
8	Schöbel and Leimeister, (2023)	Metaverse platform ecosystems	Electronic Markets	N.A	Metaverse platform ecosystems	Germany	Conceptual
9	Korbel et al., (2022)	Virtual 3D Asset Price Prediction Based on Machine Learning	Journal of Theoretical and Applied	N.A	Virtual 3D Model	Germany	Quantitative

			Electronic Commerce Research				
10	Li et al., (2023)	Toward Ubiquitous Semantic Metaverse: Challenges, Approaches, and Opportunities	IEEE Internet of Things Journal	N.A	Ubiquitous Semantic Metaverse	Portugal	Literature Review
11	Soliman et al., (2024)	Artificial intelligence powered Metaverse	Artificial Intelligence Review	N.A	Artificial intelligence powered Metaverse	Egypt	Literature Review
12	Wang et al., (2022)	Development of metaverse for intelligent healthcare	Nature Machine Intelligence	N.A	Metaverse for intelligent healthcare	United States of America	Qualitative
13	Murala et al., (2023)	MedMetaverse: Medical Care of Chronic Disease Patients and Managing Data Using Artificial Intelligence, Blockchain, and Wearable	IEEE Access	N.A	Smart Healthcare	India	Literature Review

		Devices State-of-the-Art Methodology					
14	Park et al., (2022)	AI-Enabled Grouping Bridgehead to Secure Penetration Topics of Metaverse	CMC- Computers Materials & Continua	N.A	Security and safety within the metaverse	South Korea	Qualitative
15	Mu et al., (2024)	Fashion intelligence in the Metaverse	Artificial Intelligence Review	N.A	Fashion intelligence in the Metaverse	China	Literature Review
<b>Social Category</b>							
16	Buhalis et al., (2023)	Metaverse as a driver for customer experience and value co-creation	International Journal of Contemporary Hospitality Management	Technology Acceptance Model (TAM)	Metaverse as a driver for customer experience	United Kingdom	Literature Review
17	Abilkaiyrkyzy et al., (2023)	Metaverse Key Requirements and Platforms Survey	IEEE Access	N.A	Metaverse key requirements	United Arab Emirates	Literature Review

18	Zhang et al., (2023)	Toward Green Metaverse Networking	IEEE Network	N.A	Green Metaverse Networking	Singapore	Qualitative
19	Al Khaldy et al., (2023)	Redefining E-Commerce Experience	International Journal on Semantic Web and Information Systems	N.A	E-Commerce Experience	Jordan	Literature Review
20	Nguyen and Voznak, (2024)	A Bibliometric Analysis of Technology in Digital Health Trends	IEEE Access	N.A	Technology in Digital Health	Vietnam	Literature Review
21	Nagao, (2023)	Virtual Reality Campuses as New Educational Metaverses	IEICE Transactions on Information and Systems	N.A	Educational Metaverses	Japan	Qualitative
22	Chengoden et al., (2023)	Metaverse for Healthcare	IEEE Access	N.A	Metaverse for Healthcare	India	Literature Review

23	Zhang et al., (2023)	Overview of the Integration of Communications, Sensing, Computing, and Storage as Enabling Technologies for the Metaverse over 6G Networks	Electronics	Game theory	Ubiquitous communications	China	Conceptual
24	Lim et al., (2023)	Realizing the Metaverse with Edge Intelligence	IEEE Wireless Communications	N.A	Metaverse architecture	Singapore	Qualitative
<b>Governance Category</b>							
25	Jim et al., (2023)	Advancements and Challenges in metaverse	IEEE Access	Game theory	Metaverse ecosystem	Bangladesh	Literature Review
26	Gursoy et al., (2023)	Metaverse in services marketing	Service Industries Journal	Dual coding theory	Metaverse in services marketing	United States of America	Conceptual
27	Park and Kim, (2022)	A Metaverse for Taxonomy, Components, Applications, and Open Challenges	IEEE Access	Theory of Mind	Metaverse components	South Korea	Literature Review

28	Guan and Morris, (2023)	Design Frameworks for Hyper-Connected Social XRI Immersive Metaverse Environments	IEEE Network	N.A	Immersive Metaverse Environments	Canada	Conceptual
29	Truong et al., (2023)	Blockchain Meets Metaverse and Digital Asset Management	IEEE Access	Prospect Theory	Blockchain Meets Metaverse	Canada	Literature Review
30	Xu et al., (2023)	A Full Dive Into Realizing the Edge-Enabled Metaverse: Visions, Enabling Technologies, and Challenges	IEEE Communications Surveys and Tutorials	Multi-attribute utility theory model	Metaverse architecture	Singapore	Literature Review
31	Chohan et al., (2024)	Sports fandom in the metaverse	Marketing Letters	Social identity theory	Sports fan engagement using Metaverse	South Africa	Conceptual
32	Maksymyuk et al., (2022)	Blockchain-Empowered Service Management for the Decentralized Metaverse of Things	IEEE Access	N.A	Blockchain and Metaverse	Ukraine	Qualitative

33	Cui and Liu, (2023)	Virtual Human: A Comprehensive Survey on Academic and Applications	IEEE Access	N.A	Virtual human	China	Literature Review
34	Golf-Papez et al., (2022)	Embracing falsity through the metaverse	Business Horizons	N.A	Synthetic customer experience in Metaverse	United Kingdom	Conceptual
35	Bansal et al., (2022)	Healthcare in Metaverse	IEEE Access	Theory of the reality-virtuality continuum	Healthcare in Metaverse	Singapore	Literature Review
36	Pyae et al., (2023)	Exploring User Experience and Usability in a Metaverse Learning Environment for Students	Electronics	N.A	Metaverse User Experience	Thailand	Mixed Methods
37	Paul et al., (2024)	A multidisciplinary perspective for digital transformation	International Journal of Consumer Studies	N.A	Digital transformation	United Kingdom	Literature Review

38	Bhat et al., (2023)	FinTech enablers, use cases, and role of future internet of things	Journal of King Saud University- Computer and Information Sciences	N.A	Financial Technology enablers	India	Literature Review
39	Wu et al., (2023)	Factors Affecting Avatar Customization Behavior in Virtual Environments	Electronics	Proteus effect theory	Virtual environment perception	China	Quantitative
40	Chen et al., (2024)	Avatar Migration in AIoT- Enabled Vehicular Metaverses With Trajectory Prediction	IEEE Internet of Things Journal	N.A	Artificial Intelligence of Things	China	Qualitative
41	Maeng et al., (2023)	Understanding Antecedents That Affect Customer Evaluations of Head-Mounted Display VR Devices through Text Mining and Deep Neural Network	Journal of Theoretical and Applied Electronic Commerce Research	Game theory	users' preference for Metaverse	South Korea	Mixed Methods

42	Peñaherrera-Pulla et al., (2022)	KQI Assessment of VR Services	IEEE Transactions on Network and Service Management	N.A	Virtual reality services	Spain	Qualitative
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**Source:** *Developed by authors*