

Bashar, Abu, Nyagadza, Brighton, Chuchu, Tinashe, Khan, Irfanullah and Alkadash, Tamer (2026) Research landscape structuring of customer experience (CX) in the metaverse: Evidence from a dual analytical approach using bibliometrics and topic modelling techniques. International Journal of Information Management Data Insights, 6 (2). p. 100440.

Downloaded from: <https://ray.yorks.ac.uk/id/eprint/15571/>

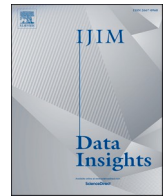
The version presented here may differ from the published version or version of record. If you intend to cite from the work you are advised to consult the publisher's version:
<https://doi.org/10.1016/j.jjime.2026.100440>

Research at York St John (RaY) is an institutional repository. It supports the principles of open access by making the research outputs of the University available in digital form. Copyright of the items stored in RaY reside with the authors and/or other copyright owners. Users may access full text items free of charge, and may download a copy for private study or non-commercial research. For further reuse terms, see licence terms governing individual outputs. [Institutional Repositories Policy Statement](#)

RaY

Research at the University of York St John

For more information please contact RaY at
ray@yorks.ac.uk



Research landscape structuring of customer experience (CX) in the metaverse: Evidence from a dual analytical approach using bibliometrics and topic modelling techniques

Abu Bashar^a, Brighton Nyagadza^{b,c,*}, Tinashe Chuchu^d, Irfanullah Khan^e,
Tamer Alkadash^a

^a Department of Media & Marketing Technology, College of Communication & Media Technologies, Gulf University, Sanad, Bahrain

^b Department of Business, Management & Health Studies, York St John University, London Campus, London, England, United Kingdom

^c Korea University Business School, Korea University, Seoul, South Korea

^d Division of Marketing, School of Business Sciences, University of the Witwatersrand, Johannesburg, South Africa

^e Department of Management Studies, Echelon Institute of Technology, Faridabad, India

ARTICLE INFO

JEL Code:

D83

M31

O33

Keywords:

Bibliometrics

Customer experience (CX)

Dual analysis

Latent dirichlet allocation (lda) metaverse

Topic modelling

ABSTRACT

The purpose of this research is to map the customer experience (CX) literature in the metaverse using a dual approach, bibliometric analysis and topic modelling. While both methods are individually known, their combined application to specifically isolate CX within metaverse research has been limited. Our objective is not to claim a breakthrough method but to offer a structured, reproducible synthesis of existing knowledge. We analysed 1460 peer-reviewed articles from the Scopus database using bibliometric techniques followed by Latent Dirichlet Allocation (LDA) topic modelling. The analysis revealed seven dominant themes: Customer Experience Enhancement, Brand Engagement & Virtual Services, Marketing Research Trends in CX, Digital Marketing Impact & NFT Adoption, AI-Driven Engagement & Mediation, Immersive Business & Value Creation, and Consumer Behavior in Virtual Retail. When interpreted collectively, these themes reveal three important patterns, a strong orientation toward positive outcomes, a notable silence on ethical and sustainability issues, and fragmentation between technical and psychological research streams. The findings call for the evolution of traditional CX frameworks to reflect immersive, co-created, and avatar-mediated experiences. Practitioners are encouraged to adopt customer-centric strategies that leverage AI, gamification, and virtual branding. The study also provides strategic guidance on where academic inquiry and innovation in CX design should be focused next.

1. Introduction

Commonly known as the customer's holistic and subjective response to direct and indirect brand interactions, customer experience (CX) involves emotional, cognitive, sensorial, and behavioural dimensions (Bashar et al., 2025; Nyagadza et al., 2025). Despite the rapid growth of the metaverse scholarship, existing review and bibliometric studies have highly applied vast strategic, technological or business centric perspectives. Customer experience (CX) has become a strategic imperative in marketing, digital transformation, and service innovation, reflecting a broader shift from product-centric to experience-centric value creation. For instance, Rejeb et al., 2023 came up with a comprehensive

systematic literature review of metaverse applications and challenges across various sectors, with customer-related elements treated as unified among many research themes. The increasing digitisation of customer touchpoints, accelerated by emerging technologies, has dramatically reshaped how experiences are designed and delivered across platforms (Maziriri et al., 2026). The emergence of the metaverse, an immersive, persistent, and socially interactive digital environment has introduced a new frontier for experience innovation. In the same vein, Li and Li (2024), their work was mainly aligned to technologies related to metaverse, architecture of platforms and emerging business models, which offers limited theorization specific constructs of customer experience (CX). Through enabling multisensory engagement, avatar-based

* Corresponding author.

E-mail addresses: dr.abu.bashar@gulfuniversity.edu.bh (A. Bashar), bnyagadza@yorksj.ac.uk (B. Nyagadza), tinashe.chuchu@wits.ac.za (T. Chuchu), tinashe.chuchu@wits.ac.za (I. Khan), dr.tamer.alkadash@gulfuniversity.edu.bh (T. Alkadash).

<https://doi.org/10.1016/j.jjimei.2026.100440>

Available online 21 August 2026

2667-0968/© 2026 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

interaction, and spatial immersion, the metaverse extends beyond conventional digital channels to offer synchronised and co-created experiences (Dwivedi et al., 2022; Mystakidis, 2022). In these environments, users are no longer passive recipients of content but active participants in branded virtual spaces, where identity, community, and interaction converge.

Recently, Piñeiro-Chousa et al., 2025 structured the overall intellectual map of the metaverse research using bibliometric techniques or methods but could not explicitly foreground customer experience (CX) at the heart of central lens of analysis. Building on the foundational framework of customer experience articulated by Lemon & Verhoef (2016), recent studies have begun to explore how immersive technologies reconfigure CX dynamics. For example, Orús et al. (2021) empirically demonstrate how virtual and augmented reality when optimally designed with high-fidelity content and embodied devices enhance perceptions of presence, ease of imagination, and visual appeal, ultimately influencing booking intentions. By systematically separating experiential dimensions such as trust, immersion, presence, engagement, and co-creation of value, the current study advances customer experience theory in immersive digital ecosystems and responds to calls for greater conceptual clarity and contextualization in the metaverse research. These findings reinforce the relevance of traditional customer experience (CX) constructs such as presence and sensory engagement in next-generation settings. This integration of classic and contemporary insights illustrates that while the core tenets of CX endure, they require re-contextualisation within digitally immersive ecosystems. In contrast, the current study places customer experience (CX) at the core of analysis and employs an integrated bibliometric and topic modelling approach to uncover the hidden thematic structure, temporal evolution and intellectual foundations of customer experience (CX) within the metaverse literature. Despite its potential, research on metaverse customer experience (MVCX) remains fragmented and conceptually diffuse. Current theoretical applications often draw from legacy models such as the Technology Acceptance Model (TAM), Flow Theory, and Service-Dominant (S-D) Logic (Davis, 1989; Vargo & Lusch, 2004; Novak et al., 2000). While valuable, these frameworks struggle to fully capture the complexities of metaverse interactions, including digital embodiment, co-presence, gamified storytelling, and virtual ownership (Dwivedi et al., 2022).

This study addresses these gaps by mapping the emerging research landscape of customer experience (CX) in the metaverse through a dual-method approach combining bibliometric analysis and topic modelling. Through identifying key theoretical streams, influential contributions, and emerging themes, this paper offers a systematic overview of how the MVCX domain is evolving. Furthermore, it surfaces research priorities, including the need for metaverse-specific measurement scales, integrative theoretical models, and interdisciplinary approaches grounded in sociology, psychology, and immersive design.

In doing so, this study contributes to both academic and managerial domains. Academically, it consolidates scattered literature to provide a coherent trajectory for future customer experience (CX) research in immersive spaces. Practically, it offers insights to organizations seeking to optimize brand presence and engagement strategies in virtual environments. As the metaverse continues to blur the boundaries between physical and digital realities, understanding the nuanced dynamics of MVCX is essential for sustaining customer loyalty, satisfaction, and long-term value creation. The study's theoretical framework is presented in the section that follows.

Despite the rapid growth of MVCX research, the existing literature remains conceptually fragmented. The methodologies applied are heterogeneous in nature and spanning diverse disciplines and theories. While prior reviews offer broad overviews, they provide limited insight into theoretical development. This necessitates a structured mapping that could identify underexplored thematic areas. Thus, this study does not claim to invent a new methodology. Instead, it applies a fairly standard dual analytical approach in a relatively underexplored

thematic context, customer experience within metaverse literature. The contribution is incremental but useful: we consolidate scattered literature, identify seven recurring themes, and offer a data-driven starting point for future scale development and theory testing.

2. Theoretical foundation of customer experience (CX) in the Metaverse

Despite the rapid proliferation of studies at the intersection of customer experience (CX) and the metaverse, the extant body of knowledge remains theoretically fragmented, methodologically limited, and insufficiently consolidated. CX has traditionally been conceptualized as a holistic, multidimensional construct encompassing cognitive, emotional, sensory and behavioural responses across customer journeys (Lemon & Verhoef, 2016; Verhoef et al., 2009; van de Sand et al., 2020). However, the change toward immersive, interactive, and persistent virtual environments fundamentally reconfigures these dimensions, introducing novel experiential attributes such as embodiment, synchronicity, and co-creation (Dwivedi et al., 2022; Mystakidis, 2022). Existing scholarship has yet to systematically capture these shifts within a unified analytical framework, resulting in a dispersed and conceptually incoherent research landscape.

Prior literature reviews, while informative, show three critical limitations. First, they are highly reductionist in scope, privileging isolated constructs such as engagement, immersion, or technology adoption, rather than interrogating CX as an integrative phenomenon within metaverse environments. Second, they rely predominantly on narrative or single-method approaches, thereby lacking the analytical rigor required to uncover latent structures, thematic evolution, and intellectual interconnectedness within the field of study. Third, they fail to reconcile competing theoretical perspectives, leading to the continued siloing of foundational frameworks. For instance, Service-Dominant Logic foregrounds value co-creation (Vargo & Lusch, 2004), while the Cognitive-Affective Model (Oliver, 1993), Flow Theory (Yang & Zhang, 2022), and Technology Acceptance Model (Davis, 1989) explain discrete aspects of experiential response and technology use. Presence and immersion theories (Slater, 2003) further illuminate virtual engagement, yet none sufficiently account for the complexity of avatar-mediated identity construction, social co-experience and hybrid value formation that characterize metaverse customer experience (MVCX) (Alexander et al., 2025; Gursoy et al., 2022). The absence of theoretical integration significantly constrains cumulative knowledge development.

This fragmentation is compounded by weak empirical grounding. A substantial proportion of MVCX research remains conceptual or exploratory, with limited efforts toward scale development or model validation. Empirical studies frequently rely on small samples, context-specific designs, or qualitative insights, thereby restricting generalisability and limiting their capacity to inform robust theory building. Consequently, there is a pronounced misalignment between the pace of technological advancement and the maturation of CX theory in immersive contexts.

In addition, critical dimensions shaping MVCX remain systematically under-theorised. In particular cases, issues of digital ethics, encompassing avatar identity, algorithmic surveillance, behavioural manipulation, and consent, are largely absent from dominant CX frameworks, despite their profound implications for trust, psychological safety, and perceived fairness. Similarly, sustainability concerns associated with blockchain infrastructures and non-fungible tokens (NFTs), including energy consumption and environmental externalities, are rarely incorporated into CX discourse, even as they increasingly influence consumer perceptions of brand authenticity and moral legitimacy. The omission of these dimensions reflects a broader failure to align CX theory with the socio-technical realities of the metaverse.

Against this backdrop, a rigorous and systematically structured review is not only warranted but necessary. By deploying a dual analytical approach that integrates bibliometric techniques with topic modelling,

this study transcends the limitations of prior reviews and enables a data driven examination of the intellectual architecture of MVCX research. This approach facilitates the identification of dominant research clusters, emergent themes, and underexplored domains, thereby offering a comprehensive and reproducible mapping of the field.

In doing so, the study advances CX scholarship in three important ways; it consolidates fragmented theoretical perspectives into a more coherent framework, incorporates neglected ethical and sustainability considerations, and establishes a foundation for future empirical and scale development. Ultimately, such an integrative effort is essential to ensure that CX theory remains analytically robust and contextually relevant in the face of ongoing metaverse-driven transformations (Dwivedi et al., 2022; Baroroh et al., 2023). Table 1 shows how Classical CX Theory is comprehended in immersive metaverse contexts.

The research methodology is outlined in the section that follows.

3. Research methodology

The methodological approach employed in this study is deliberately aligned with the thematic objectives of the research. Bibliometric analysis is used to identify influential works, intellectual clusters, and collaboration patterns. In this study it is helpful in defining the structural foundations of MVCX research. Further complementing this, topic modelling enables the systematic extraction of latent themes embedded within literature. It allows the identification of recurring conceptual parameters. Together, these methods ensure that the themes discussed in subsequent sections are directly derived from the structure of the literature itself and not imposed through subjective interpretation. A multimethod technique is adopted for this study; first bibliometric analysis is performed followed by topic modelling technique. Bibliometric analysis is one of the most applied technique to analyze large amount of academic literature to describe, the current scenario of research including best journals, authors, country, paper, affiliations etc. (Bashar et al., 2024; Wasiq et al., 2023). Topic modelling is a technique which utilizes unsupervised machine learning models to uncover the hidden semantic similarities in a large set of academic literature or any other text data (Rodrigues et al., 2021; Wasiq et al., 2024). It helps in deciphering the emerging topics, the most frequent words that further enables the deep understanding of the domain and subdomain of research filed (Bashar et al., 2023; Rabbani et al., 2022). Table 2 shows the research flow adopted for this study to gain a deeper insight into the customer experience dynamics on metaverse platforms.

Table 1
How Classical CX Theory Translates into Immersive Metaverse Contexts.

Conventional Theory	Relevance in Metaverse	Connection to our Analysis
Cognitive-Affective Model	Experience arises from thought emotion processes that are enhanced by immersion and sensory cues	It has been used to interpret themes associated with emotional engagement, virtual atmospherics, presence and satisfaction.
TAM (Davis, 1989)	Perceived usefulness and ease adoption which is extended by VR/AR usability	Has connection to LDA topics involving acceptance, engagement mechanisms as well as AI-driven interaction.
Flow Theory	Immersive, gamified environments encourage deep interactions.	It supports themes that involve topics like gamification, virtual tourism and player-like interaction.
Service-Dominant Logic	Value is co-created with consumers.	It explains topics on co-creation, virtual brand communities and VCRM.
Presence and Immersion Theory	Psychological being present underpins sensory CX.	Assists in interpreting bibliometric clusters on XR, VR and spatial experience design.

Source: Literature Review (2025).

Fig. 2 illustrates the data and methodology flow. The initial search in Scopus yielded 6538 documents. After applying inclusion and exclusion criteria (e.g., document type, language, thematic relevance), a final corpus of 1460 articles was used for both bibliometric analysis and the topic modelling. Scopus database is having large number of articles, conference papers, book chapters, editorial and short notes etc. (Głabska et al., 2021). It has been used by various social science researchers to extract data and perform bibliometric analysis to reveal the research paradigm in variety of domains (Hassan et al., 2023; Naeem et al., 2023; Singh & Bashar, 2023). The following keywords were searched from the Scopus search engine in TIT-KEY-ABS field "customer experience" OR "consumer experience" OR "user experience" OR "customer engagement" OR "customer journey" OR "brand experience") AND (metaverse OR "virtual reality" OR "augmented reality" OR "immersive environment" OR "extended reality" OR "mixed reality"). The data extraction from Scopus was conducted on April 12, 2025. The search query returned a total of 6538 documents published between 2000 and 2025; the data was extracted in .CSV format to proceed further. Next, we screened the data using various inclusion criteria like we have considered only articles other article types such as conference papers, review papers, book chapters short notes etc. were excluded, it counted as 1261 documents that made the data set to 5277. The data set further screened for languages, 48 documents written in other than English language were removed.

The final screening stage ensured thematic relevance to customer experience (CX) within a metaverse context. Two authors independently reviewed the title and abstract of the remaining 5277 documents. Documents were excluded if their primary focus fell into one of the following categories, even if they mentioned VR/AR or metaverse-related terms:

- (1) Purely technical engineering or computer science contributions with no explicit consumer, customer, or business application. Examples include papers on VR rendering algorithms, latency optimization for head-mounted displays, or network protocols for virtual environments where the end-user is a developer or engineer, not a customer.
- (2) Clinical or medical simulations and therapies where the user is a patient or medical trainee, and the outcome is health-related rather than consumption-related. Examples include VR-based surgical training, exposure therapy for phobias, or rehabilitation exercises using AR.
- (3) Agricultural, industrial, or manufacturing simulations where the focus is on operational efficiency, machine maintenance, or worker safety, with no customer-facing or retail application. Examples include VR training for factory assembly line workers or AR tools for agricultural equipment repair.

The boundary between 'technical' and 'customer-facing' can sometimes be blurred. To maintain consistency, we adopted a conservative rule: if a paper did not explicitly mention a customer, consumer, shopper, or brand interaction in its title, abstract, or keywords, it was excluded. Using this rule, 3769 documents were removed from consideration. Table 2A (see below) provides few examples of excluded papers and the reasons for their exclusion.

To ensure reliability of the screening process, two authors independently reviewed the titles and abstracts of all 5277 remaining documents. Each author classified each document as 'include' or 'exclude' based on the criteria above. Inter-rater agreement was assessed using Cohen's κ, calculated as follows:

- Observed agreement (Po) = number of documents where both authors agreed ÷ total documents.
- Chance agreement (Pe) = probability of random agreement based on marginal totals.

Table 2

Stage, process, criteria and exclusion/inclusion.

Stage	Process	Criteria / Actions	Included	Excluded
1. Identification	Data Extraction	Source: Scopus - Query using keywords combination - Fields: Title-Abstract-Keywords (TIT-KEY-ABS) - Period: 2000–2025	6538 record	–
2. Screening	Document Type Filter	- Included: Peer-reviewed journal articles - Excluded: Reviews, conference papers, book chapters, editorials	5277 record	1261 records
3. Eligibility	Language Filter	- Included: English-only publications - Removed non-English articles	5229 record	48 records
4. Thematic Screening	Title/Abstract Review	- Removed off-topic documents (e.g., medicine, agriculture, engineering) based on manual relevance review	1460 record	3769 records
5. Descriptive Bibliometric Analysis	SciNetopy (Python-based)	- Analyzed trends, citation patterns, productive authors, source impact	–	–
6. Topic Modeling	Text Preprocessing & LDA	- Stopword & punctuation removal - Tokenization & Lemmatization - DTM or TF-IDF matrix creation - Latent Dirichlet Allocation (LDA) - Coherence score optimization	–	–

Table 2: Data and Methodology Flow Diagram.

Source: Literature Review (2025).

Table 2A

Example of Few Excluded Papers with Reason.

Example Excluded Paper	Reason for Exclusion
"A novel rendering algorithm for real-time VR environments"	Purely technical – no customer or consumer mentioned
"VR-based surgical training for medical residents"	Medical simulation – patient/trainee, not customer
"AR-assisted maintenance for agricultural machinery"	Industrial/agricultural – no retail or consumer context
"Latency reduction in cloud-rendered virtual worlds"	Technical infrastructure – no CX dimension
"Exposure therapy for anxiety using immersive VR"	Clinical/therapeutic – health outcome, not consumption

Note: These are illustrative examples based on common paper types in the initial corpus. Actual excluded paper titles are not reproduced here due to space, but the full list is available from the authors on request.

$$* - \kappa = (Po - Pe) / (1 - Pe)$$

The calculated κ value was 0.87, indicating 'strong agreement' according to conventional benchmarks (Landis & Koch, 1977).

For documents where the two authors disagreed (approximately 6% of the sample, or 317 documents), disagreements were resolved through discussion between the two authors. In cases where consensus could not be reached (<1% of the sample), a third author served as an arbitrator. This process ensured that the final corpus of 1460 articles was centrally focused on the research domain, mitigating selection bias.

We conducted descriptive data analysis using Scinetopy a comprehensive software package built on python for scientific data mapping. It offer state of the art platform to analyze large bibliometric data and obtain results in tabular & graphics forms (Ahmad et al., 2024; Rabbani et al., 2021).

The topic modelling was performed using LDA (Latent Dirichlet Allocation) technique, it is probabilistic generative model that is widely used for discovering & revealing topics from a large amount of textual data. We have used LDA analysis to identify the underlying thematic structures within the academic literature on customer experience in the metaverse. LDA is a generative probabilistic topic modeling technique. LDA was chosen due to its capability to uncover latent semantic patterns across large text data in an unsupervised manner. The dataset, comprising 1460 peer-reviewed articles was preprocessed by removing stopwords, punctuation, and numerical data. Text preprocessing was conducted using the Natural Language Toolkit (NLTK) library in Python to ensure reproducibility. The steps included: (1) converting all text to lowercase; (2) removing standard English stopwords (NLTK list) and

custom stopwords (e.g., 'article', 'study', 'result'); (3) removing punctuation and numerical characters; (4) tokenizing text into unigrams; and (5) lemmatizing tokens to their dictionary base form using NLTK's WordNetLemmatizer. The following steps further explain the steps used in the preprocessing of data.

First, in addition to the standard NLTK stopwords list, we added the following custom stopwords because they appeared frequently but carried little semantic value for topic identification: 'study', 'paper', 'article', 'research', 'findings', 'analysis', 'result', 'approach', 'methodology', 'conclusion', 'discussion', 'limitation', 'future', 'direction'.

Second, we did not use bigrams or trigrams in the final model. While phrases like 'virtual reality' and 'customer experience' are conceptually important, our preliminary testing showed that including bigrams increased topic redundancy without improving coherence scores. The single terms 'virtual', 'reality', 'customer', and 'experience' captured the same semantic information effectively in our corpus. We acknowledge this as a design choice and note that future research could experiment with n-gram inclusion.

Third, hyphenated terms (e.g., 'co-creation', 'self-service', 'real-time') were split at the hyphen during tokenization (treated as separate tokens). This is the default behaviour of NLTK's word_tokenize function. Domain-specific jargon such as 'NFT', 'VR', 'AR', 'XR', and 'AI' were retained as single tokens because they are commonly used in their abbreviated form in the literature and lemmatization does not apply to them.

This standardized the corpus prior to constructing the document-term matrix for LDA. Next, a document-term matrix was constructed, and the optimal number of topics was determined through coherence score analysis. The LDA model was implemented using the Gensim library in Python. Each topic was interpreted based on its top-weighted terms, and the results were visualized using pyLDAvis to enhance interpretability.

To make the labeling of the topic we followed the following process, we moved from top-weighted terms to the final theme name. For Topic 1 the following steps followed:

Step 1: Top 10 terms from LDA output; *customer, experience, virtual, engagement, immersive, personalization, journey, gamification, emotion, satisfaction.*

Step 2: Intermediate phrase; *How customers feel and interact in immersive virtual settings across their journey'*

Step 3: Final theme label after author discussion; *Customer Experience Enhancement'.*

The above labeling results in a broad topic name, as the purpose is not to invent a category but to create a label that is representative to the

term cluster and reproducible. The same three-step process was followed for all seven topics. However, we also accept that some subjectivity remains as it is a limitation of any qualitative interpretation of LDA output.

4. Results and analysis

The themes presented in this section emerge directly from the bibliometric and topic-modelling analyses. The dominant and emerging trends within the MVCX domain are clear. Results also show that generic themes are aligned and mapping with parallel emerging theoretical synthesis.

4.1. Data characteristics

Table 3 shows an overview of the main information about data covering 25 years of timespan 2000–2025. A total of 509 journals, books, and conference proceedings found to be contributing to the topic.

The dataset contains 1460 published articles that show substantial work on various aspects of customer experience in the metaverse world. The annual growth rate of 22.78% indicates a fast and growing interest in the subject of customer dynamics in the virtual world. The average document age of 2.89 years shows that most of the research studies in this field are very recent and published over a couple of years. With an average of 34.09 citations per document, the research in this area shows significant academic impact which clearly indicates that each article has been cited over 34 times on an average. Also, the total of 104,883 references across all documents shows strong theoretical and empirical foundation. Over 3900 authors contributing to nearly 1500 journal articles show that this research domain is collaborative. On average, as shown in Fig. 1, each publication has more than three co-authors, and 38.22% of papers have international collaborations.

Fig. 1 shows annual trends from 2000 to 2025. The notable dip in publications and citations for 2025 is due to the cut-off date of data extraction (April 12, 2025), as the year was incomplete at the time of analysis. The data shows the evolution of academic interest during the past two decades. From 2000 to 2010, the average publication output was <10 per year. The total number of citations were 321, 268, and 131 in the years 2000, 2004, and 2005 respectively which shows significant attention towards this field, apparently few papers were used as foundational concepts for further research during these years. After 2019, publications jumped from 55 to 216, and citations reached 424 in 2024. An increase in publication between 2011 and 2018 shows growing academic interest in this field. This suggests a major shift in academic engagement and influence. A temporary drop in both publications (2) and citations (169) can be observed in 2025 due to partial data available for the year at the time of analysis. More publications and citations are expected to be recorded with time.

Table 3
Main information about data.

Description	Results
Timespan	2000:2025
Sources (Journals, Books, etc.)	509
Documents	1460
Annual Growth Rate %	22.78
Document Average Age	2.89
Average citations per doc	34.09
References	104,883
Keywords Plus (ID)	2715
Author's Keywords (DE)	4337
Authors	3938
Authors of single-authored docs	114
Single-authored docs	119
Co-Authors per Doc	3.44
International co-authorships %	38.22
Article	1460

Source: Authors' conception (2025).

4.2. The prolific authors

Fig. 2 presents the total number of publications by key authors in the field of immersive technologies and customer-focused research, highlighting the proportion of work published in the years 2023–2024 (orange) versus earlier contributions (blue). Rather R.A. emerges as the most prolific and currently active author, with 69% of their publications appearing in the recent period. Similarly, Khan I. and Park J. demonstrate a high concentration of recent output (70% and 80% respectively), signifying their strong contemporary research presence. In contrast, authors like de Ruyter K. and Chylinski M. show no recent publications, suggesting a past focus in the domain.

4.3. Influential journals

Fig. 3 shows leading journals by publication volume and recent research activity (2023–2024) contributing to the research domain of immersive technologies and customer experience. Journals such as the International Journal of Contemporary Hospitality Management (73%), Psychology and Marketing (61%), and Sustainability (Switzerland) (51%) demonstrate significant recent contributions. Journals like IEEE Access show lower recent activity, suggesting a broader or shifting thematic focus. This distribution helps identify high-impact publication venues currently shaping discourse in this research area.

4.4. Most contributing countries

Fig. 4 illustrates the country-wise distribution of publications and recency of research output (before 2023 vs. 2023–2024). It presents the total number of publications from the top contributing countries in the domain of immersive technologies and customer-related research, segmented by publication period. The orange segment denotes the percentage of documents published in 2023–2024, while the blue segment represents earlier contributions. The chart shows that the United States leading in total publications initially has dropped recently (46%). It suggests early dominance in the field. However, recently India (70%), Malaysia (65%), and South Korea (57%) have published a significant number of documents.

4.5. Keywords C-occurrence

Fig. 5 provides the most frequently occurring keywords and their evolution in the scholarly literature on CX in the metaverse. The chart ranks the top keywords based on the total number of documents in which they appear. The most prominent keyword is “customer experience”, appearing in over 110 documents. This highlights a strong scholarly focus on immersive environments, overall perception and satisfaction of consumers. Closely related terms “Augmented reality”, “Virtual reality”, and “Artificial intelligence” show research interest in the technologies that enable immersive and interactive experiences. These technologies form the backbone of experiential transformation in digital marketing and customer interaction frameworks. The increased use of keyword “metaverse” along with “customer engagement”, “customer satisfaction”, and “purchase intention” shows the psychological and behavioral aspects are being studied to understand impact on user attitudes, emotional involvement, and decision-making.

4.6. Topic modelling using LDA

To determine the optimal number of topics for the LDA model, a coherence score analysis was conducted using a range of topic numbers ($k = 2$ to 10) using python Jupyter notebook. It is a widely used method to find out the optimal number of topics in a dataset (Villarreal Ordenes & Silipo, 2021). The plot of coherence scores and number of topics are depicted in Fig. 6. The model with the highest coherence scores 0.567 was selected, that corresponds to 7 distinct topics in the research domain

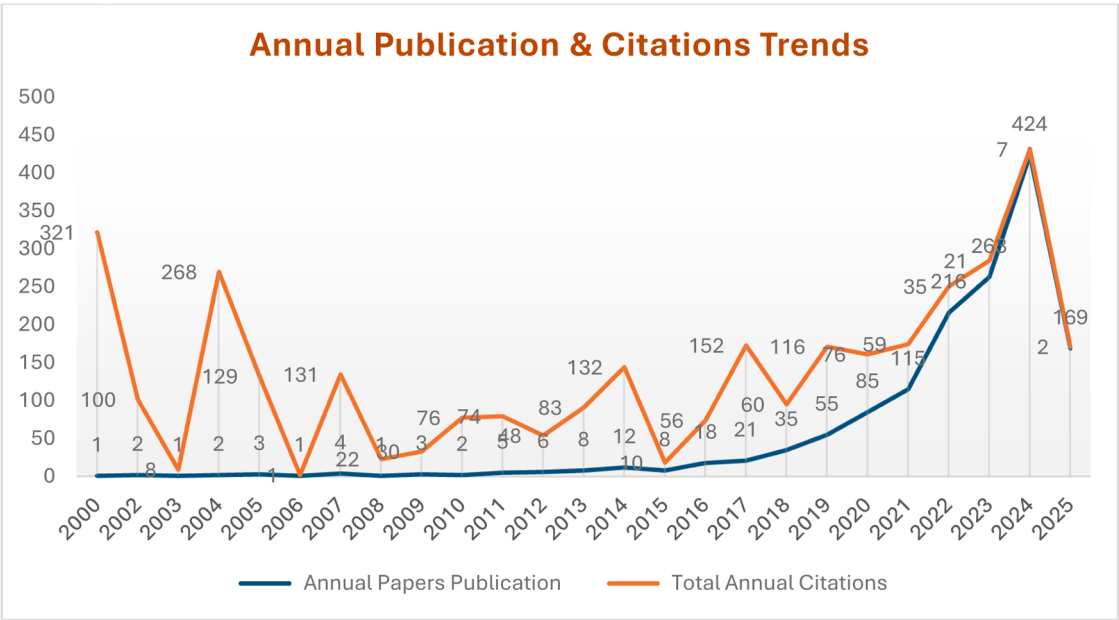


Fig. 1. Annual publications and citations.
Source: Authors' conception (2025).

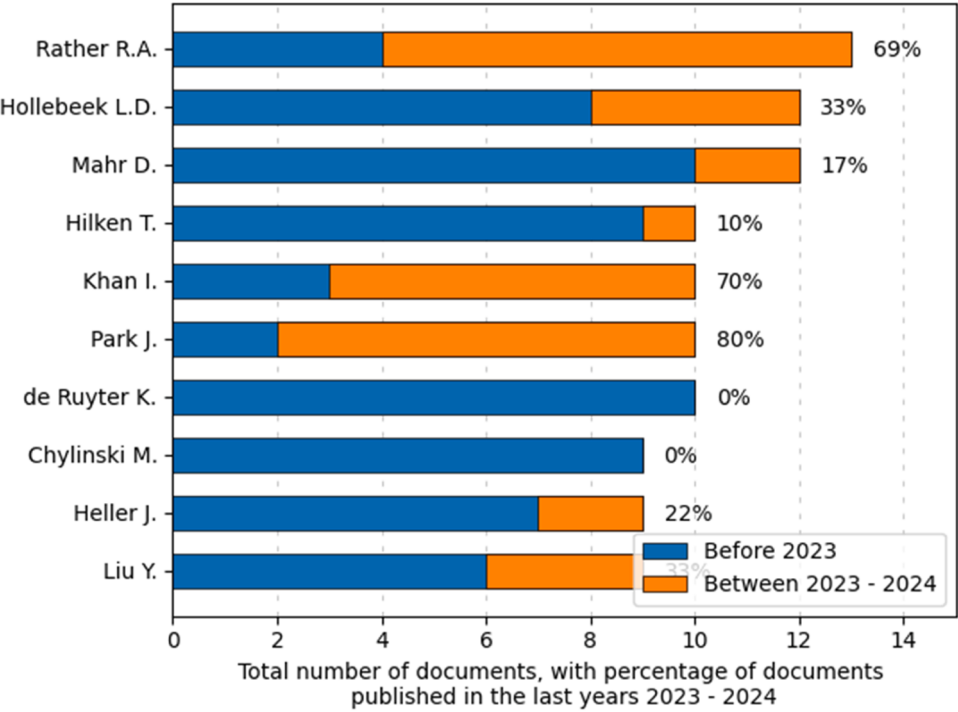


Fig. 2. 10 Most Contributing authors.
Source: Authors' conception (2025).

of customer experience in metaverse.

Beyond the overall coherence score used to select the optimal number of topics ($k = 7$), we also examined topic-wise coherence scores to assess the internal consistency of each individual topic. Topic-wise coherence was calculated using the `coherence_model_lda` function in Gensim, based on the 'c_v' method. The results were as follows:

- Topic 1 (Customer Experience Enhancement): 0.58.
- Topic 2 (Brand Engagement & Virtual Services): 0.55.

- Topic 3 (Marketing Research Trends in CX): 0.52.
- Topic 4 (Digital Marketing Impact & NFT Adoption): 0.49.
- Topic 5 (AI-Driven Engagement & Mediation): 0.53.
- Topic 6 (Immersive Business & Value Creation): 0.48.
- Topic 7 (Consumer Behavior in Virtual Retail): 0.54.

Scores above 0.50 are generally considered acceptable in social science LDA applications. Topics 4 and 6 showed slightly lower coherence, which is not surprising given that NFT and value creation research is



Fig. 3. Top contributing journals.
Source: Authors' conception (2025).

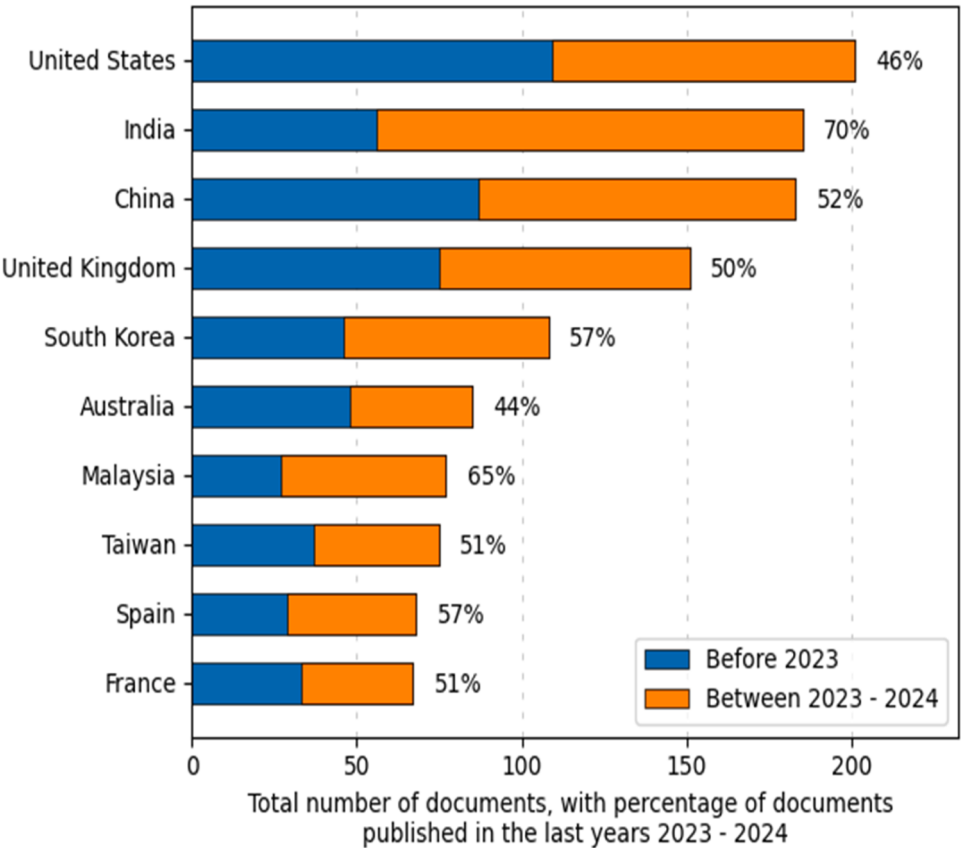


Fig. 4. Contribution of countries in the research domain of CX on Metaverse.
Source: Authors' conception (2025).

relatively newer and more fragmented compared to established themes like customer experience enhancement.

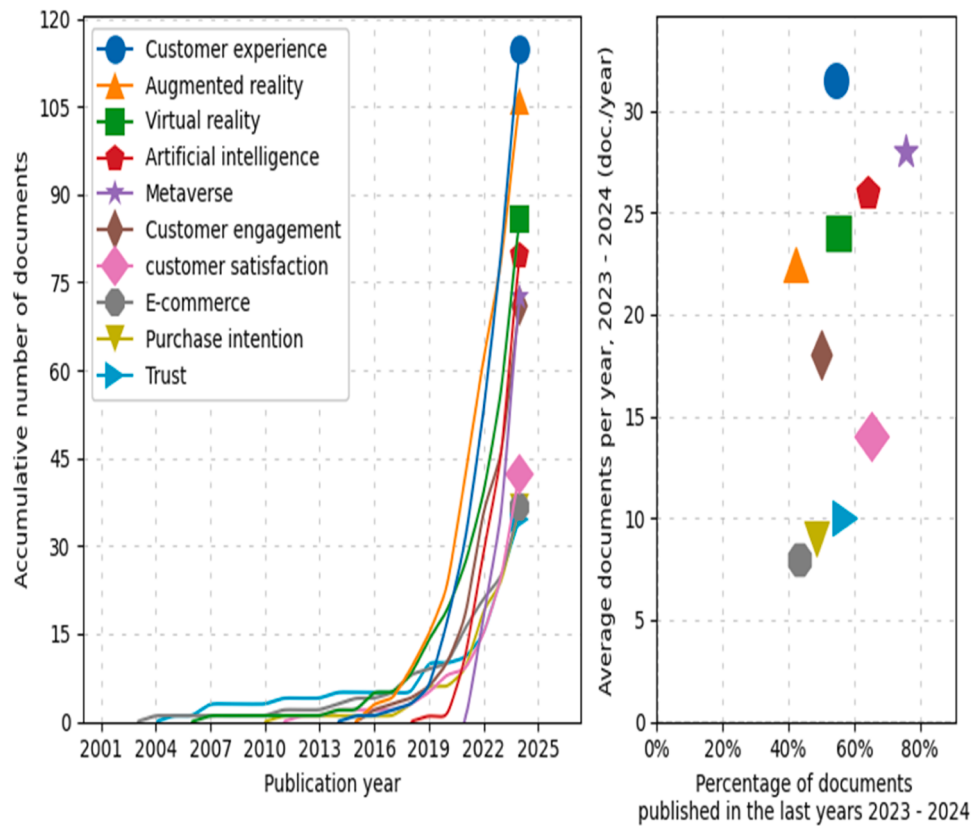


Fig. 5. Keywords and its evolution over time.
Source: Authors' conception (2025).

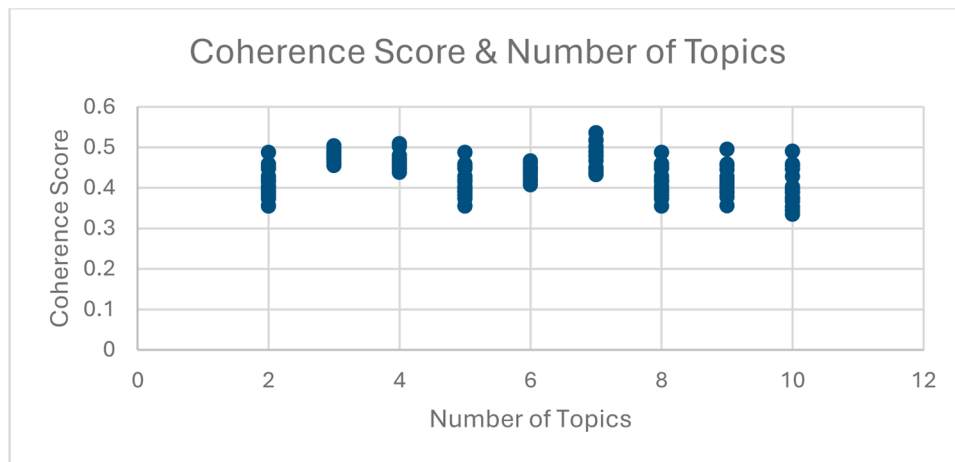


Fig. 6. Coherence score and number of topics.
Source: Authors' conception (2025).

4.7. LDA topic modelling visualization

The output of LDA topic modelling is represented in Fig. 7. It is evident that there are 7 distinct topics in the research landscape of customer experience dynamics on the virtual platforms. Each circle in the figure represents a topic, the size of the circle shows the prevalence of that topic across the whole dataset. The semantic similarity among topics can be understood by looking at the distance between the circles. There are more semantic similarities if the circles are closer to each other. The topics 1 & 2 overlap are overlapping that show that they share various common themes and words. The topic 4 and 6 are very far and

that shows they are very distinct from each other and other topics of the model.

The right panel shows the top 30 terms most relevant to Topic 1, which represents 21.5% of all tokens. The frequency within the topic is represented by red bar while overall frequency of a term in the entire corpus is represented by blue bar. It is evident that words like “customer,” “experience,” “product,” and “engagement” are highly relevant and specific to Topic 1. The other terms which are at the bottom are less relevant to the topic. The λ -slider at the right top is used for relevance matrix, if $\lambda = 1$ (default), it ranks and presents terms purely by their frequency within the topic. If $\lambda < 1$, it gives more weight to how

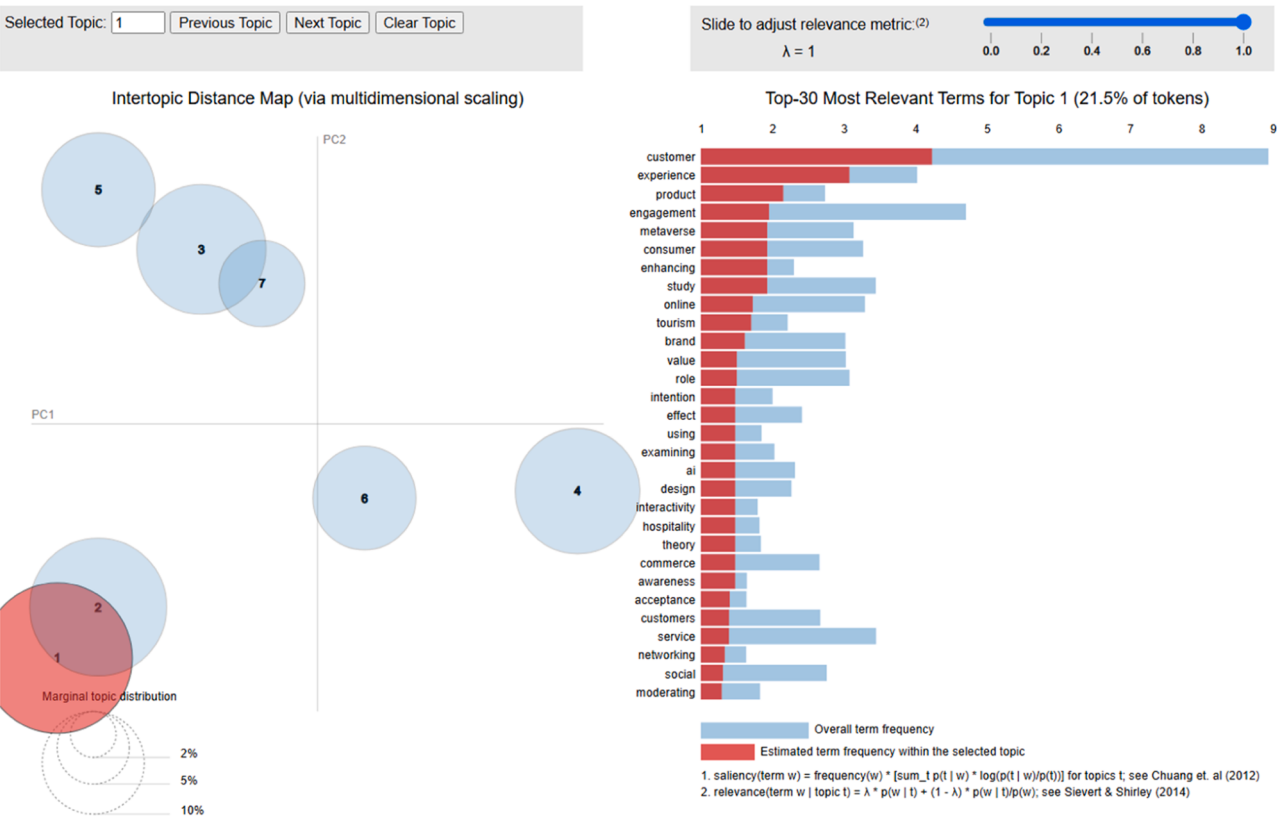


Fig. 7. Visualization of LDA Topic Modelling Output.
Source: Authors' conception (2025).

exclusive a word is to that topic. The seven-topic LDA model was interpreted and labeled through a structured, two-stage process to enhance validity. First, the top 30 highest-weighted terms for each topic, along with the 10 most representative paper titles (based on topic probability), were extracted. Two authors independently proposed descriptive labels based on this combined evidence. Second, these proposed labels were discussed and refined in consensus meetings, ensuring they accurately reflected the semantic core of each topic's term distribution and representative literature. While future work could employ formal expert surveys, this systematic, multi-evidence approach provides a robust and defensible thematic mapping. Based on their weights and semantic similarity we have named the topics as Topic 1 – Customer Experience Enhancement, Topic 2 – Brand Engagement & Virtual Services, Topic 3 – Marketing Research Trends in Customer Experience, Topic 4 – Digital Marketing Impact & NFT Adoption, Topic 5 – AI-Driven Engagement & Mediation, Topic 6 – Immersive Business & Value Creation, Topic 7 – Consumer Behavior in Virtual Retail. These topics were used for further processing throughout the analysis.

An analysis of document length confirmed the corpus contained sufficient lexical density for robust topic modeling. A reader might look at labels like 'Customer Experience Enhancement' or 'Brand Engagement & Virtual Services' and think it is obvious and known. The application of LDA here is not in discovering new themes, but it is in confirming that these broad areas do indeed dominate the literature, and in showing their relative prevalence (e.g., Topic 1 covering 21.5% of tokens) from a large corpus. The novelty lies not in the label names but in the empirical basis for saying these themes exist and in seeing which themes overlap (Topic 1 and 2) and which are distant (Topic 4 and 6).

4.7.1. Critical reflection on topic overlap

In the LDA visualization (Fig. 7) Topics 1 and 2 seemingly overlapping, however, this overlap reflects conceptual closeness, not

redundancy. Both topics are built on shared experiences based on common terms like engagement, virtual, and interaction. Looking closer at related literature shows a clear difference between them. Topic 1 is customer-centric emphasizing over satisfaction, personalization, and emotional engagement during customer journey. In contrast, Topic 2 is firm-centric based on strategic tools like brand storytelling, virtual relationship management, and service co-creation. This overlap shows two complementary perspectives on the same phenomenon. Experience as perceived by customers (Topic 1) and experience as designed and managed by firms (Topic 2). Rather than merging them into a single theme, we retain this distinction to preserve analytical clarity between experiential outcomes and managerial processes. This interpretation is consistent with prior CX literature.

4.8. Dominant research themes

The LDA analysis revealed seven dominant themes structuring the research landscape. Each is discussed below, supported by its defining keywords and associated sub-topics.

4.8.1. Customer experience enhancement

This dominant theme in Table 4 centers on leveraging the meta-verse's immersive capabilities such as virtual reality (VR), augmented reality (AR), and spatial computing to fundamentally redesign and elevate customer experiences. Research here moves beyond transactional efficiency to explore personalized virtual journeys, gamified interactions, and emotional engagement, positing the metaverse as a platform for creating deeper, more memorable, and sensorially rich customer value that transcends traditional digital touchpoints. The top 10 terms for this topic were: customer, experience, virtual, engagement, immersive, personalization, journey, gamification, emotion, satisfaction.

Table 4

Topic 1 Sub-Topics.

Main Topic	Sub-Topic	Citations
Customer Experience Enhancement	Personalized Virtual Experiences	(Ashley & Tuten, 2015; Huang & Rust, 2021)
	Customer Journey Mapping in Metaverse	(Anderl et al., 2016; Sriharan et al., 2019)
	Gamification in Enhancing Engagement	(Beck et al., 2022; Hoffman et al., 2022)
	Virtual Tourism Experiences	(Beck et al., 2022; Chevet, 2018)
	Digital Twin Integration in CX	(Anderl et al., 2016; Baxendale et al., 2015)
	Consumer Empowerment through Customization	(Kugler, 2021)
	Omnichannel Experience Consistency	(Baxendale et al., 2015)
	Emotional Engagement in Virtual Settings	(Chevet, 2018)

Source: Literature Review (2025).

4.8.2. Brand engagement and virtual services

This topic examines in Table 5 the transformation of brand-consumer relationships within persistent virtual environments. It focuses on strategies for immersive brand storytelling, avatar-mediated interactions, and the co-creation of virtual services. The core inquiry revolves around building trust, fostering loyalty, and managing customer relationships (VCRM) in contexts where brand presence is experiential and participatory rather than static or merely promotional. The top 10 terms for this topic were: brand, virtual, service, storytelling, avatar, trust, loyalty, community, co-creation, relationship.

4.8.3. Marketing research trends in CX

This stream captures in Table 6 the methodological and conceptual evolution of customer experience research itself in response to virtual environments. It encompasses bibliometric analyses, systematic literature reviews, and the development of new metrics and models tailored to measure CX in immersive settings. This theme reflects the field's self-awareness and its efforts to establish a rigorous, theory-informed foundation for studying metaverse-based customer interactions. The top 10 terms for this topic were: bibliometric, review, literature, trend, model, metric, acceptance, touchpoint, analysis, framework.

4.8.4. Digital marketing impact and NFT adoption

This emerging theme in Table 7 investigates the convergence of marketing, blockchain technology, and virtual ownership. It explores how Non-Fungible Tokens (NFTs) and digital assets are being used to

Table 5

Topic 2 Sub-Topics.

Main Topic	Sub-Topic	Citations
Brand Engagement and Virtual Services	Immersive Brand Storytelling	(Wang et al., 2025)
	Virtual Service Co-creation	(Sreejesh & Ghosh, 2025)
	Trust-building in Virtual Commerce	(Ashley & Tuten, 2015)
	Virtual Customer Relationship Management (VCRM)	(Sreejesh & Ghosh, 2025; Wang et al., 2025)
	Influencer and Avatar Marketing	(Ashley & Tuten, 2015; Wang et al., 2025)
	Cross-platform Brand Consistency	(Wang et al., 2025; Xia & Shannon, 2025)
	Customer Participation and Brand Loyalty	(Ashley & Tuten, 2015)
	Service Experience Innovation	(Baxendale et al., 2015; Mz et al., 2025)

Source: Literature Review (2025).

Table 6

Topic 3 Sub-Topics.

Main Topic	Sub-Topic	Citations
Marketing Research Trends in CX	Systematic Reviews on CX in Virtual Contexts	(Anderl et al., 2016; Ashley & Tuten, 2015)
	Bibliometric Analyses of CX Literature	(Baxendale et al., 2015; Beck et al., 2022; Chevet, 2018)
	Evolution of Marketing Models in Virtual Environments	(Dowling, 2022)
	CX Metrics and Measurement in Immersive Settings	(Chevet, 2018)
	Technology Acceptance Studies in Metaverse	(Hoffman et al., 2022; Kugler, 2021)
	Customer Touchpoints in Digital Experience Research	(Baxendale et al., 2015)
	Content Analysis of CX-related Marketing Communications	(Bassiouni & Meshreki, 2025; Xu et al., 2025)

Source: Literature Review (2025).

Table 7

Topic 4 Sub-Topics.

Main Topic	Sub-Topic	Citations
Digital Marketing Impact and NFT Adoption	Perceived Value and Ownership in NFTs	(Ra et al., 2024)
	NFTs and Brand Identity Formation	
	Digital Scarcity and Exclusivity Marketing	(Mr et al., 2025)
	Influencer Use of NFTs	(Deventer et al., 2024)
	Customer Loyalty through Tokenized Assets	(Sung et al., 2023; Wang et al., 2023)
	Advertising Strategies in NFT Ecosystems	(Deventer et al., 2024)
	Consumer Psychology in Digital Asset Use	(Kugler, 2021)

Source: Literature Review (2025).

create perceived value, exclusivity, and novel forms of customer loyalty within metaverse economies. Research delves into consumer psychology related to digital ownership and the role of NFTs in reshaping brand identity and advertising strategies in decentralized virtual spaces. The top 10 terms for this topic were: NFT, blockchain, digital asset, ownership, token, loyalty, scarcity, influencer, advertising, value.

4.8.5. AI-Driven engagement and mediation

This topic in Table 8 highlights the critical role of artificial intelligence as the enabling infrastructure for personalized and scalable experiences in the metaverse. It covers AI-powered personalization, conversational agents (chatbots), sentiment analysis, and ethical mediation. The focus is on how intelligent systems can facilitate real-time adaptation, service delivery, and conflict resolution, making vast and complex virtual environments navigable and responsive to individual

Table 8

Topic 5 Sub-Topics.

Main Topic	Sub-Topic	Citations
AI-Driven Engagement and Mediation	AI-powered Personalization in CX	(Bedenk, 2023)
	Ethical Considerations in AI-mediated CX	(Baek, 2023)
	Chatbots and Conversational Agents in Engagement	
	Sentiment and Emotion Detection via AI	(Bedenk, 2023)
	Moderation and Conflict Resolution via AI	(Kaur et al., 2022)
	AI-enhanced Customer Feedback Systems	(Bilgihan & Ricci, 2024)

Source: Literature Review (2025).

customer needs. The top 10 terms for this topic were: AI, artificial intelligence, chatbot, personalization, sentiment, algorithm, ethics, mediation, feedback, automation.

4.8.6. Immersive business and value creation

This theme in Table 9 shifts the lens from experience design to business model innovation, examining how value is captured and monetized within virtual economies. It explores new revenue models, the integration of Extended Reality (XR) in smart retail, and case studies of immersive branding. The research asks how businesses can build sustainable and profitable ventures by leveraging the unique commercial and co-creative opportunities presented by the metaverse. The top 10 terms for this topic were: value, co-creation, business model, revenue, XR, smart retail, monetization, ecosystem, platform, innovation.

4.8.7. Consumer behavior in virtual retail

This cluster in Table 10 focuses on the micro-level analysis of consumer decision-making processes within virtual retail settings. It investigates how virtual store atmospherics, social influence, peer reviews, and security concerns impact phenomena like impulse buying, trust, and cross-device shopping behavior. The topic seeks to translate fundamental principles of consumer psychology into the context of augmented and virtual commerce environments. The top 10 terms for this topic were: consumer, behavior, virtual retail, impulse, trust, security, atmospherics, social influence, decision-making, cross-device.

The following sections address the theoretical and practical implications, limitations and future research directions of the current research study.

4.9. Integrating bibliometric and topic modelling insights

The bibliometric analysis and LDA topic modelling were initially presented sequentially. However, their combined interpretation provides deeper insights and therefore we integrated the findings from these two methods. While examining the most prolific authors (Fig. 2), it was evident that highly productive scholars are focused on specific thematic areas rather than the entire domain. For example, the recent authors are activity associated with Topics 1 and 2 related to customer experience enhancement and brand engagement. This suggests the recent research is mostly driven by experience and engagement, while technical areas (like Topics 4 and 6) are more niche and fragmented. Also, comparing leading journals (Fig. 3) with LDA topics shows clear publication patterns. For example, journals like “Psychology & Marketing” and “International Journal of Contemporary Hospitality Management” are distinctively focused on consumer-centricity (Topics 1, 2, and 7). The other technological and interdisciplinary journals tend to publish work on newer, technical themes like Topic 4 (NFT adoption) and Topic 6 (immersive business models). This suggests a segmentation of the knowledge produced aligned with different perspectives. The geographical analysis (Fig. 4) also complements topic modelling results. The emerging research are in the countries like India, Malaysia, and

Table 9
Topic 6 Sub-Topics.

Main Topic	Sub-Topic	Citations
Immersive Business and Value Creation	Immersive Customer Value Co-creation	(Bedenk, 2023)
	Smart Retail and XR Integration	
	Business Model Innovation in Virtual Economies	(Ario et al., 2022)
	Revenue Models in Metaverse Commerce	(Schultz & Kumar, 2024)
	Case Studies in Immersive Branding	(Blackman, 2024; Schultz & Kumar, 2024)

Source: Literature Review (2025).

Table 10
Topic 7 Sub-Topics.

Main Topic	Sub-Topic	Citations
Consumer Behavior in Virtual Retail	Virtual Store Atmospherics and Customer Response	(Ario et al., 2022)
	Social Influence and Peer Reviews	(Kaur et al., 2022; Schultz & Kumar, 2024)
	Impulse Buying in Virtual Environments	(Malik et al., 2022; Pantano et al., 2024)
	Customer Trust and Security Concerns	(Nguyen et al., 2021; Pantano et al., 2017)
	Cross-device Shopping Behavior	(Harrison-Boudreau & Bellemare, 2022)
	Consumer Decision-making in Augmented Commerce	(Schultheiß, 2023; Tan & Saraniemi, 2022)

Source: Literature Review (2025).

South Korea and the distinct domains include AI (Topic 5) and virtual retail behavior (Topic 7). This shows a shift towards trending global digital transformation.

These cross-analyses provide substantial evidence that bibliometric structures (authors, journals, countries) are not independent but are closely connected. The dual-method approach proves to be complementary providing a more holistic understanding of the domain. While the bibliometric analysis reveals who is producing knowledge and where it is published. The topic modelling explains what is being studied. And when we examine the seven topics together rather than in isolation, three patterns become noticeable. First, ethical concerns privacy, consent, algorithmic bias, avatar safety appears across multiple topics but never as a dominant theme. Second, sustainability issues related to blockchain infrastructure and NFT energy consumption are almost entirely absent from literature. Third, there is a noticeable fragmentation between technically oriented topics (Topics 4 and 6) and psychologically oriented topics (Topics 1, 2, and 7). These patterns are not directly visible from any single topic. We interpret their significance and implications in the Discussion section that follows.

5. Discussion

Our analysis identified seven topics that structure the current literature on customer experience in the metaverse. But identifying topics is not the same as understanding them. In this section, we step back from description and ask what these topics mean collectively, where the literature is surprisingly silent, and how our findings compare with what other reviews have reported.

5.1. What the seven topics tell us when read together

Looking across Topics 1, 2, and 7 which focus on experience enhancement, brand engagement, and virtual retail behaviour one pattern is clear. The literature is heavily oriented toward positive outcomes. Satisfaction, loyalty, engagement, and emotional connection dominate the conversation. This is not wrong, but it is incomplete. Topics 4 and 6 (NFTs, digital marketing, value creation) sit at a distance from the consumer behaviour topics. This separation suggests that technical and commercial discussions are not yet well integrated with psychological ones. A customer deciding whether to trust an NFT-based loyalty program is simultaneously making a technical, economic, and emotional decision but literature largely studies these dimensions separately.

Moreover, Topic 4, which captures NFTs, digital assets and tokenized ownership, also signals an underdeveloped sustainability conversation within the current literature. While these innovations are often framed as value-creation tools, limited attention is offered to environmental implications of blockchain infrastructures, energy consumption as well as carbon intensity. This therefore suggests that commercial enthusiasm may currently exceed ecological reflection. Likewise, Topic 5, centered

on AI-driven engagement and mediation, reflects growing reliance on intelligent systems for personalization, automation, and customer support. However, the same technologies raise ethical concerns that relate to privacy, algorithmic bias, surveillance, and reduced human agency. The relative marginality of these concerns indicates that responsible AI governance has yet to become a central stream within metaverse customer experience research.

5.2. Where the literature is surprisingly silent

Three absences struck us as noteworthy. First, ethical issues, privacy, consent, algorithmic manipulation, avatar safety appear across multiple topics but never as a central theme. Papers mention ethics in passing, then move on. Second, sustainability is almost entirely missing. Discussions of NFTs and blockchain (Topic 4) rarely mention energy consumption or carbon footprint. Third, negative experiences are rarely studied. Virtual harassment, financial loss, addiction, identity theft, these are real risks in metaverse environments, but the CX literature treats experience as something to optimise, not something that can seriously harm.

These silences are not minor. They suggest that the field is still in an early, optimistic phase. Researchers are focused on what works and how to make it better. Critical questions about harm, exploitation, and environmental cost are being left for later. Given how fast the metaverse is being commercialised, later may be too late.

5.3. Unexpected findings

We did not expect to see such clear fragmentation between Topics 4 and 7. Intuitively, papers about NFT marketing should engage deeply with consumer psychology. But our topic modelling shows these two clusters are semantically distant. This indicates a real divide in the literature. Technical and commercial researchers are not talking enough to behavioural researchers.

Another unexpected pattern is the overlap between Topics 1 and 2. They share many terms and are close in the visualisation. This suggests that customer experience enhancement and brand engagement are not truly separate in the literature they bleed into each other. That is not a problem, but it does raise a question: are researchers treating them as distinct constructs when they should be treated as integrated?

5.4. How our findings compare with previous reviews

Previous bibliometric reviews such as Piñeiro-Chousa et al., 2025 and Rejeb et al., 2023 took a broad view of the entire metaverse literature, including technology architecture, governance, and business models. Our narrower focus on CX allows us to see patterns those reviews might miss. For example, the ethics gap we identified is not visible in general metaverse reviews because ethics is discussed in other contexts like platform governance. But within the CX subfield, ethics is strikingly absent. This is a contribution of our study.

Similarly, Li and Li (2024) focused on business models and platform architecture but did not examine how those technical choices affect emotional or psychological dimensions of CX. Our findings suggest that this separation is not a limitation of their review alone, it is a feature of the broader literature. The fragmentation we observed appears to be systemic.

5.5. What these gaps mean for future research

If the field continues to ignore ethics, sustainability, and negative experiences, it will produce knowledge that is technically useful but morally and practically incomplete. Practitioners reading the current literature might implement aggressive personalisation strategies without considering consent, or launch NFT loyalty programs without considering environmental backlash. We are not saying every paper

must address these issues. But the near-complete absence of these topics from 1460 articles is a signal. The field needs corrective attention.

5.6. A note on the limits of our interpretation

We want to be honest. Our identification of gaps, ethics, sustainability, and fragmentation come from reading across the seven topics. This is a qualitative interpretive act. Another researcher looking at the same LDA output might emphasise different patterns or see different gaps. We have tried to be systematic and transparent, but we do not claim our interpretation is the only valid one. Future research could test our claims using expert surveys, Delphi methods, or citation network analysis.

6. Theoretical implications

This study offers theoretical contributions by showing how customer experience (CX) in the metaverse extends beyond traditional digital experience models into a more immersive, identity-rich, and co-created phenomenon. Inferring from the seven themes identified through bibliometric and topic modelling analyses, four major theoretical implications emerge.

First, customer experience theory requires expansion from touchpoint-based logic toward spatial and persistent experience ecosystems. This is because Topics 1 (Customer Experience Enhancement), 2 (Brand Engagement & Virtual Services) and 7 (Consumer Behaviour in Virtual Retail) indicate that experiences in the metaverse are shaped not only by isolated interactions but by continuous presence, avatar identity, and evolving virtual environments. These insights therefore extend foundational CX work (Lemon & Verhoef, 2016) by suggesting that experience unfolds across persistent digital spaces rather than linear merely journeys alone. Second, it is established that technology adoption theories such as TAM require recontextualisation. Topics 5 (AI-Driven Engagement & Mediation) and 4 (Digital Marketing Impact & NFT Adoption) suggest that perceived usefulness and ease of use are insufficient to explain metaverse participation. Adoption in immersive environments may also depend on perceived immersion quality, identity fit, trust in AI systems, and perceived legitimacy of digital ownership. These findings make the call for metaverse-specific adoption models.

Third, it can be said that value co-creation theories gain new relevance in virtual ecosystems. This is because Topics 2 and 6 (Immersive Business & Value Creation) show that value is increasingly co-created through avatar communities, virtual services, tokenized assets, and platform participation. This therefore extends service-dominant logic by highlighting multi-actor value creation between firms, users, creators and digital communities. The relative marginality of sustainability and ethics within Topics 4 and 5 suggests that existing metaverse CX theory remains innovation-oriented but underdeveloped in relation to responsible technology adoption. Future models should incorporate environmental legitimacy and algorithmic trust as core antecedents of immersive customer experience.

Fourth, the findings also reveal crucial theoretical absences that should guide future scholarship. Ethics, privacy, algorithmic fairness and sustainability were present only weakly across topics rather than as dominant streams, suggesting that current CX theory remains overly optimisation oriented. Future theoretical development should thus integrate responsibility, psychological safety, and environmental legitimacy into models of immersive experience quality. Together, these findings support the emergence of a distinct subfield that could be called Metaverse Customer Experience (MVCX), where experience is participatory, persistent, technologically mediated and socially co-created.

7. Practical implications

First, firms should increase their attention to immersive experience design, because customer experience in metaverse environments is

shaped by more than visuals alone. Topic 1 shows that personalization, gamification, emotional engagement, and journey enhancement dominate current research. Managers should therefore invest in virtual environments that are interactive, memorable, and emotionally engaging rather than merely visually attractive, because richer experiences are more likely to strengthen satisfaction, engagement as well as participation.

Second, firms should also strengthen trust-centred virtual relationship management since consumers are likely to experience uncertainty when interacting through avatars and digital identities. Topic 2 highlights trust, loyalty, community participation, and co-creation as key drivers of brand success in virtual spaces. Managers are therefore encouraged to implement visible trust signals such as secure systems, identity verification, responsive support, and moderated communities, because these mechanisms may improve confidence and long-term loyalty.

Third, firms should adopt AI-enabled service support carefully, because immersive environments often require real-time responsiveness at scale. Topic 5 reveals the growing attention to chatbots, sentiment analysis, and adaptive engagement systems. Managers should therefore use AI tools for personalised assistance and rapid service recovery, while maintaining transparency, because opaque automation may reduce trust and weaken customer relationships. Fourth, firms should approach tokenized loyalty models strategically, because digital ownership can create engagement when linked to genuine customer value. Topic 4 indicates increasing interest in NFTs and digital assets. Managers should therefore use tokenized rewards for access privileges, exclusive experiences, or membership benefits rather than speculative offerings, because practical value is more likely to build attachment than hype-driven initiatives. Firms considering NFT-based strategies should also evaluate blockchain platforms not only on cost and scalability, but also on environmental efficiency, because sustainability concerns may influence brand legitimacy and customer acceptance.

Fifth, firms should also lower consumer risk perceptions in virtual retail environments, because trust remains central to purchase behaviour even in immersive settings. Topic 7 highlights security, atmospherics, social influence, and decision-making as important themes. Managers should therefore simplify navigation, display payment safeguards, and integrate trusted reviews, because lower perceived risk may improve purchase confidence and conversion outcomes. Finally, firms should use the strategic framework presented in this study as a planning guide, because successful metaverse customer experience depends on combining immersive design, relationship management, intelligent systems, trust governance, and performance measurement. The framework translates the seven themes into a practical roadmap, because managers often require integrated guidance rather than isolated tactical recommendations. Fig. 8.

8. Limitations

Although the use of both bibliometric and topic modelling techniques provides robust analytical depth, this study has several limitations. Firstly, the dataset is limited to publications indexed in selected databases, potentially excluding grey literature or non-English contributions that may hold cultural or regional insights. Secondly, while topic modelling via LDA offers semantic structure, it does not account for deeper contextual relationships or citation networks across themes. Thirdly, limitation relates to topic labeling. While we followed a two-stage independent review process, the final labels remain interpretive. We did not conduct external validation such as surveys of domain experts or inter-coder reliability tests on the labels themselves. Different researchers might name the same topic clusters differently. Future studies could strengthen this by involving a panel of metaverse researchers to validate or refine our theme labels. Fourthly, the partial data for 2025 may underrepresent recent publication trends and citations. Additionally, while we report topic-wise coherence scores and

provide the top 30 terms for each topic in supplementary material, we did not conduct external validation such as a formal expert survey or Delphi study. Topic labeling inevitably involves researcher subjectivity. To partially address this, we compared our seven topic labels with themes reported in three recent metaverse literature reviews (Rejeb et al., 2023; Piñeiro-Chousa et al., 2025; Li & Li, 2024). Our labels showed substantial conceptual overlap with their thematic categories, providing indirect validation. Nevertheless, future research could strengthen our findings by inviting a panel of metaverse and CX researchers to independently review and refine our theme labels.

9. Conclusion

This study sets out to map the customer experience literature in the metaverse using a dual approach based on bibliometric analysis and LDA topic modelling. The originality of this study does not rest on claiming entirely new themes, but on offering the first structured dual-method synthesis specifically centred on customer experience within metaverse scholarship. By combining bibliometric mapping with LDA topic modelling, the study moves beyond descriptive reviews to reveal seven dominant thematic clusters, intellectual fragmentation between technical and behavioural streams, and neglected areas such as ethics and sustainability. In doing so, it provides a clearer developmental roadmap for future MVCX scholarship. Based on 1460 peer-reviewed articles, we identified seven dominant themes that structure this research domain.

Rather than repeating what those themes are (already covered in Results and Discussion), we want to highlight what this mapping revealed about the state of the field. First, the literature is heavily oriented toward positive outcomes like engagement, satisfaction, loyalty, emotional connection. This is useful but incomplete. Second, there are notable silences. Ethical issues like privacy, consent, and algorithmic manipulation appear across topics but never as a central concern. Sustainability, particularly the environmental cost of blockchain and NFTs, is almost entirely missing. Negative experiences such as virtual harassment, financial loss, or addiction are rarely studied.

Third, there is fragmentation between technically focused research (NFTs, platforms, value creation) and psychologically focused research (consumer behaviour, emotions and engagement). These two clusters do not talk to each other enough.

These findings do not mean the existing literature is wrong. It means the field is still young and still optimising. The next phase of metaverse CX research needs to move beyond optimisation to ask harder questions about harm, consent, environmental cost, and integration across disciplines. We offer our seven themes and the patterns we identified as a starting point for that next phase. Researchers can use this mapping to locate their work, identify understudied areas, and build more complete theories of customer experience in immersive digital worlds. Fig. 9.

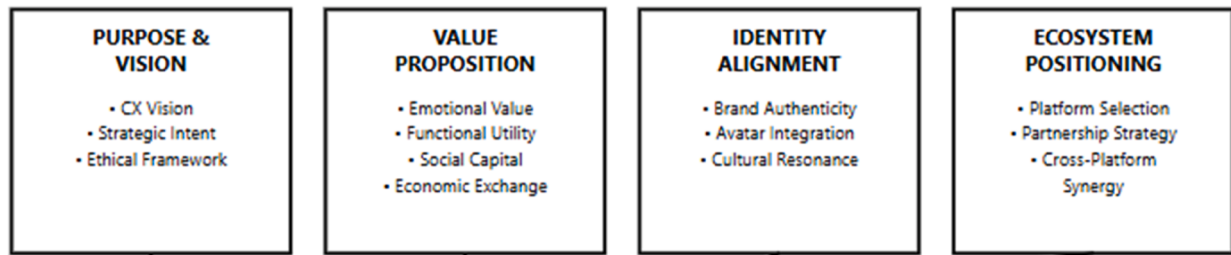
10. Future research directions

Several avenues emerge for future investigation. Firstly, there is a clear need for validated MVCX scales that encompass interactivity, immersion, co-presence, and digital ownership to enhance empirical rigour. Scholars should also develop hybrid theoretical frameworks that integrate consumer psychology, affective computing, social presence, and digital ethics to better reflect the multifaceted nature of virtual CX. Future research could explore comparative studies across platforms (e.g., Roblox vs. Meta Horizon), industries (e.g., retail vs. tourism), and cultural contexts to capture variations in CX dynamics. Additionally, as AI, avatars, and digital assets increasingly mediate interactions, there is an urgent need to examine ethical concerns such as privacy, manipulation, and informed consent in virtual commerce. Another underexplored area is cross-device experience continuity, understanding how customers transition between mobile, AR, and VR environments and the resulting impact on experiential consistency. Ultimately, the metaverse represents both a challenge and a frontier for CX researchers. Its

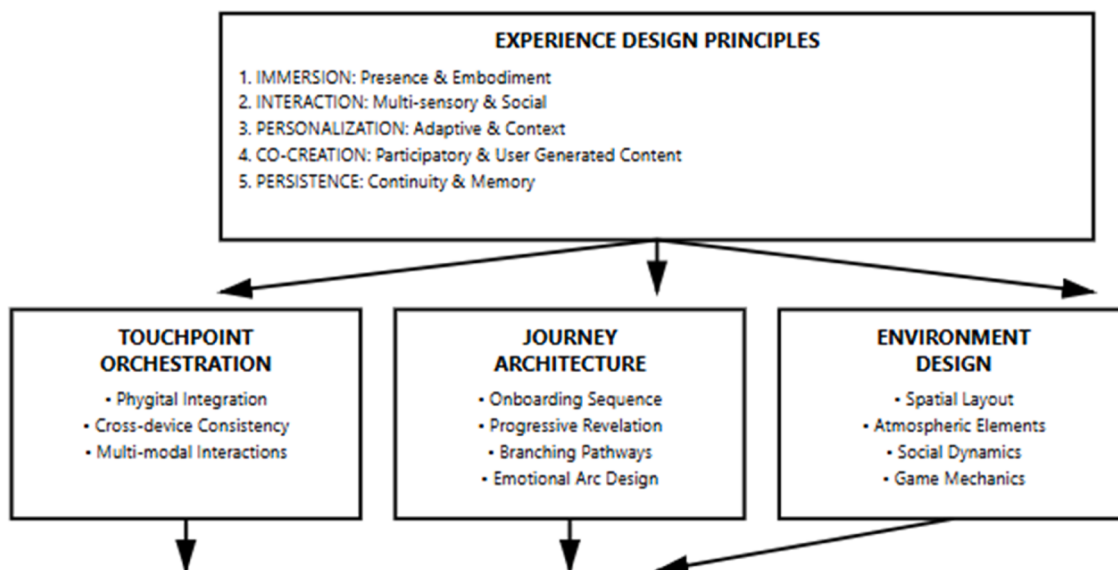
MVCX STRATEGIC FRAMEWORK

(Holistic, Multi-Layered, Co-Creation Focus)

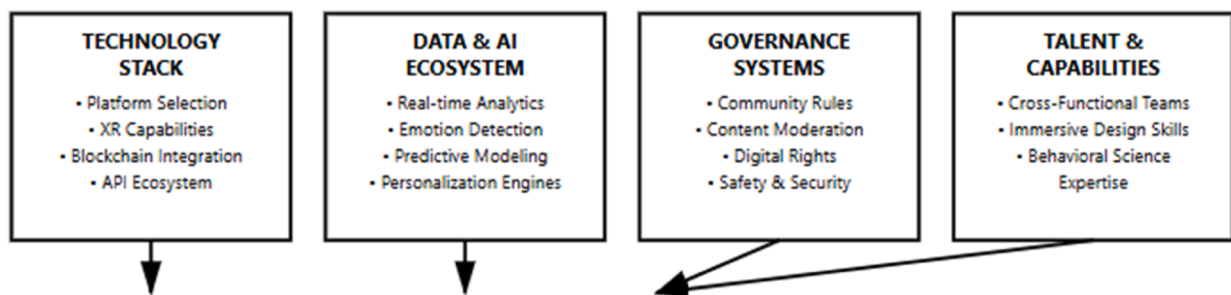
LAYER 1: FOUNDATIONAL PILLARS (WHY & WHAT)



LAYER 2: EXPERIENCE ARCHITECTURE (HOW)



LAYER 3: ENABLING SYSTEMS (WITH WHAT)



LAYER 4: PERFORMANCE & EVOLUTION



Fig. 8. Strategic Conceptual Modelling Framework for CX on Metaverse.

Note: The framework shown in Figure 15 is not a direct output of our LDA or bibliometric models. It is our attempt to synthesise the seven themes into a practical structure for managers. We want to be honest here — this framework is conceptually derived, not statistically validated. It should be seen as a starting point for

discussion, not as a proven model. Future research could test its components empirically.

Source: Authors' conception (2025).

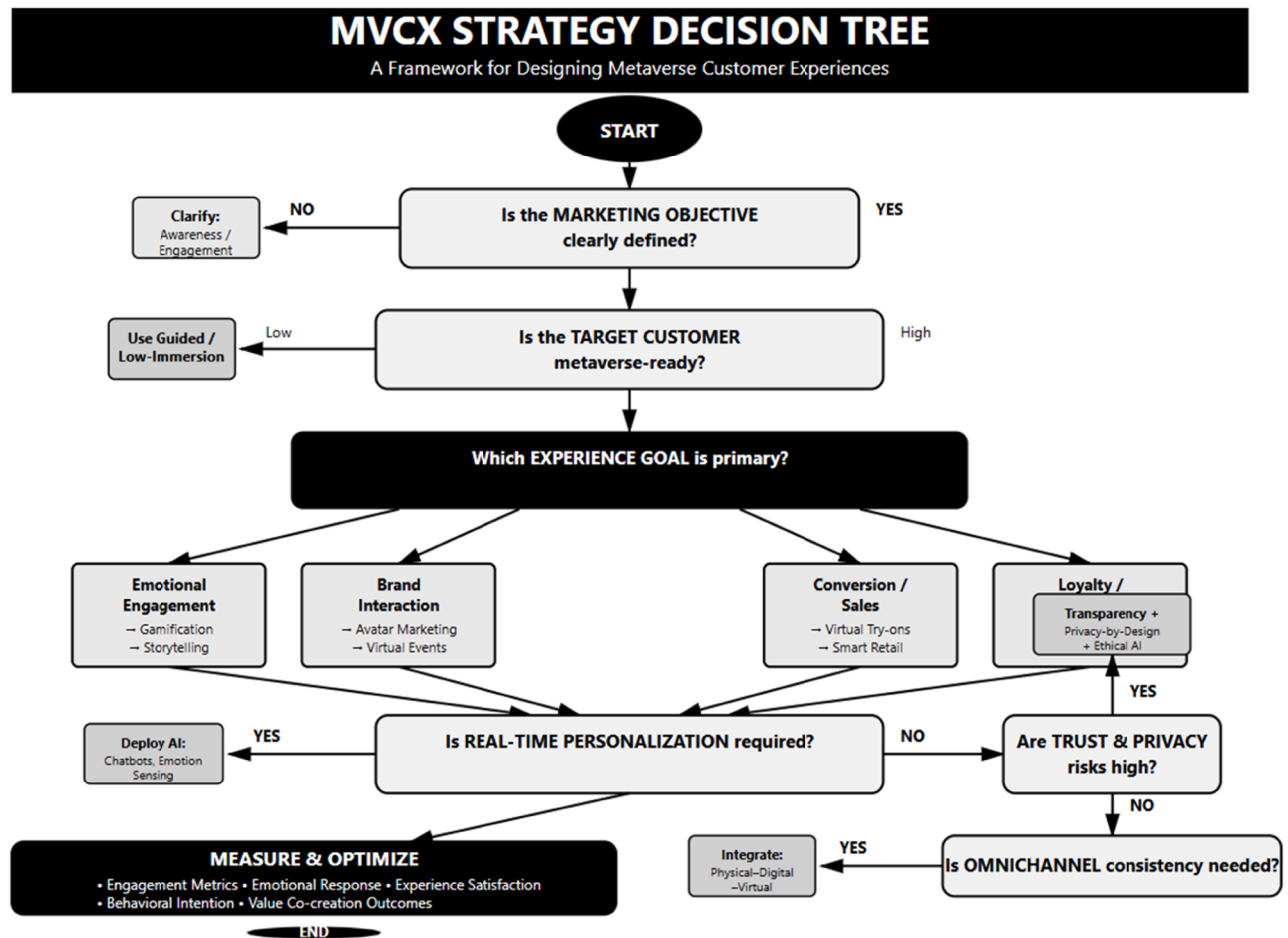


Fig. 9. Strategic Decision Tree for Designing CX on Metaverse.

Source: Authors' conception (2025).

immersive, identity-rich environment compels a redefinition of customer experience that is participatory, persistent, and profoundly personal. Future research should also empirically examine the impact of ethical choices of transparency, data governance, NFT, etc. on customer trust, engagement, and long-term experience outcomes. Comparative studies on blockchain protocols and governance models may further broaden the idea of value creation, ethical or environmental responsibility in metaverse ecosystems.

Ethics approval and consent to participate

This article does not involve any studies with human participants or animals performed by any of the authors. Therefore, ethical approval was not required. All data and materials used in this work are publicly available or obtained through legal and ethical means.

Consent for publication

All authors consent publication of the article.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of

any affiliated agency of the authors.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Declaration of generative AI in scientific writing

The chapter was scientifically prepared without the writing assistance of any enhanced generative Artificial Intelligence (AI) software(s).

CRedit authorship contribution statement

Abu Bashar: Investigation, Funding acquisition, Formal analysis, Conceptualization. **Brighton Nyagadza:** Writing – review & editing, Visualization, Project administration, Funding acquisition, Formal analysis, Data curation. **Tinashe Chuchu:** Writing – review & editing, Writing – original draft, Methodology. **Irfanullah Khan:** Writing – review & editing, Visualization, Validation, Investigation. **Tamer Alkaidash:** Methodology, Investigation, Funding acquisition, Formal analysis.

Declaration of competing interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Data availability

Not applicable.

References

- Ahmad Aizuddin Hamzah Galad Mohamed Barre, A. R. K. A. B. M. S. K. I. T. H. \& A. M. I. (2024). Millennial Muslims intention to donate cash using the extended theory of planned behavior approach. *Economy and Finance Enthusiastic*, 2(2), 134–146.
- Alexander, B., Blazquez, M., Chrimes, C., & Boardman, R. (2025). The role of immersive spaces on the customer experience: An exploration of fashion metaverses. *Psychology & Marketing*, 42, 539–553. <https://doi.org/10.1002/mar.22140>
- Anderl, E., Becker, I., von Wangenheim, F., & Schumann, J. H. (2016). Mapping the customer journey: Lessons learned from graph-based online attribution modeling. *International Journal of Research in Marketing*, 33(3), 457–474. <https://doi.org/10.1016/j.ijresmar.2016.03.001>
- Ario, M. K., Santoso, Y. K., Basyari, F., Fajar, M., Panggabean, F. M., & Satria, T. G. (2022). Towards an implementation of immersive experience application for marketing and promotion through virtual exhibition. *Software Impacts*, 14, Article 100439. <https://doi.org/10.1016/j.simpa.2022.100439>
- Ashley, C., & Tuten, T. (2015). Creative strategies in social media marketing: An exploratory study of branded social content and consumer engagement. *Psychology & Marketing*, 32(1), 15–27. <https://doi.org/10.1002/mar.20761>
- Baek, T. H. (2023). Digital advertising in the age of generative AI. *Journal of Current Issues and Research in Advertising*, 44(3), 249–251. <https://doi.org/10.1080/10641734.2023.2243496>
- Bashar, A., Alkadas, T., Nyagadza, B., & Muposhi, A. (2025). Sustainable Digital Marketing (SDM): review, taxonomy, conceptualization and future research avenues mapping. *Quality & Quantity (ESCI/SCOPUS)*. <https://doi.org/10.1007/s11135-025-02438-7>
- Bashar, A., Singh, S., & Pathak, V. K. (2023). A influência da cultura no comportamento de compra por impulso: Uma revisão sistemática da literatura. *BBR Brazilian Business Review*, 20, 465–484.
- Bashar, A., Wasiq, M., Nyagadza, B., & Maziriri, E. T. (2024). Emerging trends in social media marketing: A retrospective review using data mining and bibliometric analysis. *Future Business Journal*, 10(1), 23.
- Bassiouni, D. H., & Meshreki, H. (2025). The metaverse: A liquid consumer Utopia a journey into Gen Z's usage intention behavior using the tram model. *Journal of Consumer Behaviour*, 24, 771–784. <https://doi.org/10.1002/cb.2443>
- Baxendale, S., Macdonald, E. K., & Wilson, H. N. (2015). The impact of different touchpoints on brand consideration. *Journal of Retailing*, 91(2), 235–253. <https://doi.org/10.1016/j.jretai.2014.12.008>
- Beck, R., Müller-Bloch, C., & King, J. L. (2022). Governance in the metaverse: A research agenda. *Journal of Information Technology*, 37(1), 1–17. <https://doi.org/10.1177/02683962211070950>
- Beden, T. (2023). New tech: Economic crisis shifts focus and budgets. *ZWF Zeitschrift fuer Wirtschaftlichen Fabrikbetrieb*, 118(5), 350–351. <https://doi.org/10.1515/zwf-2023-1067>
- Bilgihan, A., & Ricci, P. (2024). The new era of hotel marketing: Integrating cutting-edge technologies with core marketing principles. *Journal of Hospitality and Tourism Technology*, 15(1), 123–137. <https://doi.org/10.1108/JHTT-04-2023-0095>
- Blackman, T. (2024). Virtual reality and videogames: immersion, presence, and the performative spatiality of 'being there' in virtual worlds. *Social & Cultural Geography*, 25(3), 404–422. <https://doi.org/10.1080/14649365.2022.2157041>
- Chevet, S. (2018). Blockchain technology and non-fungible tokens: Reshaping digital art. *Journal of Digital Innovation*, 1(2), 45–56.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13, 319–340. <https://doi.org/10.2307/249008>
- Deventer, C., de Sousa, V. A., & Pirnay, L. (2024). NFTByBrands: Value identification framework for analysis and design of NFT initiatives. *International Journal of Electronic Commerce*, 28, 33–62. <https://doi.org/10.1080/10864415.2023.2295070>
- Dowling, M. (2022). Fertile LAND: Pricing non-fungible tokens. *Finance Research Letters*, 44, Article 102096. <https://doi.org/10.1016/j.frl.2021.102096>
- Dwivedi, Y. K., Hughes, L., Baabdullah, A. M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M. M., ... Wamba, S. F. (2022). Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 66, 102542. <https://doi.org/10.1016/j.jinifomgt.2022.102542>
- Głabaska, D., Skolmowska, D., & Guzek, D. (2021). Food preferences and food choice determinants in a polish adolescents' covid-19 experience (Place-19) study. *Nutrients*, 13(8), 2491. <https://doi.org/10.3390/nu13082491>
- Gursoy, D., Malodia, S., & Dhir, A. (2022). The metaverse in the hospitality and tourism industry: An overview of current trends and future research directions. *Journal of Hospitality Marketing & Management*, 31(5), 527–534. <https://doi.org/10.1080/19368623.2022.2072504>
- Hassan, M. K., Rabbani, M. R., Brodmann, J., Bashar, A., & Grewal, H. (2023). Bibliometric and scientometric analysis on CSR practices in the banking sector. *Review of Financial Economics*, 41(2), 177–196. <https://doi.org/10.1002/rfe.1171>
- Hoffman, D. L., Novak, T. P., & Stein, R. (2022). Digital avatars: Promoting consumer engagement through virtual identities. *Journal of Marketing*, 86(1), 1–18. <https://doi.org/10.1177/00222429211043212>
- Huang, M.-H., & Rust, R. T. (2022). A framework for collaborative artificial intelligence in marketing. *Journal of Retailing*, 98, 209–223. <https://doi.org/10.1016/j.jretai.2021.03.001>
- Kaur, R., Singh, R., Gehlot, A., Priyadarshi, N., & Twala, B. (2022). Marketing strategies 4.0: Recent trends and technologies in marketing. *Sustainability (Switzerland)*, 14 (24), Article 16356. <https://doi.org/10.3390/SU142416356>
- Kugler, L. (2021). The rise of NFTs. *Communications of the ACM*, 64(7), 46–53. <https://doi.org/10.1145/3464905>
- Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33(1), 159.
- Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of Marketing*, 80(6), 69–96. <https://doi.org/10.1509/jm.15.0420>
- Li, Y., & Li, X. (2023). The metaverse: A systematic review of business models, technologies, and future research directions. *Journal of Business Research*, 167, Article 114182. <https://doi.org/10.1016/j.jbusres.2023.114182>
- Malik, N., Wei, Y., Appel, G., & Luo, L. (2023). Blockchain technology for creative industries: Current state and research opportunities. *International Journal of Research in Marketing*, 40, 38–48. <https://doi.org/10.1016/j.ijresmar.2022.07.004>
- Maziriri, E. T., Mapuranga, M., Mabyuna, B., Nyagadza, B., & Mandipaka, F. (2026). From intention to actual use of metaverse-enabled entrepreneurship: The moderating role of technophobia and technophilia. *Strategic Business Research*. <https://doi.org/10.1016/j.sbr.2025.100042>
- Mr, G., Mccullough, H., Gabler, C., Ferrell, L., & Oc, F. (2025). Examining the customer experience in the metaverse retail revolution. *Journal of Business Research*, 186.0.
- Mystakidis, S. (2022). Metaverse. *Encyclopedia*, 2(1), 486–497. <https://doi.org/10.3390/encyclopedia2010031>
- Mz, N., Guzmán, F., & Nawaz, S. (2025). Technology-enabled engagement process of brand virtual-try-on services. *Journal of Product and Brand Management*, 34.0(1).
- Naem, M. A., Karim, S., Rabbani, M. R., Bashar, A., & Kumar, S. (2023). Current state and future directions of green and sustainable finance: A bibliometric analysis. *Qualitative Research in Financial Markets*, 15(4), 608–629.
- Nguyen, T. H., Ngo, H. Q., & Dương, T. T. (2021). Motivations influencing virtual supermarket shopping: An exploratory study using means-end chains analysis. *Cogent Business and Management*, 8(1). <https://doi.org/10.1080/23311975.2021.1954491>
- Novak, T. P., Hoffman, D. L., & Yung, Y.-F. (2000). Measuring the customer experience in online environments: A structural modeling approach. *Marketing Science*, 19(1), 22–42. <https://doi.org/10.1287/mksc.19.1.22.15184>
- Nyagadza, B., Bashar, A., Khan, I., Wasiq, M., & Chuchu, T. (2025). Customer experience (CX) in virtual realms: a theories-contexts-characteristics-methodologies (TCCM) guided bibliometric study. *Journal of Global Marketing*. <https://doi.org/10.1080/08911762.2025.2549706>
- Oliver, R. L. (1993). Cognitive, affective, and attribute bases of the satisfaction response. *Journal of Consumer Research*, 20(3), 418–430. <https://doi.org/10.1086/209358>
- Orús, C., Ibáñez-Sánchez, S., & Flavián, C. (2021). Enhancing the customer experience with virtual and augmented reality: The impact of content and device type. *International Journal of Hospitality Management*, 98, 103019. <https://doi.org/10.1016/j.ijhm.2021.103019>
- Pantano, E., Carlson, J., Spanaki, K., & Christodoulides, G. (2024). Guest editorial: More supportive or more distractive? Investigating the negative effects of technology at the customer interface. *International Journal of Information Management*, 75, Article 102752. <https://doi.org/10.1016/j.jinifomgt.2023.102752>
- Pantano, E., Rese, A., & Baier, D. (2017). Enhancing the online decision-making process by using augmented reality: A two country comparison of youth markets. *Journal of Retailing and Consumer Services*, 38, 81–95. <https://doi.org/10.1016/j.jretconser.2017.05.011>
- Piñero-Chousa, J., Vizcaíno-González, M., López-Cabarcos, M.Á., & Romero-Castro, N. (2024). Mapping the intellectual structure of metaverse research: A bibliometric analysis. *Technological Forecasting and Social Change*, 205, Article 123456. <https://doi.org/10.1016/j.techfore.2024.123456>
- Ra, A., Nilashi, M., Halabi, O., & Ali, R. (2024). Does metaverse improve recommendations quality and customer trust? A user-centric evaluation framework based on the cognitive-affective-behavioural theory. *Journal of Innovation and Knowledge*, 9.0(4).
- Rabbani, M. R., Bashar, A., Hawaldar, I. T., Shaik, M., & Selim, M. (2022). What do we know about crowdfunding and P2P lending research? A bibliometric review and meta-analysis. *MdpiCom*, 15, 451. <https://doi.org/10.3390/jrfm15100451>
- Rabbani, M. R., Bashar, A., Nawaz, N., Karim, S., Ali, M. A. M., Rahiman, H. U., & Alam, M. S. (2021). Exploring the role of Islamic fintech in combating the aftershocks of covid-19: The open social innovation of the Islamic financial system. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(2), 136. <https://doi.org/10.3390/joitmc7020136>
- Rejeb, A., Rejeb, K., Simske, S., & Keogh, J. G. (2023). Metaverse and the future of digital business: A systematic literature review. *Internet Research*, 33(4), 1210–1240. <https://doi.org/10.1108/INTR-01-2022-0054>
- Rodrigues, A. P., Fernandes, R., Bhandary, A., Shenoy, A. C., Shetty, A., & Anisha, M. (2021). Real-time twitter trend analysis using big data analytics and machine learning techniques. *Wireless Communications and Mobile Computing*, 2021. <https://doi.org/10.1155/2021/3920325>

- Schultheiß, S. (2023). How search engine marketing influences user knowledge gain: Development and empirical testing of an information search behavior model. In Proceedings of the 2023 ACM SIGIR Conference on Human Information Interaction and Retrieval (CHIIR '23). Association for Computing Machinery. <https://doi.org/10.1145/3576840.3578297>.
- Schultz, C. D., & Kumar, H. (2024). ARvolution: Decoding consumer motivation and value dimensions in augmented reality. *Journal of Retailing and Consumer Services*, 78, Article 103701. <https://doi.org/10.1016/j.jretconser.2023.103701>
- Singh, S., & Bashar, A. (2023). A bibliometric review on the development in e-tourism research. *International Hospitality Review*, 37(1), 71–93. <https://doi.org/10.1108/ihr-03-2021-0015>
- Sreejesh, S., & Ghosh, T. (2025). Winning the ad battle: Exploring the influence of subtle design elements and gaming platform on consumer attention and brand memory in in-game advertising. *Australasian Marketing Journal*, 33.0(1).
- Sriharan, P., Pongsakonrungrungsilp, S., & Pongsakonrungrungsilp, P. (2019). Consumer culture, food choices and cultural tourism development: A study from Thailand. *International Journal of Innovation, Creativity and Change*, 7(5), 345–361. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85076517001&partnerID=40&md5=90cd99a9d541ea38b355d265778d5769>.
- Sung, E., Kwon, O., & Sohn, K. (2023). NFT luxury brand marketing in the metaverse: Leveraging blockchain-certified NFTs to drive consumer behavior. *Psychology and Marketing*, 40(11), 2306–2325. <https://doi.org/10.1002/mar.21854>
- Tan, T. M., & Saraniemi, S. (2023). Trust in blockchain-enabled exchanges: Future directions in blockchain marketing. *Journal of the Academy of Marketing Science*, 51, 914–939. <https://doi.org/10.1007/s11747-022-00889-0>
- van de Sand, F., Frison, A.-K., Zotz, P., Riener, A., & Holl, K. (2020). *User experience is brand experience: The psychology behind successful digital products and services*. Cham: Springer. <https://doi.org/10.1007/978-3-030-29868-5>.
- Vargo, S. L., & Lusch, R. F. (2004). Evolving to a new dominant logic for marketing. *Journal of Marketing*, 68(1), 1–17. <https://doi.org/10.1509/jmkg.68.1.1.24036>
- Verhoef, P. C., Lemon, K. N., Parasuraman, A., Roggeveen, A., Tsiros, M., & Schlesinger, L. A. (2009). Customer experience creation: Determinants, dynamics and management strategies. *Journal of Retailing*, 85(1), 31–41. <https://doi.org/10.1016/j.jretai.2008.11.001>
- Villarroel Ordenes, F., & Silipo, R. (2021). Machine learning for marketing on the KNIME Hub: The development of a live repository for marketing applications. *Journal of Business Research*, 137, 393–410. <https://doi.org/10.1016/j.jbusres.2021.08.036>
- Wang, J., Du, B., & Cao, X. (2023). A study of the impact of metaverse marketing characteristics on consumers' purchase intention. *Digitalization and management innovation II*. IOS Press. <https://doi.org/10.3233/FAIA230722>.
- Harrisson-Boudreau, J.-P., & Bellemare, J. (2022). Going above and beyond eCommerce in the future highly virtualized world and increasingly digital ecosystem. In A. L. Andersen, et al. (Eds.), *Towards sustainable customization: Bridging smart products and manufacturing systems* (pp. 789–797). Springer. https://doi.org/10.1007/978-3-030-90700-6_90.
- Wang, Q., Yao, X., Li, X., Yan, X., & Li, R. (2025). When peripheral route meets central route: An elaboration likelihood model of sales performance in live commerce. *Journal of Retailing and Consumer Services*, 84, Article 104218, 840.
- Wasiq, M., Bashar, A., Akmal, S., Rabbani, M. R., Saifi, M. A., Nawaz, N., & Nasef, Y. T. (2023). Adoption and applications of blockchain technology in marketing: A retrospective overview and bibliometric analysis. *Sustainability*, 15(4), 3279.
- Wasiq, M., Bashar, A., Nyagadza, B., & Johri, A. (2024). Deciphering the evolution of metaverse-A techno-functional perspective in digital marketing. *International Journal of Information Management Data Insights*, 4(2), Article 100296.
- Xia, Z., & Shannon, R. (2025). Navigating the digital frontier: Exploring the dynamics of customer–brand relationships through ai chatbots. *Sustainability (Switzerland)*, 17(5), 0.
- Xu, L., Xu, H., Luo, J., Zhang, R., Pan, Y., & Xu, J. (2025). Immersive digital imaging experience: An empirical study on audiences' switching intention to metaverse online art museum. *IEEE Access: Practical Innovations, Open Solutions*, 13, 1175–1196.