Bridging the Metaverse and Social Cohesion in Smart Cities.

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Abstract. It is estimated that the metaverse has the potential to affect peoples' and communities' lives. As an integrative virtual space that offers immersive experiences to its users, the metaverse can foster virtual interactions that not only mimic but also enhance real-world social activities and relations. With its ability to narrow or eliminate physical boundaries, the metaverse presents potential opportunities for enhancing social cohesion in diverse communities. Social cohesion - characterized by a sense of belonging, mutual trust, and collaboration - plays a vital role in connecting community members. This article provides a systematic review of existing literature on the metaverse's implications, to explore its potential to promote social connections and inclusivity in communities, both essential elements of social cohesion. The study reviews articles sourced from the scientific repositories ScienceDirect, Web of Science, Google Scholar, and Scopus. The results show that the metaverse has the potential to bridge economic, social, and cultural gaps by facilitating social interactions, broadening access to education, fostering engagement as well as by creating new economic opportunities. These advancements can encourage a sense of unity and belonging, especially in the context of smart cities, where innovation and community building come together.

Keywords. Metaverse, Implications, Social Cohesion, Smart Cities, CitiVerse.
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1. Introduction

The metaverse is rapidly emerging as a transformative digital space with the potential to impact various aspects of individuals' lives. The metaverse has been recently defined as "an integrative ecosystem of virtual worlds offering immersive experiences to users, that modify pre-existing and create new value from economic, environmental, social and cultural perspectives" (ITU, 2023). This definition outlines the metaverse's potential to reshape the relationships between people as well as societies within physical and virtual spaces. Given its potential to shape daily life significantly, a thorough examination of its implications is essential. However, it is important to especially focus on the impact of the metaverse on communities and more specifically, to examine whether the metaverse can contribute towards social integration. Social cohesion, defined as *"the capacity of a society to ensure the well-being of all its members, minimizing disparities and avoiding marginalization, while fostering a sense of belonging, trust, and shared values among its members"* (Council of Europe, 2005), is vital for thriving communities. This article explores the relation between the metaverse and social cohesion within cities and communities. Addressing this issue is challenging, since the metaverse seems to have begun to transform from a science fiction concept into a tangible reality enabled by advances in technologies (Lee et al., 2021), reshaping human interactions and redefining the way communities are formed.

This transformative potential extends to urban context in the form of the "CitiVerse", an urban application of the

metaverse. Metaverse in cities -the so-called CitiVerse- (ITU, 2024) can be catalysed by the existence of installed Information and Communications Technologies (ICT), and more importantly by emerging ones like Digital Twining and Artificial Intelligence (AI), which are both targeted by smart cities. According to Anthopoulos (2017) and Díaz-Díaz et al. (2017), a smart city can be seen as an ICT-based urban innovation that aims to address challenges that cities face, such as efficiency, quality of life, and sustainability. Being such an urban innovation, smart cities generate public value and drive social cohesion, integrating technological progress with community needs. Furthermore, Camboim et al. (2019) refer to the smart city as an ecosystem of urban innovation, while Appio et al. (2019) identify it as a collaborative ecosystem that fosters innovation and establishes relationships between its stakeholders (citizens, government, businesses).

The existing literature on smart cities and digital transformation mainly explores the role of emerging technologies such as Internet of Things (IoT), AI and Blockchain in enhancing urban efficiency and governance (Anthopoulos, 2017). However, there is a notable gap in research concerning how the metaverse can contribute to social cohesion within smart cities. This research contributes to bridging this gap by examining the role of the metaverse in promoting social cohesion through its integration in urban ecosystems. The remainder of this article includes the following: Section 2 discusses the theoretical background of this article, and in particular the concepts of smart city, metaverse, CitiVerse, and social cohesion. Section 3 contains the systematic literature review methodology that was followed, while Section 4 outlines the systematic review results. Finally, Section 5 focuses on the implications of the metaverse related to social cohesion, and Section 6 contains the conclusions of the article.

2. Background

This section outlines the theoretical background relevant to the subject of this article. Firstly, it explores the smart city concept, emphasizing the use of ICT to enhance efficiency, sustainability, and quality of life. Following, the evolving concept of the metaverse as well as its integration into real-world cities, the so-called CitiVerse are presented. To conclude, this section discusses the key factors of social cohesion.

2.1 Smart City

Trying to find a single, comprehensive definition of "smart city" is not entirely feasible as there are several different approaches to this concept. They range from ICT-based cities to smart resource management, to mobilizing partnerships between different stakeholders using ICT, to cities that apply new technologies to innovate, or even cities that innovate politically and managerially (Anthopoulos, 2017).

According to Díaz-Díaz et al. (2017), the term "smart city" refers to urban innovation where, mainly through the use of ICT and innovation, challenges of modern cities, such as efficiency, quality of life, climate change, and sustainability are addressed. In a smart city ecosystem, technology, infrastructure, data, services, stakeholders, the physical environment, and governance are interconnected (Anthopoulos, 2017), which consequently conveys that a smart city is characterized by connectivity, sustainability, security, and technology (Grossi & Trunova, 2021). Moreover, Barrutia et al. (2022) describe a smart city as one that aspires to become smarter by prioritizing efficiency, equity, and sustainability. They also argue that a pivotal attribute of smart city's intelligence lies in the comprehension of citizens' expectations and the subsequent satisfaction. Various stakeholders interact, transferring knowledge and creating shared value, in a participatory and flexible governance that invests in digital infrastructure (Camboim et al., 2019; Cosgrave et al., 2014).

Furthermore, according to Bibri et al. (2022), the most prominent digital processes supporting data-driven smart cities are digital instrumentation, digital hyper-connectivity, datafication, algorithmization, and platformization. Digital infrastructure of the smart city produces enormous volumes of data from devices like IoT sensors, enabling real-time analysis and city governance. Hyper-connectivity based on technological advancements like IoT and 5G connects systems, devices, and individuals, organizing smart cities. Additionally, datafication in smart cities, driven by digital hyper-connectivity, has enabled algorithmization and platformization. Datafication turns social activities into quantifiable data that can be tracked in real-time and analysed through AI algorithms. Algorithmization converts urban activities into structured instructions for AI and big data systems, enabling smart cities to make data-driven decisions based on predictive analysis. Digital platforms, which combine technology with organizational structures, are expanding in governance, economy, and services, and are inducing a shift in social, political, and economic practices. These platforms enable citizen participation, and permit public-private partnerships. The metaverse, driven by data and platformization, is impacting urban life by integrating digital technologies into smart city infrastructure. As such, the metaverse is perceived as a central force in shaping the future of urban life, presenting new forms of digital governance and infrastructure.

2.2 Metaverse

The concept of the metaverse has its roots in science fiction, first coined in 1992 by the author Neal Stephenson in his novel "Snow Crash" (Stephenson, 1992). In this book, Neal Stephenson described a virtual world where users,

represented by avatars - digital representations of people's physical identities - could interact with each other in an immersive virtual environment. The last decades, the metaverse has evolved from a science fiction concept into a reality, due to the advancements in digital technologies like the IoT, Digital Twins, Augmented Reality (AR), Virtual Reality (VR), AI, and Blockchain (Lee et al., 2021). Various virtual spaces have already been developed, such as Second Life (https://secondlife.com/) and later Decentraland (https://decentraland.org/), both of which allow users to create, socialize, and trade within shared digital spaces.

With the ongoing technological developments, the metaverse possesses the ability to significantly change the way people work, socialize, learn and entertain themselves. Kontogianni and Anthopoulos (2024) are considering whether the metaverse can affect people's lives by generating value. They conclude that it offers several opportunities for economic, public, and social value generation. The metaverse holds economic value for both industry and consumers. Moreover, public benefits focus on citizen empowerment and improved government efficiency, while socially, the metaverse promotes employment growth and provides immersive experiences in areas like entertainment and education.

The metaverse can further benefit smart cities as it holds the potential for the overall transformation and maintenance of the smart city environment by seamlessly integrating the digital and physical worlds while keeping people at the centre of its operational framework. The smart city concept can be augmented through the implementation of an interconnected city's representation approach, endowing users and residents with the capacity to be actively involved in the strategic planning processes, generating new value for cities through the concept of increased public participation (ITU, 2023b), thus bonding the community. Yaqoob et al. (2023) emphasize the metaverse's transformative role in smart cities, detailing its key advantages for various smart city applications. One major benefit is enhanced teamwork and collaboration, as the metaverse enables real-time communication, skill development, and AI-led innovation across diverse disciplines. Additionally, training and testing processes, particularly in fields like medicine, can be improved through the use of extended reality (XR) technologies by providing realistic simulations. They also argue that the metaverse creates new business opportunities through virtual retail, and trading, expanding the digital economy within smart cities. Moreover, the use of digital twins further enables urban planning and infrastructure management by replicating real-world objects with real-time data. Social connections enabled in the metaverse strengthens human connections by overcoming geographical and accessibility challenges, offering immersive experiences for community building. Furthermore, the metaverse redefines entertainment experiences, through virtual events and metaverse tourism, making cultural and entertaining activities more accessible. Lastly, they highlight metaverse's contribution to environmental sustainability in smart cities by replacing physical transportation with virtual experiences, which can significantly lower energy use and carbon emissions.

2.3 CitiVerse

The term "CitiVerse" is a compound word derived from the combination of the terms "cities" and "metaverse". CitiVerse can be understood as the integration of the metaverse into real-world cities, facilitating the interaction between tangible and intangible entities of the physical world within a city's envisioned digital framework. Although the term CitiVerse has not yet been scientifically defined, the International Telecommunications Union (ITU) proposes that CitiVerse can be perceived as an *"interconnected and distributed hybrid and virtual worlds representing, and synchronized with, their physical city and community counterparts to offer new and improved capabilities to cities and communities"* (ITU, 2024). The concept of CitiVerse delineates a particular physical expanse, constrained by the geographical and/or administrative parameters of a physical city. According to Zhao et al. (2022), by applying metaverse in cities, it is feasible to provide functional services through simulation, prediction, and optimization while maintaining an accurate depiction of the physical components of the urban environment. Users can have a highly realistic experience of the city by immersing themselves in this virtual world, exploring the city, and interacting with its infrastructure and its simulated population.

The CitiVerse, as proposed by NCP Flanders (2023), has the potential to influence various urban sectors including energy, transportation, water supply, waste management, and education by leveraging technologies such as IoT, AI, Digital Twin, and Blockchain. It can enhance the interactivity and responsiveness of cities, and address the challenges presented by aging infrastructure and population growth, optimizing the utilization of existing resources. The integration of the CitiVerse concept will contribute towards the creation of urban spaces that promote interactivity and inclusivity which helps in social bonding.

Furthermore, Vanderhorst, Heesom, and Yenneti (2024) introduce the concept of a "Meta Smart Twin City" which integrates digital twins methodology, smart urban environments, and blockchain technology in order to create more sustainable, efficient, and intelligent urban environments. Digital twins -virtual replicas of physical entities- enable real-time monitoring and simulation. When applied to urban environments, they enable improved planning, management, and operational efficiency. The use of blockchain technology ensures secure and transparent data transactions, further enhancing the reliability of digital infrastructures. The authors also present a comprehensive framework for integrating these technologies into the physical world, emphasizing the use of IoT devices, reality capture tools, immersive technologies like VR and AR, and AI to optimize urban management. While these

innovations offer significant potential, the authors highlight the ethical, social, and technical challenges that must be addressed to ensure their long-term effectiveness.

Some cities have already announced their intention to develop their own CitiVerses, which will meet the needs of their citizens. One of them is the city of Seoul which has initiated the process of developing a CitiVerse, referred to as "Metaverse Seoul" (Seoul Metropolitan Government, 2023). Metaverse Seoul aims to provide urban services and improve current ones by acting as a virtual duplicate of the city. Within the Metaverse Seoul framework, there will be virtual administrative offices specializing in services regarding education, culture, and tourism, and simultaneously, users will be able to digitally simulate visits to diverse tourist landmarks such as Seoul City Hall, Seoul Plaza, Blue House, Gwanghwamun Square, and the Bukchon Hanok Village, among others. Apart from the city of Seoul, the "Dubai International Financial Centre Metaverse Platform" constitutes a part of the Dubai Metaverse Strategy, which was launched in July 2022, pursuant to the objective of furnishing an enriched customer experience to its inhabitants, notably within the spheres of tourism, education, public services, retail, and real estate (UAE Government, 2023).

2.4 Social Cohesion

The study of social cohesion began in the late 1800s and has been examined by many academic fields, including sociology, mental health, and public health (Fonseca et al., 2019). As Bruhn (2009) pointed out, social cohesion is a complicated social construct, given the diverse geographical locations, the political representatives, and the economic systems of human societies around the world. That is why we meet many definitions of this concept. Starting from 1897, Durkheim defines social cohesion as *"the characteristic of society that shows the interdependence in between individuals of that society"* (Durkheim, 1897) reaching to 2013 that Parsons (2013) views social cohesion as a degree of stability and order that is derived from common norms and values. As noted by Fonseca et al. (2019), social cohesion can be comprehensively understood by examining it across three different levels, each contributing to the complexity of the concept. These levels include the level of the Community, the level of the Individual, and the level of the Institutions, influencing each other. Cohesion emerges at the intersection of the three identified levels. The relationship between the three levels and the components of each level are addressed by the framework they created to describe social cohesion, based on the literature. The developed framework presents possible factors that are relevant to social cohesion per level, in an indicative manner. According to this framework, at the level of the Community, the main factors include the social environment, the relationships and the ties, and the performance and the common objectives of the community. At the level of the Individual, self-motivation, perceptions, norms and values, and participation and performance are indicated as primary factors, while at the level of the Institutions the mentioned factors are the conflict management and the decision making, the human rights, and the environment.

Furthermore, the purpose of Schiefer and van der Noll (2017) was to examine the literature on social cohesion to identify its core elements. They identified six key dimensions of social cohesion: social relations, identification, orientation towards the common good, shared values, equality/inequality, and subjective/objective quality of life. Proposing that (in)equality, quality of life, and shared values are better understood as outcomes of social cohesion rather than core components, they define social cohesion as *"a descriptive, multifaceted and gradual phenomenon attributed to a collective, indicating the quality of collective togetherness"*.

3. Methodology

The systematic literature review, as a research methodology, gives rise to the identification, evaluation, and interpretation of all relevant studies concerning a specific research question or concept. All studies considered in a systematic literature review are referred to as primary studies, whereas a systematic review is considered as secondary. Its importance lies in the fact that it synthesizes the existing study equitably (Kitchenham, 2004). This method was applied to identify the implications of the metaverse. Preliminary research in scientific repositories Google Scholar, Scopus, Science Direct, and Web of Science concerning the metaverse's implications was conducted to gather data on the metaverse's implications, with the numerical findings presented in Table 1.

Tab. 1 - Literature findings (August 2024).

Sources	Results
Scopus	7
ScienceDirect	9
Web of Science	3
Google Scholar	104

As the number of the studies reach 123, it was considered necessary to apply a systematic methodology to delimit the results. The methodology used, follows the guidelines mentioned by Kitchenham in her paper "Procedures for performing systematic reviews" (Kitchenham, 2004) which help to opt for quality studies. This approach was selected as it follows a standard protocol that develops in three phases, with the following particular stages (Figure 1):

Phase 1 – Planning the review: Includes the identification of the need for a review and the development of a review protocol.

Phase 2 – Conducting the review: Includes the implementation of the review protocol.

Phase 3 – Reporting the review: Includes the presentation of the results.

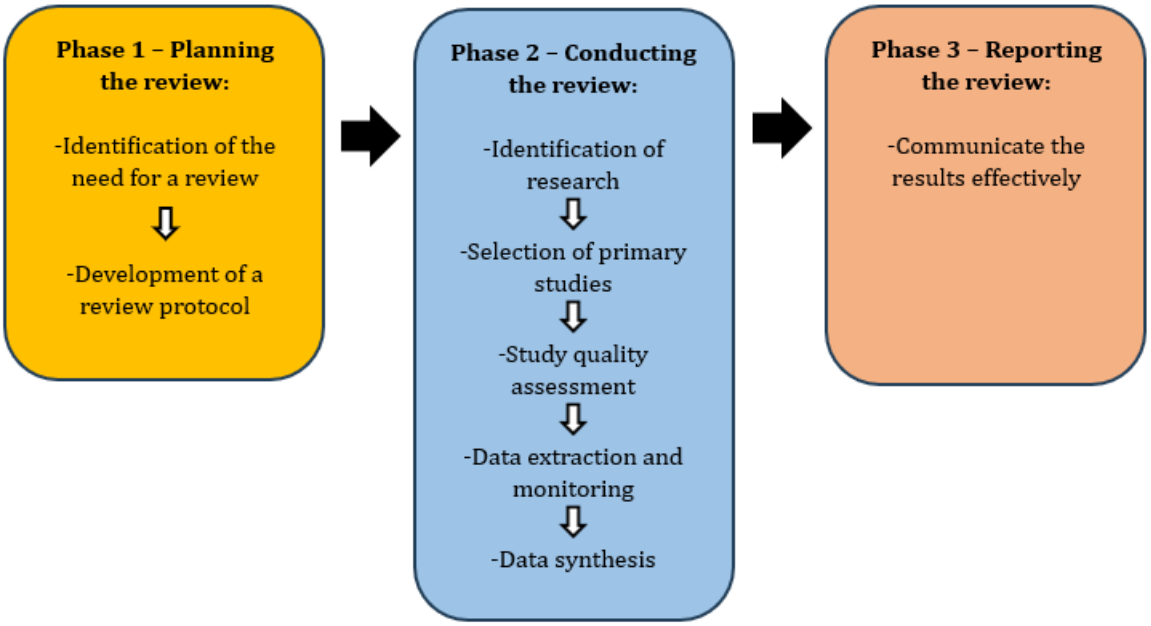

Fig. 1 - A systematic review into three main phases.

Phase 1. In the existing literature, numerous articles examine the implications of the metaverse. However, most of them focus on specific sectors, and there is a lack of studies that unify the overall findings on the metaverse. Hence, the need for a systematic review is deemed imperative. Furthermore, examining the implications of the metaverse will provide insights into its impact on cities and communities. In order to carry out the systematic literature review, a review protocol, which is described in Phase 2, was defined. The protocol includes elements such as the research questions, the search strategy for primary studies, the criteria for inclusion and exclusion of studies, the quality control criteria, and the data extraction strategy.

Phase 2. The research question that the review is intended to answer was defined. As the implications of the metaverse need to be studied, it is important to identify which sectors seem to be affected by the metaverse according to the findings so far. As such, the research question that emerges is "Which sectors are affected by the metaverse based on current findings?"

The search strategy included an automated search in digital libraries, which was conducted in August 2024. The selected digital resources included Google Scholar, Scopus, Science Direct, and Web of Science. The search term used was “metaverse implications” applied to the title, abstract, and keywords of the articles. Following, inclusion and exclusion criteria for primary studies were defined and applied, in order to evaluate the gathered articles and to determine which of them will be included. The inclusion and exclusion criteria used were as follows:

Inclusion criteria:

- Articles published in journals and conference proceedings.
- Articles discussing the metaverse’s implications.

Exclusion criteria:

- Articles referring to the metaverse in general, without reflecting any implications.
- Articles written in languages other than English.

Apart from the primary article selection criteria mentioned above, it is equally important to assess the quality of the final sample of studies in order to produce more detailed article selection criteria and to weigh the importance of the results of each study, which will be requisite subsequently in the synthesis of the results. The criteria for quality assessment in the review process included:

- the clarity and documentation of the terms, methods, and results cited in the article,
- the accessibility of the data used (i.e. providing organizations, DOI),
- the detailed description of the methodology followed, and
- the comprehensive presentation of the results.

The search conducted using the term "metaverse implications" initially returned 7 articles from Scopus, 9 from ScienceDirect, 3 from Web of Science, and 104 from Google Scholar (Table 1). The Inclusion criterion 1 resulted in a subset of 89 articles, 78 of which were journal articles and 11 were conference articles. After studying the remaining articles, 69 more were excluded based on the inclusion/exclusion and the quality assessment criteria. Consequently, the number of articles was limited to 20, comprising 6 articles from Scopus, 7 articles from Science Direct, 3 articles from Web of Science, and 4 articles from Google Scholar. Finally, after the removal of duplicate articles, the final sample consisted of 16 unique articles (Figure 2).

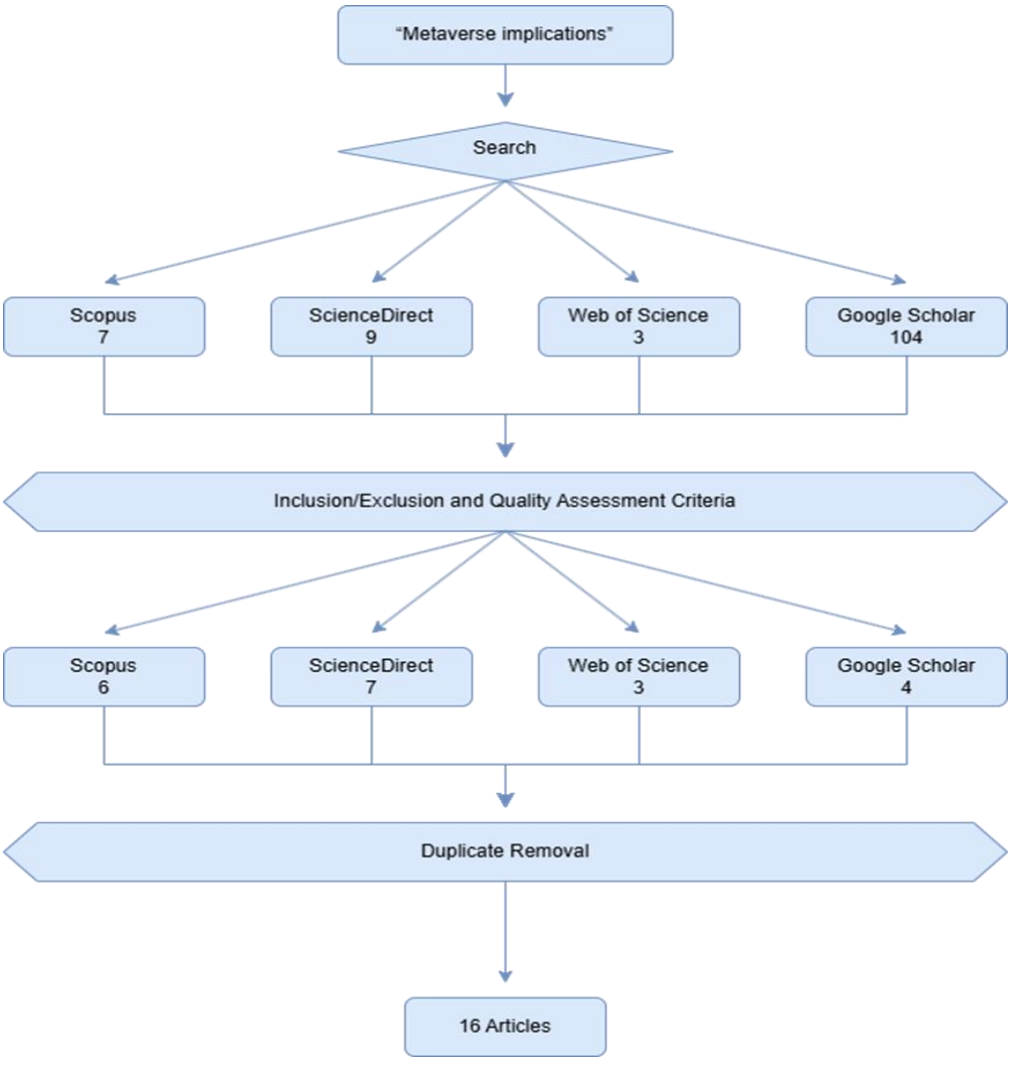

Fig. 2 - Selection process of the final sample of the review articles.

To complete the second phase, the final sample of 16 articles was studied in detail and analysed. Key insights regarding the implications of the metaverse were meticulously extracted from each article and subsequently organized according to the sector they addressed. Upon completing this initial categorization for every article, broader thematic categories were synthesized to enhance the clarity and coherence of the results' presentation. This structured approach ensured a comprehensive understanding of the metaverse's implications in different areas.

Phase 3. This phase involves the comprehensive presentation and critical evaluation of the findings from the systematic review. A coherent presentation, which facilitates an in-depth understanding of the main implications of the metaverse is presented in Section 4.

4. Systematic Review Results

This section describes the findings of the research and is organized in two subsections. Section 4.1 outlines the initial sample of articles, while section 4.2 provides a summary of the results from the analysed articles.

4.1 Quantitative Analysis

The number of studies examining the implications of the metaverse up to August 2024 are presented in Table 1. The search returned in total 123 articles, 7 from Scopus, 9 from ScienceDirect, 3 from Web of Science, and 104 from Google Scholar.

Furthermore, Figure 3 illustrates the distribution of different types of these publications. Journal articles constitute the majority, representing 63% of the total. Book chapters constitute 13% of the publications, while conference papers represent the smallest proportion at 9%. The remaining 15% (other) includes final theses, dissertations, call for papers, etc. Additionally, Figure 4 illustrates the number of publications for the search term "metaverse implications" per digital library. The majority of studies come from Google Scholar (85%), followed by ScienceDirect (7%), Scopus (6%), and Web of Science (2%).

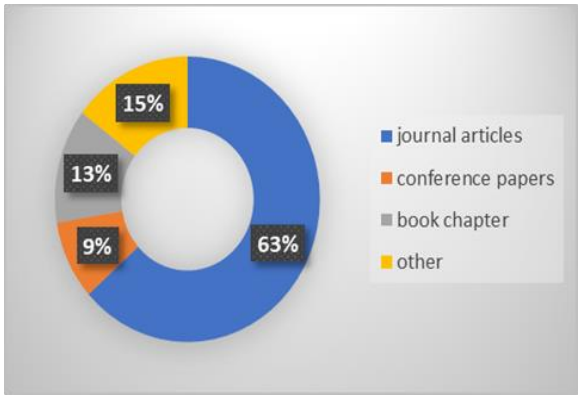

Fig. 3 - Types of publications.

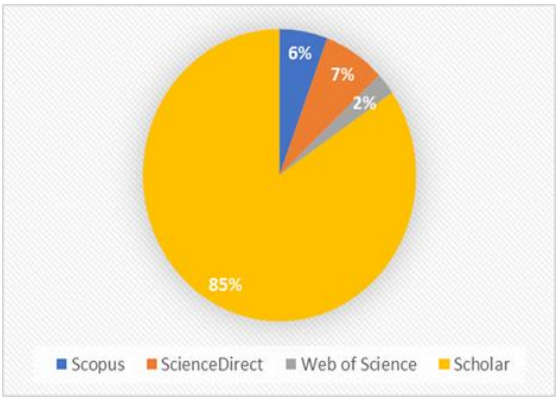

Fig. 4 - Number of publications for "Metaverse Implications" search term per digital library.

The initial study was published in 2020, the sole publication for this year. For 2021, the number of publications increased only to two. From 2022 onwards, there is an increase in the number of publications, with 14 publications recorded for that year, followed by a significant increase to 62 publications for 2023. By August 2024, 44 publications had been documented for that year (Figure 5).

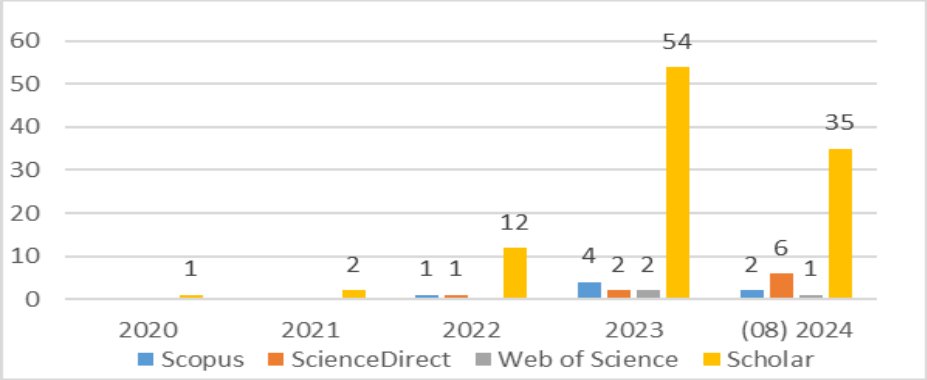

Fig. 5 - Number of publications per year and per digital library.

Figures 3, 4, and 5 present key statistical insights on the implications of the metaverse. Especially Figure 5 highlights the growing academic interest in the impact of metaverse, showing a notable rise in publications over time. This trend reflects an increasing focus on understanding the metaverse's role in digital transformation, indicating its emerging importance in shaping the digital future.

4.2 Qualitative Analysis

Using Kitchenham's methodology, the authors analysed a total of 16 articles from the original sample. Each article was systematically studied to identify all the implications of the metaverse discussed within. In response to the research question, the identified implications were categorized based on the sectors they pertain to. Subsequently, all identified implications were grouped by relevance into broader categories, encompassing all sectors referenced in the 16 articles examined.

Trying to provide a systematic analysis of the articles reviewed, the Table 2 was structured. The first column of this table introduces the broader categories that were defined, which serve as general themes that encompass the subcategories identified in the second column. In the third column, the associated references are listed.

The broader categories that were created are: Economic and Business Implications, Educational and Skill Development, Environmental and Sustainability Impacts, Healthcare and Well-being, Industry Implications, Security and Privacy Concerns, Social and Ethical Implications, and Technological and Innovation Impacts. The "Economic and Business Implications" category includes economic impacts (Metz & Gurău, 2023; Dwivedi et al., 2023; Dwivedi et al., 2022), business-oriented impacts (Schmitt, 2023; Jung et al., 2024; Lim et al., 2024; Dwivedi et al., 2022), marketing strategies (Bilgihan et al., 2024; Lim et al., 2024), and brand development (Bilgihan et al., 2024). The category of "Educational and Skill Development" covers the metaverse's potential in enhancing education and training (Salvetti, 2023; Jung et al., 2024; Pellegrino et al., 2023; Dwivedi et al., 2022; Pentangelo et al., 2024; Al-kfairy et al., 2024; Han et al., 2023), and opportunities for content creators (Bilgihan et al., 2024), while the "Environmental and Sustainability Impacts" category covers the environmental consequences (Pellegrino et al., 2023), urban ecosystem implications (Pellegrino et al., 2023), and sustainability issues (Pellegrino et al., 2023; Dwivedi et al., 2022). The "Healthcare and Well-being" category embraces the metaverse's role in healthcare (Jung et al., 2024; Al-kfairy et al., 2024), in mental health support (Din & Almogren, 2023), and overall well-being (Dwivedi et al., 2022; Din & Almogren, 2023). Furthermore, the "Industry Implications" category includes impacts on various sectors, such as the military (Metz & Gurău, 2023), hospitality (Jung et al., 2024; Dwivedi et al., 2022), retail (Dwivedi et al., 2022), tourism (Jung et al., 2024; Dwivedi et al., 2022; Din & Almogren, 2023; Suanpang et al., 2022; Baker et al., 2023), and the fashion industry (Donvito et al., 2024). The "Security and Privacy Concerns" category consists of issues like data protection (Jung et al., 2024), privacy (Bilgihan et al., 2024; Dwivedi et al., 2022; Al-kfairy et al., 2024), security ((Metz & Gurău, 2023; Dwivedi et al., 2023; Schmitt, 2023; Jung et al., 2024; Dwivedi et al., 2022), misinformation (Dwivedi et al., 2023), and legal challenges (Metz & Gurău, 2023; Dwivedi et al., 2023). The "Social and Ethical Implications" category involves social and political attitudes (Dwivedi et al., 2023; Schmitt, 2023; Pellegrino et al., 2023; Lim et al., 2024; Dwivedi et al., 2022; Al-kfairy et al., 2024; Din & Almogren, 2023), ethical considerations (Dwivedi et al., 2023; Schmitt, 2023; Bilgihan et al., 2024; Pellegrino et al., 2023; Lim et al., 2024; Al-kfairy et al., 2024), and the impact on users (Al-kfairy et al., 2024), on consumers (Bilgihan et al., 2024; Lim et al., 2024; Dwivedi et al., 2022), and on vulnerable populations (Dwivedi et al., 2023; Din & Almogren, 2023). Lastly, the "Technological and Innovation Impacts" category incorporates technological advancements (Bilgihan et al., 2024; Dwivedi et al., 2022), and innovation (Lim et al., 2024; Dwivedi et al., 2022). These categories provide a structured framework for a comprehensive exploration of the areas affected by the application of the metaverse, as discussed in the articles studied.

Tab. 2 - Implications and Broader Categories.

Broader Categories	Implications' Sectors	Associated References
Economic and Business Implications	• Brand development • Business Implications • Economic Implications • Economic and Financial Crimes • Marketing • Marketing Strategies	• (Al-kfairy et al., 2024) • (Bilgihan et al., 2024) • (Dwivedi et al., 2022) • (Dwivedi et al., 2023) • (Jung et al., 2024) • (Lim et al., 2024) • (Metz & Gurău, 2023) • (Schmitt, 2023)
Educational and Skill Development	• Content creators • Education • Educational and Skill Development • Educational and Training Advantages	• (Al-kfairy et al., 2024) • (Bilgihan et al., 2024) • (Dwivedi et al., 2022) • (Han et al., 2023) • (Jung et al., 2024) • (Pellegrino et al., 2023) • (Pentangelo et al., 2024) • (Salvetti, 2023) • (Schmitt, 2023)
Environmental and Sustainability Impacts	• Environmental Impact • Implications for urban ecosystems • Sustainable marketing • Sustainability	• (Al-kfairy et al., 2024) • (Dwivedi et al., 2022) • (Pellegrino et al., 2023) • (Schmitt, 2023)
Healthcare and Well-being	• Health • Healthcare • Mental Health • Well-Being	• (Al-kfairy et al., 2024) • (Din & Almogren, 2023) • (Dwivedi et al., 2022) • (Dwivedi et al., 2023) • (Jung et al., 2024) • (Schmitt, 2023)
Industry Implications	• Fashion industry • Industries • Military Implications • Retailing • Tourism • Tourism and Hospitality	• (Baker et al., 2023) • (Din & Almogren, 2023) • (Donvito et al., 2024) • (Dwivedi et al., 2022) • (Jung et al., 2024) • (Metz & Gurău, 2023) • (Suanpang et al., 2022) • (Schmitt, 2023)
Security and Privacy Concerns	• Data Privacy • Law Enforcement and	• (Al-kfairy et al., 2024)

	Governance • Legal Issues • Manipulation and Misinformation • Privacy • Safety • Security • Terrorism	• (Bilgihan et al., 2024) • (Dwivedi et al., 2022) • (Dwivedi et al., 2023) • (Jung et al., 2024) • (Metz & Gurău, 2023) • (Lim et al., 2024) • (Schmitt, 2023)
Social and Ethical Implications	• Consumers (Behavior/ Experience) • Ethical Considerations • Political Implications • Social Impact • Social Interactions • Societal - Behavioral • Societal Norms • User Behavior/Experience • Vulnerable Populations	• (Al-kfairy et al., 2024) • (Bilgihan et al., 2024) • (Din & Almogren, 2023) • (Dwivedi et al., 2022) • (Dwivedi et al., 2023) • (Lim et al., 2024) • (Pellegrino et al., 2023) • (Schmitt, 2023)
Technological and Innovation Impacts	• Business Innovation • Innovation • Technological Investments	• (Bilgihan et al., 2024) • (Dwivedi et al., 2022) • (Lim et al., 2024) • (Schmitt, 2023)

The analysis highlights the impact of the metaverse on key sectors such as business, security, education, society, technology, environment, healthcare, and various industries. Moreover, it underlines the metaverse's transformative potential to reshape economies, redefine social interactions, drive technological innovation, and create new opportunities while also presenting challenges that should be addressed.

5. Discussion: Metaverse and Social Cohesion

The systematic literature review first highlighted the quantity and types of studies examining the implications of the metaverse. Subsequently, this article pointed out the areas affected by the metaverse as indicated in the analysed articles. Further delving into these areas and examining them more closely reveals that the metaverse can significantly promote social cohesion within the smart city context.

Primarily, the metaverse can transform education by creating virtual environments that foster inclusivity, accessibility, and collaboration. By bridging physical and cultural gaps, the metaverse allows students from different socio-economic and geographical backgrounds to interact and collaborate, reducing barriers to education and communication (Pentangelo et al., 2024). Students from developed or developing regions, with many or few resources for education, can participate equally in these learning environments, bridging therefore educational inequalities. Moreover, the immersive nature of metaverse technologies enables students to engage in social interactions that resemble real-world experiences, fostering a sense of community and belonging (Lim et al., 2024). Immersive technologies (like VR and AR) offer new ways to engage students and improve learning outcomes (Al-kfairy et al., 2024). The metaverse facilitates personalized learning experiences, enhances communication and collaboration, and introduces new ways of teaching and learning, by enabling students to not only hear about concepts but to immerse themselves in the learning experiences (Pellegrino et al., 2023). Additionally, the integration of AI, Blockchain, and immersive tools within educational environments ensures security, and transparency for all users, further enhancing social integration (Han et al., 2023). This inclusiveness promotes social cohesion by creating equal opportunities for education and by promoting interaction and collaboration among students. Such educational and collaborative environments can help bridge divides and build cohesive, well-integrated communities that value diversity and mutual support.

Furthermore, healthcare can become a medium for promoting social connections and mental health. In a metaverse environment, healthcare can extend beyond traditional medical treatment. Virtual healthcare environments offer personalized healthcare services for vulnerable groups such as the elderly and people with disabilities, reducing social isolation and promoting a sense of community engagement (Din & Almogren, 2023). The integration of technologies like XR can enhance patient care, revolutionize surgical practices, and elevate the education and training of medical professionals. By combining XR with traditional treatments, such as those for post-traumatic stress disorder, anxiety and fear conditions, and pain management, the metaverse can offer an individualized, cost-effective alternative to conventional treatments (Jung et al., 2024). Additionally, by creating supportive spaces where patients can communicate with healthcare professionals, the metaverse can reduce waiting times, relieve pressure on healthcare systems, and create safe, anonymous environments where patients can comfortably share their concerns (Jung et al., 2024). Thus, the metaverse can contribute to mental wellbeing, a key component for building connected urban communities. However, challenges such as data privacy and potential addiction to such virtual environments may arise from the use of metaverse (Jung et al., 2024).

In addition, virtual marketplaces, created by the metaverse, can provide equal access to economic opportunities by connecting people across several economic layers (Dwivedi et al., 2022). By facilitating global transactions and offering new models of remote work, the metaverse can integrate emerging and frontier economies into the broader digital economy, fostering economic inclusion (Schmitt, 2023). Moreover, the metaverse's capabilities for global collaboration and virtual workspaces enhance productivity and connect people globally. By creating a global network, geographical barriers are broken down and a sense of common purpose and inclusivity among the various participants is promoted (Schmitt, 2023). This inclusivity not only promotes economic growth but also promotes social cohesion by ensuring that no community is left behind. Similarly, the integration of metaverse technologies in smart cities can enhance these benefits by enabling digital infrastructure, promoting economic growth and improving urban quality of life. As smart cities utilize advanced technologies such as IoT and AI to optimise urban services, the metaverse can also help by offering immersive platforms for collaboration, virtual commerce and innovative urban planning.

Along with these, the metaverse's immersive nature can redefine social interactions and enhance a sense of belonging. Virtual spaces provide opportunities for individuals to engage with others, which can reduce loneliness and promote cultural exchanges (Din & Almogren, 2023). Additionally, the metaverse supports the hosting of events and social activities that reinforce common values and mutual trust. Especially in the context of smart cities, which prioritize the integration of technology and sustainability, the metaverse can promote the development of interactive spaces where citizens can participate in a variety of activities. As a result, the integration of metaverse in smart cities can strengthen social bonds and community networks, promoting citizens' interactions and engagement. However, challenges such as the potential for unethical behaviour must be addressed through robust governance and ethical guidelines (Dwivedi et al., 2022; Al-kfairy et al., 2024).

Additionally, as sustainability aligns seamlessly with the principles of smart cities, the metaverse can contribute in several ways to this effort. By promoting virtual tourism, the metaverse holds the potential to reduce the environmental impact of physical travel, and thereby fostering a sense of shared responsibility among citizens (Suanpang et al., 2022). Other than virtual tourism, the metaverse can also reduce the need for physical mobility by facilitating activities such as work, education, and entertainment in virtual spaces. By creating shared virtual environments within smart cities, citizens can collaborate, learn, and engage in several activities, fostering a sense of community and inclusivity with less environmental impact. Moreover, the metaverse can positively impact urban ecosystems involving citizens in city planning and decision-making. Citizen participation ensures that urban development serves all groups of citizens equally. Such initiatives in smart cities can support social cohesion by promoting transparency, participation and inclusiveness while utilizing advanced digital technologies.

While the potential benefits are promising, the role of the metaverse in promoting social cohesion requires addressing significant challenges. These include ensuring digital equality to prevent the exclusion of less privileged groups, implementing effective governance to address issues such as cyberbullying, hate speech and unethical behaviour, and protecting privacy (Dwivedi et al., 2023; Dwivedi et al., 2022).

In conclusion, in the smart city context, the metaverse can be a catalyst for strengthening social cohesion, by bringing people together regardless of physical, cultural, and economic differences. It offers innovation in education, new ways of communication, new models for healthcare, and opportunities for economic growth, promoting inclusivity and social well-being. However, to fully realize these benefits, it is necessary to implement safeguards that promote ethical use, protect privacy and ensure equal access for all. Careful integration of the metaverse in the context of smart cities can, thus, pave the way for more cohesive, inclusive and connected communities.

6. Conclusions

This article attempted to highlight the role of the metaverse in promoting social cohesion, especially in the smart

city context. As the metaverse is increasingly becoming a part of people's lives, it is of high interest to explore its impact on both individuals and communities.

In this paper a systematic literature review was conducted to explore the existing literature on the metaverse's implications on people. The outcomes were utilized to identify how social cohesion, especially within cities and communities is associated with them.

The review has extracted some useful findings: the metaverse can offer significant opportunities to promote social cohesion, in particular in the context of smart cities. By improving education, expanding access to healthcare, promoting economic participation and facilitating social interaction, the metaverse can create more connected and inclusive communities. As a result, people from all social backgrounds can participate, collaborate and thrive together. In an era when cities are digitally transformed, the metaverse has the potential to bring community members closer together by enhancing social interactions and connections, encouraging civic engagement and participation, and developing a sense of social belonging – all essential components of social cohesion. However, challenges such as the digital divide, security and privacy concerns and ethical behaviour in virtual spaces need to be addressed. Effective governance, strong regulatory frameworks and collaborative efforts need to be put in place to ensure accessibility and inclusiveness of the metaverse.

From a broader perspective, the metaverse presents both promising opportunities and considerable challenges. On the one hand, it has the potential to transform the urban experience by creating immersive, accessible, and innovative spaces for education, economic growth, social interactions, and civic participation. It can serve as a tool for reducing physical barriers, enabling global connectivity, and enriching smart city experiences. On the other hand, digital exclusion, data privacy, and governance remain key issues. The rapid expansion of virtual spaces raises questions concerning equitable access, the potential for aggravating socioeconomic disparities, and the ethical considerations of digital interaction replacing real-world social relationships. Despite these challenges, the metaverse has enormous potential to promote social cohesion in smart cities. By balancing technological innovation with ethical governance and inclusive policies, smart cities can leverage the metaverse to create more inclusive, equitable and resilient urban environments.

These findings contribute to the growing discussion on digital urbanism, and the evolution of smart cities, highlighting the metaverse as a critical contributor. In addition, these insights offer guidance to policy makers, urban planners and technology developers to design metaverse-driven solutions that promote social cohesion in communities. Priority needs to be given to strategies to mitigate digital exclusion, ensure ethical use of metaverse technologies, and promote equal participation.

While this study provides valuable insights, it is subject to certain limitations. A limitation of this research is the relatively small number of articles analysed, as only a small subset met the applied inclusion criteria. Furthermore, the evolving nature of metaverse technologies, driven by continuous advancements in AI, VR, and blockchain, makes long-term predictions challenging.

Some future thoughts concern the analysis of the implications of the metaverse by sector in order to develop a more detailed framework of its impact on both people and society. Moreover, future research should explore long-term social effects of metaverse-based urban planning, incorporating qualitative approaches to understand users' experiences and perceptions. As we move forward, continued research and collaborative efforts will be essential to navigate this evolving digital landscape, ensuring that the metaverse becomes a key for strengthening the society as a whole. By addressing these research directions, future studies can contribute to a more comprehensive understanding of the role of the metaverse in promoting social cohesion within smart cities.

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