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Metaverses and Business Transformation

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Abstract. Metaverses refer to virtual worlds which enable the interaction between users and simulate people, places and things of the physical world. The wider use of metaverses can disrupt how we interact and bring a plethora of implications for businesses and society. While the term metaverse received increased attention recently due to the interest of tech giants, researchers have been exploring virtual world interactions for over a decade. In light of new exciting metaverse implementations, it is necessary to consolidate information via existing research on how the use of metaverses can transform businesses. As a first step, this paper outlines the methodology to be followed by future researchers aiming to shed light on metaverse and business transformation. It proposes a framework to assist authors in organizing existing literature on metaverses and guide them in identifying future research avenues.

Keywords: Virtual reality · Augmented reality · Avatars · Digital twins · Virtual worlds

1 Introduction

The term 'metaverse' has been initially coined by the science fiction writer Neal Stephenson in his Snow Crash book in 1992, to refer to a computer-generated universe [1] –a massive collective virtual environment that simulates the physical world, where users can get together to play games, socialize and work. Here, we define metaverse as an immersive virtual world where people, places and things of the physical world are represented by their digital representations (e.g., avatars) and can meet, communicate, interact and collaborate. The notion of virtual three-dimensional world has existed ever since tools like Open Simulator project, Second Life and VR-head mounting displays (e.g., Oculus Rift) appeared in the market. The virtual world is defined as a reality-inspired digital multimedia 3-dimensional online environment where users can interact by using avatars [2]. A virtual world comprises certain characteristics [3]; it has a three-dimensional format offering an immersive experience, it involves an active user role through the avatar, and

there is a collaborative relationship with other users who exist through their avatars in the specific virtual environment. Avatars in virtual environments have been used in different contexts and situations such as e-commerce, e-therapy, virtual worlds, videogames, collaborative online design etc. [4]. Research on these topics provides valuable knowledge on metaverse's predecessors.

Metaverse is currently receiving increased attention. The maturity of technologies including extended reality, human-computer interaction, artificial intelligence, blockchain, computer vision, edge and cloud computing and mobile networks, is currently driving the wider use of metaverses [5]. Enhanced accessibility, wider use of mobile technologies, social distancing due to the pandemic and the need for alternative ways of investing are some of the drivers of recent interest of the wider population. For example, Decentraland[1] is a 3D virtual platform that goes beyond interaction with users, as they can create, explore, and purchase virtual property through it. Such property ownership is supported by non-fungible token (NFT) which is based on Ethereum blockchain, serving as public certificate of authenticity or proof of ownership.

Tech giants (e.g., Facebook, Microsoft) recently made announcements on their intention to transform their platforms towards metaverse. In October 2021, Facebook announced its rebranding into Meta[2], bringing together all applications and technologies offered by the company under a new company brand. The company aims to elevate its online social experiences into three dimensions or even sometimes project them in the physical world, so that users can share their experiences and connect with others, even when they are not able to be in the same physical location. Meta also aims to enable users to complete activities that they cannot do in the physical world. Along the same lines, in November 2nd, 2021, Microsoft announced the mesh features for its Mesh for Teams application in an effort to offer mixed reality capabilities and enable users in different physical locations to make their meetings more collaborative and share holographic experiences [6]. Mesh for Teams release is expected in the first half of 2022.

3D avatar-based virtual and augmented reality tools have been available for more than a decade. However, recent announcements of tech giants on enhancing online social media and communication tools using immersive virtual environments are expected to advance advancements in the area, thus most likely leading to a significant increase on our use of metaverse soon. As metaverse brings new capabilities and challenges to businesses, it is expected to inspire changes in their strategies, operations, policies and organizational structure, similar to the ones that social media brought two decades ago. Our goal here is to facilitate a discussion on how the information system field can help uncover the potential of metaverses for business transformation and how should a systematic literature review be designed to address this goal.

2 Background and Motivation

Existing literature has focused on reviewing the technical aspects of the technologies related to metaverse. Lee et al. [5], examine the latest metaverse developments on the

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[1] https://decentraland.org/.

[2] https://about.fb.com/news/2021/10/facebook-company-is-now-meta/.

state-of-the-art technologies which are serving as metaverse enablers and reflect on the user-centric factors that enable metaverse ecosystems. Information Systems (IS) scholars have also focused on reviewing existing literature on tools and technologies related to metaverse and their impact to specific application domains (e.g., Second Life, Open Simulator, use of head-mounted displays etc.). Most of this work has focused on reviewing such technologies with respect to its impact for the e-learning field. For example, in [7] the authors provide a review of virtual reality technologies in e-learning. In [8], they review empirical studies on e-learning and organizational learning and exhibit how existing research in these areas has made use of metaverse related technologies. In [9] the authors conduct a systematic review of how researchers have applied immersive VR (head-mounted displays) in higher education. Other scholars have also focused on reviewing existing literature on 3D virtual worlds on collaboration and their impact for businesses [10].

Despite the potential of the metaverse to bring the next 'digital big bang' [5], IS literature currently lacks a systematic review which reflects on our so far knowledge on its business transformation potential. This gap signals scarcity of sufficient information sources and leaves researchers as well as practitioners in unchartered territories when in need to decide upon new research experiments in virtual worlds or sketch new strategies and policies to respond to the rapid changes in the tech arena. To extract useful theoretical and practical implications and identify research avenues related to the metaverse, it is necessary for future researchers to map existing IS research on the intersection of metaverse (and related technologies) and business transformation).

To address this gap, researchers may review existing research on metaverse related technologies (e.g., Open Simulator project, Second Life, VR-head mounted displays etc.) of the past decade. Below we include a couple of research questions which could shape this body of research:

RQ1: What is the status of the research on metaverses and its predecessors from a business transformation perspective?

RQ2: Which are the potential future research avenues at the intersection of metaverse and business transformation?

As a first step towards this direction, in this paper we outline a methodological approach and framework which could guide future researchers in organizing existing research. Section 3 describes the methodological approach to be followed for conducting a systematic literature review framed by the research questions of this paper and Sect. 4 outlines a proposed research framework that can be employed for analyzing the extant literature.

3 Methodology

Reflecting on the research questions proposed earlier in this paper, this Section suggests a structured process for identifying papers which could be included in a structured literature review analysis. Inspired by [11], scoping review approach for this purpose could include a comprehensive overview of relevant papers while remaining open on

excluding papers on metaverse related topics which go beyond the proposed research questions. More specifically, such a process will encapsulate sources of research scan, the means to retrieve the papers identified and the criteria for inclusion and exclusion of papers depending on their relevance to the research questions [11]. In particular, this process may include a search approach for identifying relevant conference and journal papers in databases that cover the major venues of IS publications. In particular, the databases to be addressed may include the AIS Senior Scholar's Basket of Journals (basket of 8), AIS Electronic Library, ScienceDirect, IEEE Xplore and other major databases related to IS. We suggest that the process will only accounts for scientific knowledge as arising by scientific papers on the topic and exclude publications such as press releases, media, white papers, book chapters, communications, encyclopedias and reviews.

The approach of [12] may be followed to cover the three main issues which need to be examined when evaluating the quality of shortlisted papers; rigor, credibility and relevance. Such criteria have also been used in the past for reviewing adjunct IS research areas, e.g., e-Learning [8]. Relevance could also be associated with application area, use, design, impact, benefits, challenges associated with the use of metaverse related technologies for individuals, society, organizations and industries. During the review process, the samples of the approach followed may also be discussed among authors to ensure a consistent process will be followed across all databases and papers identified minizine in this way the risk of subjectivity in the shortlisting process. Paper duplicates should be excluded from the paper count process.

After finalizing the list of papers to be reviewed, a qualitative content analysis can be followed. The qualitative content analysis may encapsulate three steps as illustrated in Fig. 1 leading to the final number of papers to emerge from this process.

Researchers may adopt the predefined set of categories and descriptions of [13] to organize advancements relevant to metaverse. They may follow Morris' five-step process for directed content analysis [14]. For each paper researchers may begin with determining the unit of analysis, then categorize the papers with respect to the academic discipline and research method employed. Then, researchers may use the selected framework to further organize papers and related knowledge.
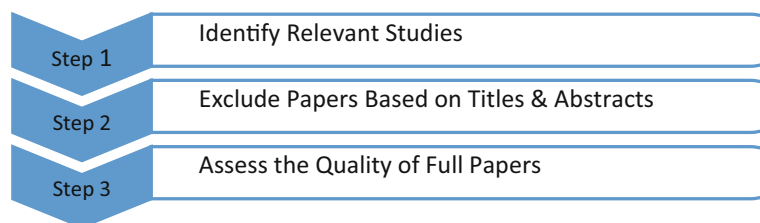
Step 1	Identify Relevant Studies
Step 2	Exclude Papers Based on Titles & Abstracts
Step 3	Assess the Quality of Full Papers

Fig. 1. Stages of paper selection process

4 An Organizing Framework for Metaverse Research

In [13] the authors, propose a framework for reviewing the social medical literature. In their proposed framework, acknowledge the framework's intention to guide research in

the areas of social media and digital transformation. As the social media research area holds a plethora of similarities with metaverse (e.g., virtual profiles, communication, user interaction etc.), we consider this framework as a viable starting point for reviewing existing research on the metaverse topic. Other IS scholars have already employed this framework to review research in other IS domains e.g., blockchain research [15]. In their framework, the authors identify four thematic research areas which span across three (overlapping) units of analysis: Users and society; Intermediaries and platforms; Firms and industries. Researchers may employ these 4 thematic areas, to describe how users and business create and use metaverse related technologies. Adding to the existing discussion [16], we present examples that can guide researchers further towards realizing the role of IS to uncover the potential of metaverses for business transformation.

1. **Design and features.** How users and organizations interact with metaverse features; whether metaverse features serve the objectives of the users; how platforms, organizations and governments design, implement, standardize and regulate these features to foster or control the use of metaverse related technologies; how can metaverse platform providers transfer sensed information from real world to virtual world objects; what features should firms consider when developing metaverses.
2. **Strategy and tactics:** How users, organizations and governments can make the most out of their use of metaverse; how they may use metaverse tools and create strategies (e.g., product development, pricing etc.) which meet their requirements or goals; what new market opportunities arise for metaverse platforms and intermediaries; how can metaverse platforms serve organizations in order to achieve their business goal.
3. **Management and organization:** How should users adjust their routines in order to better facilitate the use of metaverses; what skills do users need to develop in order to benefit by the use of metaverses; how should platform providers create and maintain metaverse platforms; what is the role of intermediaries in re-training the population on the use of metaverses.
4. **Measurement and value:** What is the emotional and behavioral impact of metaverses on users; what are the factors shaping positive user experiences; what is the impact of using metaverses for the environment; what is the impact of ownership ambiguity in virtual worlds for platform providers; how do metaverses add value to firms in different industries

In this paper we propose an approach for mapping existing research on metaverse for business transformation as well as a framework for analyzing existing research. We note that the mapping of existing research may vary on depth and the breadth and researchers may choose to select keywords to be included in their search accordingly (e.g., may only include "metaverse" or may also include "virtual worlds", "avatars" etc.) Reflecting on the proposed framework, we highlight the adequacy of this framework for analyzing metaverses literature with regards to business transformation. In particular, the framework distinguishes across three levels of analysis which can be employed to reflect on existing research from a specific viewpoint. Consumers and society such as individuals who make use of metaverse. Platforms and intermediaries such as for example, organizations or Governmental actors that build, operate, or innovate using

metaverse. Firms and industries, such as for example firms or industries that use and interact with metaverse. We hope that the approach and framework will inspire future researchers to map and analyze existing knowledge on this topic.

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