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EDITORIAL PERSPECTIVE

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Digital transformation: A multidisciplinary perspective and future research agenda

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Abstract

Digital transformation has had an unprecedented influence on all sectors of business over the last decade. We are now entering an era characterized by the extensive digital transformation of businesses, society, and consumers. Therefore, digital transformation has become a pivotal focus for organizations across various sectors in recent years. Despite differing scholarly perspectives on the concept and elements of digital transformation, a consensus exists that it significantly impacts consumer decisions and necessitates organizational adaptation. Recent challenges such as the COVID-19

pandemic have further accelerated the need for digital transformation and its effects on consumers. This necessitates an editorial perspective on this most important topic to establish future research agenda encompassing the various dimensions of digital transformation. The purpose of this editorial perspective is to review research on digital transformation from a multidisciplinary viewpoint and provide insights into several key domains—Internet-of-Things, social media, mobile apps, artificial intelligence, augmented and virtual reality, the metaverse, and corporate digital responsibility—that are poised to fuel the pace of digital transformation. Each domain is analyzed through a lens of introduction, role, importance, multifaceted impact, and conclusions. Future research directions are suggested.

KEYWORDS
artificial intelligence, ChatGPT, digital transformation, Internet-of-things, mobile apps, social media

1 | DIGITAL TRANSFORMATION: AN OVERVIEW

Digital transformation has revolutionized the way we live, do businesses, and make decisions as consumers. Spending on digital transformation technologies and services worldwide has exceeded $2.16 trillion in 2023 and is expected to reach $3.5 trillion in the near future, which shows the emphasis placed on its investment as a potential growth enhancer for organizations (Statista, 2023). Literature argues that digital transformation is influencing managerial decisions and actions in different industries and contexts (e.g., Benner & Waldfogel, 2020; Correani et al., 2020). The recent business challenges created by COVID-19 have also pushed organizations to accelerate digital transformation (Hanelt et al., 2020). Although there is diverse literature on digital transformation, scholars do not necessarily agree on what digital transformation is and what it includes (e.g., Hanelt et al., 2020; Warner & Wager, 2019; Wessel et al., 2021). Despite the lack of clarity, the starting point is that as organizations immerse themselves with digital technologies (Bharadwaj et al., 2013), they need to adapt (Warner & Wager, 2019). Vial (2019) defines digital transformation as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (p. 121). This definition is consistent with "digitalization" that encompasses three aspects: (i) the individual, organizational, and broader contexts (Legner et al., 2017, p. 301) (ii) the outcome of digital transformation, that is, improvement (iii) the means of digital transformation, that is the information, computing, communication, connectivity technologies that evolve over time (Bharadwaj et al., 2013). Whereas the first and third aspects have been studied from diverse perspectives, the second referring to the outcome of digital transformation has been largely missing from the literature until recently. It is inextricably linked to organizational change, defined as "difference in form, quality, or state over time in an organizational entity" (Van de Ven & Poole, 1995, p. 512), and in our case change caused by the introduction of digital technologies and wider changes that this introduction brings, as it transforms the current operational models. This may also impact upon processes, and capabilities to enable a firm to achieve sustainable competitive advantage, as well as significant increases in performance and profits (Bharadwaj et al., 2013; Li, 2020). To achieve digital transformation, organizations also make significant investments, devising digital technology strategies to help them understand how they can better create and appropriate value (Correani et al., 2020). Thus, recent scholarship has attempted to reflect, review, and examine understandings and implications of digital transformation for strategy, organizational change, and research (see Hanelt et al., 2020, Verhoef et al., 2021 and Vial, 2019 for recent examples). Verhoef et al. (2021) allude to the substantial pressure that digital transformation brings to companies and specific markets, as customer expectations and behaviors change. In particular, a multidisciplinary approach is taken that contextualizes digital transformation as occurring in three stages from digitization, "change in a firm's organizing logic by instilling new properties into product platforms" (Sandberg et al., 2020, p. 130), to digitalization and finally digital transformation. Therefore, in more recent definitions and conceptualizations, an acknowledgment is given both to exterior influences, such as the competitive environment, as well as planned essential components, including adequate staff resource and an appropriate organizational infrastructure. Other studies on digital transformation have focused on how the transition from a current to a desired future state is managed, by evaluating and readjusting the organization's vision and strategy using digital technologies (Li, 2020), or on challenges that organizations face when transitioning to a new state that may hinder digital transformation (Hanelt et al., 2020; Hess et al., 2016; Vial, 2019). Other scholars have investigated the alignment between business strategy and IT (Bharadwaj et al., 2013; Chanias et al., 2019; Hess et al., 2016). In a recent study, Li et al. (2022) looked at how organizations build through digital technology the appropriate capabilities to facilitate digital strategy (Bharadwaj et al., 2013; Ross et al., 2017) whereas other scholars have explained how organizations digitally transformed their

operations to deal with the repercussions of COVID-19 and moved from on- and off- line operations to omnichannel (Sharma et al., 2020; Ivanov & Dolgui, 2020), or on how they balanced their everyday operations with managing the transition to digital (Li, 2020). Vial (2019) argues that digital transformation transforms the value creation process in the following ways (i) value proposition: firms use digital technologies to propose and develop new products and services based on customer preferences; (ii) value network: firms redefine their value networks through the use of digital technologies, as customers are incentivized for engagement and participation in the value co-creation process (Lusch et al., 2010); (iii) digital channels: firms use digital technologies to change their distribution and sales channels and introduce customer-facing channels (Verhoef et al., 2021); (iv) agility and adaptability: organizations use digital technologies to adapt to the environmental conditions, or to create those capabilities that allow them to exploit and explore at the same time to create value (e.g., Andriopoulos & Lewis, 2010; Park & Mithas, 2020). To benefit from digital transformation, organizations could use different steps, that is, analyze current digital technology trends to understand the impact of digital transformation especially vis-à-vis the current positioning in terms of digitization, digitalization, and digital transformation; then organizations would need to seek clarification on how they will bridge the possible gap between the current state and the digital transformation state, followed by implementation of the plan with technical and managerial support (Parviainen et al., 2017). However, numerous challenges persist in terms of access, usability, trust, and governance, as digital transformation is embraced more widely by energy corporations, healthcare institutions, and within an increasing number of marketing and consumer contexts, among others. One of the more up-to-date Lloyds Bank UK Consumer Digital Index reports has estimated that 21% of the population lacks at least one basic digital skill. This is equal to 11.3 million adults not being digitally included. Although this figure has declined since 2015 (from 12.6 million), the digitally excluded part of society is still significant (Dafoulas et al., 2022, Ueno et al., 2023). Additional estimations suggest that 6.9 million people will be classed as digitally excluded by 2028 (Milner, 2018). Thus, access and utilization of digital technologies remain illusive and inaccessible to many, despite considerable organizational and infrastructure investment globally. Researchers have also discussed areas of concern including the ethical, fair, and protective use of data and technology (Wirtz et al., 2023). As a result, there is more emphasis within emerging literature on the prevention of privacy risks and security issues for customers that emerge when companies invest in digital transformation (Dörr, 2020; Elliott et al., 2021). Practitioners and researchers alike continue to be fascinated as much by the failure of digital transformations as by their success. For example, a recent book focusing on "why digital transformations fail" includes a foreword by the retired chairman and CEO of Proctor and Gamble (Saldanha, 2019). Failure as the result of technological disruption can be attributed to the need for reorganization, synchronization, agility, and managing risk. A recent issue of the Harvard Business Review focused on digital transformation failures, entitled "Why so many high-profile digital transformations fail" (Davenport & Westerman, 2018). As part of this review, global brands including Burberry, General Electric, Proctor and Gamble, and Lego are discussed, in relation to their specific digital transformation project failures. These primarily relate to a lack of financial and strategic planning and lower than expected quality outcomes in the digital transformation system(s). It is noted that numerous core examples of failure manifest themselves when large obligations to digital competence expansion meet basic finance-orientated performance problems. This can be attributed in most instances to failures in other aspects of the business that cannot be rectified by digital transformation. Therefore, no senior leaders should perceive digital, or any other significant technological innovation as the inevitable route to success (Davenport & Westerman, 2018), but part of a process of change innovation to facilitate potential growth. Researchers examining digital transformation in high-reliability organizations including a European utility company, also identified tensions between the organizations' identity and key characteristics of digital transformation which resulted in self-protecting behaviors by the IT workforce, that could ultimately disrupt the transformative process (Poláková-Kersten et al., 2023). Thus, the importance of bottom-up processes and organizational-wide plans for digital transformation implementation remain key to integration achievement.

By examining multiple perspectives on the integration and adoption of digital transformation, this article aims to provide insights into its influence, importance, and application within marketing and social media innovation, mobile apps, artificial intelligence including ChatGPT, augmented, and virtual reality, the metaverse, as well as via an examination of the role of corporate digital responsibility (CDR), from the customer's perspective. The evolving nature of digital transformation is likely to impact numerous business sectors and permeate across various communities and global societies. In this sense, the article provides valuable understandings of considerations for integration, as well as relevant advice and recommendations for implementation, for academics considering new areas of research and practice-based communities reviewing new ideas for innovation.

The rest of this article encompasses seven distinct topics, each of which has accelerated the speed of digital transformation. These topics are discussed individually and include an introduction, the role, the importance, the multifaceted impact, and future research directions. Various authors have contributed to the writing of these sections, and their respective contributions are outlined in Table 1. The article ends with concluding remarks.

2 | INTERNET-OF-THINGS AND DIGITAL TRANSFORMATION

Internet-of-Things is a dynamic network, comprising "things" (i.e., objects) that have unique identities, physical attributes, and intelligent interfaces (Guillemin & Friess, 2009), that "collects data, processes it, and delivers output. This data is used by an ecosystem of stakeholders which act as business enablers" (Sorri et al., 2022) of the digital transformation of the provision of products and services. The digital transformation of services driven by the development of applications based on Internet-of-Things technologies is founded on

TABLE 1 Authors' contributions.

Contributions	Contributors
Project administration, conclusion, review, re-write, edit the manuscript	Justin Paul, Akiko Ueno, and Charles Dennis
Digital transformation: An overview	Thanos Papadopoulos and Lucill Curtis
Internet-of-Things and digital transformation	Eleftherios Alamanos and Thanos Papadopoulos
Social media and digital transformation	Eleonora Pantano and Charles Dennis
Mobile apps and digital transformation	Agnieszka Kacprzak and Sapina Tyagi
Artificial intelligence including ChatGPT and digital transformation	Jonathan Liu, Sree Lekshmi Sreekumaran Nair, and Ozlem Ozdemir
Augmented reality, virtual reality and digital transformation	Olivia Petit and Lucill Curtis
Metaverse and digital transformation	Pantea Foroudi and Reza Marvi
Corporate Digital Responsibility and digital transformation: A customer perspective	Jochen Wirtz and Werner Kunz

three main parameters, namely, technological, market potential, and regulatory environment (Lu et al., 2018). This section aims to highlight the marketing-related implications of the role of Internet-of-Things applications in the digital transformation of products and services with a particular focus on the marketing-related implications on firms' business models such as branding, customer relationship management, and adoption of such technologies by the customers.

2.1 | The role of Internet-of-Things in the digital transformation

Internet-of-Things has a key role in the digital transformation of business models (Paiola et al., 2022), the relationship between brands and consumers in connecting consumers with the products and services that various brands offer, as well as the users with various services. The main role of Internet-of-Things in the digital transformation of products and services is to facilitate innovation in their digitalization. Businesses use data to address challenges and create opportunities (Sorri et al., 2022). The digital transformation of services driven by the development of applications based on Internet-of-Things technologies is founded on three main parameters, namely, technological, market potential, and regulatory environment (Lu et al., 2018). Past research suggests that interaction with brands via Internet-of-Things enabled applications enhances customers' attachment with the brand (Wu et al., 2017). Specific examples of the key role that Internet-of-Things has in the digital transformation of various products and services are the developments in the digital transformation of cities and homes to smart in particular with regard to home automation and domestic energy management (Li et al., 2022). A key characteristic of such smart product and services is the communication among the objects that comprise them where the role of Internet-of-Things as a digital technology is crucial. Other scholars have identified the impact of Internet-of-Things services on perceived well-being by consumers (Attié & Meyer-Waarden, 2022). Internet-of-Things also plays an important role in the provision of healthcare services where it makes a major impact on the lives and well-being of individuals, as such technologies can provide patients with more independence and change the role that relatives and carers have in the provision of healthcare services (Schneider-Kamp & Askegaard, 2022). Others have investigated the ways in which Internet-of-Things could improve social welfare of individuals (Attié & Meyer-Waarden, 2022) as the technology facilitates the transformation of interventions from reactive to preventive due to real-time information exchange between the stakeholders (Chang et al., 2023; Park et al., 2022).

2.2 | The importance of Internet-of-Things in driving digital transformation

In the context of marketing, past research suggests that brands that offer Internet-of-Things applications and interconnected products and services build stronger brand loyalty as consumers tend to buy smart products from the same brand to avoid compatibility issues (Liang et al., 2021) as past research has identified compatibility as one of the main factors based on which consumers select Internet-of-Things enabled products (Shin et al., 2018). This can be very important for firms as the seamless exchange of information facilitated by Internet-of-Things technologies can increase competition by lowering switching costs for customers (Basaure et al., 2020). Internet-of-Things applications can also provide disruptive solutions to improve the performance of organizations. The digitalization of products and services can add value to society by generating several benefits to society and environment such as reduced energy consumption, reduced environmental impact, and positive impact on social sustainability (Paschou et al., 2020).

2.3 | The multifaceted impact of Internet-of-Things in driving digital transformation

Within the marketing literature, organizations develop Internet-of-Things based business models to better support the development and the sales of their products and services and the innovations management within their organization. Such models could be used for creating/enhancing customer experiences; financial transactions between firms and customers; and customer-related issues. Internet-of-Things technologies can be also used in improving corporate communications by creating tailored messages based on real-life information exchange between firms and their customers (Valentinetti & Flores Muñoz, 2021). In some cases, firms can create side businesses by offering new services or solutions to business problems informed

by the utilizations of the rich data that is generated by Internet-of-Things technologies in addition to traditional sales of products (Gimpel, 2020). Another stream of research on Internet-of-Things focuses on the enhancement of customer experience and satisfaction by examining the role of the exchange of information between devices via the Internet in improving the product performance. In healthcare services, wearable devices utilize Internet-of-Things technologies to connect healthcare-providers and patients to enhance the provision of the service and the wellbeing of patients (Chang et al., 2023). In the energy management sector, Internet-of-Things technologies facilitate the development of smart grid services that enable seamless communication between service providers and individual users aiming to optimize the use of energy resources (Radenković et al., 2020). However, one of the concerns is how firms can protect customer privacy. For instance, in the digital transformation of retail services and the transition to omnichannel retail strategy, Internet-of-Things technologies can have a major role in channel integration (Caro & Sadr, 2019), as well as in value co-creation with customers which in turn can influence continuance intentions and word of mouth intentions (Balaji & Roy, 2017). On the other hand, the process of collecting data-driven insights and developing services can be a major privacy concern (Leroux & Pupion, 2022; Roe et al., 2022). Such concerns and related lack of trust are the main barriers for domestic Internet-of-Things services adoption, in particular for late adopters of such services (Alraja, 2022; Jaspers & Pearson, 2022), whereas utilitarian benefits (Attié & Meyer-Waarden, 2022) and perceived enjoyment (Baudier et al., 2022) are the main drivers of adoption. Past research has also identified a spill-over effect of the perceived overall value of using the Internet on behavioral intentions of using Internet-of-Things based applications (Lu et al., 2021).

2.4 | Future research directions

Prior research on marketing-related Internet-of-Things technologies predominately focuses on the contribution of such applications in the development of new business models, the application of smart devices in the provision of services, the perceived benefits to the customers/consumers in the form of societal (e.g., protection of the environment), utilitarian (e.g., discounts, etc.) (Radenković et al., 2020) and hedonic benefits (entertainment, social interaction, etc.), and in turn customers' adoption and purchases intentions (Caputo et al., 2018). With regard to business models, the implementation of Internet-of-Things technologies in business model innovations, the main role that such technologies have are in relation to interaction with consumers that can potentially lead to value-co-creation via the exchange of behavioral information (Roy et al., 2019) leading to better data usage, enhancement of product and services, which in turn, can create new opportunities and therefore a competitive advantage for firms (Cranmer et al., 2022) as well as helping firms developing a more sustainable approach in delivering their products and services (Paiola et al., 2021). Such opportunities can include (i) improving business processes, (ii) managing stock, (iii) automating customer service, (iv) improving customer journey, and (v) reducing costs (Naik et al., 2020). However, in transitioning to new business models, firms can face three types of barriers, namely, confidence, mixing, and collaboration barriers (Gebauer et al., 2020). Past literature suggests that to facilitate digital transformation firms should (i) Start small and build on benefits; (ii) create competitive advantage from brand recognition; (iii) engage in standardization efforts; (iv) manage data ethically; and (v) ensure organization-wide commitment (Saarikko et al., 2020). Another stream of research on the Internet-of-Things focuses on the enhancement of customer experience and satisfaction by the digital transformation of firms' product offering by examining the role of the exchange of information between devices via the internet in improving the performance of such products. In addition, Internet-of-Things technologies can enhance customer relationship management (CRM) by capturing consumer data that can inform CRM decisions and tactics (Kumar et al., 2021) as Internet-of-Things technologies inform the creation of new solutions and the optimization of communication with customers which facilitates the examination of their future needs by utilizing various touchpoints and stages in the overall customer life cycle (Lo & Campos, 2018).

Internet-of-Things applications play an important role in the facilitation of innovation in the digitization of products and services, the enhancement of customer experiences; the financial transactions between firms and customers; and customer-related issues such as the management of the relationship between brands and consumers. Past research focuses on business models, operations, and mainstream marketing-related concepts such as adoption and satisfaction. There is scarce research on Internet-of-Things applications from the consumer perspective, particularly in relation to the societal impact of such applications. Hence, future research in digital transformation should focus on the role of such technologies in their day-to-day activities beyond the healthcare and wearable devices context and the effect that such technologies have on consumer well-being and social inclusion.

3 | SOCIAL MEDIA AND DIGITAL TRANSFORMATION

Social media plays a significant role in facilitating the creation and exchange of vast amounts of unstructured knowledge among firms, clients, and even between clients themselves (Hartmann et al., 2019). This abundance of data, coupled with its analysis, empowers organizations to leverage this knowledge to maintain and enhance their competitive advantage, ultimately driving digital transformation across various sectors. In particular, business-to-consumer (B2C) companies extensively utilize social media platforms as part of their digital transformation strategies to boost sales, enhance brand awareness and loyalty, offer customer support, and more (Pantano, 2021). Similarly, business-to-business (B2B) companies employ social media platforms for tasks such as product comparisons and fostering relationships with sales personnel (Dwivedi et al., 2021). A concrete illustration of this can be seen in the utilization of social media by the Victoria Beckham brand, which employs platforms like Facebook, particularly the VB Messenger

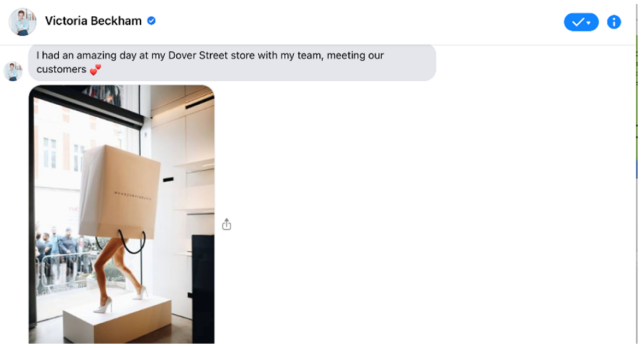

FIGURE 1 Victoria Beckham chatbot simulating real conversation with customers via Facebook Messenger.

experience, to engage with potential customers and generate interest in new collections and initiatives through an interactive chatbot, simulating the genuine Victoria Beckham experience (see Figure 1).

3.1 | The role of social media in the digital transformation

Social media platforms have become integral to the digital transformation process, reshaping various sectors and industries. In the education sector, numerous universities have established their own social media profiles to promote their programs, connect with prospective students, and engage with current students and staff. Social media has also been extensively utilized by public health organizations to disseminate information about vaccinations and other safety measures. For example, during the COVID-19 pandemic, the World Health Organization (WHO) heavily relied on social media platforms, including Twitter, to encourage the population to adopt specific safety measures and engage in vaccination efforts (Pantano, 2021). However, it is important to note that social media platforms also play a critical role in amplifying users' opinions with limited control from organizations (Pantano, 2021). Additionally, as social media provides a channel for expressing interests, opinions, and attitudes toward brands (Walasek et al., 2018), it offers a new means of assessing companies' brand images while enabling the extraction of valuable insights from user-generated content such as tweets, posts, images, and videos. Consequently, previous studies have utilized the analysis of consumers' shared online opinions to gain insights into various topics, such as the reasons behind renting luxury clothes (Pantano & Stylos, 2020) or the use of social media by small and medium enterprises (SMEs) as an integral part of their marketing mix to enhance business performance (Feitosa Jorge et al., 2022; Pantano et al., 2019).

3.2 | The importance of social media in driving digital transformation

Social media platforms have emerged as powerful drivers of digital transformation, enabling organizations to enhance stakeholder engagement, promote knowledge sharing, and drive business value. From a management perspective, engaging with social media platforms allows organizations to promote and facilitate knowledge sharing among both internal and external stakeholders (Adhiatma et al., 2023). This enhances the organization's ability to share information, facilitate problem-solving, minimize duplicated efforts, and increase business agility, resulting in benefits such as greater stakeholder involvement with the senior management team and the development of competitive advantages through the acquisition of new knowledge and talents (Adhiatma et al., 2023). Furthermore, several studies have demonstrated that B2B marketers can employ strategies similar to those used in B2C contexts to generate value and boost sales (Cheng et al., 2023). Specifically, the usage of social media platforms has been linked to increased communication, engagement and satisfaction levels among consumers, employees, students, tourists, and residents. The interactive nature of social media fosters meaningful connections, facilitates real-time interactions, and allows for personalized experiences, ultimately driving digital transformation in various domains.

3.3 | The multifaceted impact of social media in driving digital transformation

It also contributes to value creation, relationship management (including building, strengthening, and severing relationships), brand awareness and management, knowledge generation, corporate credibility, acquisition of new customers (both private and industrial), performance improvement (including employee and academic performance, as well as organizational and financial performance), and increased willingness to engage in buying and selling activities across B2B and B2C contexts, hospitality/tourism, and education sectors (Table 2).

On one hand, social media plays a pivotal role in driving digital transformation by offering new channels for direct interaction with clients and gathering valuable information that complements traditional marketing research methods (Roelen-Blasberg et al., 2023). On the other hand, it is important to acknowledge that user-generated content on social media platforms is not subject to peer review and often lacks proper source citations, making it challenging to verify the credibility and sources of the information shared (Ma & Atkin, 2017).

3.4 | Future research directions

Research indicates a growing trend of small and medium enterprises (SMEs) embracing social media, as it provides substantial benefits without requiring significant financial investments (Boarah et al., 2022; Cao & Weerawardena, 2023; Iannacci et al., 2021). However, the increased integration of social media into business practices, both in B2C and B2B sectors, necessitates the development of new skills to effectively manage the flow of information and facilitate knowledge creation through these platforms. We propose the following areas for future research and practice to further support digital

TABLE 2 Main studies on the benefits of social media.

Benefits of social media	Authors
Satisfaction • Consumers' satisfaction • Employees' satisfaction • Students' satisfaction • Tourists' and residents' satisfaction	Agnihotri et al. (2016); Chen and Lin (2019); Kaewkitipong et al. (2016); Priporas et al. (2020); Wang, Wang, and Liu (2021); Wang et al. (2023); Zhang et al. (2019)
Value creation	Cheng et al. (2023); Hamilton et al. (2016)
Relationships • Maintaining relationships • Strengthening relationships • Breaking relationships	Hudson et al. (2016); Lin and Wu (2023); Reinikainen et al. (2021)
Brand awareness, engagement, and management	Buy et al. (2022); Chen and Lin (2019)
Knowledge creation	Cao and Ali (2018); Kallinikos and Tempini (2014); Shwartz-Asher et al. (2020); Yee et al. (2021)
Corporate credibility	Chung and Cho (2017); Dwivedi et al. (2019); Li and Li (2014)
New customers acquisition	Son and Niehm (2021); Tsimonis and Dimitradis (2014); Abbasi et al. (2023); Iannacci et al. (2021)
Salesperson performance • Employees performance • Students and academic performance • Organization/financial performance	Boarah et al. (2022); Cao and Ali (2018); Cao and Weerawardena (2023); Lay (2017); Liu et al. (2023); Song et al. (2019); Tafesse and Wien (2018); Widmar et al. (2020)
Willingness to buy	Agnihotri et al. (2016); Chen and Lin (2019); Cheng et al. (2023)

transformation via social media. Specifically, we expect that companies need to have:

i. Talented individuals with expertise in marketing and social media analytics who can consistently monitor and track relevant information, maintain an organizational memory, and intervene when necessary.
ii. An organizational structure that facilitates the maintenance, updates, and analytics of social media platforms.
iii. Processes in place to ensure that the insights gained from monitoring, intervention, and analytics are shared with other relevant departments within the organization.
iv. The necessary technology infrastructure to enable the seamless functioning of these processes.

Other areas for future research include:

i. Ethical implications and privacy concerns
ii. Impact on mental health and well-being
iii. Role of artificial intelligence and machine learning
iv. Influence on political discourse and public opinion
v. Cross-cultural and global perspectives on social media usage
vi. Integration of emerging technologies (e.g., virtual reality, augmented reality)
vii. Effects on organizational practices and employee engagement
viii. Social media as a tool for social change and activism
ix. Long-term effects of digital transformation on society
x. Innovative strategies for managing and mitigating misinformation and disinformation.

Social media plays a significant role in the digital transformation by enabling engagement, knowledge sharing, and brand assessment. Whether in the education sector, public health, or business environment, social media platforms empower organizations to connect with their target audience, disseminate information, and gain valuable insights. As the digital landscape continues to evolve, social media's role in the digital transformation process will only grow in importance, shaping the way individuals, organizations, and societies interact and evolve in the digital era. Future research in these areas can help organizations maximize the potential of social media to drive their digital transformation efforts.

4 | MOBILE APPS AND DIGITAL TRANSFORMATION

Mobile apps play a significant role in the digital transformation of various activities, including shopping, information-seeking, and socializing (McLean et al., 2022). With the widespread adoption of mobile technologies, consumers can access a wide range of apps anytime and anywhere, resulting in increased engagement and usage (Phang et al., 2019). The COVID-19 pandemic led to a substantial surge in mobile app usage and spending, with a 20% increase in smartphone usage and a 25% rise in app spending (App Annie, 2020). Currently there are 3.5 million apps available on Google's Play Store, alongside around 2.2 million apps hosted on Apple's App Store (Statista, 2022a). In 2021 global users were found to have spent an average of 55 min/day engaged with social media apps, 16 for gaming, 14 min for entertainment apps, 13 for shopping, 10 for travel and 6 min for finance (Statista, 2021). In this context, exploring the relationship between mobile apps and digital transformation is crucial for understanding the transformative power of these applications in various sectors.

4.1 | The role of mobile apps in the digital transformation

Mobile apps play a pivotal role in driving the digital transformation across various sectors and business functions. They encompass a wide range of functionalities, including communication (e.g., WhatsApp, Viber), social media (e.g., Facebook, Instagram), productivity (e.g., Trello, Evernote), entertainment (e.g., Netflix, Spotify), gaming (e.g., Candy Crush, Roblox), news and media (e.g., CNN, Times), shopping

(e.g., Amazon, Vinted), travel (e.g., Booking, Tripadvisor), and finance (e.g., banking). Another popular typology is based on monetization model, encompassing: free apps, freemium apps (with an option to pay for premium features), paid apps (one-time payment or subscription), in-app advertising apps (Tang, 2019). These apps contribute to the digital transformation by revolutionizing how businesses operate and engage with customers.

From a business perspective, three types of mobile apps hold particular importance in driving digital transformation:

1. Branded Apps: free, brand-prominent applications that support business functions like brand building, sales promotions, and customer relationships (Zhao & Balague, 2015).
2. Revenue Generating Apps: being the brands themselves, they directly generate revenue through different strategies described above (Stocchi et al., 2022).
3. Management Apps: focused on enhancing employee engagement and productivity, allow scheduling, automate daily activities, and facilitate real-time communication through various tools. Businesses can also use mobile apps to streamline their operations (e.g., inventory management, customer feedback, logistics) (Cioppi et al., 2023).

By leveraging the functionalities of mobile apps, businesses can embrace the digital transformation and unlock numerous opportunities for growth, innovation, and operational excellence. These apps not only enhance customer experiences and brand loyalty but also enable businesses to optimize their internal operations and empower employees in the digital era. The role of mobile apps in digital transformation is instrumental in shaping the future of business and driving organizational success in the digital age.

4.2 | The importance of mobile apps in driving digital transformation

Mobile applications have emerged as powerful drivers of digital transformation, playing a crucial role in integrating digital technology into all aspects of business and society. They have revolutionized communication, enabling instant messaging, voice calls, and video calls globally (Kim et al., 2015). The advent of social media apps, in particular, have reshaped information sharing and fostered the formation of new digital communities (Gu et al., 2022). In addition to communication, mobile apps empower consumers with on-demand services, ranging from transportation and food delivery to accommodation (Albayrak et al., 2023; Furunes & Mkono, 2019; Lanamaki et al., 2020). The mobile apps are also changing the way people take care of their health offering monitoring capabilities and instant medical advice, which has the potential to democratize access to healthcare services (Galetsi et al., 2023; Ghose et al., 2022; Verissimo, 2018). Educational apps have transformed the way people learn, providing access to online courses and interactive learning experiences (Laasch et al., 2020). Mobile apps have not only facilitated everyday life activities such as smart home management, shopping, and personal finance but have also become entertainment hubs offering diverse options, from gaming to music and movie streaming (Pappas et al., 2019; Tang, 2017). This feature of mobile apps offers escape from daily stresses, providing instant gratification and even leading to escapism behavior, which has implications on mental wellbeing (McLean et al., 2022).

In the field of business and management, mobile apps have significantly contributed to digital transformation, particularly through the rise of mobile commerce (m-commerce). The m-commerce, which refers to the buying and selling of goods and services through mobile devices, accounts for more than 70% of all retail e-commerce (Statista, 2022b). Companies have welcomed mobile apps as an additional communication channel to attract new customers and increase brand loyalty among existing ones (Al-Nabhani et al., 2022; Fang, 2019). Branded mobile apps enhance customer experiences by providing personalized interactions, real-time updates, and easy accessibility (McLean et al., 2018; Parise et al., 2016). Mobile apps influence consumer decisions, with unique attributes like ease of use, speed, simplicity, and efficiency positively impacting purchase intentions and customer satisfaction (Iyer et al., 2018; Pop et al., 2023; Sharma et al., 2023).

For managers, mobile apps provide enhanced efficiency, productivity, and improved customer interactions and engagement (Lim et al., 2022). They streamline processes, generate data-driven insights, enable price transparency, and contribute to brand distinctiveness and customer loyalty. The decision to adopt mobile apps is influenced by perceived usefulness, top management support, and competitive pressure (Swani, 2021). Notably, mobile apps facilitate various touchpoints in the customer journey, creating firm value through peer-to-peer interactions, personal-oriented interactions, and the purchase phase itself (Boyd et al., 2019). Key trends such as channel integration, augmented reality, and gamification further enhance user retention, customer experience, engagement, loyalty, and business outcomes (Bitrian et al., 2021; Sung et al., 2022; Yen, 2023).

Furthermore, mobile apps have transformed the way employees perform their work in various sectors. For instance, they enable healthcare professionals to provide more efficient and effective care to patients (Santos-Vijande et al., 2022), and they enhance employee interactions with customers, delivering efficient and personalized travel experiences (Flacandji & Vlad, 2022). Organizations leverage mobile apps to boost employee productivity, reduce costs, and provide exceptional customer experiences, thereby driving digital transformation and achieving business success (Chakraborty et al., 2022).

4.3 | The multifaceted impact of mobile apps in driving digital transformation

Mobile apps are transforming a wide range of industries by providing convenience, personalization, and enhanced customer experiences (Palos-Sanchez et al., 2021). It is significant to highlight that sectors

such as retail, hotels and travel, healthcare, banking and finance, education, sports and fitness, hospitality, food and restaurants, along with entertainment and gaming, are currently employing mobile applications as key tools for digital transformation. Figure 2 illustrates the sectors that the research on mobile apps most frequently refers to. Mobile apps are transforming the retail shopping experience in the form of mobile payments, personalized recommendations, loyalty, and AR making it more convenient, personalized, and engaging for consumers (Thakur, 2019).

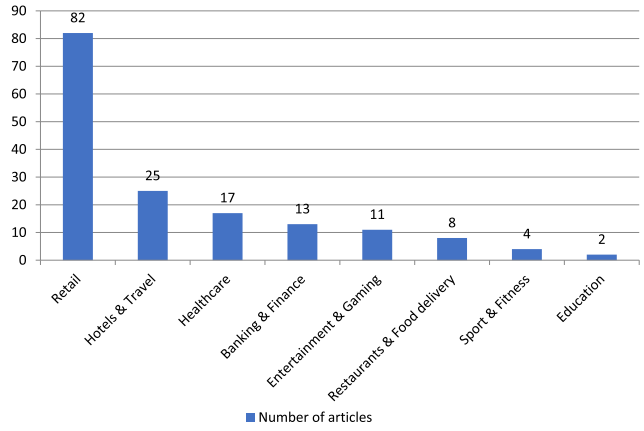

FIGURE 2 Number of articles on mobile applications in the field of Business and Management indexed in Web of Science SSCI across sectors.

Mobile apps have also significantly contributed to the travel industry in terms of bookings/reservation, mobile check-in/check-out, personalized recommendations, and mobile concierge (Coves-Martinez et al., 2023; Palos-Sanchez et al., 2021). In the healthcare domain telemedicine, remote monitoring, health and wellness tracking, and electronic health record are being facilitated by mobile apps, and so on (Galetsi et al., 2021; Galetsi et al., 2023; Santos-Vijande et al., 2022). Mobile apps have also contributed to the rise of m-banking, with banks worldwide investing heavily to improve customer services and leverage digital technology for better, cost-effective services (Sharma et al., 2022). In the domain of gaming and entertainment apps, various studies explore monetary aspects such as in-app purchases, advertising, or monetization models, suggesting that future research could pivot toward strategic approaches for developing unique differentiators (Tang, 2019). Further, in sport and fitness industry mobile apps promote health and fitness, increase fan engagement, improve athlete performance and training, streamline event management, offer sponsorship and marketing opportunities, provide data and analytics, and facilitate sports management processes (Uhrich, 2022). For restaurants and food, online orders, delivery/pickup are ways mobile apps are revolutionizing food chain delivery (Burlea-Schiopoiu et al., 2022). Mobile apps in the education sector help to accelerate digital transformation by improving assessment and feedback procedures, enabling personalized learning, supporting remote and blended learning, and increasing access to educational resources (Dastane et al., 2023).

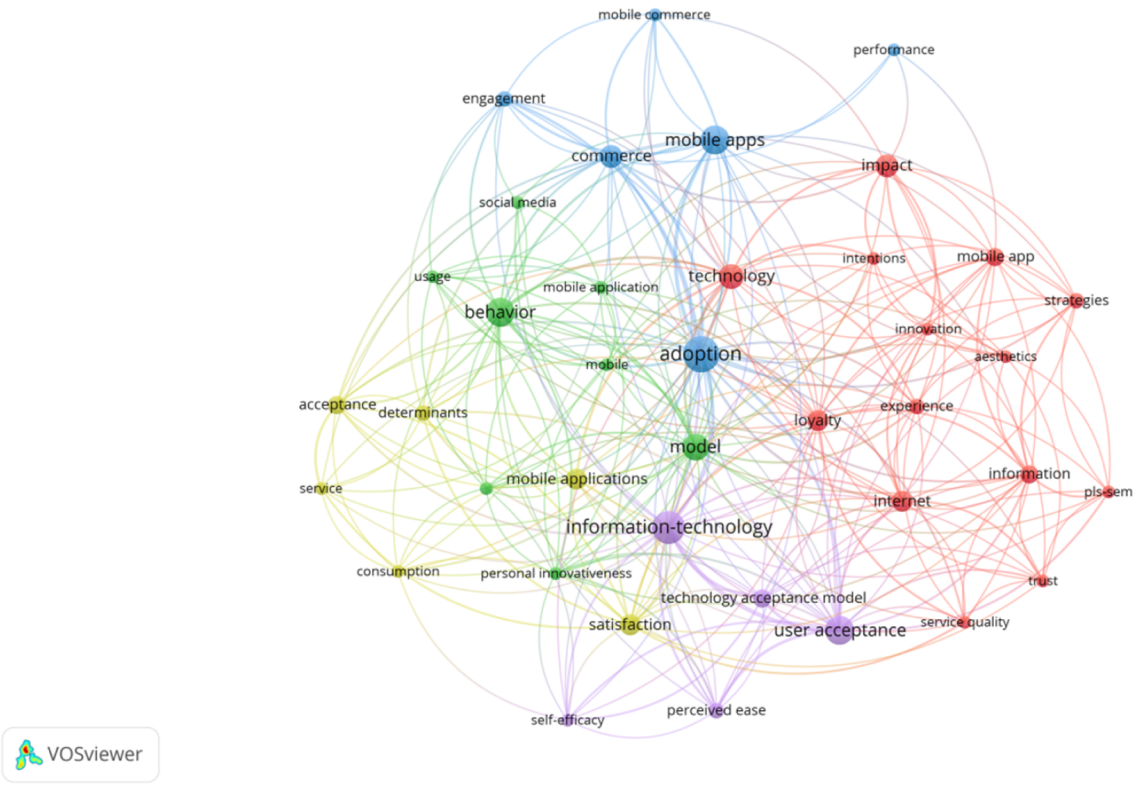

FIGURE 3 Keywords network for Web of Science SSCI indexed articles published in 2014–2018.

4.4 | Future research directions

An analysis of approximately 300 articles from Web of Science SSCI-indexed journals reveals a notable transition in Business and Management research from a general investigation of mobile app adoption to an industry-specific approach. Initial studies in the domain predominantly investigated user attitudes and behaviors toward general mobile app adoption (Bart et al., 2014; Ghose & Han, 2014; Kim et al., 2015). The trend becomes apparent in Figure 3, depicting the keyword network for articles published from 2014 to 2018. Recent literature, however, exhibits an industry-focused approach, examining the application of mobile technologies in sectors such as hospitality (e.g., Albayrak et al., 2023), retail (e.g., Yen, 2023), finance (e.g., Carlin et al., 2023), and healthcare (e.g., Galetsi et al., 2023) (see Figure 4).

There is a noticeable shift in the research focus from examining the elements that influence mobile app adoption and usage (studies associated with the technology acceptance model) (e.g., Shen, 2015), toward exploring consumer engagement (Hsieh et al., 2023), app stickiness (Yoon et al., 2022), continuance intention (Tseng et al., 2022), and loyalty (Molinillo et al., 2022). The research interest in the design of mobile apps, user experience, and satisfaction has also seen an upswing (Akdim et al., 2022; Al-Nabhani et al., 2022; Windasari et al., 2022). Moreover, the role of mobile apps in the experience economy and mobile app atmospherics impact on user behavior have come to the forefront of recent investigations (Lee & Kim, 2019; Sung, 2021).

Another emerging area of interest lies in the examination of multichannel, omnichannel, and online-to-offline (O2O) platforms, with a focus on the customer journey (Chakraborty et al., 2022; Cuesta-Valino et al., 2023; Tupikovskaja-Omovie & Tyler, 2020; Yen, 2023). This perspective acknowledges that the use of mobile apps is just one facet of the customer journey, illustrating the interconnectedness of diverse touchpoints that consumers encounter. In this context, mobile apps are viewed as an essential component within a more extensive network of platforms that collectively facilitate and shape the customer experience (Stocchi et al., 2022).

The rise of health and well-being related research within the domain of mobile apps is noteworthy (Ghose et al., 2022; Santos-Vijande et al., 2022; Wittkowski et al., 2020). With a heightened focus on user behavior, personalization, and privacy concerns, the research echoes a shift toward a more user-centric approach (Keusch et al., 2023; Sengupta & Cao, 2022). In parallel, the exploration of mobile apps' role in promoting sustainable and ethical consumption is on the rise. This underscores the role of mobile apps in promoting sustainable business practices, addressing societal challenges, and fostering positive social impact (Rakshit et al., 2021; Saura et al., 2022; Vo-Thanh et al., 2021). More research on the sustainability of mobile app-driven business models and their potential to contribute to circular economy principles will be valuable.

The research landscape is progressively evolving to include investigations into emerging technologies and how these novel advancements are impacting the mobile app industry (Lin et al., 2022; Plotkina & Saurel, 2019; Visconti-Caparros & Campos-Blazquez, 2022). Technologies such as blockchain, augmented reality (AR), and artificial

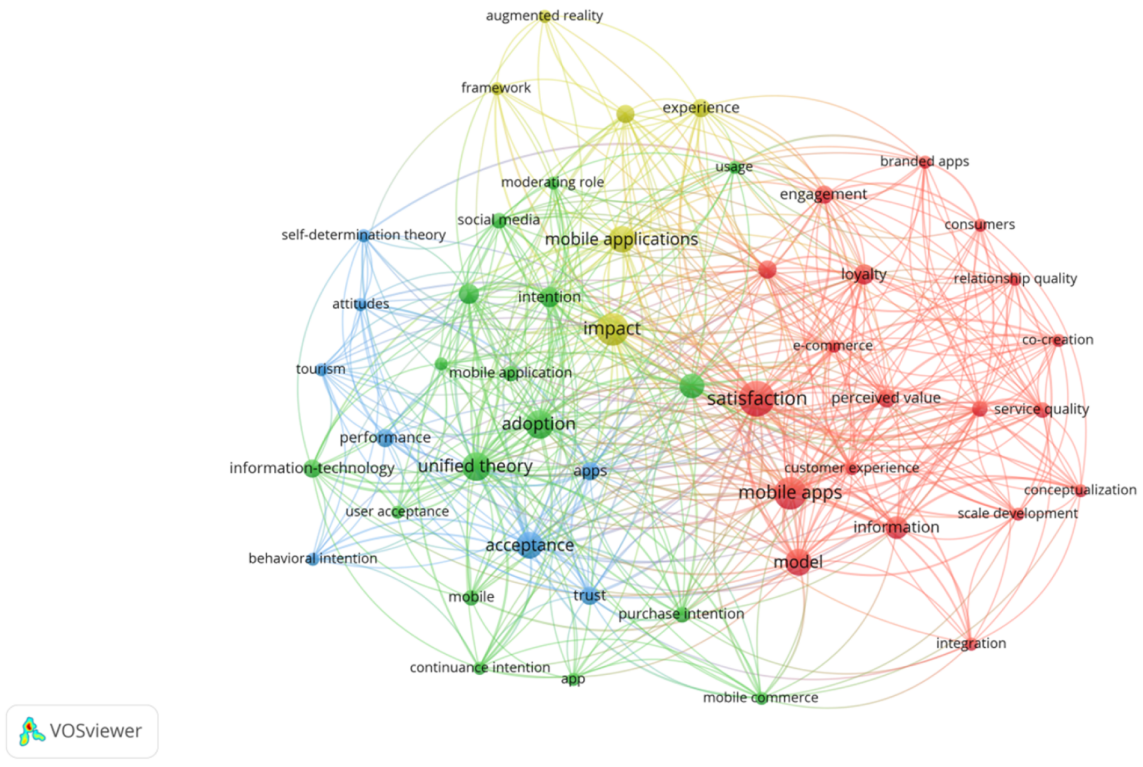

FIGURE 4 Keywords network for Web of Science SSCI indexed articles published in 2019–2023.

intelligence (AI) are taking center stage, leading to potential new applications in mobile technology.

It is worth highlighting that ~80% of the research articles indexed in the Web of Science primarily focus on marketing and consumer behavior aspects. Conversely, a relatively minor portion, around 20%, is dedicated to other facets of Business and Management. This imbalance suggests a need for more in-depth research into mobile apps intended for internal company use. The promising avenue of research includes apps for human resource management (Kim et al., 2023; Ting & Ahn, 2022). These apps have the potential to transform the process of recruitment, employee training, and development. Researchers could explore how these technological tools can enhance HR procedures, efficiency of talent procurement, contribute to skill advancement, continuous learning, and performance. Additional domains within business and management that could greatly benefit from further research into the application of mobile apps include: operations and supply chain management (Swani, 2021), entrepreneurship (Shaheer & Li, 2020), strategic management (Cristofaro, 2020; Tani et al., 2022), as well as finance and accounting.

Finally, the exploration of cross-industry applications and comparative studies presents a promising direction for future research. Most studies focus on specific industries. There might be potential for research that compares the impact of mobile apps across various sectors, or regions, providing a more comprehensive understanding of their role in digital transformation.

5 | ARTIFICIAL INTELLIGENCE INCLUDING ChatGPT AND DIGITAL TRANSFORMATION

Artificial Intelligence (AI) is considered to be able to increase business productivity by 40% (Johnson & Nick, 2023). However, it is not clear how AI, including ChatGPT in relation to digital transformation will affect business productivity in the future. Before examining the future trajectories, digital transformation in the context of AI is needed to be understand by the business world. As mentioned by Greenway et al. (2021), digital transformation is about applying the culture, practices, business models, and technologies of the internet era to respond to people's raised expectations of productivity and quality. Successful digital transformation makes it possible not only to deliver products and services that are simpler, cheaper, and better, but for the organization as a whole to operate effectively in the online era. Similarly, Larsson and Teigland (2020) assert that digital transformation is in reality not a matter of implementing one project, but rather a whole series of different projects, effectively necessitating the organization to deal better with change overall. Digital transformation, in the context of AI is becoming a crucial tool and has already been implemented by many organizations.

5.1 | The role of AI in the digital transformation

According to research (IBM), 77% of businesses are using or exploring AI. Among them, 35% of companies are using AI and 42% of companies are exploring AI for its implementation in the future as it offers a number of advantages, such as improved accuracy, efficiency, and productivity in a wide variety of tasks. At the most basic level, AI-driven scheduled software helps businesses reduce the time and resources required to manage staffing (Dennison, 2023). For instance, AI has been proven to be helpful related to hiring more diversely, including anonymizing resumes and interviewees. According to McKinsey research, algorithms can consider various characteristics on a resume and consider only the specific characteristics or traits that predict a desired outcome. Another area ripe for AI assistance is the healthcare systems. The article that has been published in Economist in the June 2018 showed the impressive results in oncology. According to the article, Holger Haenssle of the University of Heidelberg, in Germany, pitted an AI system against 58 dermatologists and when the humans were able to identify 86.6% of skin cancers, the computer found 95%.

Digitalization is considered as the conversion of business processes using digital technology and it includes both digitization and digitalization (Wang, Huang, et al., 2021). The organization needs to be digitally capable to use the digital technology to change the business processes (Pan et al., 2022). In this, the areas such as information management, flexible development, and IT technology are included (Levallet & Chan, 2018). Moreover, organizations can use digital technology to create, innovate, or alter organizational resources, models of their business and management to execute the strategies to the changing environment (Warner & Wager, 2019). Digital transformation includes both digitization and transformation (Gebayew et al., 2018). This not only includes the technical capability, but also the multidimensional capability includes the changes in organization and management (Chen & Xu, 2020; Vial, 2019).

Digital transformation is applicable in marketing, sales, and service in each sector and across organizations. In marketing, the main goal of digital transformation is to discover increased customers by investing less money (Salesforce, 2022). Through digital market technologies like social media marketing, influencer marketing the organization will get quality leads which aids to increase the sales. Additionally, the media of marketing such as email and digital materials are cheap compared with traditional marketing methods. Also, through digital marketing the organization can track and communicate with their customers. In addition to this, the customers behavior can be observed.

The newest version of this digital transformation includes AI and ChatGPT. AI is considered as the intelligence of a machine or computer which facilitates to duplicate the human abilities (Kanade, 2022). AI includes different technologies which allows machines to plan, act, and learn with the same intelligence level as humans. AI's scope is wide, and can be applied across any functions of the business.

5.2 | The importance of AI in driving digital transformation

There is no doubt that the main benefits of digital transformation are improving performance, enhancing efficiency, and reducing cost

(Guo & Xu, 2021). However, these benefits vary between industries and departments. While the healthcare systems adopt digital transformation for enhancing the efficiency to be able to identify the most suitable expert for a patient, HR industries adopt it to minimize bias in hiring the best candidate.

Over the past years, the necessity to effectively use big data has dramatically increased the growth of AI. OECD (2023) defines an AI system as a machine learning system that can, for a given set of human-defined objectives, make predictions, recommendations, or decisions influencing real or virtual environments. The power of AI has been harnessed by organizations across different sectors. Additional to human resources and the healthcare systems mentioned above, many other sectors have adopted AI to monitor their customers' preferences or employee productivity and performance. For instance, Netflix has been using AI to power content-recommendations for years to predict which images best engage which viewers as they scroll through the company's many thousands of titles. Another important usage of AI that has been adopted by many organizations is monitoring the employee performance. AI can evaluate a range of data from employee software use, communications, manufacturing and service delivery censors and video and audio images feeds to judge employee performance more accurately and fairly than human managers are able to do and this information helps with decisions such as which staff to employ, when and where, who to promote into which role and which staff to award pay rises to optimize motivation and retention (Charlwood & Guenole, 2022). Another AI tool, ChatGPT, has been launched by OpenAI in 2019 which works with algorithms and is trained to generate human-like text that can be used in conversation. Some potential uses for ChatGPT include customer service chatbot, virtual assistants, and conversational for websites and mobile apps (Cano et al., 2023). This new technology has been adopted by many organizations to reduce costs associated with training and hiring customer services, eliminating the need for human customer care services.

Digital transformation is widely recognized as a significant force that reshapes traditional value chains and business systems. Among various sectors, the retail industry has emerged as a frontrunner in digital transformation, primarily due to the advent of digital marketing. According to the Alibaba Cloud Research Center (2019), the digitalization rate in the retail industry is projected to witness a remarkable increase of 70%–80% within the next 3–5 years. However, despite this potential, the retail sector continues to face challenges in effectively implementing digitalization (Wang et al., 2020). Research by Sailer et al. (2019) suggests that a significant percentage, ranging from 60% to 85%, of organizations struggle to achieve successful digital transformation. Meanwhile, in other sectors, healthcare providers were already embracing technology even before the COVID-19 pandemic, aiming to streamline processes such as generating patient reports and conducting risk analysis. Similarly, the financial sector has embraced technology to enhance customer retention, particularly through online payment systems. Furthermore, the entertainment industry has already adapted to online streaming platforms, and has experienced growth in the post-pandemic era, offering customers a unique and immersive experience (Star Knowledge, 2023).

Digital transformation encompasses various aspects of society. Organizations are compelled to pursue innovation in response to societal demands. Businesses are increasingly cognizant of their customers' attitudes, behaviors, and expectations, and are striving to meet them effectively. As a result of digital transformation, customers now enjoy personalized experiences (IEEE Digital Reality, 2023). Businesses can also attain a competitive advantage by implementing diverse technological advancements, such as developing their own apps or digital online platforms. Moreover, digital transformation not only benefits societies and customers, but also facilitates improved customer service, training, and development for employees, thereby enhancing overall organizational performance.

When examining the role of AI in digital transformation, it becomes evident that AI possesses the ability to automate tasks, solve complex problems, and learn from past experiences. A notable example is Morgan Stanley's deployment of GPT-4, as mentioned by OpenAI (2023), which has proven valuable in leveraging their knowledge base. Such advances in AI technology offer significant benefits to consumers, including customers, employees, and society at large. According to a study conducted by Accenture (2023), AI has the potential to double annual economic growth rates by 2035 by fostering a symbiotic relationship between humans and machines, thereby increasing employee productivity by 40%. Furthermore, without the application of AI, the digitalization of products and processes generates vast amounts of data that cannot be feasibly analyzed by humans within an acceptable timeframe.

AI has found applications in various industries, including healthcare, retail, banking, logistics, travel, and real estate (Paul et al., 2023). Specifically, ChatGPT can be effectively utilized in fields such as education and IT. In the healthcare sector, AI, in conjunction with ChatGPT, can assist in selecting optimal treatment plans and evaluating patients' medical records to identify potential courses of treatment. This technology proves beneficial to patients as it enables them to receive improved healthcare services. In the retail sector, AI plays a pivotal role in helping organizations meet customer expectations. AI algorithms provide personalized product recommendations to customers, enhancing their shopping experience. Additionally, chatbots available on e-commerce websites efficiently address customer queries, further contributing to a positive customer experience. Such AI-driven strategies also contribute to increased sales and business growth.

5.3 | The multifaceted impact of AI in driving digital transformation

Digital transformation is considered as important in different sectors. For example, in banking, it is already established mobile banking applications and mobile payments. Banks also can adopt blockchain technology. It can also apply analytics to customer data and AI algorithms for upselling and improving customer experiences. In the manufacturing sector, digital transformation can be used to increase operational efficiencies and reduce costs. It can also enhance product quality

through analytics. The customer experience can improve by enhancing customer experience. This technology also helps to have better decisions, and this can also improve the customer needs and market changes.

The transformation of the HR process using machine learning concluded that there are many innovative ways to apply AI in HR functions. Moreover, the different studies discussed the current impact of technology on the HR process, and this is rapidly increasing than the traditional HR research findings.

The implementation of AI in the workplace for analyzing employee performance offers several benefits, including real-time comparisons and feedback (Duggan et al., 2020; Evans & Kitchin, 2018; Gandini, 2019; Williams & Beck, 2018). This data serves as a primary indicator for assessing employees' daily performance and their progress toward performance goals (Holland et al., 2017; Leicht-Deobald et al., 2019; Woyke, 2018; Zax, 2013). However, it is important to note that performance evaluation can sometimes have a negative impact on employee motivation (Lepper & Greene, 1975). Conversely, feedback can assist employees in learning and enhancing their competence (Vallerand & Reid, 1984). With the aid of AI, employees can receive frequent and effective feedback (Stark & Pais, 2020). Furthermore, relying solely on comparative feedback can limit the information available to workers (Duggan et al., 2020). However, through the use of AI, updated data is more readily accessible compared with traditional performance appraisal systems. This, in turn, impacts job satisfaction and employee behavior (Gagne et al., 2021), potentially making employees feel less autonomous and fostering a more competitive work environment.

The challenges in AI can be reduced through the forecasting of research and development, operations, production planning, demand, and service especially in the non-profit organizations (Johnson et al., 2018). The opportunities of ChatGPT are mainly evident in the education sector as the education sector needs to upgrade to knowledge transfer, increasing the competencies, societal abilities, and technological efficiency. The question for academics is whether they are going to adapt it or resist.

5.4 | Future research directions

AI research is acknowledged to have started in 1950 by Alan Turing when he published an article on computing machinery and intelligence and whether machines can think like humans (Turing, 1950). One area where AI can have a profound impact is in Human Resources (HR), where it can streamline administrative tasks and enable HR professionals to focus on strategic initiatives. Future research can explore the specific applications of AI in talent acquisition, learning and development, and employee engagement and retention. Understanding the questions to be answered, the benefits, and the data requirements for implementing AI in HR practices is essential.

ChatGPT, a language model powered by AI algorithms, can provide conversational capabilities, answer questions, and generate human-like text. It has potential applications in education, content generation, and information retrieval. ChatGPT can prepare students to become technologically efficient and prepare them for the future challenges within their career (Cano et al., 2023). Therefore, future research can investigate the role of ChatGPT in education and its implications for technological proficiency and career readiness.

While AI presents exciting opportunities, its impact on humanity raises concerns about integrity and morality. Governments worldwide are grappling with the unpredictability of AI outcomes. Future research should focus on establishing frameworks and guidelines to ensure the ethical and responsible use of AI, similar to considerations in genetic engineering.

In conclusion, the understanding of the origins and developments of AI provides valuable insights into its potential and future trajectory. However, it is crucial to maintain a balanced approach to the use and development of AI technologies, with a counterbalance on integrity and morality. Further research in the identified areas can contribute to a comprehensive understanding of AI's impact and pave the way for responsible and beneficial implementation.

6 | AUGMENTED REALITY, VIRTUAL REALITY, AND DIGITAL TRANSFORMATION

Navigating through the landscape of digital transformation, Augmented Reality (AR) and Virtual Reality (VR) are becoming cornerstone technologies, introducing a new dimension of immersive experiences and altering customer interactions. Pioneering studies have classified these technologies within a "Reality–Virtuality" continuum, highlighting their potential to morph real and virtual settings and contribute to the digital transformation discourse.

6.1 | The role of AR and VR in the digital transformation

AR and VR technologies create immersive experiences and introduce new realities that significantly impact customer experiences and drive the digital transformation (Hoyer et al., 2020; Petit, Velasco, et al., 2022). In this regard, the "Reality–Virtuality continuum" of Milgram and Kishino (1994), has been the reference for categorizing a wide variety of realities. In this continuum, real physical environments are located on one extreme. Fully virtual environments are on the other end, and mixed reality is in the center, which merges real and virtual settings. Thus, AR and VR are positioned on the same continuum. However, more recently, Rauschnabel, Babin, et al. (2022) proposed an XReality (XR) framework, in which AR and VR represent fundamentally different realities, based on whether the physical environment is, at least visually, part of the user experience (=AR) or not (=VR). They define AR as "*a hybrid experience consisting of context-specific virtual content that is merged into a user's real-time perception of the physical environment through computing devices*," while VR was represented as "*an artificial, virtual, and viewer-centered experience in which the user is enclosed in an all-encompassing 3D space that is—at*

FIGURE 5 XReality (XR) framework: augmented and virtual reality (Rauschnabel, Felix, et al., 2022)

least visually—sealed off from the physical environment" (Rauschnabel, Felix, et al., 2022, p. 13). From this point of view, AR experiences require a local presence, which depends on the degree to which AR objects are part of the physical environment (e.g., text vs. three-dimensional [3D] plate). For VR, the key point is telepresence, that corresponds to the degree to which a user feels present in the virtual environment, rather than the physical one (e.g., simple abstract geometric objects vs. multisensual and fully immersive experiences) (Figure 5).

6.2 | The importance of AR and VR in driving digital transformation

AR and VR technologies have emerged as powerful drivers of digital transformation across various sectors. Their unique capabilities have been harnessed in retail (Flavián et al., 2019), advertisement (Jayawardena et al., 2023), service (Zarantonello & Schmitt, 2023), and tourism (Fan et al., 2022) revolutionizing customer experiences and transforming industry practices. However, due to their specificities, AR and VR can impact these sectors differently. By integrating digital content into the physical environment, AR can be more easily incorporated into consumers' daily experiences, compared with VR (Zarantonello & Schmitt, 2023). AR mainly improves the visuals or use of products, which makes it particularly relevant for advertising and the retail sector (Wedel et al., 2020). AR advertisements help to stimulate mental imagery and have positive effects on attitudes and purchase intentions (Grudzewski et al., 2018; Petit, Javornik, & Velasco, 2022). Recent examples include Sephora Virtual Artist Application (App), Digital Fashion's Augmented LFW Filter, and Denny's AR food menu.

VR has the potential to create fully immersive and multisensory experiences (Petit et al., 2019). As such, VR allows marketers to be more creative and to be able to imagine extraordinary experiences for the consumer (Zarantonello & Schmitt, 2023). During sporting events, VR has been shown to have positive effects on supporters' experiences, increasing their satisfaction and purchase intention (Langaro et al., 2022), with positive effects on sponsor attachment (Petit et al., 2023). In the tourism sector, VR has been shown to improve telepresence, facilitating the decision-making process (Israel et al., 2019). Recent examples include the London Natural History Museum: Virtual Museum, the Thomas Cook: Try Before You Fly, and the Topshop: VR Catwalk Show.

6.3 | The multifaceted impact of AR and VR in driving digital transformation

AR and VR apps are likely to impact all phases of the customer journey, signaling a major shift in digital transformation (Lemon & Verhoef, 2016). In the pre-purchase phase, due to their interactivity and immersion, VR ads have been shown to help the customer to simulate experiences with products and services (Claffey & Brady, 2017). The perceived control of VR videos has been found to influence brand interest, willingness to consider it, as well as brand recall (Wang & Chen, 2019), and VR telepresence (re)visit intentions (Ying et al., 2022). By integrating multisensory stimulations in VR, it is also possible to obtain a better image of the product and the brand (see Flavián et al., 2021; Petit et al., 2019). Concerning AR adverts, they are perceived as more entertaining and informative than traditional adverts (Sung et al., 2022). They have also been shown to enhance escapism experiences by stimulating mental imagery, with positive effects on social media sharing, brand attitudes, and new brand engagement (Sung et al., 2022). It should, however, be noted that AR adverts can generate distraction and information overload, with negative effects on purchase intentions (Arghashi, 2022).

AR and VR can also facilitate the decision-making process, another critical aspect of digital transformation. AR has been shown to reduce overload and confusion, as well as increase customers' confidence in shopping situations (Garaus & Wagner, 2016). By improving customer's mental imagery ability in the retail frontline, AR apps improve decision comfort and facilitate choices of higher value products (Heller et al., 2019a). However, it is important that the AR app be perceived as enjoyable, useful, and contributing to the information acquisition, to have positive effects on attitudes and shopping behavior (Qin et al., 2021). Concerning VR technologies, VR-style websites have been shown to have positive effects on consumers' knowledge of the product, leading to more favorable attitudes and purchase intention, compared with traditional websites (Suh & Lee, 2005). It should, however, be noted that VR-style (vs. traditional) websites may dissuade customers from future consumption if they perceive similarities between virtual and real experiences (Deng et al., 2019).

As digital transformation progresses, VR and AR continue to redefine the post-purchase stage. These technologies provide additional contextual information and offer customers the opportunity to re-experience the consumption process (Wedel et al., 2020). VR appears to be a relevant tool to reinforce loyalty and brand advocacy (see de Regt et al., 2021; Farah et al., 2019; Zarantonello & Schmitt, 2023). In the service sector, virtual world social networks have been shown to stimulate positive word-of-mouth, through improved customer-to-business interaction and customer participation in service scape opportunities (Kim & Hardin, 2010). However, VR can also have negative effects during the post-consumption stage. For example, after a

VR luxury brand fashion show, customers perceived anxiety and loneliness (Jung et al., 2021). For AR, the support offered by the technology before and during purchase, are likely to generate positive consequences (Zarantonello & Schmitt, 2023). For example, in addition to customer decision comfort, Heller et al. (2019a) found that the improvement of the customer's mental imagery ability motivates positive word-of mouth. However, it appears that AR can also have negative effects, such as cognitive dissonance and sadness because of the gap with the real world (see Batat, 2021; Romano et al., 2021; Zarantonello & Schmitt, 2023).

6.4 | Future research directions

There are several aspects of AR/VR in marketing that deserve further research. AR and VR have proven to compensate for certain biases related to the lack of sensory information via mental imagery (Heller et al., 2019a; Petit et al., 2023; Petit, Javornik, & Velasco, 2022). However, further research is needed to understand how beyond vision, sensory-enabling technologies can improve the customer experience (Petit et al., 2019). Some work has been carried out on sound (Doucé et al., 2022; Jin, 2009; Pagani et al., 2019) and touch (Heller et al., 2019b; Mishra et al., 2021; Rauschnabel, 2018), but very few studies have been conducted on smell and taste (Flavián et al., 2021). It is also necessary to better understand the impact of multisensory stimulations, and more particularly the effects of semantic congruency, cross-modal correspondence, as well as sensory dominance, and sensory overload on AR/VR experiences (Petit et al., 2019; Spence et al., 2014).

These sensory stimulations also lead us to think about the ethical consequences linked to the extension of self through AR/ VR (Belk, 2013; Petit, Velasco, et al., 2022). For example, Ionta et al. (2011) found that visuo-tactile stimulation in VR can lead to alterations of first-person perspective and the localization of the self-outside of the body. Marketers can stimulate the senses through the real environment and/or use sensory-enabling technologies to make these sensory stimulations congruent/incongruent with the consumer's physical and/or virtual environment (Petit, Velasco, et al., 2022). These differences in congruency can create sensory confusion. Further research is needed to understand the consequences on self-consciousness, mental health, and well-being (Petit, Velasco, et al., 2022).

The self-extension in AR/VR also raises questions about the impact on social interactions. Only limited research has to date been conducted on the consequences of AR/VR experiments in this field. It has been shown that social VR engagement reflects the consumer's social investment in their VR interactions (Kumar et al., 2019) and that VR engagement is likely to reinforce brand connection (Prentice & Loureiro, 2018). Further research needs to be conducted to understand what drives social exchanges in VR. There is also a need for research to understand more specifically how avatar anthropomorphism may improve self-AI integration, engagement, and social interactions (Alabed et al., 2022; Steinhoff et al., 2019). Beyond social interactions, it is also important to improve our understanding of the impact of AR/VR on society at large, and if these technologies are likely to blur the lines between human and avatar identity (Zarantonello & Schmitt, 2023).

7 | METAVERSE AND DIGITAL TRANSFORMATION

The concept of the "metaverse" has evolved from its initial fictional depiction in Neal Stephenson's book Snow Crash (Stephenson, 2003) to a tangible consideration for businesses, including marketing and various applications, within the context of digital transformation. The metaverse represents a highly interconnected digital realm that holds the potential to revolutionize consumer–brand interactions and transactions throughout the consumer journey. It is an integral part of the ongoing digital transformation shaping our society.

7.1 | The role of the metaverse in the digital transformation

The metaverse was originally portrayed as a black spherical planet accessed through virtual reality terminals, where users assumed avatar identities. In the 1990s, it was perceived as a hybrid reality combining physical and virtual elements, resembling a cyber-planet (Allbeck & Badler, 1998; Perlin & Goldberg, 1996). Early definitions described the metaverse as immersive 3D virtual worlds where people interacted through avatars (Davis et al., 2009), or as a scalable and socially oriented 3D networked virtual realm (Wright et al., 2008).

Over time, subsequent definitions of the metaverse introduced the notion of interconnectedness as an essential aspect. Dionisio et al. (2013) put forth a definition of the metaverse as "an integrated network of 3D virtual worlds" (p. 2). They further suggest that the metaverse is distinguished by its immersive realism, ubiquity, interoperability, and scalability. More recent definitions of a metaverse embrace the concept of interconnectedness and interaction. For instance, Yoo et al. (2023) define the metaverse as "an online collaborative shared space built of 3D environments that leverage high consumer immersion techniques to reduce the perception of technological mediation alongside transferrable and unique digital assets while allowing user-generated digital personas to interact with each other" (pp. 2–3).

Based on the review of the above studies, there is currently no specific definition for the metaverse. As the metaverse platform is based on two-dimensional space—watching a screen rather than immersing ourselves in a simulated reality—it is a basic and initial form of metaverse reality. In this study, we define today's metaverse as a collective virtual space (combination of augmented, virtual, and mixed reality) in which users can interact with each other using avatars and virtual reality technologies to experience virtual and real-world interactions based on their language and culture in an inclusive digital community. There are several main features of the metaverse, including

Boundless (no limit to the number of users), Persistent (no disconnecting or reset), Immersive (new level of involvement), Decentralized (the users have full control over their personal data, no single company or platform holds it), Economic system (e.g., cryptocurrency), and Social experiences (participation in co-experiences and co-creating the future of the metaverse) (Dwivedi et al., 2022; Forbes, 2023; Goldberg & Schär, 2023).

Consumer behaviors have undergone a significant shift, with a growing preference for digital consumption across various platforms (Shah & Murthi, 2021). This shift is an integral part of the broader digital transformation taking place across industries. It is evidenced by the increasing interaction between consumers and brands through online channels (Elmasry et al., 2022) and touchpoints (Wunderman Thompson Intelligence, 2021). Concurrently, firms are investing more in online digital platforms (Holmes, 2021). The metaverse, as the next evolutionary step of the Internet, plays a crucial role in driving this digital transformation.

A consistent observation found in every aspect of the metaverse is the profound level of consumer connections within this virtual realm when compared with other digital platforms (Gadalla et al., 2013). The metaverse offers promising opportunities for marketers due to the intricate and immersive social relationships it enables (Ooi et al., 2023). By fostering online collaboration and local communities, enabling authentic social interactions, and presenting digital personas that foster a sense of closeness, the metaverse provides marketers with a complex landscape to engage with consumers in novel ways (McGrath & Charan, 2023; Plangger et al., 2022).

7.2 | The importance of the metaverse in driving digital transformation

The metaverse, within the context of digital transformation, holds immense importance in reshaping consumer engagement and revolutionizing the customer–firm relationship. As technological advancements continue to transform the global landscape, multinational companies have recognized the business opportunities presented by the metaverse and have begun investing in this digital realm (Dwivedi et al., 2023).

The metaverse holds significant importance in driving digital transformation, allowing businesses to establish virtual presences, deliver personalized experiences, and foster immersive social interactions. It presents a new frontier for marketers to explore and leverage, offering opportunities for transformative consumer engagement and novel approaches to building customer relationships in the digital age.

It is anticipated that the metaverse will bring about a fundamental shift in the way that consumers engage with the digital realm, and will revolutionize the customer–firm relationship (Austin, 2021). Dogadkina (2022) provides evidence indicating that consumers tend to stay more engaged for longer periods when shopping in immersive environments compared with traditional or mobile websites. Moreover, it suggests that consumers are also more inclined to make purchases in these immersive environments. Brands can leverage the metaverse to offer virtual experiences to prospective customers (Rauschnabel, Babin, et al., 2022). This allows brands to interact with potential customers, even without them leaving their homes, while also reaching out to new target demographics. As a result, brands can deliver personalized experiences that transform virtual customers into paying customers in the real world. Furthermore, users can participate in a range of events, including live concerts, museum tours, and dance nightclubs, all from the comfort of their own homes. This facilitates the sharing and experiencing of hybrid worlds among metaverse users, creating a sense of community, and bridging the gap between physically distant customers (Rauschnabel, Babin, et al., 2022).

One such example is J.P. Morgan, which established its inaugural bank branch within the metaverse and initiated customer service operations in February 2022. Big brands such as Nike and Hyundai are buying up "land" in the Metaverse (Koohang et al., 2023). Luxury brands like Gucci and Ralph Lauren have embraced the digital realm by creating virtual storefronts within platforms like Roblox, where they sell digital clothing items (Wong, 2022). Leading restaurant chains like McDonald's have taken steps to explore the potential of the metaverse by submitting applications to the US Patent and Trademark Office and expressing their intent to establish virtual stores within this digital realm (Main, 2022).

7.3 | The multifaceted impact of the metaverse in driving digital transformation

As the metaverse represents an interconnected digital realm, it has the potential to reshape how consumers engage with brands, conduct transactions, and navigate their digital experiences. In the metaverse, users can customize their environment, attend virtual concerts and educational events, socialize, advertise, and shop for real or virtual goods. It opens up new possibilities and opportunities for businesses to transform their operations and create immersive digital experiences for their customers. However, living with avatars in two worlds poses challenges in navigating reality and the metaverse simultaneously. Some real-world activities may eventually be replaced by the metaverse. Experts believe that the metaverse could have a transformative impact on business and social life beyond the Internet era (Hennig-Thurau et al., 2022). By 2030, the metaverse is projected to generate substantial economic value of $4 trillion to $5 trillion across consumer and enterprise sectors (McKinsey, 2023).

The metaverse is a growing distributed and decentralized platform that presents both opportunities and challenges within the digital transformation landscape. Security is one of its key concerns, with a need to establish a robust security infrastructure that guarantees system integrity. Additionally, user privacy is a key challenge that the metaverse must address by ensuring that users have control over their data. Scalability is another significant challenge that the metaverse must contend with, given the exponential increase in the number of transactions and users (Dwivedi, Hughes, et al., 2023). Allocating resources, such as computing power and storage space, becomes critical for the metaverse platform. Compliance with laws and regulations

is necessary as the platform expands. User adoption relies on a seamless, intuitive, and accessible platform design, making user experience pivotal to its success. Promoting diversity and inclusion within the metaverse community is an ongoing challenge.

The metaverse holds exciting possibilities, but its full potential can only be realized by addressing these challenges. As it continues to drive digital transformation, a comprehensive approach is required to ensure the metaverse thrives as an interconnected and immersive platform for users worldwide.

7.4 | Future research directions

Overall, reflecting on the constant changes of the metaverse, it appears that researchers and practitioners widely concur that the metaverse can be defined as a technology-mediated network, as described by Hoffman and Novak (1996), which materializes as a 3D iteration of the Internet (Hennig-Thurau et al., 2022). Second, past research emphasizes the integration of physical elements within the virtual environment as a prominent characteristic of the metaverse (Belk et al., 2022). Consequently, it is more accurate to portray the metaverse as an environment situated on the spectrum of extended reality rather than, solely, a virtual world (Hagtvedt, 2022). Third, past research suggests that an examination of metaverse applications reveals that the majority of past studies concur on the notion that the user experience plays a pivotal role in any metaverse application (Tan et al., 2022).

The future research agenda for the metaverse should be classified into several interconnected domains. These should include:

1. *Digital Consumer Behavior in the Metaverse*: One key area of study should be the behavioral patterns of consumers within the metaverse. This can include how they engage with brands, their buying habits within the metaverse economy, and how their behaviors are influenced by their metaverse experiences.
2. *Impact of Immersive Experiences on Engagement*: Research should explore how the immersion provided by the metaverse impacts user engagement. This could entail studying how much longer users engage with immersive shopping experiences versus traditional online or mobile websites.
3. *Business Strategy and the Metaverse*: It will be essential to examine how businesses can utilize the metaverse to revolutionize their operations, reach out to new demographic segments, and provide personalized customer experiences.
4. *Cross-reality Business Operations*: An exploration of how businesses are incorporating metaverse technology into their real-world operations could provide valuable insights into the future of retail, entertainment, and other industries.
5. *Security and Privacy in the Metaverse*: The metaverse's increasing role in everyday life brings with it significant security and privacy concerns. Research will be needed to establish robust security infrastructures and ensure users have control over their personal data.
6. *Social Dynamics and Community Building in the Metaverse*: A key aspect of the metaverse is its social component. Studies into the creation of metaverse communities and the dynamics within them could provide important information for both businesses and individuals.
7. *Metaverse Accessibility and Inclusion*: Research should address the accessibility of the metaverse to users of all abilities and backgrounds, ensuring it becomes a platform that fosters diversity and inclusivity.
8. *Scalability of the Metaverse*: With the anticipated exponential growth in the number of metaverse transactions and users, studies on how to manage this increase effectively will be of great importance.
9. *The Metaverse as a Catalyst for Digital Innovation*: Research should explore how the metaverse serves as a driving force for digital innovation, impacting other technological trends, and reshaping the wider digital landscape
10. *Regulations and Compliance in the Metaverse*: As the metaverse continues to expand, there will be a growing need for research into the legal and regulatory challenges it presents.

These research directions provide a comprehensive blueprint for studying the metaverse and its implications for digital transformation.

8 | CORPORATE DIGITAL RESPONSIBILITY AND DIGITAL TRANSFORMATION: A CUSTOMER PERSPECTIVE

Corporate Digital Responsibility (CDR) is a relatively new area of research that is viewed as being instrumental in mitigating downsides of the digital transformation of our economies (Lobschat et al., 2021). The digital transformation captures and integrates data from many sources often on digital platforms and ecosystems (Rangaswamy et al., 2020; Wirtz et al., 2019) and can combine customer profile data, transaction data, likes and comments, customer segment aggregated data, inferred data (e.g., predicted preference data), public data (e.g., maps and public ratings), and increasingly "trial and error" data (e.g., A/B testing is widely used in quick field experiments to estimate customer responses to offers) (Wirtz et al., 2023). These data and insights are then fed into powerful algorithms to predict, nudge, and manipulate customers "often without their awareness and nearly always without any oversight or accountability" (Gawer, 2021, p. 12).

The digital transformation increasingly combines these data and insights with ever more advanced digital technologies (e.g., natural language processing, computer vision, robotic process automation, machine learning, analytics, and generative AI) to achieve fully end-to-end (E2E) automated and scalable customer service processes. Google, fintechs such as Wise and Revolute, and other digital native firms have focused on automated and scalable service since their inception with services such as Google Maps, GoogleScholar, and the fintech's services being offered with virtually no human service employees involved.

Legacy firms follow suit and go through their own digital transformations. For example, leading banks have fully automated the process of segmenting markets, identifying target segments, marketing to potential target customers (mostly online and on social media), acquiring customers, opening accounts and onboarding customers, all the way to issuing credits cards (which can also be virtual), disbursing consumer loans, and writing travel insurances (Bornet et al., 2021; Wirtz et al., 2018). As such, the digital transformation with its fully automated services raises a gamut of ethical, fairness, and privacy risks. The negligible costs and increasing possibilities of capturing data, observing customers, and harvesting value, a practice also referred to as *surveillance capitalism* (Zuboff, 2015, 2019), has serious privacy and ethical implications which can even be considered inconsistent with digital human rights conventions (Thomaz et al., 2020; United Nations Human Rights Office of the High Commissioner, 2021). It is therefore critical that these risks are acknowledged and mitigated for the digital transformation of our economies to build consumer trust and contribute to customer wellbeing rather than detract from it (Wirtz et al., 2018).

8.1 | The role of CDR in the digital transformation

CDR is defined as "the principles underpinning a service firm's ethical, fair, and protective use of data and technology" (Wirtz et al., 2023, p. 173). Its main purpose is to recognize, prevent, and mitigate potential consumer ethical, fairness, privacy risks that emerge when firms go through digital transformation of their service offerings (Dörr, 2020; Elliott et al., 2021). These risks emerge not only from the collection and creation of digital technologies and collection of consumer data (e.g., algorithmic biases, overcollection of data, and inappropriate variable labeling), but also from the operation, refinement, and retirement of AI systems and the data it uses (e.g., interpretability of algorithmic output and "poisoning" of datasets) (Herden et al., 2021; Lobschat et al., 2021).

CDR risks can be categorized into concerns related to privacy (e.g., indiscriminate data collection, data breaches, identity theft, and undisclosed and unauthorized sharing of consumer data; (e.g., Lwin et al., 2007; Wirtz & Lwin, 2009), ethics (e.g., manipulation of consumers and disempowerment), and fairness (e.g., automated decision processes that lead to unfair outcomes caused by algorithmic biases and unrepresentativeness of data) (Du & Xie, 2021; Herden et al., 2021; Wirtz et al., 2023). These CDR risks can cause myriad of undesirable consumer consequences including dehumanization, psychological distress, loss of autonomy and dignity, social isolation, social engineering, addiction, discrimination, marginalization of at-risk consumers, unfair treatment, and more (Dörr, 2020; Wirtz et al., 2023; Zuboff, 2015).

8.2 | The importance of CDR in driving digital transformation

It is generally accepted that the use of digital technologies should be governed by moral norms and ethical considerations (Bailey & Shantz, 2018; Ferrell & Ferrell, 2021). These considerations are the focus of CDR, as there is a need to make organizational behaviors accountable to moral norms and ethical considerations.

Avoiding CDR failures and moving the digital transformation forward with good CDR practices is important because of the digital transformation's vast streams of data, and the omnipresence, opacity, and complexity of digital technologies. It is therefore imperative for organizations to develop a strong sense of CDR (Lobschat et al., 2021; Wirtz et al., 2023). They need to actively consider, identify, and mitigate potentially negative and unintended consequences and related consumer vulnerabilities caused by the digital transformation. Downside risks of not doing so include legal, reputation, and regulatory risks and lead to missed opportunities of building brand equity, trust, and goodwill in consumer and labor markets, partner and supplier ecosystems, and society at large (Wirtz et al., 2023).

8.3 | The multifaceted impact of CDR in driving digital transformation

It is surprising to see many organizations that do not follow good CDR practices given that one can assume that digitally enlightened organizations would want to follow good CDR. Here, it is important to acknowledge that while good CDR has benefits, it also comes with barriers that discourage organizations from doing good. Wirtz et al. (2023) identified two drivers of good CDR behaviors and four barriers, and they introduced the CDR calculus to capture these tradeoffs (Figure 6).

The benefits of engaging in good CDR are twofold. First, good CDR helps to reduce legal, reputational, and regulatory risks (Bock et al., 2020; Mueller, 2022). Second, good CDR can help building brand equity, consumer trust, and loyalty. CDR can become a dimension of an organization's brand image and help build a competitive advantage.

The four categories related to the costs of good CDR are: (1) lost incremental revenues (e.g., good CDR practices prevent the full use of data and insights for improved consumer targeting, upselling, cross-

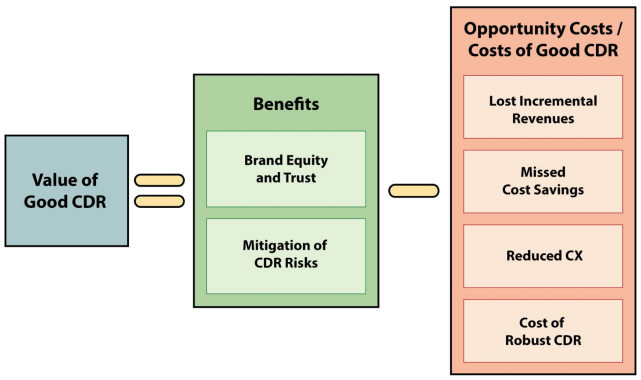

FIGURE 6 CDR Calculus of the Benefits and Costs of Good CDR. *Source*: Adapted from Wirtz et al. (2023).

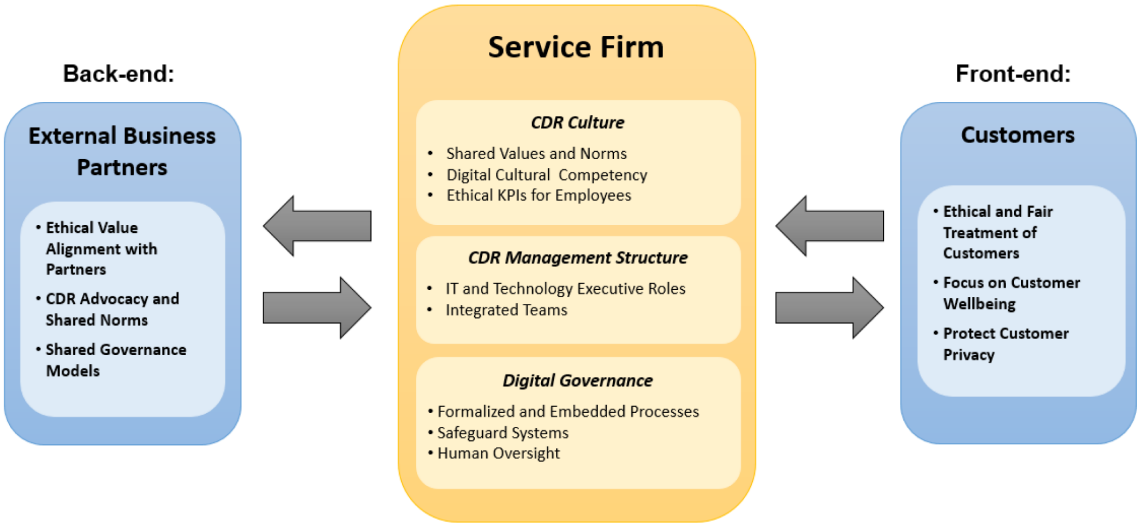

FIGURE 7 Factors shaping good organizational CDR. Adapted from Wirtz et al. (2023).

selling, price discrimination, churn prediction and prevention, selling data and insights to third parties); (2) reduced customer experience (e.g., customization, personalization, convenience, accessibility and speed of service can be hindered without full use of available data and insights); (3) untranslated potential cost savings (e.g., optimization and automation of service processes, risk assessment and fraud detection, and optimization of the supply chain can be hindered by good CDR); and (4) costs of building and maintaining good CDR have to be incurred (e.g., cost of building a good CDR culture, setting up the management structure and team, and the cost of CDR governance).

The benefits and costs of good CDR require organizations to navigate difficult trade-offs between profits (i.e., "doing well") and customer wellbeing (i.e., "doing good"). To manage these trade-offs organizations should implement and maintain good CDR policies and practices. These include adherence with external governance guidelines (e.g., GDPR) and industry standards, embedding ethical and anti-discrimination safeguards into algorithms and auditing their performance, developing a positive CDR culture, and improving the digital literacy and ethical awareness of employees (Figure 7, Wirtz et al., 2023).

8.4 | Future research directions

CDR is a new and increasingly important research area to mitigate the risks of the digital transformation of our businesses and economies. It seems imperative for the digital transformation to succeed by protecting organizations' sustainability and customers' wellbeing. One can expect that the organization will engage in good CDR if the calculus is positive or not too negative, so that organizations are willing to sacrifice some profits for not "doing bad." However, if the sacrifices become too high, poor CDR behaviors are likely and regulation has to step in. Floridi (2021) concluded that "the time has come to acknowledge that, much as it was worth trying, self-regulation did not work. … Self-regulation needs to be replaced by the law; the sooner, the better" (p. 622).

As CDR is a relatively new field it offers a gamut of exciting research opportunities. First, the CDR calculus makes CDR trade-offs explicit offering research opportunities on how organizations can deal with these conflicting objectives. Here, the organizational ambidexterity literature in management (e.g., Raisch & Birkinshaw, 2008) and the service literature on cost-effective service excellence (Wirtz & Zeithaml, 2018) may offer pathways for organizations to effectively deal with the conflicting objectives.

Second, research is needed to explore how technology can be used to enhance organizational CDR performance. For example, AI can be designed to overcome rather than to cause discrimination (Cukier, 2021). We need to understand the potential role of AI in fostering, monitoring, and enforcing good CDR.

Third, the impact of good CDR on organizational outcomes needs to be better understood. Like greenwashing in the environmental, social, and governance (ESG) context, "machinewashing" (i.e., intentionally misleading behaviors and messaging about an organization's good CDR practices [Seele & Schultz, 2022]) may be a tempting option for organizations to avoid costly CDR practices (Wirtz et al., 2023). As "the tension between financial and normative/social demands on the firm is real and needs to be examined in greater detail" (Parmar et al., 2010, p. 413), research on the benefits and costs of good versus "machinewashed" versus poor CDR is needed.

Fourth, the emergence of generative AI (e.g., ChatGPT and Bard) is expected to have a major impact on the digital transformation of our society (Dwivedi, Kshetri, et al., 2023) with its new challenges. For example, training sets used in generative AI can be "poisoned." By way of illustration, replacing merely 1000 images of apples (representing 0.00025% of the data) in a training data set, an AI was caused to consistently misidentify images as containing apples (Tramèr et al., 2022). As data poisoning can be used to manipulate search results (e.g., "which brand is best for …?"), we need to understand

how to mitigate the risks of individuals being exploited, markets manipulated, and society's well-being harmed (Kunz & Wirtz, 2023). Such an understanding can help to reduce the risk of digital transformation experiencing setbacks due to serious CDR failures.

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9 | CONCLUSION

The various sections of this article have provided in-depth analyses on the individual roles of the Internet-of-Things, social media, mobile apps, AI including ChatGPT, AR/VR, the metaverse, and CDR in the context of digital transformation. These multifaceted technologies are shaping the future of digital transformation, each bringing unique challenges and opportunities. From Internet-of-Things ubiquity, the pervasive influence of social media, the convenience of mobile apps, to the complex capabilities of AI, the immersive experiences of AR/VR, and the expansive possibilities of the metaverse, it is clear that ethical considerations and digital responsibility need to be at the forefront. CDR must guide the deployment and management of these technologies, balancing profitability with ethical responsibility, protecting user privacy, and promoting fairness. As we continue this digital journey, it is imperative to adapt, evolve, and ensure the equitable and ethical application of these revolutionary technologies.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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