Forming Digital Workspace: Current State and Applications of Extended Reality in Virtual Teams

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Abstract

Extended reality (XR) has been widely applied as an umbrella term encompassing virtual reality, augmented reality, and mixed reality. Despite extensive research on XR applications in various contexts, little attention has been drawn to its utilization in work scenarios, particularly in virtual teams. This study is a systematic literature review of virtual teams utilizing XR in the digital workspace, incorporating related articles from four scientific databases over the past decade. The review focuses on two aspects: the current state of XR implementation in virtual teams and how technology addresses the digital collaborative process. Findings highlight team types, application areas, collaboration modes, and key actions associated with XR usage. A theoretical gap is revealed, as previous studies focus on either the technological aspects of XR or its outcomes. Additionally, this study proposes a model to illustrate how XR technologies empower virtual teams, providing valuable insight for organizations regarding its potential usage.

Keywords: Extended reality, Virtual team, Digital workspace, Team collaboration.

1. Introduction

In response to the growing decentralization and globalization of the work process, organizations have adapted to their dynamic environments by establishing virtual teams [47]. These teams collaborate across geographical boundaries through information technologies to achieve common goals [4]. The rapid advancement of information technologies has accelerated this trend, resulting in an increasing number of virtual teams [49].

In recent years, there has been a growing interest in the adoption of emerging XR technologies within virtual teams [26], driven by the need to address the challenge of weak connections among team members that organizations are striving to overcome [49]. XR is advancing rapidly and can be far more valuable beyond its applications in gaming [4]. Significant investments in the XR applications can be seen. For example, Meta company has established the Metaverse digital platform and launched Meta Horizon virtual workrooms, leveraging XR technologies [38]. Moreover, XR technologies have already been implemented within certain virtual teams, such as maintenance teams, to provide expertise through simulated scenarios and facilitate remote expert situational awareness [32].

However, given the novelty of XR technologies and the limited number of cases, our understanding of how XR technologies can empower virtual teams remains incomplete [21]. We are interested in the phenomena of virtual teams using XR in the digital workspace: What types of virtual teams are utilizing XR? What are the reasons behind their selection of XR? How does collaboration occur through XR? What remains to be seen for virtual teams using

XR? Therefore, the objective of this paper is to investigate XR-mediated virtual teams in the digital workspace through a systematic literature review. The research question follows:

How have virtual teams leveraged XR technologies to collaborate in the digital workspace?

Further, employing a concept-centric analysis [58], this study aims to identify the research gap in XR-mediated virtual teams and develop a research agenda in IS research field.

2. Extended Reality, Virtual Teams, and Digital Workspaces

This section seeks to establish common ground by interpreting the definitions of XR, virtual teams, and digital workspaces, ensuring a shared understanding for further exploration.

2.1. Extended Reality

The term Extended Reality (XR) appeared in the early 21st century as an umbrella term for Virtual reality (VR), Augmented reality (AR) and Mixed Reality (MR) [45]. VR refers to the technology that creates the simulated digital environment [59], while AR refers to the technology that overlays digital information on the physical world [8]. MR is a mix of VR and AR, and it addresses complex interactions between the digital and physical worlds [39].

2.2. Virtual Teams

A virtual team is a group of geographically distributed individuals who accomplish tasks together using information technologies [47]. While the definition of a virtual team has evolved over time and lacks universal consensus, geographic dispersion has commonly been recognized as a defining characteristic [3]. However, the emergence of co-located virtual teams, where individuals work together using XR to blend digital information, challenges the traditional definition. For example, the co-located virtual team emerged to represent people who work at the same place via MR for blending digital information to increase understanding [9]. This study includes such teams due to their potential impact and relevance, despite deviating from the conventional definition of virtual teams.

2.3. Digital Workspaces

Digital workspaces are areas of the digital enterprise where digital technologies and information are brought together in a specific context [51]. This study narrowed the scope of virtual teams into digital workspaces, which focuses on working scenarios instead of gaming or learning. The concept of a digital workspace has emerged as a way to address digital transformation, aiming to create a unified virtual environment that supports modern workstyles [51].

XR technologies have the potential to create powerful digital workspaces in which users can interact with digital objects and environments as if they were real [50]. Besides, XR digital workspaces offer an engaging way to interact with digital content, making it easier to discuss complex ideas [60].

3. Methodology

This study conducted a systematic literature review in the interdisciplinary areas of XR technology and its applications in virtual teams. The review process followed a five-step procedure based on Caligiuri and Thomas (2013), which includes: (1) Determine the research aim and question; (2) Formulate review criteria; (3) Select and evaluate; (4) Synthesize the findings; (5) Report the findings [15].

In alignment with the research aim outlined in the introduction, keywords and search criteria have been formulated. First, commonly used keywords from virtual team literature reviews were extracted [3, 17], including “virtual team”, “remote team”, “distributed team”, and “remote collaboration”. Second, keywords frequently employed in XR literature reviews emerged [45, 52], including “extended reality”, “virtual reality”, “augmented reality”, “mixed reality” and “immersive technology”. Additionally, “metaverse” was included as an emerging trend grounded in XR technologies [21]. To facilitate automatic searching in the selected database, all identified keywords were written using Boolean logic as follows:

("remote team" OR "virtual team*" OR "distributed team*" OR "remote collaboration") AND ("virtual reality" OR "VR" OR "extended reality" OR "XR" OR "augmented reality" OR "AR" OR "mixed reality" OR "MR" OR "immersive technology" OR "metaverse")*

To ensure comprehensive coverage, four primary scientific databases commonly utilized in related research fields were retrieved: Web of Science, Scopus, Science Direct, and IEEE Xplore. Considering the rapid evolution of technology, this study considers solely articles published within the last decade (2013-2023). Given the novel nature of XR technology's application in virtual teams and the emergence of numerous articles in recent conferences, this study includes both peer-reviewed conference papers and journal papers in its review.

The selection criteria have been formulated to align with the research aim of this study. To ensure a comprehensive analysis, full-text articles are required for inclusion. The focus is on how virtual teams utilize XR technology for collaboration, excluding articles that primarily discuss software algorithms and architecture. This study specifically focuses on XR with additional equipment to enhance the immersive experience or visualize objects. However, due to the ambiguity of terms in the XR research field [50], many articles discuss the virtual world, like Second Life or 2D web-based tools. Those articles were excluded as they do not align with the focus of device based XR. Additionally, to explore XR technologies applied to virtual teams in the digital workspace, only articles addressing work scenarios are included.

As of February 2023, the search in the selected database yielded a total of 1597 articles. After removing duplicates, 1489 articles remained. The selection criteria were applied in two rounds. In the first round, articles were screened based on title and abstract, resulting in the inclusion of 426 articles. The second round further excluded articles through content reading. Finally, 45 articles are selected for further analysis. The entire process and the number of excluded articles are recorded in the PRISMA flowchart [25], which is replicable.

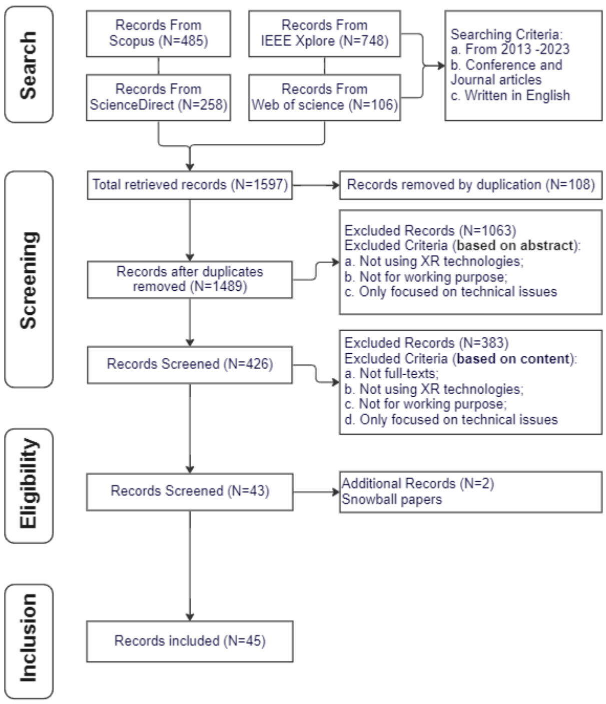

Fig 1. The PRISMA flowchart of paper selection.

4. Results

The analysis of this review follows the concept-centric approach developed by Webster and Watson (2002), which provides a clear track to synthesize the literature. The concept matrix covers key concepts that this study aims to explore: XR technologies, type of teams, application areas, collaboration mode, and XR-enabled key actions. Table 1 shows the overview.

Table 1. The concept matrix.

Articles	XR Technologies			Type of teams							Application Areas					Collaboration Modes			Key Actions		
Unit of analysis	Mobile AR	VR Head-Mounted Display	AR\MR Head-Mounted Display	AEC Team	Analytic Team	Professional Team	Design Review Team	Maintenance Team	R&D Team	Unspecified Team	Expert Guidance	Data Visualization	Design and Review	Decision Making	Meetings	Remote, Synchronous	Co-located, Synchronous	Co-located, Asynchronous	Operational Actions	Socializing Actions	Presentation Actions
[43]		X								X				X		X			X		
[2]		X								X				X		X			X		X
[37]	X							X			X					X			X		
[36]	X							X			X					X			X		
[9]		X			X							X					X				X
[28]		X							X			X				X					X
[20]		X							X				X			X					X
[29]		X								X					X	X				X	
[34]		X								X					X	X				X	
[6]		X	X					X			X					X			X		
[44]			X		X							X				X					X
[35]			X						X			X					X		X		
[33]		X	X		X							X				X					X
[61]		X						X					X				X		X		
[19]	X					X					X					X			X		
[27]		X					X						X			X					X
[41]			X			X						X				X					X
[13]		X								X					X	X				X	
[57]		X								X					X	X				X	
[10]		X							X					X		X					X
[11]		X							X					X		X					X
[14]		X								X				X				X			X
[5]			X			X					X					X			X		
[56]		X								X				X		X			X		
[23]		X	X		X							X				X					X
[1]		X	X						X			X					X				X
[53]		X							X				X			X			X		
[48]		X								X				X		X				X	
[60]		X								X				X			X		X		
[62]		X								X					X	X				X	
[40]		X								X				X		X				X	
[32]		X	X					X			X					X			X		
[18]		X			X							X					X				X
[7]		X		X									X			X			X		
[54]		X		X									X			X			X		
[55]		X		X									X			X			X		
[63]			X					X			X					X			X		
[24]			X							X				X		X					X
[22]			X	X							X					X			X		
[12]			X							X					X	X				X	
[16]	X							X								X			X		
[42]		X				X									X	X				X	
[46]		X	X							X				X		X				X	
[30]			X					X			X					X					
[31]		X				X									X	X				X	

We applied thematic analysis to identify five key concepts [58]. The first three concepts focus on identifying which XR technologies have been employed by what types of virtual teams for which specific application areas. The next concepts focus on collaboration modes and the actions generated by XR technology. The unit of analysis emerged from the literature based on each key concept and was coded accordingly. These key concepts and units of analysis serve as a framework to guide the discussion and synthesis of the selected literature [58].

The timeframe for the review was 2013 to 2023, the majority of articles were published after 2019, indicating a recent surge in interest in the topic of XR-mediated virtual teams. Additionally, articles examined were primarily from the fields of architecture, engineering, computer science, innovation, and technology.

4.1. XR Technologies

The software and hardware of XR devices form the foundation for creating digital workspaces for virtual teams. In the articles reviewed, three types of hardware were commonly employed in various contexts: Mobile AR, VR head-mounted displays (HMDs), and MR/AR head-mounted displays [37, 43, 22].

Mobile AR hardware refers to devices that utilize smartphones or tablets as display platforms [19]. These devices leverage the camera, sensors, and processing power to track user movements and blend digital information with the real world [37].

VR HMDs refer to devices that provide a non-transmissive virtual experience, which blocks users' eyesight in the virtual environment with the headsets [27]. These headsets typically include a screen positioned in front of the eyes and lenses that adjust the distance and focus of the stereoscopic 3D image [43].

MR/AR HMDs can be distinguished from VR HMDs through the transmissive feature. These devices often present users with digital information alongside physical world objects, rather than immersing users in a purely virtual environment [22].

The successful application of XR technology relies not only on affordable and easy-to-use hardware but also on software solutions. The primary emphasis of XR software is on the architecture of virtual scenarios and the interface across platforms [6]. Customized simulation is often required in various contexts. For example, Zhang et al. (2022) developed a software system that enables the sharing of stereoscopic scenes in local workspaces to support assembly tasks, while Benjamin et al. (2021) built a workspace software platform to facilitate visual data analysis. Established simulation has been applied in some cases, such as Bonfert et al. (2023) using established VR platforms that allow integrating presentations to achieve co-presence.

XR software and hardware align to facilitate virtual team collaboration by stimulating users' senses and fostering situational awareness [46, 52]. This synergy creates either an immersive or interactive environment that enhances collaboration among team members.

Stimulations in XR enhance user experiences through sensory, auditory, haptic, and olfactory and gustatory stimulation. *Sensory stimulation* occurs through visual display, creating immersive virtual environments for activities like meetings and interactions [52]. In the virtual environment, visual cues that guide users can be achieved through annotations such as laser pointer, eye gaze, virtual hand movement, etc. [46]. *Auditory stimulation* complements the visual experience with realistic spatial audio. XR devices can utilize spatial audio to create a 360-degree soundscape, allowing users to perceive sounds as if they were coming from different directions and distances [48]. *Haptic stimulation* enables interaction between users and virtual objects. Haptic gloves or controllers, for example, provide haptic feedback using touch and vibrations to simulate user interactions [52]. In virtual collaboration, a remote expert can guide local workers in assembly tasks by using a virtual hand or pressing a pointer [30]. *Olfactory and gustatory stimulation* are not common but may exist in the future.

Awareness building in the XR context relies on the sense of presence and immersion [2]. Three dimensions of presence have been identified from the literature, namely, spatial presence, self-presence, and social presence [2]. Spatial presence is particularly important in work scenarios, which provides workers with the feeling that they have a shared workspace to collaborate [24]. It has been found that a shared digital workspace can help reduce the isolation of remote workers [24]. Self-presence refers to users' sense of being present in the virtual environment as themselves, often achieved through the use of avatars [57]. Social presence is crucial for collaboration and refers to users' sense of connection and engagement with others in the virtual workspace [48].

Immersion in XR interprets the depth of awareness, while presence describes the breadth of awareness. Users can immerse in the virtual environment through verbal, gestural and auditory cues [52]. The level of immersion required can vary depending on the use case. For example, virtual social events that emphasize social interaction may require a highly immersive environment to achieve effective communication [42]. In other cases, the degree of immersion may be less important, particularly when there is a need to blend digital information with physical objects [22]. An example is expert guidance in maintenance tasks, where workers require digital information to manipulate physical objects [5, 63].

4.2. Type of Teams

The review identified seven primary types of virtual teams where XR technologies had been adopted or explored extensively. These include architecture, engineering, and construction (AEC) teams, analytic teams, professional teams, design review teams, maintenance teams, programming teams, and research and development (R&D) teams. While some articles focused on specific team types, others discussed XR functions with unspecified teams in experiments.

AEC teams have utilized XR for tasks such as marking and measuring virtual buildings, which allows for complex representations and improves working accuracy while reducing the need for unnecessary travel [7, 54, 55].

Analytic teams have applied XR for data visualization, enabling immersive collaborative analysis and a better understanding of information [23, 33].

Professional teams refer to police teams, astronaut teams, surgery teams and research teams, though they are less commonly mentioned in articles [5, 19, 31, 41]. XR application in these teams is still exploratory, driven by the potential benefits and motivated users. For example, police teams have used mobile AR to investigate crime scenes with remote expert assistance, while research teams have utilized VR HMDs for conference arrangements [5, 19].

Design review teams have employed XR for product design review to improve the understanding of the product [27]. XR facilitates better representation and communication among multiple stakeholders in these teams, beyond just designers.

Maintenance teams have been a frequent topic of discussion, utilizing XR for guiding repair, installation, and inspection tasks [6, 32, 37, 63]. The remote expert can be aware of what is going on in the task space through XR technologies, thus guiding the collaborators' activities.

R&D teams have applied XR in product design and development [10, 53]. For example, software teams have used VR as an integrated tool for designing software platforms [53].

Unspecified teams encompass articles that explore the applications of XR without limiting team types. For instance, XR can be used for immersive meetings to enhance communication efficiency across different team types [12, 29, 57]. Researchers have also applied XR for teams in various contexts: Participants arranged the placement of virtual bins on campus; Participants shared different fragment information to make a decision; Participants collaborated asynchronously to place virtual furniture in a digital space [14, 40, 43].

4.3. Application Areas

Analyzing XR applications from the perspective of application areas is crucial due to the presence of various unspecified team types. The applications of XR technologies have been widely investigated in various contexts, and we coded them in the following aspects.

Expert guidance: XR is widely applied in virtual teams for expert guidance in surgery operations, assembling tasks, and repair tasks [5, 6, 32]. It enables remote experts to provide digital guidance information overlaid on physical tasks, offering local workers an "expert hand" to solve problems effectively.

Data visualization: XR is widely explored for data visualization in virtual teams such as business analysts, pair programming, and medical research [28, 33]. In these cases, XR technologies are more likely to be applied for building a virtual space where workers could investigate the depth of information and details of complex data.

Design and review: XR technologies find extensive adoption in product development and AEC teams for design and review purposes [7, 11, 54]. XR technologies help create a simulation of the product, building or infrastructure. For example, team members can interact with virtual objects, manipulate them, and scrutinize details, leading to improved comprehension and more effective design and review processes.

Decision making: XR is employed in various decision-making contexts, enhancing awareness and information integration [40]. For example, participants collaborate using XR technology to select optimal holiday locations [24]. Another example is that the participants collaborate using XR to decide on furniture placement in a virtual room [14].

Meetings: Although still underutilized in real-life scenarios, XR has been explored for virtual conferences and commercial meetings, particularly to enhance social interactions [31]. With avatars representing team members, XR enables non-verbal communication cues and fosters a stronger sense of presence and engagement [12].

4.4. Collaboration Modes

Collaboration modes in XR can be categorized based on team members' geographical location and synchronicity:

Remote - Synchronous is a common mode in which team members collaborate from different locations in real-time. For example, remote team members can conduct social events at a certain time via VR HMDs despite different time zones [12].

Co-located - Synchronous exists in several cases as an emerging mode, in which team members collaborate at the same location simultaneously. Both AR and VR technology can be employed in this mode when the purpose of the application is not to overcome distance issues. For example, an R&D team can discuss and evaluate a simulated product within a virtual space using VR HMDs, reducing the need for physical equipment [35]. Similarly, an analyst team can visualize data through AR HMDs while discussing at the same location [33].

Co-located - Asynchronous shows up in one article as a rare mode, in which team members co-located at the same place but different time. Wang etc. (2022) presented this collaboration mode to show a co-located team place furniture in a virtual space at different time.

4.5. Key Actions

Identifying key actions generated by XR provides insights into how technologies impact virtual teams [30]. Three action categories are observed and coded in the concept matrix: operational actions, socializing actions, and presentation actions.

Operational actions involve tasks such as marking up virtual buildings, measuring equipment, manipulating virtual objects, and navigating with virtual tools [43, 55, 63]. These actions are common in maintenance teams, enhancing operational processes through XR.

Socializing actions occur during communication and include discussions with each other, avatar movement, and micro-expressions such as eye gaze [12, 31]. These actions are common in virtual meetings and virtual events via XR, which increase team members’ sense of presence and immerse them in team interaction.

Presentation actions were identified during the presentation of virtual objects, including reviewing the design and visualizing data or products [18, 27, 33]. These actions are applicable in various teams, leveraging XR to create immersive experiences for better comprehension.

4.6. Identified Challenges

The concept matrix does not present challenges that drive virtual teams toward XR, but it is necessary to notice and emphasize these challenges as they emerge from virtual teams. Despite multiple team types, some specific common challenges provoked their desire to utilize XR. Sensing these challenges can serve as inspiration for organizations that are considering exerting XR in their virtual teams. The following are seven typical challenges identified:

Low situational awareness. Virtual teams turned to XR for the need of high situational awareness in a remote place, especially in collaboration where workers need to be aware of the scenarios. For example, when an office worker assigns tasks to a field worker, photos or videos alone are insufficient to provide the necessary information for effective communication and understanding of what is happening in the field [22].

Limited shared understanding. Many teams applied XR to improve shared understanding, which is strongly required in distributed teams. For example, remote design review teams may face limited understanding of a product based solely on descriptions or images [27]. Limited shared understanding of complex data drives virtual teams to turn to XR, which enables visualization and enhances comprehension of complex data structures [33, 44].

Difficulty in representation of complex scenarios. Virtual teams grappling with decision-making in complex contexts turn to XR for improved representation of scenarios. For example, the representation of an onboard operational simulation can improve workers' ability to effectively communicate OT network status to the ship commander, thus fostering decision-making and improving the accuracy of decisions in the complex system [35].

Inability to share, examine, and measure features. XR is utilized by virtual teams, particularly in architecture, engineering, and construction (AEC) teams, to facilitate the sharing, examination, and measurement of features. Simulated buildings, for example, provide easier inspection and measurement, leading to cost savings [55].

Conversation ambiguity. XR helps virtual teams overcome conversation ambiguity and enhance trust. For example, VR technology addresses the limitation of traditional video contexts by including non-verbal cues like hand gestures and micro-expressions [12].

Low sense of presence. Geographical isolation in remote teams often results in a low sense of presence [52]. Immersive VR meetings and social events have been tested to address this issue, with findings showing higher satisfaction and a stronger sense of presence compared to computer-based online meetings [42].

Difficulty in providing expertise. Surgery, maintenance, and assembly teams turn to XR technologies to address the challenge of providing expertise [5, 32, 36]. For example, remote experts can utilize AR to guide local workers, using virtual hands or pointers to indicate specific areas and provide instructions for repairs or tasks [32].

5. Discussion

This section presents a holistic model of XR-mediated virtual teams and a research agenda.

5.1. Proposed Model

A model is proposed according to the findings above, which encompasses key elements, enabling factors, identified challenges, and outcomes of XR-mediated virtual teams. This model aims to offer a holistic view for organizations considering employing XR to forge their digital workspaces, enabling them to assess its compatibility and possible applications. It also provides insights for those who have already implemented XR, inspiring them to optimize its use through enhanced understanding. Figure 2 depicts the model.

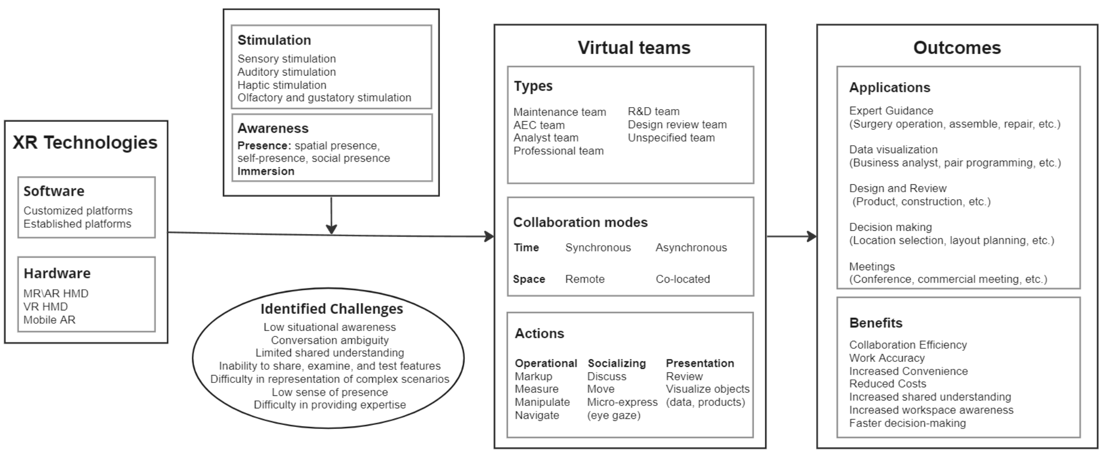

Fig 2. Model of XR technologies applied in virtual teams.

XR technologies, comprising hardware and software components, enable virtual teams through sensory stimulation and awareness building [6, 24]. Virtual teams turned to XR due to identified challenges, including low situational awareness, limited shared understanding, conversation ambiguity, low sense of presence, difficulty in representation of complex scenarios, and difficulty in providing expertise [6, 7, 14, 18, 32].

Various team types, including maintenance, AEC, analyst, R&D, design review, professional, and unspecified teams, have explored or implemented XR applications [9, 37, 54]. Collaboration modes in XR-mediated virtual teams can be categorized as synchronous or asynchronous in terms of time, and remote or co-located in terms of space [61]. Key actions generated by XR in virtual teams have been identified and coded into three types: operational actions, socializing actions, and presentation actions.

The outcomes of XR implementation in virtual teams manifest in diverse applications and benefits. Five types of applications are coded, including XR for expert guidance, data visualization, design and review, decision-making, and meeting. Benefits of XR include, but are not limited to, increasing collaboration efficiency and accuracy, providing work convenience, reducing costs, increasing shared understanding and workspace awareness, and faster decision-making [33, 44].

5.2. Research agenda

This systematic literature review identified a research opportunity regarding XR technologies applied to virtual teams in the digital workspace: Previous research either solely focuses on XR technology (software and hardware functions), or the outcomes that manifest in virtual teams. Thus, attention is required in terms of the collaboration process in the XR context. Meanwhile, the challenges associated with using XR in virtual teams require further exploration.

It is apparent from the publications that most of the articles pertain to AEC, computer science, innovation, and technology research fields. The application of XR technology in virtual teams must consider and examine both user behaviours and technology features, which should be encouraged in the IS research field. However, none of the selected articles were from the Association for Information Systems (AIS) scholars' basket of journals and conferences, which further reveals this gap in IS field. Furthermore, due to the novelty of XR-mediated virtual team collaboration, no established theories currently explain the phenomena [21].

So far, most research endeavours have been dedicated to creating enabling technologies, overcoming engineering obstacles, and proposing approaches to support XR design. There is a need for deeper insight into how team collaboration occurs in the XR-mediated context, which contributes to shaping future digital workspace through XR and inspiring organizations that are still in the pilot phase of utilizing XR. Therefore, a research agenda is proposed, emphasizing the responsibility of IS scholars in establishing theories or contextual frameworks that interpret how XR technologies facilitate the collaborative process. Table 2 presents the agenda.

Table 2. Research agenda.

Knowledge gap	**Research Agenda**
Theorizing the phenomena	Investigate and develop theories for XR-mediated virtual teams.
Inquiring team collaboration process	Investigate the team collaboration process utilizing XR technologies.
Identifying challenges of XR usage	Empirically investigate practical applications of XR to identify the challenges of using XR in the digital workspace.

5.3. Limitations

This study acknowledges several limitations inherent in the literature search, selection, and analysis process. The search was limited to four databases, potentially leaving out relevant papers from other sources. The chosen query method and selection criteria may have unintentionally omitted papers aligned with the research objectives. Additionally, the literature analysis may not encompass all significant aspects within the XR research field, as any inadequacy in the novel XR context could hinder a clear understanding of its application. However, none of the limitations hinders the value of this work, as it provides insight and serves as a foundation for further exploration of XR-mediated teams.

6. Conclusion

Powerful and more affordable XR hardware, aligned with various software platforms, is promising for organizations to direct their attention to utilizing contemporary XR technology in virtual teams. Being aware of this rapid growth and interest, this study synthesized XR research in virtual teams limited to work scenarios. Through a concept-centric analysis, this study identified the usage of XR technologies (hardware and software), main driving challenges, virtual team types, application areas, collaboration modes, and key actions enabled by XR.

The review uncovers a growing phenomenon of XR applications in virtual teams, where XR technologies offer team members a digital workspace that can either be a purely simulated environment or a blend of digital information and physical environment. This digital workspace benefits team collaboration through many aspects, such as improving shared understanding and situational awareness.

The research findings further develop a model to interpret how XR technologies empower virtual team collaboration. The model explicitly represents the key elements and possible applications of XR in virtual teams, which can provide insight to organizations interested in implementing XR technologies. However, the collaboration process has remained unclear, which can be further studied following the research agenda. Finally, we argue there is a need for research on XR-mediated team collaboration in the IS context.

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