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RESEARCH

The State of Video Game Research in Computer-Supported Cooperative Work – A Systematic Literature Review

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Abstract. Video games have been a unique study context for computer-supported cooperative work (CSCW) researchers for decades. However, despite their collaborative richness, CSCW has not yet developed a systematic understanding of video games as a site for studying cooperation and social interaction—limiting its ability to engage with the increasingly social, digital, and playful nature of work. Particularly, what are the academic characteristics of video game studies? What topics are studied in the context of video games? And what are the unique facets of the video game context? To answer these questions, we conducted a systematic literature review by analyzing 67 studies of video games published in CSCW outlets between 1998 and 2023. We describe these studies' academic characteristics and the topics studied in the context of video games through seven themes. We further identify six unique facets of collaborative work that scholars gain through game studies. We conclude that video games not only serve as an empirically rich site for examining and enriching existing CSCW theories and frameworks, but also constitute unique and oftentimes novel sociotechnical configurations that recontextualize CSCW. We further point to gaps, opportunities, and future directions for CSCW researchers interested in exploring the diverse social and collaborative dynamics in games, thus contributing to a more inclusive and expansive understanding of collaboration in digitally mediated environments.

Keywords: Video games, Computer-Supported Cooperative Work (CSCW), Human–Computer Interaction (HCI), Collaboration, Systematic Literature Review, Sociotechnical Systems

1 Introduction

Video games have become an increasingly relevant context for studying collaboration and sociotechnical systems, offering rich, playful, and complex environments where cooperation, coordination, and community are constantly negotiated. Research on video games has been a sustained area of interest in human–computer interaction (HCI) for over two decades (Nacke 2017), and continues to evolve, with recent work examining how games research connects to

broader HCI agendas (Mandryk et al. 2024). The unique, playful interactions offered by games have also captured the interest of computer-supported cooperative work (CSCW) scholars.

However, despite their rich collaborative dynamics, video games have remained on the periphery of CSCW research, often treated as an unconventional study context rather than a core domain for understanding cooperation (Freeman et al. 2024a, b). While a growing number of CSCW scholars have examined elements of playful collaboration and their implications for work (Gallacher et al. 2015; Stickel et al. 2015; Rajadesingan et al. 2023) such studies remain scattered and have yet to establish games as a mainstream context within the field.

This gap is important to address because CSCW has a strong tradition of valuing the study context (Ciolfi et al. 2020), recognizing that technology uses and practices are always situated within specific environments. Over the years, CSCW research has explored a variety of contexts, from traditional workplace settings (Schmidt 2000) to social media (DeVito et al. 2017) and smart homes (Zheng et al. 2018), to understand how different environments shape cooperative work and social interactions.

Video games represent a particularly compelling addition to this tradition, offering immersive environments that challenge conventional notions of both work and collaboration. Unlike traditional applications, games provide interactive, high-engagement spaces where cooperation, competition, and community-building emerge organically (Sall and Grinter 2007) that foster complex social interactions and community building. This distinctiveness provides an opportunity to reevaluate and expand our understanding of collaborative technology's role in leisure and play. For example, massive multi-player games like EverQuest (Sony Online Entertainment 1999; Shen 2014) and Dark Age of Camelot (Mythic Entertainment 2001; Seay et al. 2004) exemplify the intricate forms of online social organization that develop in gaming environments—insights that can inform broader CSCW research. The increasing cultural and social significance of video games, particularly those that foster persistent collaborative virtual environments with complex social structures and strong social bonds, has been highlighted in the literature (B. Brown and Bell 2004).

Despite these examples, the field has yet to systematically integrate video games as a core context for studying collaboration and social interaction (Freeman et al. 2024a, b). While past work has explored gaming within CSCW, much of this research remains fragmented, focusing on specific aspects of player experience, such as social toxicity, teamwork, or immersion (Frommel et al. 2022). Beyond introductions to the state of games and play (Dourish 1998; B. Brown and Barkhuus 2007), a systematic understanding of how video games function as sociotechnical spaces within CSCW remains underdeveloped.

To achieve these objectives, we conducted a systematic literature review of video games in CSCW research. A systematic literature review serves as an

invaluable tool for synthesizing research approaches, methodologies, and themes (Gough et al. 2017), allowing us to identify patterns and offer a roadmap for future research. Furthermore, examining video game research through the lens of CSCW can yield insights into broader topics, providing actionable steps for game designers, researchers, and professionals across diverse domains:

RQ1: What are the academic characteristics of video games studies in CSCW?
RQ2: What CSCW topics are studied in the context of video games?
RQ3: What are the unique facets of the video game context?

To answer the three primary research questions, we identified and analyzed 67 studies published between March 1998 (i.e., the earliest a video game study published in a CSCW venue) and October 2023 (i.e., the latest by the time of data collection), from three academic digital libraries through Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al. 2009). We found that game studies within CSCW have seen steady growth since 1998, with the CSCW conference (through both ACM CSCW and PACMHCI) as the strongest outlet, and qualitative methods dominating the research landscape. Massively multiplayer online role-playing games and multiplayer online battle arena are particularly popular genres due to their complex social dynamics, while studies on less popular genres like sports games and virtual worlds game are sparse. Seven themes that prior research in video games has connected to broader topics in CSCW include teamwork, community, social relationships, video game usability, collocation, governance, and self-agency. Lastly, we found six unique facets that explore the distinctive contributions that the video game context offers to CSCW through an interpretive lens of the studies in our corpus.

Based on these findings, we reflect on how game studies broaden our understanding of CSCW and how they contribute to the field by expanding its critical components, including conceptualizations of work, interdisciplinary collaborations, and the role of players. Before outlining a research agenda for the future of CSCW in game studies, we discuss the gaps and opportunities we identified, positioning them as key areas for further investigation.

Our SLR contributions to HCI and CSCW are threefold: first, we present an in-depth review of prior work on game studies in computer-supported cooperative work, providing one of the first comprehensive overviews of video game research in the field. Second, we examine how and what video games contribute to computer-supported cooperative work, exploring their distinct characteristics as a study context. Third, we highlight future research opportunities that connect gaming and non-gaming contexts, offering a roadmap for researchers and practitioners interested in expanding the role of game studies in computer-supported cooperative work.

2 Background

Since its early emergence, CSCW has evolved significantly since its inception in the late 1980 s, primarily focusing on understanding how collaborative activities and their technological support can be integrated effectively. Early works by Greif (1988) and Schmidt and Bannon (1992) helped define the scope and aspirations of CSCW, emphasizing the role of technology in mediating group interactions. These foundational ideas were further explored through the lens of sociotechnical systems in studies by Baecker et al. (2014), which detailed the design of collaborative software, and Grudin (1994), who addressed the challenges of discrepancies between who benefits and who pays in cooperative settings. In recent years, CSCW has expanded to include emerging technologies like artificial intelligence (Morris et al. 2024), large language models (Kulkarni et al. 2023), and embodied virtual spaces (Freeman, Frommel, et al. 2024), which shape new forms of collaboration and interaction (Schmidt 2002; Murray et al. 2023).

As CSCW matured, it became apparent that the field was receptive to exploring virtually any type of system or interaction under its umbrella, provided it involved some aspect of collaboration or cooperation supported by technology. This broad inclusivity is evident in research by Fitzpatrick and Ellingsen (2013), which examined the implications of CSCW in healthcare settings, and the work of Ackerman et al. (2003), focusing on the engineering challenges of collaboration. The study of money and finance within CSCW has also garnered attention, as demonstrated by Vines et al. (2012), who explored the complex interactions between technology, social behavior, and financial transactions, particularly focusing on traditional banking practices and their significance in modern society. Additionally, Liu's work (2014) on crowdsourcing illustrates how CSCW can support the strategic deployment of crowd-based resources in emergency management, enhancing response effectiveness and coordination. These various of topics and subjects within the CSCW demonstrate the openness and the degree to which 'work' has been identified and studied in the past. Previous systematic literature review research at the intersection of game studies and CSCW-related frameworks has largely focused on specific aspects of player experience, such as being stuck in a game (Drey et al. 2021), toxicity in multiplayer games (Wijkstra et al. 2024), measurement of player experience constructs (Aeschbach et al. 2021) and realism in games (Rogers et al. 2022). While these studies contribute valuable insights into individual facets of player experience, they do not examine video games as a phenomenologically situated context within CSCW, one where collaboration is dynamically shaped by emergent player behavior, evolving rules, and social norms.

Context is central to understanding interaction in HCI (Dourish 2004), as artifacts and their contexts are mutually defining rather than separate entities. Video games exemplify this fluidity: interaction is constructed on the fly, collaboratively, and in response to the evolving game state. Unlike structured work

environments, game worlds present emergent governance structures, shifting social roles, and dynamic constraints that require CSCW scholars to reconsider traditional collaboration models. As a result, there remains a critical gap in understanding video games as collaborative and social environments within CSCW.

The openness of CSCW to various research topics naturally extended to the study of leisure activities (B. Brown and Barkhuus 2007), reflecting its evolving nature. Earlier discussions, such as those by Snowdon et al. (2001) on collaborative virtual environments, which have found significant application in leisure contexts like online gaming, and the study by Grinter and Palen (2002) on instant messaging among teens, highlight how the field has embraced complex, often non-traditional environments. Further explorations by Brown et al. (2003) into the use of mixed reality systems for public entertainment and by Ducheneaut et al. (2004) on social dynamics in massively multiplayer online games, showcase the field's expansion into more eclectic and varied systems related to leisure and entertainment. This opened up many opportunities on CSCW topics that are possible to be studied in the context of video games. For example, accessibility in multiplayer games (Gonçalves et al. 2020), collaborative play and teamwork dynamics (Marlow et al. 2016; Freeman and Wohn 2019; Musick et al. 2021), and content moderation in gaming communities (Sparrow et al. 2024). These works highlight the importance of answering and understanding how CSCW topics are studied in the context of video games.

Despite the evident relevance of game studies to CSCW, literature on the unique facets of video games remains somewhat scattered, even though video games have evolved from simple text-based input to complex virtual communication and collaboration environments (Figure 1). Dourish (1998) provided a crucial historical perspective on the role of multi-user dungeons in CSCW, tracing their evolution from simple text-based adventure games to complex social and collaborative environments. His work underscores the early adoption of multi-user dungeons as platforms for both leisure and research, illustrating how these environments facilitate diverse forms of collaboration and community building. After advancements in computer graphics, collaborative dynamics within virtual spaces have been studied and it has been found that games like World of Warcraft (Ducheneaut et al. 2006; Nardi and Harris 2006) and Star Wars Galaxies (Sony Online Entertainment 2003; Ducheneaut et al. 2007) provide a fertile ground for examining the complexities of social interactions and the nuances of collective play. More recently, research has expanded beyond traditional multiplayer online games to examine collaboration and social interaction in live-streaming and esports environments (Wohn and Freeman 2020; Chen and Wu 2024). Additionally, studies on platform-based gaming communities have explored how cross-platform play and third-party communication tools like Discord shape multiplayer experiences and online social structures (Akkawi et al. 2004; Johnson and Salter 2022). These studies reveal unique



Figure 1. The evolution of virtual communication and collaboration among players in games. Left: A multi-user dungeon game, Forgotten Kingdoms (Forgotten Kingdoms Developers 1999; Williamson 2020) featuring simple text-based inputs. Right: A massively multiplayer online role-playing game, World of Warcraft (Blizzard Entertainment 2004), with overlaid extensions, add-ons, and gameplay data.

facets of video game studies, demonstrating how video games offer rich and diverse opportunities to examine various topics.

While prior systematic literature reviews have examined various aspects of game studies in HCI and related fields, to the best of our knowledge, none have systematically assessed how video games function as a sociotechnical and collaborative context within CSCW. Existing SLRs often focus on player experience, game mechanics, or design methodologies, but they do not investigate how CSCW theories and frameworks have been applied to games, nor do they analyze how gaming environments reshape our understanding of collaboration, teamwork, and governance in digital spaces.

Our review addresses this gap by synthesizing video game studies specifically within CSCW research outlets, examining how games have been used to explore social interaction, cooperation, and collaborative systems. By structuring our review around our three research questions, we aim to bridge this divide, offering a roadmap for better integrating video game studies into CSCW. A systematic review is necessary not only to consolidate insights from prior studies but also to critically assess how games extend, challenge, or enrich CSCW's core theories and methodologies, an aspect that remains largely underexplored in existing literature.

3 Methods

Our literature review was guided by the PRISMA framework, a systematic approach introduced by Moher et al. (2009) for organizing and reporting systematic reviews and meta-analyses. We selected PRISMA because it offers a structured and replicable process for identifying relevant studies, reducing selection bias, and ensuring comprehensive coverage. Given the fragmented nature of video game research in CSCW, as discussed in the background section, this framework enabled us to consolidate diverse insights and map the field with methodological rigor (Harris et al. 2019; Ma et al. 2023; Shi et al. 2023).

We chose to conduct a systematic literature review (SLR) to synthesize knowledge across studies and establish a well-defined foundation for answering our research questions. In contrast to narrative reviews, which often provide exploratory insights, the SLR approach allows for transparent and exhaustive literature assessment. PRISMA's four phases—identification, screening, eligibility, and inclusion—aligned with our goal of systematically examining collaborative gaming environments within CSCW.

Data collection took place between September and November 2023. During this period, we defined our inclusion criteria and implemented the review in accordance with PRISMA guidelines. In total, 67 publications were identified as meeting all criteria and included in the final analysis. This structured process not only supports the validity and reproducibility of our findings but also provides a foundation for future work to build upon.

3.1 Inclusion criteria

The criteria for including studies in this SLR were centered on identifying research that examined games within CSCW-designated venues. To ensure consistency and minimize bias, we defined a set of CSCW-related venues at the outset, rather than assessing alignment with CSCW principles on a case-by-case basis. By relying on venues with clearly established CSCW aims and scopes, we leveraged their peer review and editorial standards to ensure relevance. We also excluded book chapters, as these sources often vary in peer-review rigor and indexing standards across digital libraries, which could compromise consistency in quality and accessibility.

- An article must be a full research paper published in a CSCW-related conference proceeding or journal. To determine if a work meets our criteria, we (1) identified the proceedings related to CSCW and (2) ensured that the piece is categorized as a research article within the digital library, not as an extended abstract or poster.
- An article must be written in English due to the research team's language capacity, as reviewing papers in other languages falls beyond the scope of this study.
- An article must investigate games within their own context as the primary subject of study, rather than using games solely as a tool, setting, or intermediary for studying unrelated objectives. In other words, the research should directly examine aspects of games themselves rather than employing games simply to study other phenomena.

3.2 PRISMA steps

3.2.1 Identification: database and keywork searching.

Before developing our search procedure, we first identified relevant digital libraries based on their alignment with CSCW research. In this case, the focus was on the ACM Digital Library (ACM DL), Springer Link, and the EUSSET Digital Library because these platforms host core CSCW venues, including both historical foundations and emerging publication outlets. ACM DL includes the ACM CSCW Conference (est. 1986) and PACMHCI (est. 2017), which reflect the evolution of CSCW within HCI. Springer hosts the Journal of CSCW (est. 1992), and EUSSET provides access to ECSCW and COOP, which emphasize European and practice-based perspectives.

These databases were selected to ensure comprehensive coverage of the field's geographic, thematic, and institutional diversity (see Schmidt and Bannon 2013). Together, they represent the most prominent and accessible sources of peer-reviewed CSCW scholarship Table 1.

The next step in identification was to develop our search query through multiple iterative sessions with researchers in our lab. Our goal was to capture a broad but relevant set of terms that reflect both foundational definitions of games and the genres most commonly discussed in CSCW contexts. The final query includes synonyms and abbreviations for video games, as well as representative genre terms known for their collaborative or social affordances.

To ground our keyword design, we began with Tekinbas and Zimmerman's (2003, 81) widely cited definition of games as "a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome." This offered a conceptual starting point, particularly for distinguishing games from playful or gamified systems. However, this definition alone does not address genre diversity or platform-specific terminology commonly used in game research.

We reviewed existing systematic literature reviews in adjacent fields (Apperley 2006; Hamari and Keronen 2017) and followed recommendations for including genre terms that reflect specific research attention in social gaming contexts. For instance, genres like MMO, RPG, and FPS were selected due to their strong association with collaboration, competition, and social interaction, all of which are central to CSCW inquiry. Esports and mobile games were included based on their increasing representation in CSCW and HCI venues in recent years (Freeman and Wohn 2019; Chi et al. 2022).

To keep the review focused and methodologically manageable, we limited our scope to digital games. Non-digital games introduce distinct challenges in terms of affordances, interaction modalities, and data availability, which would require separate analytical frameworks.

Table 2 shows the list of all keywords used to search the full text of the identified dataset. We opted for full-text searches rather than limiting to titles or abstracts because some databases, such as Springer and EUSSET, lack filtering tools for those fields. Each database also operates differently, requiring tailored search strategies to ensure accuracy.

For example, ACM Digital Library supports wildcard operations (ACM Digital Library 2024), allowing the asterisk (*) to substitute for unknown characters—e.g., the query game* captures terms like "games," "gaming," and "gamers." In contrast, EUSSET DL does not support wildcard queries, so we manually input keyword variations. Prior to launching full-scale data collection, we tested wildcard behavior using shorter sample queries (e.g., paper titles) to confirm they returned the expected results. For databases without wildcard support, such as EUSSET DL, we applied all relevant variations manually to ensure consistency and coverage.

We did not select a specific time window for the publications, and the cutoff for papers was anything that was available on the digital libraries until November 2nd, 2023, the end point of data collection.

Table 1. Data collection sources and database.

Conference/ Journal	**ACM CSCW Conference**		**ACM GROUP Conference**		**Journal of CSCW**	**European Conference on CSCW**	**Inernational Conference on the Design of Cooperative Systems (COOP)**
Publication Years	1986–2017 (CSCW proceedings) 1986-current (CSCW Companion)	2017-Current (Proceedings of the ACM on Human Computer Interaction)	1997–2017 (Group proceedings) 2017-Current (Group proceedings)	2017-current (Proceedings of the ACM on Human–Computer Interction)	1992-Current	1989-current Journal of CSCW (full paper and after 2017) EUSSET Digital Library (exploratory papers)	1994–2018 (merged with ECSCW)
Database	ACM Digital Library	ACM Digital Library	ACM Digital Library	ACM Digital Library	Springer Link	EUSSET Digital Library	EUSSET Digital Library

Table 2. Keywords were used to search through the database, and filters have been applied

Keyword search list:	Filters (only available on ACM DL)
{"gameplay"OR"game*"OR"video game*"OR"mobile game*"OR"multiplayer*"OR"gaming"OR"playful*" OR"esport*"OR"MMO"OR"RPG"OR"FPS"}	"filter": {Article Type: Research Article, Publication Date: (TO 11/02/2023)}

3.2.2 Screening

The screening involved two of the authors reviewing the title and abstract of each of the 1,577 papers separately on a CVS file. During this process, the authors left notes and applied tags using Excel's built-in features to flag papers that potentially did not meet the criteria. These flagged papers were then discussed during regular group meetings. Based on this review process, 1,510 and 1,502 papers were filtered out separately by each author. Then, the two researchers resolved disagreements (N = 10) on the initially screened results, which led to a total number of 56 papers. We did not conduct keyword-based screening, as not all digital libraries (e.g., EUSSET) consistently included or exposed keyword metadata; thus, we relied on title and abstract screening for consistency across sources.

Forward and backward snowball sampling To ensure our SLR was exhaustive, we implemented forward and backward snowball sampling prior to commencing the in-depth review of the initial 56 papers. This strategy helped us trace the origins of these articles in prior studies and their influence on subsequent research. The procedure for conducting the snowball sampling was inspired by Claes Wohlin (2014) and is detailed in the following:

For backward sampling, we reviewed the references in all 56 papers, specifically looking for (1) papers published in the same proceedings we used for data collection and (2) whether these papers were already on our list. This method helped us identify 6 additional papers.

For forward sampling, we individually searched each of the 56 papers on Google Scholar, utilizing the 'Cited by [number]' feature to verify (1) if a paper was published in the identified proceedings for our data collection and (2) if it was already included in our list. This approach led to the identification of 5 more papers.

3.2.3 Eligibility and exclusion

After identification and screening, we conducted an eligibility assessment based on exclusion criteria informed by Tekinbas & Zimmerman's (2003) definition of games, which emphasizes systematic rules, artificial conflict, and quantifiable outcomes. The following exclusion criteria were applied to studies rather than games themselves:

- Studies analyzing games in non-gaming contexts, such as research on using games for workspace collaboration enhancement, were excluded. A gaming context refers to situations where games are played for entertainment, competition, or leisure rather than as tools for work, education, or training.
- Studies on extended reality (XR) as a medium, rather than as a game environment, were excluded. This includes research focusing on playful interaction, immersion, or social embodiment in platforms like VRChat, unless the study explicitly examines gameplay interaction or game-related aspects. However, this exclusion does not apply to VR or AR games.
- Studies on gamification, where game mechanics are used to make non-gaming contexts more engaging, were excluded, as these do not align with the game definition considered in this study.
- Studies on non-digital games—such as research on board games or chess—were excluded, as they fall outside the scope of digital gaming environments examined in CSCW.
- Studies focusing on games designed for secondary purposes or combined uses, such as exergames for exercise, were excluded because they do not align with our focus on entertainment-centered gaming experiences.

The reason for these exclusions, including'secondary purposes or combined uses is that expanding the study to include these categories would significantly broaden the research scope, making it difficult to maintain a focused analysis on entertainment-centered games. Additionally, secondary-purpose games and gamified applications are designed with functional or utilitarian objectives rather than for purely immersive play experiences. Including these would require a distinct analytical framework to evaluate their effectiveness in achieving these non-entertainment goals, which differs from our study's aim to understand games created for the primary purpose of engaging players through gameplay alone Figure 2.

3.3 Data analysis

The data analysis of our SLR consisted of three stages to answer each RQ. In the first stage, we focused on revealing overall patterns of games in CSCW to answer RQ1 by providing descriptive statistics in terms of publication year, publication venue, prominent work, game genre, and methodologies. We used analytical visualization to familiarize ourselves with the trends and developed our mental model to draw patterns.

In the second stage, we focused on identifying the position of games and game studies in CSCW via a reflexive thematic analysis (Braun and Clarke 2006), which involves identifying, analyzing, and reporting patterns (themes) within data to answer RQ2. Two authors individually assigned codes to studies based on the keywords appearing in the studies'titles, abstracts, and provided keyword sections in order to understand how the studies relate to the already established

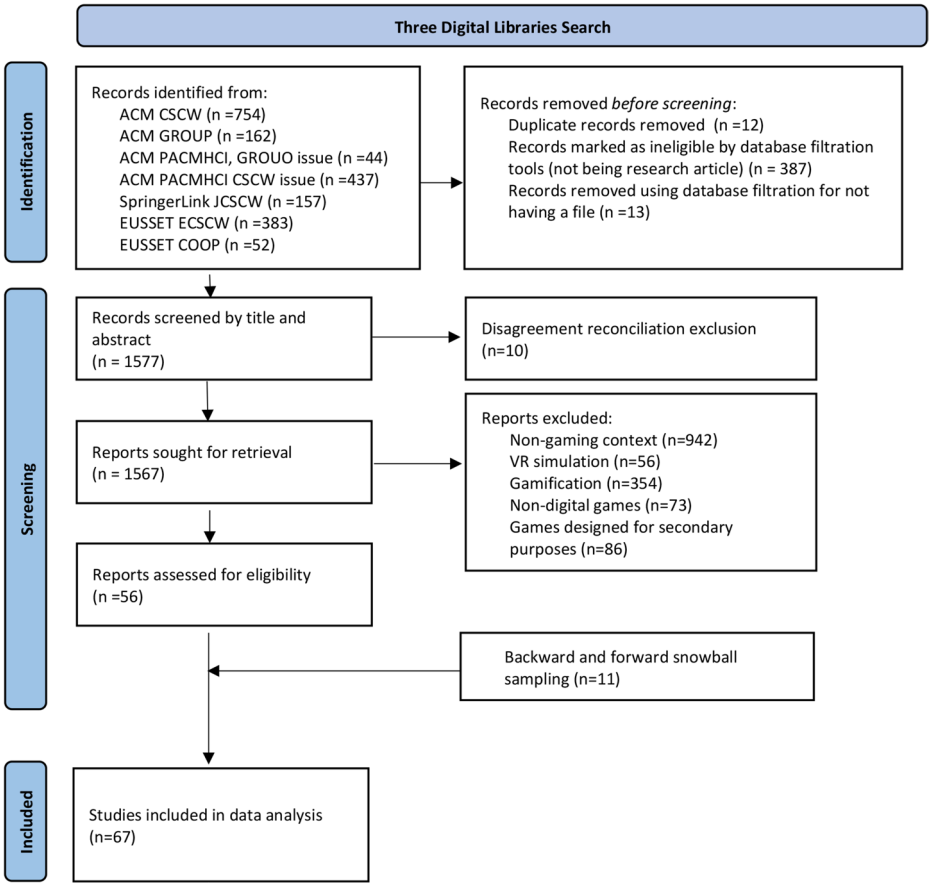


Figure 2. The systematic data collection and process following PRISMA framework

topics in CSCW. Depending on the study and the way the researchers engaged with the topics, each paper received one or multiple initial codes during this step.

We then held meetings to calibrate and align our thematic findings at a higher level, discussing how best to group the emerging codes into cohesive themes. These discussions focused less on direct disagreements and more on refining our interpretations to ensure consistency and rigor in capturing the studies'contributions to CSCW. For example, by analyzing a title like'A Case Study of How a Reduction in Explicit Leadership Changed an Online Game Community'(McEwan and Gutwin 2017) and reading its abstract, we initially assigned the code'Community.'Further analysis of the abstract revealed the study investigated'Equity'in the sense that it examines how leadership reduction impacts various sub-communities differently, highlighting the need for equitable support and resources across all groups within the community. Based on

the refined initial codes, each paper was assigned to only one sub-theme—the sub-theme that best represented the essence of that research based on the refined initial code. Through an iterative and collaborative process, we refined the codes and themes accordingly, using criteria such as thematic coherence, relevance to CSCW topics, and alignment with the data to ensure a robust and nuanced analysis.

In the third stage, again using a thematic analysis approach (Braun and Clarke 2006), we systematically categorized and interpreted aspects of the literature to distill and integrate findings. One key difference in this stage was due to the different approach of RQ3; we were looking for how studies characterize what is truly new about the video game context. For this reason, the authors engaged deeply with the corpus, starting with assigning initial codes, and then held meetings to discuss the categorization of codes. For example, in the case of 'Intergenerational Communication' by Lee et al. (2020), we interpreted it as 'how games mediate intergenerational relationships that already existed before games appeared.' Through an iterative process, this was later themed as 'Video Games as a New Mediator.'

4 Findings

This section presents how prior literature has investigated video games as the study site within the CSCW context. It describes academic characteristics (sub-Sect. 4.1), how traditional CSCW topics are studied within the video game context (sub-Sect. 4.2), and unique facets of the video game context that are new (sub-Sect. 4.3). Our analysis is based on a final corpus of 67 peer-reviewed studies published between 1998 and 2023, across venues such as ACM CSCW, ECSCW, PACMHCI, and the Journal of CSCW. These studies vary in methodological approach, with qualitative research dominating the dataset, followed by mixed-methods and quantitative designs. Genres most frequently studied include MMOs and MOBAs, reflecting their rich collaborative dynamics.

4.1 RQ1: the academic characteristics of game studies in CSCW

Our SLR analysis (N = 67) identified the most frequent proceedings and journal publications in our corpus focusing on game studies. Figure 3 presents these findings in detail, including the type of publication and venue. Chronologically speaking, our findings indicate that the first study to consider games as a study site was published in JCSCW in 1998 (Muramatsu and Ackerman 1998). Subsequently, in 2004, we observe the appearance of game studies in ACM CSCW with three studies (B. Brown and Bell 2004; Ducheneaut and Moore 2004; Mandryk and Inkpen 2004). From 2006 onwards, there has been a steady presence of

game studies, with at least one publication each year. The number of publications per year exhibits fluctuations, reaching an all-time high of eight papers in 2012 (Figure 3).

From the methodological standpoint (Figure 4), our analysis demonstrated that qualitative methods are more frequently applied in game studies, with over half of the studies (N = 40) employing various qualitative methods such as participant observation (Su 2010), ethnography (Muramatsu and Ackerman 1998; Ducheneaut et al. 2007; Ringland et al. 2015), user interviews (Xu et al. 2011; Lipovaya et al. 2018), ethnomethodology (Bennerstedt and Ivarsson 2010), and discourse analysis (Kou 2021). Quantitative methods, on the other hand, had the least application (N = 12), with approaches like regression-based multiple mediation (Poretski and Arazy 2017), operational definitions and clustering (Leavitt et al. 2016), and ANOVA (Savery et al. 2014) being some of the methods used in quantitative studies. Mixed-method approaches were also a popular strategy within our analysis (N = 15), where researchers integrated both quantitative and qualitative components, such as semi-structured interviews combined with game history logs (Wang et al. 2012), survey study and follow-up interviews (R. Zhang et al. 2021), and virtual ethnography with game logs (Ducheneaut et al. 2007). There was only one study where the authors specifically mentioned a semi-qualitative approach (Lipovaya et al. 2018), which involved interviews with professional and amateur players as well as a questionnaire design.

We further analyzed the studies in our corpus[1] based on well-established literature on video game genres (Apperley 2006; Arsenault 2009) and applied their taxonomies (Figure 5). Our analysis demonstrated that massively multiplayer online role-playing games like World of Warcraft and Star Wars Galaxies (N = 17) were the most popular genre for game study in CSCW. Next in popularity were multiplayer online battle arena games (N = 11), and third were first-person shooter games (N = 9). After these three most studied genres, there is a drastic drop in the number of studies to Sandbox games (N = 5), all focusing on Minecraft (Mojang Studios 2011; Ringland et al. 2015; Ames and Burrell 2017; Koutsouras et al. 2017; Jagannath et al. 2020; Frey et al. 2022). On the lower end, genres such as sports games (Mandryk and Inkpen 2004) and virtual worlds (There) (Makena Technologies 2003; B. Brown and Bell 2004) were each represented by one study.

Our SLR revealed that game studies within CSCW have seen steady growth since 1998, with the CSCW conference (through both ACM CSCW and PACMHCI) as the strongest outlet, and qualitative methods dominating the research landscape. This focus on qualitative approaches highlights the field's interest in

[1] Studies that did not share details about their games were excluded from this analysis. We also counted all the games within studies, not per study. This means if a study examined two games and disclosed details, both were counted separately.

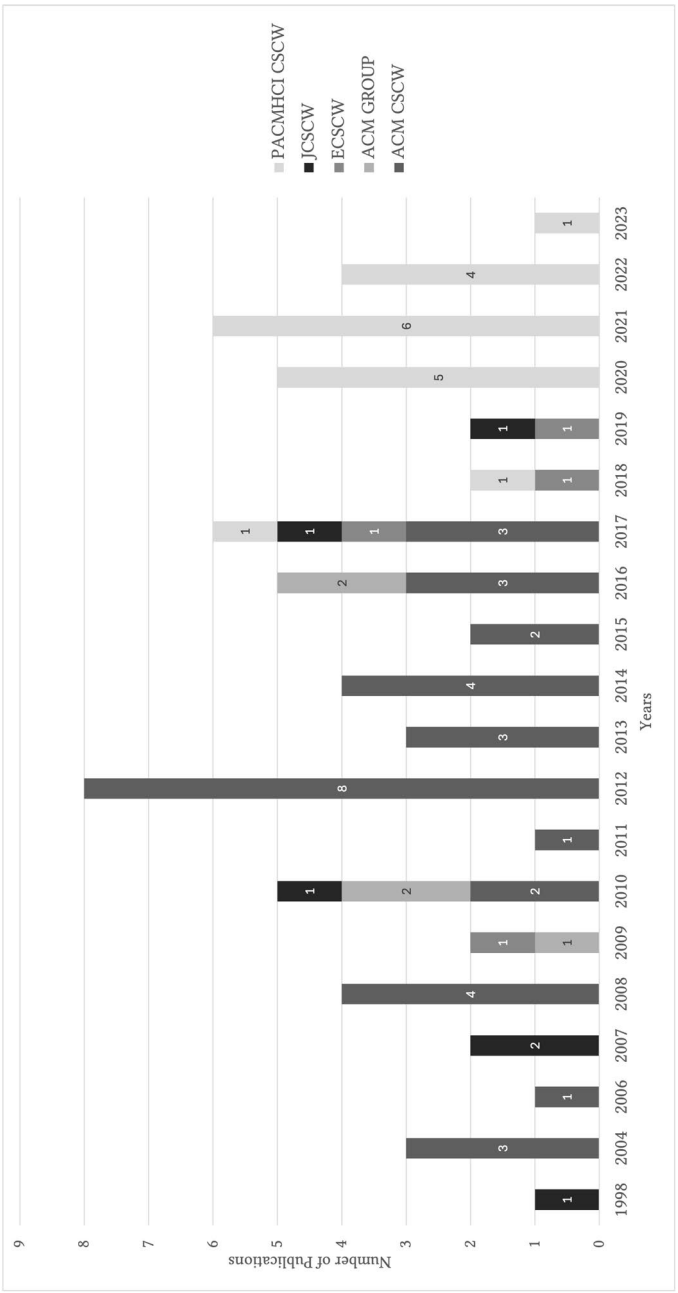


Figure 3. The distribution of video game studies by numbers and publications [Note that PACMHCI refers to its CSCW issues, which started in 2017 to replace CSCW proceedings. Thus, it was only in 2017 that both venues co-existed in the same year]

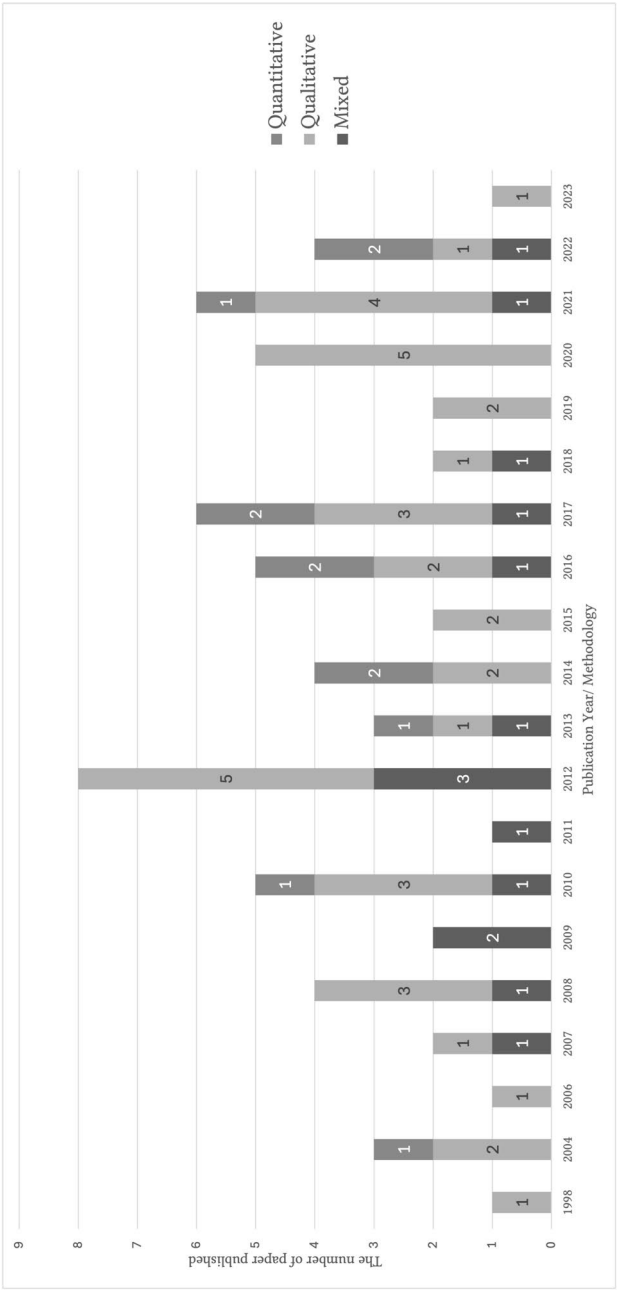


Figure 4. The distribution of video game studies by numbers and methodologies

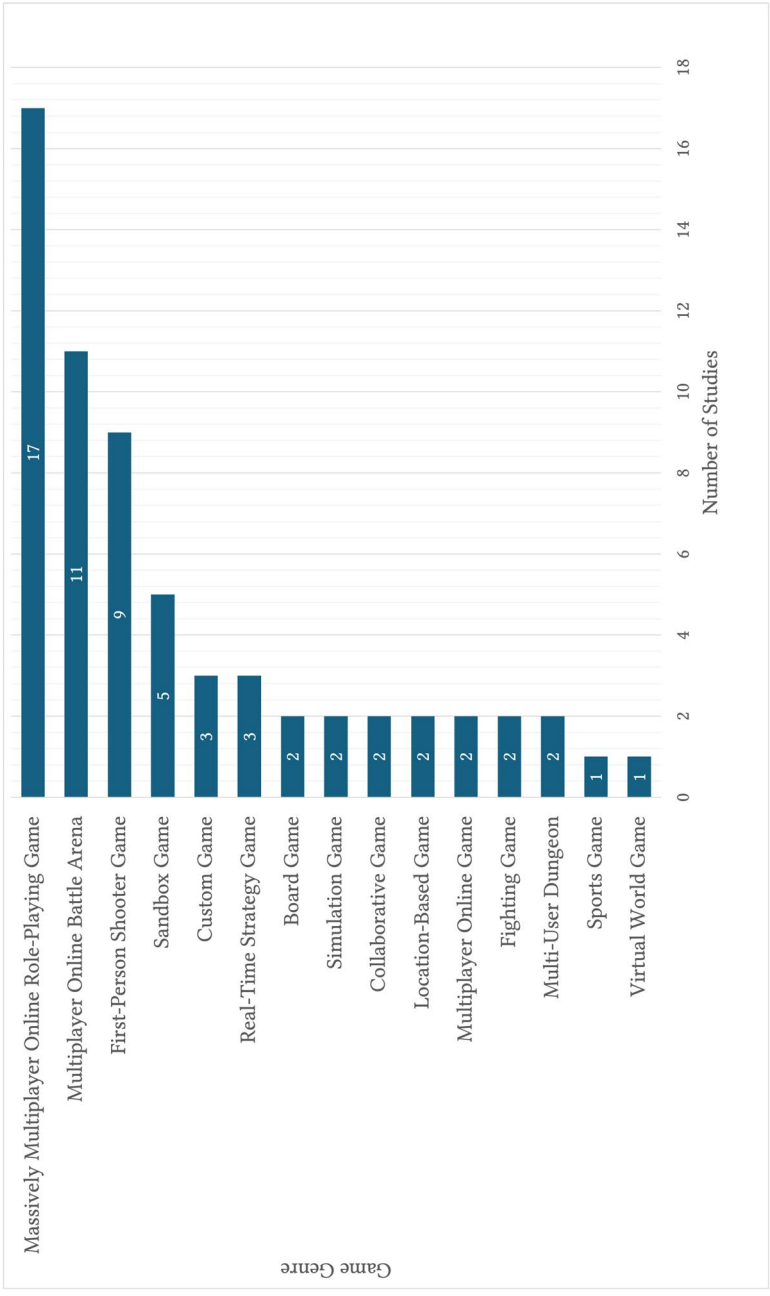


Figure 5. The distribution of video game genre in our corpus

engaging with players for a deep understanding of their behavior, attitudes, and beliefs. Massively multiplayer online role-playing games and multiplayer online battle arena games are particularly popular genres due to their complex social dynamics, while studies on less popular genres like sports games and virtual worlds games are sparse. The steady increase in publications underscores the rising significance of game studies in CSCW, suggesting a need for such systematic literature reviews to gain more understanding about the characteristics of work and reflections on the larger theme of CSCW.

4.2 RQ2: CSCW topics studied in the context of video games

In this section, we will discuss seven themes that prior research in video games has connected to broader topics in CSCW. This highlights how video game studies can fit into classic CSCW topics due to their specific characteristics. These studies are characterized based on the analysis of their research questions, key findings, and key discussion points Table 3.

4.2.1 Teamwork

Teamwork characterizes a group of studies (N = 22) focused on understanding the dynamics and mechanisms that facilitate effective collaboration and team interactions in video game environments. These studies explore various aspects of how players interact and work together to achieve common objectives, highlighting the parallels between in-game teamwork and broader CSCW contexts. This group of studies generally tends to use qualitative approaches (N = 13) (Muramatsu and Ackerman 1998; Nardi and Harris 2006; Moore et al. 2007; S. Bardzell et al. 2008; Bennerstedt and Ivarsson 2010; J. Bardzell et al. 2012; V. Cheung et al. 2012; Benefield et al. 2016; Kelly et al. 2016; McEwan and Gutwin 2016; Aal and Hauptmeier 2019; Musick et al. 2021; R. Zhang et al. 2023) with mixed-method approaches next in popularity (N = 6) (Wong et al. 2009; Tang et al. 2012; Huang et al. 2013; Gutwin et al. 2016; Lipovaya et al. 2018; R. Zhang et al. 2021). The majority of qualitative studies collect data through players' interviews (N = 9) (Nardi and Harris 2006; S. Bardzell et al. 2008; Bennerstedt and Ivarsson 2010; J. Bardzell et al. 2012; Huang et al. 2013; Kelly et al. 2016; Freeman and Wohn 2019; Musick et al. 2021; R. Zhang et al. 2023). In the following, we discuss different characteristics of teamwork studies.

Coordinative communication Coordinative communication refers to the strategies and methods used by players to effectively share information and synchronize their actions to achieve common goals. The six studies (Bennerstedt and Ivarsson 2010; V. Cheung et al. 2012; Tang et al. 2012; Gutwin et al. 2016; McEwan and Gutwin 2016; Kim et al. 2017) in this sub-category examine the vital role of communication in enabling effective coordination among players in order to achieve their shared goals in a teamwork manner. For example, Kim et al.

Table 3. Summary of themes, descriptions, and associated studies in the context of in video game

Theme	Description	Studies
Teamwork	Examines the dynamics and mechanisms that enable effective collaboration and team interactions in game environments	(Muramatsu and Ackerman 1998; Nardi and Harris 2006; Nardi and Harris 2006; Moore et al. 2007; S. Bardzell et al. 2008; S. Bardzell et al. 2008; Wong et al. 2009; Bennerstedt and Ivarsson 2010; Bennerstedt and Ivarsson 2010; J. Bardzell et al. 2012; J. Bardzell et al. 2012; V. Cheung et al. 2012; Tang et al. 2012; Huang et al. 2013; Huang et al. 2013; Benefield et al. 2016; Gutwin et al. 2016; Kelly et al. 2016; Kelly et al. 2016; McEwan and Gutwin 2016; Lipovaya et al. 2018; Aal and Hauptmeier 2019; Freeman and Wohn 2019; Musick et al. 2021; Musick et al. 2021; R. Zhang et al. 2021; R. Zhang et al. 2023; R. Zhang et al. 2023)
Community	Focuses on the cultural, supportive, and equitable aspects of player interactions and activities within video game communities	(Su 2010; Kow and Young 2013; Ringland et al. 2015; Ames and Burrell 2017; Koutsouras et al. 2017; McEwan and Gutwin 2017; Poretski and Arazy 2017; Rapp 2021; Toombs et al. 2022)
Social Relationships	Looks at the various ways video games influence and are shaped by the relationships among players	(B. Brown and Bell 2004; Ducheneaut and Moore 2004; Ducheneaut et al. 2007; Xu et al. 2011; Go et al. 2012; Kow et al. 2012; McEwan et al. 2012; Grandprey-Shores et al. 2014; Procyk and Neustaedter 2014; Freeman et al. 2015; S. Lee et al. 2020; Bisberg et al. 2022)
Video Game Usability	Investigates how players engage with game interfaces and systems, emphasizing ease of use, accessibility, and user experience in multiplayer and networked settings	(Mandryk and Inkpen 2004; Pinelle et al. 2009; Savery et al. 2010, 2014; Wang et al. 2012)
Collocation	Studies collaborative play within shared physical spaces and explores the interplay between physical and digital environments	(Cao et al. 2008; Lindtner et al. 2008; O'Hara et al. 2008; Voida et al. 2010; X. Zhang et al. 2020)
Governance	Explores how rules, policies, and community standards are created, enforced, and understood within video game environments	(Ackerman et al. 2010; G. Cheung and Huang 2012; Kou et al. 2017; Jagannath et al. 2020; Kou and Gui 2020a; Kou 2021; Frey et al. 2022; Ma et al. 2022)
Self-Agency	Examines how players express and manage their identities and actions in video games, highlighting both personal and social dimensions of gaming experiences	(Livingston et al. 2014; Leavitt et al. 2016; Kou and Gui 2018, 2020b; Jiang et al. 2021; Tally et al. 2021)

(2017) investigates collective intelligence in online gaming, highlighting how tacit coordination enhances team performance. Cheung et al. (2012) focuses on the use of unconventional communication channels and awareness cues in time-critical games, demonstrating players'adaptability in maintaining coordination. Tang et al. (2012) explores verbal coordination in first-person shooter games, emphasizing the importance of timely tactical communications. Bennerstedt and Ivarsson (2010) examines virtual actions and text chat in massively multiplayer online games, showcasing how non-verbal cues facilitate coordinated actions. Gutwin al. (2016) illustrate real-time collaboration through high-speed interaction in a modified groupware game, and McEwan and Gutwin (2016) show how artifact-based communication in online board games replaces verbal interactions to achieve coordination. Collectively, these studies underscore the importance of both verbal and non-verbal strategies for seamless teamwork.

Collaborative teamwork Collaborative teamwork involves players working together to achieve shared goals through coordinated efforts and mutual support. The eight studies (Muramatsu and Ackerman 1998; Nardi and Harris 2006; S. Bardzell et al. 2008; Wong et al. 2009; Huang et al. 2013; Mason and Clauset 2013; Kelly et al. 2016; Aal and Hauptmeier 2019) in this sub-category examine the intricate dynamics of collaborative teamwork in online gaming environments. These studies highlight how interactions, both formal and informal, significantly impact team performance and individual experiences. For example, they reveal that friendships and social bonds (Nardi and Harris 2006; Mason and Clauset 2013) often enhance collaborative efforts, leading to improved outcomes and increased pro-social behaviors. The importance of diverse collaboration strategies, such as visualizations and character sharing (Wong et al. 2009; Kelly et al. 2016), is highlighted for supporting fairness and fostering cooperation. Collaboration ranges from spontaneous interactions to highly organized group activities (S. Bardzell et al. 2008; Huang et al. 2013), enriching the gaming experience by promoting enjoyment and learning. Additionally, the design of game systems and social structures within these environments (Muramatsu and Ackerman 1998; Aal and Hauptmeier 2019) plays a critical role in enabling effective teamwork. These studies provide valuable insights into the multifaceted nature of collaboration, illustrating how players coordinate to achieve shared goals.

Roles and responsibilities Roles and responsibilities in collaborative gaming environments refer to the specific duties and functions that players adopt to achieve team objectives and ensure effective teamwork. The eight studies (Moore et al. 2007; J. Bardzell et al. 2012; Benefield et al. 2016; Lipovaya et al. 2018; Freeman and Wohn 2019; Musick et al. 2021; R. Zhang et al. 2021; R. Zhang et al. 2023) in this sub-category examine how clearly defined roles and responsibilities enhance team performance. These studies demonstrate the importance of social structures, role clarity, and the dynamics of leadership

and team formation. For example, research on raiding in World of Warcraft (J. Bardzell et al. 2012) and team success in virtual team networks (Benefield et al. 2016) emphasizes the significance of defined roles and social capital in achieving team objectives. Studies on eSports (Lipovaya et al. 2018; Freeman and Wohn 2019; Musick et al. 2021) highlight the critical role of clear communication and role understanding in blending physical and computer-mediated activities. Research on human-AI teaming (R. Zhang et al. 2021; R. Zhang et al. 2023) emphasizes the importance of AI teammates adopting clear communication strategies and role expectations to build trust and situation awareness. Additionally, Moore et al. (2007) underscore accountability in online worlds, focusing on social activity management and conflict resolution within team roles. Together, these studies illustrate the necessity of well-defined roles and responsibilities for effective collaboration in diverse gaming contexts.

4.2.2 Community

The Community theme encompasses studies that investigate the cultural, supportive, and equitable aspects of player interactions and activities within video game communities. These studies offer insights into how gaming communities form, sustain, and evolve, reflecting broader social dynamics. Characterized by a focus on sandbox games like Minecraft (N = 3) (Ringland et al. 2015; Ames and Burrell 2017; Koutsouras et al. 2017) and predominantly utilizing qualitative approaches (N = 7) (Su 2010; Kow and Young 2013; Ringland et al. 2015; Ames and Burrell 2017; Koutsouras et al. 2017; Rapp 2021; Toombs et al. 2022), such as ethnography (Rapp 2021) and participant observation fieldwork (Su 2010), this group of studies delves deep into the social fabric of gaming communities.

Cultural practices Studies in this sub-category (Su 2010; Kow and Young 2013; Toombs et al. 2022) explore cultural norms within gaming communities. They examine aspects such as competitiveness in Street Fighter IV (Capcom 2008) across different platforms (Su 2010), the role of media technologies in learning within the StarCraft (Blizzard Entertainment 1998) community (Kow and Young 2013), and social interactions on the100 platform for Destiny 2 (Bungie 2017) players (Toombs et al. 2022). These studies highlight the role of cultural practices in shaping gaming community dynamics. Effective engagement emerges from competitive interactions, educational media use, and strong social structures. Integrating public and private media channels fosters broad and deep learning, while adapting traditional gaming practices to online spaces sustains social legitimacy and competitive status. Shared responsibilities among players, platform designers, and developers enhance cohesion and participation, illustrating the multi-layered relationships that sustain community activities (Su 2010; Kow and Young 2013; Toombs et al. 2022).

Support mechanisms Studies in this group (Ringland et al. 2015; Koutsouras et al. 2017; Poretski and Arazy 2017; Rapp 2021) focus on the diverse ways gaming communities offer support and enhance user engagement. Studies explore creating safe virtual spaces for children with autism (Ringland et al. 2015), organizational assimilation in World of Warcraft (Rapp 2021), the effectiveness of community co-creation activities in enhancing product sales (Poretski and Arazy 2017), and the creation of Minecraft content supported by a distributed economy (Koutsouras et al. 2017). Insights reveal that explicit rules and monitoring maintain safe spaces (Ringland et al. 2015), structured roles and goals strengthen community cohesion (Rapp 2021), and user-generated content boosts engagement and product value (Poretski and Arazy 2017). Additionally, distributed economies thrive on organized support structures (Koutsouras et al. 2017). Together, these findings highlight the importance of structured support and collaboration in fostering community dynamics and player engagement.

Equitable participation Studies in this group focus on fairness and inclusivity within gaming communities. They examine the impact of reduced leadership in an online board-and-card-game community (McEwan and Gutwin 2017), and ensuring educational equity in Minecraft (Ames and Burrell 2017). Studies frequently indicate that equitable practices are crucial for community success. Leadership changes can have mixed effects on community resilience (McEwan and Gutwin 2017), while efforts in Minecraft show partial success but face persistent barriers (Ames and Burrell 2017). Overall, these studies highlight the importance of adaptive leadership and targeted strategies to foster equity in gaming communities.

4.2.3 Social relationships

The Social Relationships theme explores the various ways video games influence and are influenced by the relationships among players. These studies (N = 12) (B. Brown and Bell 2004; Ducheneaut and Moore 2004; Ducheneaut et al. 2007; Xu et al. 2011; Go et al. 2012; Kow et al. 2012; McEwan et al. 2012; Grandprey-Shores et al. 2014; Procyk and Neustaedter 2014; Freeman et al. 2015; S. Lee et al. 2020; Bisberg et al. 2022) delve into the dynamics of family interactions, team relationships, and broader social interactions within gaming environments, providing insights into how these interactions mirror and differ from real-world social relationships. The studies tend to apply qualitative approaches (N = 8) (B. Brown and Bell 2004; Ducheneaut and Moore 2004; Ducheneaut et al. 2007; Go et al. 2012; Kow et al. 2012; Procyk and Neustaedter 2014; Freeman et al. 2015; S. Lee et al. 2020), with most interest in Massively Multiplayer Online (MMO) games like Star Wars Galaxies (Ducheneaut and Moore 2004; Ducheneaut et al. 2007), Sky: Children of Light (Bisberg et al. 2022), There (B. Brown and Bell 2004), and Audition (Freeman et al. 2015).

Family relationship Studies in the Family Relationships sub-category (Go et al. 2012; Kow et al. 2012; S. Lee et al. 2020) explore how video games support interactions among family members. They examine features in QQ Farm (Tencent Games 2009a, b) that connect younger and older players (Kow et al. 2012), life metaphoric games fostering intergenerational communication (S. Lee et al. 2020), and game design's impact on sibling play dynamics (Go et al. 2012). Findings commonly demonstrate that video games enhance family relationships through shared experiences and communication. Features like low entry barriers and asynchronous play support intergenerational interactions (Kow et al. 2012). Metaphoric game elements facilitate discussions about personal memories, enhancing communication (S. Lee et al. 2020), while game design shapes sibling dynamics, fostering cooperation or conflict (Go et al. 2012). These studies demonstrate video games'potential to strengthen family bonds.

Team relationship Studies in the Team Relationships sub-category (Ducheneaut et al. 2007; Xu et al. 2011) focus on the role of video games in forming and nurturing team-based social connections. For example, Ducheneaut et al. (2007) and Xu et al. (2011) show how first-person shooter games facilitate social relationships through competitive gameplay. These studies demonstrate that video games enhance team-based social connections by creating virtual"third places"that promote camaraderie and informal interactions, despite challenges like automated players (Ducheneaut et al. 2007). First-person shooter games foster diverse and persistent social relationships, central to players'enjoyment (Xu et al. 2011). Thus, video games uniquely strengthen social bonds within teams.

Communal relationships Studies in this sub-theme (B. Brown and Bell 2004; Ducheneaut and Moore 2004; McEwan et al. 2012; Grandprey-Shores et al. 2014; Procyk and Neustaedter 2014; Freeman et al. 2015; Bisberg et al. 2022) investigate how video games facilitate connections and interactions among community members. They explore the formation and maintenance of social bonds within game environments. Studies frequently indicate that video games support diverse social dynamics, from impersonal and transient interactions to deep and meaningful connections. For instance, studies show that while some game environments promote short, instrumental interactions (Ducheneaut and Moore 2004; McEwan et al. 2012), others foster more profound social engagements through features like in-game marriages and flexible play spaces (B. Brown and Bell 2004; Freeman et al. 2015). Additionally, the presence of friends and generous acts can enhance player retention and encourage positive social behaviors (Grandprey-Shores et al. 2014; Bisberg et al. 2022). Location-based storytelling games also highlight how environmental engagement can strengthen communal ties (Procyk and Neustaedter 2014). These findings underscore

the varied ways video games can nurture communal relationships, balancing both superficial and deep social interactions to enhance player engagement and community cohesion.

4.2.4 Video game usability

The Video Game Usability theme explores how players interact with game interfaces and systems, focusing on the ease of use, accessibility, and overall user experience in multiplayer and networked environments. Studies in this group (Mandryk and Inkpen 2004; Pinelle et al. 2009; Savery et al. 2010, 2014; Wang et al. 2012) investigate the specific challenges and requirements of multiplayer usability and the consistency of networked play, highlighting the unique usability issues that arise in these complex, interactive settings. This group of studies focuses on usability heuristics, players' needs in online and offline contexts, and human factors affecting consistency in networked games. What sets apart the studies in this group is the frequent use of quantitative approaches in four out of five studies, such as Mixed-factorial ANOVA (Savery et al. 2014) and simulation experiment (Savery et al. 2010). Another characteristic is that the majority of the studied games are not commercial but are usually custom-made for lab setting purposes.

Multiplayer usability Studies in this sub-theme (Mandryk and Inkpen 2004; Pinelle et al. 2009; Wang et al. 2012) focus on the usability challenges unique to multiplayer games. They explore how tailored heuristics, infrastructure, and physiological measures can enhance player experiences. Common findings reveal the need for customized usability evaluations and innovative measurement techniques. For instance, Networked Game Heuristics specifically address multiplayer interaction issues, proving more effective than traditional heuristics (Pinelle et al. 2009). The impact of infrastructure on gaming experiences is highlighted by the concentrated activity patterns and the emergence of new socio-technical structures in ArcOnline (Wang et al. 2012). Additionally, physiological measures provide reliable indicators of engagement and emotional states, offering valuable insights into collaborative gameplay experiences (Mandryk and Inkpen 2004). These findings emphasize the importance of specialized approaches in evaluating and enhancing multiplayer game usability.

Network consistency This sub-theme explores the essential role of network consistency in improving player experiences. The studies (Savery et al. 2010, 2014) investigate how consistency maintenance techniques influence user satisfaction and gameplay quality. Different game scenarios require varied consistency maintenance techniques, with no single method being optimal for all situations (Savery et al. 2010). The impact of game-critical decisions and error correction on player experience is significant, with players favoring smoother

animations and understandable outcomes (Savery et al. 2014). These findings highlight the importance of effective consistency strategies to enhance the overall usability of networked games.

4.2.5 Collocation

The Collocation theme explores collaborative play within shared physical spaces and the interaction between physical and digital environments. Studies in this theme (Cao et al. 2008; Lindtner et al. 2008; O'Hara et al. 2008; Voida et al. 2010; X. Zhang et al. 2020) examine how players initiate and coordinate gaming activities in public and private settings, focusing on social and spatial aspects. They emphasize real-world interactions and the impact of physical spaces on gaming behavior, often using ethnographic and observational methods. These studies also investigate cultural, socio-economic, and regulatory influences on gaming practices, offering a comprehensive view of collocated gaming environments. The studies in this group tend to apply qualitative approaches (Lindtner et al. 2008; O'Hara et al. 2008; X. Zhang et al. 2020) and collect data through several mediums like gaming environment sketches (Voida et al. 2010), system logs (Cao et al. 2008), and video recordings (O'Hara et al. 2008).

Temporary play Studies in this sub-theme focus on the dynamics of short-term, spontaneous gaming sessions in public settings. The two studies, O'Hara et al. (2008) and Cao et al. (2008), explore how collaborative play is initiated and coordinated among participants who may not know each other. Collaborative play on large urban displays highlights engagement strategies, while player and spectator behaviors on public displays emphasize social interactions (Cao et al. 2008). These studies show that temporary play fosters social connections and unique gaming experiences, acting as icebreakers and attracting diverse audiences (Cao et al. 2008). Physical settings and social dynamics impact gameplay, requiring measures like temporary barriers and professional comperes (O'Hara et al. 2008). Adapting strategies to facilitate collaborative play in public environments is crucial.

Collocated play Studies in this sub-theme explore the dynamics of gaming when players are physically together, focusing on how proximity influences gaming practices and social interactions. Voida et al. (2010) examines console gaming groups, emphasizing individual and group dynamics, and the spatiality of mobile gaming, exploring how place affects practices in non-location-based mobile games (X. Zhang et al. 2020). These studies reveal that physical space and cultural context significantly shape gaming behaviors. University students'mobile gaming practices are influenced by locations like dormitories and classrooms, with social contexts shaping gameplay (X. Zhang et al. 2020). Console gaming

involves both group and individual dynamics, highlighting complex social interactions (Voida et al. 2010). In China, World of Warcraft play blends digital and physical spaces in Internet cafes, enriched by socio-economic and political factors (Lindtner et al. 2008). Recognizing the impact of proximity and cultural context is crucial for understanding gaming experiences.

4.2.6 Governance

The Governance theme delves into how rules, policies, and community standards are developed, enforced, and perceived within video game environments. This theme includes eight studies (Ackerman et al. 2010; G. Cheung and Huang 2012; Kou et al. 2017; Jagannath et al. 2020; Kou and Gui 2020a; Kou 2021; Frey et al. 2022; Ma et al. 2022) that examine the socio-technical design implications of using code, the impact of rule changes on game balance, and the role of moderation in fostering prosocial behavior in gaming communities. The common thread among these studies is the exploration of how governance structures influence player behavior and community dynamics, often through mixed methods such as qualitative analyses and surveys. While a variety of games have been studied in this group, League of Legends (Riot Games 2009a, b) is particularly popular, featured in half of the overall studies (N = 4), with qualitative methods being the most prevalent (N = 6).

Governance mechanisms Studies in this sub-theme (Ackerman et al. 2010; G. Cheung and Huang 2012; Frey et al. 2022; Ma et al. 2022) focus on the development, implementation, and effectiveness of governance mechanisms within gaming environments. They explore the implications for socio-technical design, game balance, and community behavior. For instance, research on Texas Hold'em (Microsoft Game Studios 2006) and Halo 2 (Bungie 2004) introduces the'chain of necessity'theory, highlighting how new rules necessitate further changes until equilibrium is restored (G. Cheung and Huang 2012). Another study by Ackerman et al. (2010) examines how code changes social regulation by making user actions visible, preventing certain actions automatically, and failing to detect nuanced actions. Rule enforcement in League of Legends esports reveals that penalties are highly contextual and influenced by factors such as year, region, and perpetrator identity (Ma et al. 2022). More mature communities like those in Minecraft, Reddit, and World of Warcraft tend to have formalized governance structures that increase with community size, age, and engagement (Frey et al. 2022). These studies demonstrate the complexities and impacts of governance mechanisms in maintaining order and engagement in gaming communities.

Player experiences with governance mechanisms This sub-theme with four studies (Kou et al. 2017; Jagannath et al. 2020; Kou and Gui 2020a; Kou 2021) examines how players encounter and experience governance mechanisms,

focusing on their perceptions and navigation of these systems. For instance, studies on moderated Minecraft servers by Jagannath et al. (2020) show how structured team-based quests and social interactions promote prosocial behaviors and conflict resolution among youth. Kou et al (2017) reveal in League of Legends and Weibo, participants generally appreciate crowdsourced governance but often act beyond their designated roles, indicating a complex engagement with these systems. Kou (2021) demonstrates players have varied perceptions of permanent bans, viewing them as retribution, community purification, and their impact on the platform economy, often challenging the official narrative. Additionally, in AI-led moderation, players create explanations for AI decisions, categorized into socially-oriented, system-oriented, and action-oriented, to understand and sometimes contest these decisions (Kou and Gui 2020a). These studies highlight the importance of understanding player responses to governance mechanisms and their impact on community dynamics.

4.2.7 Self-agency

The Self-Agency theme explores how players express and manage their identities and actions within video games, focusing on personal and social aspects of gaming experiences. Self-agency, as defined by Bandura (2001), refers to the capacity of individuals to act independently and make their own free choices. Studies in this group (Livingston et al. 2014; Leavitt et al. 2016; Kou and Gui 2018, 2020b; Jiang et al. 2021; Tally et al. 2021) investigate the construction and regulation of player identities, the emotional and cognitive strategies employed during gameplay, and the diverse ways players interact with and value their virtual personas. This theme is characterized by a strong emphasis on qualitative approaches (Livingston et al. 2014; Kou and Gui 2018, 2020b; Tally et al. 2021) to understand the subjective and nuanced experiences of players. The majority of studies in this group focus on games like multiplayer online battle arena game, e.g. League of Legends (Kou and Gui 2018, 2020b; Jiang et al. 2021) and massively multiplayer online role-playing games, e.g. World of Warcraft (Livingston et al. 2014), reflecting their rich environments for examining self-agency and identity formation.

Identity formation Studies in the Identity Formation sub-theme (Livingston et al. 2014; Jiang et al. 2021; Tally et al. 2021) explore how players identify and perceive their in-game personas. For example, gamertags serve as crucial tools for managing identity and privacy, reflecting a balance between self-expression and anonymity within gaming communities (Tally et al. 2021). Players form distinct clusters based on gameplay styles in League of Legends, such as generalists, specialists, and mavericks, which impact both individual and team performance (Jiang et al. 2021). Additionally, World of Warcraft players attach

diverse values to their characters, including utility, memory, and self-expression, highlighting the multifaceted nature of virtual identities (Livingston et al. 2014). These studies collectively point the complex processes of identity formation in gaming, emphasizing how players navigate and negotiate their virtual personas through names, gameplay styles, and character attachments, ultimately shaping their gaming experiences and social interactions.

Self-management Studies in this sub-theme (Leavitt et al. 2016; Kou and Gui 2018, 2020b) examine how players build and manage their in-game experiences. Kou and Gui study (2018) reveals that League of Legends players use quantification tools to assess themselves and others, which reinforces competitive dynamics and influences self-perception. Emotion regulation strategies in competitive esports settings are similar to those in physical sports, focusing on emotional self-care and leadership to manage stress and maintain performance (Kou and Gui 2020b). Additionally, the creation of multiple characters in online games is linked to demographic factors such as being male, younger, and from English-speaking countries, which impacts social interactions and network methods (Leavitt et al. 2016). These studies highlight the intricate processes of self-management in gaming, emphasizing how quantification, emotion regulation, and character creation shape players' experiences and interactions.

4.3 RQ3: unique facets of the video game context

In this section, we address the third research question: What are the unique facets of the video game context? While RQ2 focuses on how traditional CSCW topics are studied within the video game context, RQ3 characterizes what is genuinely new and unique about the video game context itself. We explore the distinctive contributions that the video game context offers to CSCW through an interpretive lens of the studies in our corpus. CSCW researchers recognize unique aspects in video games, prompting them to study these games to achieve various goals. We discuss the uniqueness of video games in achieving these goals in six parts.

4.3.1 Game-driven ecosystem

CSCW scholars have noticed that video games are not isolated worlds but are enmeshed in broader networks of people, organizations, systems, and practices. Studies in the Game-Driven Ecosystem theme (N = 6) (B. Brown and Bell 2004; Su 2010; Procyk and Neustaedter 2014; Koutsouras et al. 2017; Poretski and Arazy 2017; Ma et al. 2022) suggest that video games create vibrant cultural ecosystems that drive cultural production and innovation. Platforms like Minecraft and competitive gaming environments foster dynamic interactions where local cultural elements and global trends intersect (Su 2010; Koutsouras et al. 2017). The governance structures in esports illustrate how rules shape community behavior

and professional growth, contributing to these game-driven ecosystems (Ma et al. 2022). Additionally, narrative mechanics in games like GEMS (Mediatonic 2019) and social interactions in virtual environments showcase the role of digital narratives and cultural tools in promoting collaboration and social bonds (B. Brown and Bell 2004; Procyk and Neustaedter 2014). These observations highlight how video games provide a rich context for studying game-driven ecosystems, enabling collaborative production, enhancing social interactions, and integrating diverse cultural practices. This theme captures how video games offer CSCW scholars an opportunity to explore the vibrant ecosystems that emerge from gaming.

4.3.2 Video games as a new mediator

CSCW scholars have identified that video games serve as new mediators, reinforcing, impacting, and amplifying relationships that existed before the advent of games. This theme (N = 4) (Go et al. 2012; Kow et al. 2012; Ringland et al. 2015; S. Lee et al. 2020) examines how games serve this role. For instance, the study involving Long Journey of Life demonstrates how life metaphoric games mediating deep self-reflection and meaningful communication between senior participants and young adult partners through shared intergenerational experiences provided by the game (S. Lee et al. 2020). Research on Minecraft shows how the game environment allows parents to mediate and enhance their relationships with children with autism by helping them understand concepts of safe and unsafe spaces in online environments (Ringland et al. 2015). The study on QQ Farm illustrates how online games can bridge generational gaps and maintain family dynamics by mediating interactions that extend real-life relationships, addressing social and occupational responsibilities, and catering to varied gaming interests (Kow et al. 2012). Additionally, observations of sibling interactions in different gaming paradigms reveal how video games mediate learning and development, providing unique opportunities for social scaffolding and reinforcing familial bonds (Go et al. 2012). We found these studies collectively demonstrate the unique capacity of video games to act as mediators, transforming and enriching pre-existing social relationships, and offering CSCW scholars valuable insights into the ways games foster collaboration, social cohesion, and personal growth across different age groups.

4.3.3 Boundary management

CSCW scholars have observed that the interplay between online and offline worlds is a critical aspect of gaming. This resonates with the concept of synthetic worlds, where online games establish and experiment with governance structures that reflect and influence real-world social organization (Castronova 2008). While some studies focus solely on in-game interactions, this theme (N = 8) (Aal and Hauptmeier 2019; Cao et al. 2008; Leavitt et al. 2016; Lindtner et al. 2008;

Livingston et al. 2014; O'Hara et al. 2008; Voida et al. 2010; X. Zhang et al. 2020) explores how players cross or maintain boundaries between their physical and virtual selves. For instance, digital-physical collaboration in gaming creates hybrid environments where cultural value systems shape practices (Lindtner et al. 2008). Shifting from account-level to character-centric viewpoints reveals complex social network dynamics, highlighting how players manage boundaries between their true self (physical world) and gaming self (virtual) (Leavitt et al. 2016). Game design significantly influences interpersonal dynamics in collocated gaming, showcasing how boundary management occurs in shared physical spaces (Voida et al. 2010). The emotional, psychological, and social value players derive from in-game personas underscores the cognitive engagement and creative expression involved in maintaining distinct boundaries between virtual and real-life roles (Livingston et al. 2014). These insights show that video games create complex social systems, intertwining online and offline, physical and virtual interactions, and requiring continuous boundary management. This body of research enriches CSCW by demonstrating how digital and physical realms converge in gaming, shaping social interactions and cultural practices.

4.3.4 Emergent forms of governance

CSCW scholars have noted that video games introduce novel governance mechanisms, creating unique opportunities for community-building and interaction. This resonates with the idea of innovative social governance (Filgueiras and Almeida 2021), where games serve as experimental platforms for developing and testing governance structures that can inform real-world practices. This theme (N = 13) (Muramatsu and Ackerman 1998; Ducheneaut and Moore 2004; Ducheneaut et al. 2007; Wong et al. 2009; G. Cheung and Huang 2012; Freeman et al. 2015; Kou et al. 2017; Lipovaya et al. 2018; Kou and Gui 2020a; Kou 2021; Rapp 2021; Bisberg et al. 2022; Frey et al. 2022) explores how video games facilitate innovative forms of governance and social organization. For example, gaming communities often establish norms and governance structures within non-hierarchical frameworks, showcasing social innovation (Kou et al. 2017). The complexity of social systems in collaborative games is shaped by interactions and game management (Muramatsu and Ackerman 1998; Ducheneaut et al. 2007). Institutional formalization in online communities shows how governance structures align with institutional frameworks (Frey et al. 2022). Generosity in massively multiplayer online role-playing games spreads through social learning, demonstrating how communal norms evolve and adapt (Bisberg et al. 2022). Player-driven rule modifications reveal adaptive design and collaborative problem-solving as key components of emergent governance (G. Cheung and Huang 2012). Interactivity patterns in massively multiplayer online role-playing games highlight the influence of game design on social interactions and the formation

of governance mechanisms (Ducheneaut and Moore 2004). Disciplinary actions like permanent bans shape social roles and enforce community standards (Kou 2021), while cooperation in eSports illustrates cognitive engagement and teamwork as foundational to governance structures (Kou 2021). Role-playing games reveal how societal values and norms are constructed, challenged, and redefined within gaming communities (Freeman et al. 2015). These studies highlight the adaptability and creativity of players in establishing and maintaining governance structures, enriching CSCW research by showcasing the innovative governance mechanisms emerging in gaming communities.

4.3.5 Games as a new workplace

This facet, Games as a New Workplace (N = 26) examines how games serve as simulated environments where large-scale behavioral data can be harvested, something often difficult to achieve in conventional workplaces. CSCW scholars have observed that video games function as sophisticated social networks and collaborative work environments, offering unique opportunities for research. This theme explores the unique opportunities that video games bring, such as the formation and utilization of social capital, leading to new forms of social networks. Additionally, games create new virtual teamwork environments, allowing the study of elements and aspects of teamwork that are not possible or difficult in non-gaming environments. This is achieved by investigating the cognitive and emotional processes engaged during gameplay that inform us about teamwork. Studies in this group tend to have a psychological lens, often reannotating with theories like social capital theory (Putnam 2000) and cognitive psychology (Bandura 2001), which provide insights into the dynamic and multifaceted nature of social networks and teamwork in virtual gaming environments.

Games as new forms of social networks CSCW scholars have recognized that video games provide a unique lens for studying social networks due to their ability to simulate and enhance complex social interactions. This sub-theme (N = 10) (Ackerman et al. 2010; Xu et al. 2011; Kow et al. 2012; McEwan et al. 2012; Huang et al. 2013; Mason and Clauset 2013; Grandprey-Shores et al. 2014; Benefield et al. 2016; McEwan and Gutwin 2017; Tally et al. 2021) explores how video games function as new forms of social networks, building and utilizing social capital to enhance community dynamics and cooperation. These studies are valuable because they offer insights into social relationships and network structures that are difficult to observe in conventional settings. For example, digital-physical collaboration in massively multiplayer online games illustrates how team collaboration leads to the development of robust social networks (Huang et al. 2013). Dragon Nest (Eyedentity Games 2010) encourages teamwork at all levels through unique design mechanisms like multiple task difficulties and fatigue points, facilitating robust social networks by providing opportunities for

players to interact and engage in social activities (Benefield et al. 2016). Games create scenarios that facilitate the formation of real-world relationships, illustrating the persistence of social dynamics within online contexts (Xu et al. 2011). Leadership changes in social communities affect behavior and resilience, emphasizing the adaptability of social structures in these new social networks (McEwan and Gutwin 2017). These studies illustrate that video games act as new forms of social networks through enhancing social capital, community dynamics, and cooperation. This body of research provides valuable insights into the intersection of gaming and social connectivity and the way CSCW researchers have found the potential of games for investigating new forms of social networks.

Games as new virtual teamwork CSCW scholars have identified that video games offer a unique and innovative platform for studying virtual teamwork, providing opportunities to observe and analyze team performance and collaboration in ways that are challenging to replicate in traditional settings. This sub-theme, encompassing sixteen studies (N = 16) (Mandryk and Inkpen 2004; Moore et al. 2007; Bennerstedt and Ivarsson 2010; J. Bardzell et al. 2012; V. Cheung et al. 2012; Tang et al. 2012; Gutwin et al. 2016; Kelly et al. 2016; McEwan and Gutwin 2016; Kim et al. 2017; Kou and Gui 2018; Kou and Gui 2020b; Jiang et al. 2021; Musick et al. 2021; R. Zhang et al. 2021; R. Zhang et al. 2023), explores how games function as innovative platforms for virtual teamwork, by demonstrating team performance and collaboration through cognitive and emotional processes. For example, collective intelligence in competitive online gaming significantly influences team effectiveness, highlighting the role of gender dynamics and social perceptiveness in enhancing virtual teamwork (Kim et al. 2017). Non-verbal coordination in massively multiplayer online games emphasizes the importance of interaction rituals and cognitive engagement in fostering effective teamwork (Bennerstedt and Ivarsson 2010). Longitudinal analyses of raiding behaviors in virtual worlds demonstrate the dynamic nature of cognitive engagement, showing how both system-imposed and player-chosen behaviors shape teamwork over time (J. Bardzell et al. 2012). Emotion regulation in competitive eSports illustrates how players manage stress and maintain performance, underscoring the cognitive and emotional challenges of virtual teamwork (Kou and Gui 2020b). The quantification of performance metrics provides insights into how data interpretation mediates teamwork, affecting both emotional and mental states (Kou and Gui 2018). These studies illustrate how games serve as a novel site to demonstrate the intricate cognitive and emotional processes involved in virtual teamwork, enhancing our understanding of how players develop mutual understanding, coordinate actions, and communicate effectively within a team. This body of research enriches CSCW by demonstrating how games, as new forms of virtual teamwork, foster collaboration and improve team dynamics in digital environments.

4.3.6 Games as an Exemplar of Connected Learning

CSCW scholars have observed that gaming environments are not just spaces for play, but rich platforms for social and interest-based learning. The facet Games as Exemplars of Connected Learning (N = 7) (Nardi and Harris 2006; S. Bardzell et al. 2008; Go et al. 2012; Kow and Young 2013; Ames and Burrell 2017; Freeman and Wohn 2019; Toombs et al. 2022) explores how games facilitate connected learning, highlighting the dynamic interplay between game environments and educational processes. Through an interpretive lens, these studies show how games create opportunities for learning experiences, collaboration, and social interactions, resonating with concepts from activity theory (Engeström 2005), media synchronicity theory (Dennis et al. 2008), and socio-cultural theory (Vygotsky and Cole 1978). For example, routine activities in structured environments like World of Warcraft illustrate the evolution of collaborative learning and efficiency in gameplay (S. Bardzell et al. 2008). The synchronization of communication modalities in eSports underscores the importance of multimodal communication for team performance and learning (Freeman and Wohn 2019). Social interactions and cultural tools in video games mediate learning through peer-to-peer teaching and skill development (Go et al. 2012). The multiplicity of collaborations in massively multiplayer online role-playing games emphasizes the role of structured environments in facilitating learning (Nardi and Harris 2006). Multi-platform participation in online gaming communities demonstrates how media convergence theory explains the synergy between different platforms to enhance social interactions (Toombs et al. 2022). Finally, learning ecosystems in online gaming communities show how media-enhanced collaborative learning facilitates knowledge sharing and skill development, distinguishing between public and private learning channels (Kow and Young 2013). This approach provides nuanced insights into the ways games foster connected learning, enhance social interactions, and address educational and equity challenges.

5 Discussion

Our systematic review highlights how video games have been studied in CSCW, revealing seven key themes that connect game studies to CSCW topics and six unique facets of collaborative work that emerge in gaming contexts. Beyond identifying these patterns, our findings illustrate how methodologies, study topics, and game genres have evolved over time in CSCW research.

In this section, we critically examine how video games fit into CSCW, tracing shifts from early conceptualizations of work to modern interpretations influenced by game studies. We argue that video games are not just another domain for applying CSCW theories but constitute unique sociotechnical configurations that

challenge and extend CSCW frameworks. Finally, we highlight key gaps, opportunities, and future research directions for CSCW scholars interested in leveraging video games to study social and collaborative dynamics in new ways.

5.1 When gaming meets work in computer-supported cooperative work

Video game studies in CSCW provide valuable insights into redefining and expanding what constitutes'work.'Early CSCW research primarily focused on corporate efficiency in small to medium-sized settings (Greif 1988; Schmidt and Bannon 1992). However, concerns about its applicability to broader and non-traditional contexts (Grudin 1994) led to calls for a more inclusive understanding of'work.'Game studies, particularly from the early years, addressed these concerns by conceptualizing work in innovative ways. For instance, Muramatsu and Ackerman (1998) demonstrated how MUDs and games serve as social worlds, blurring the line between play and work.

Through game studies, CSCW researchers have gained fresh perspectives on work and group collaboration. Studies like Benefield et al. (2016) and Koutsouras et al. (2017) positioned ludic experiences alongside work, highlighting overlaps. Our findings for RQ2, Sect. 4.2, further illustrate how activities such as managing in-game resources (Aal and Hauptmeier 2019), strategizing in real-time (G. Cheung and Huang 2012), and adapting to dynamic virtual scenarios (Tally et al. 2021) can be considered work in the gaming environment. These skills—resource management, strategic planning, and adaptability—are transferable to professional contexts, where project managers face similar challenges in allocating resources, planning strategies, and responding to change.

Additionally, practical applications emerge from this intersection, such as designing games inspired by real-world response practices, including fire emergency response and urban search and rescue (Toups Dugas et al. 2016). These findings demonstrate that video games, as rich and diverse environments, expand CSCW study sites by offering profound insights into teamwork, community, and social dynamics. This integration ultimately enriches CSCW theories and models for modern collaborative work.

Playing games and engaging in CSCW activities share striking similarities, particularly in collaborative practices and community dynamics. For example, studies on gaming communities reveal practices like using media for learning in the StarCraft community (Kow and Young 2013) and fostering social interactions on Destiny 2's the100 platform (Toombs et al. 2022), which resemble cultural practices observed in professional workspaces like GitHub (Hastings et al. 2018; Harris et al. 2019). Such overlaps highlight the potential for integrating game studies with broader CSCW research to deepen intellectual engagement and generate insights across diverse collaborative environments. Blurring the lines between game and non-game contexts offers opportunities for interdisciplinary

studies, as recommended by Aagaard-Hansen (2007). This integration can break cross-context disciplinary boundaries, enabling a more comprehensive understanding of collaboration within CSCW.

Game studies in CSCW provide a powerful lens for understanding users through the unique, dynamic behaviors of game players. Compared to users in other CSCW contexts, players exhibit diverse behaviors such as support mechanisms (Poretski and Arazy 2017), toxicity (Grandprey-Shores et al. 2014; Kou 2021), and disruption (Kou et al. 2017), which are shaped by spontaneous, highly cooperative, and intense gameplay, particularly in multiplayer online battle arena games like League of Legends. These environments offer CSCW scholars a rich study site to analyze behaviors and emotions that are difficult to observe in non-gaming contexts. By focusing on players, CSCW researchers can uncover nuanced user needs, informing the design of more intuitive and effective systems. For instance, insights from indie game development practices (Freeman and McNeese 2019), have influenced the design of collaborative systems that address the social needs of creative teams. This perspective broadens CSCW's understanding of users, their practices, and cultural contexts. Moreover, video games offer opportunities to study polarized users (McClure and Mears 1984; Rajadesingan et al. 2023), which are less common in traditional CSCW studies.

5.2 Reflecting on game and non-game studies

In this section, we reflect on the challenges and opportunities of bridging game studies and non-gaming contexts within CSCW. Our findings reveal key barriers that limit the integration of these domains, including differences in terminology, cultural practices, and methodological approaches. Addressing these barriers can create a more inclusive and comprehensive understanding of collaboration in CSCW. For instance, one significant challenge is the use of technical gaming terms and mechanics, which can make game studies less accessible to non-game researchers. Abbreviations like"MMORPG"or"PvP"and modes such as"Ranked"or"Classic"are often assumed to be familiar but can confuse non-specialist audiences. While most studies in our corpus provide some explanations, clearer definitions and analogies to non-gaming contexts can further bridge this gap, making findings more impactful and accessible.

Cultural barriers also limit the integration of game studies into broader CSCW discourse. Non-game researchers may struggle to grasp the social significance of in-game events like raiding (J. Bardzell et al. 2012) or the communal dynamics of gaming spaces such as internet cafes (Lindtner et al. 2008). Drawing parallels between gaming and non-gaming concepts (J. A. Brown 2017), using visual aids (Yim et al. 2010), and contextualizing research findings (Wallace et al. 2013) researchers can make game studies more accessible and relevant. This approach provides a more inclusive space and fosters a deeper understanding

and appreciation within the wider CSCW field. These approaches highlight how studies can clear communication and contextualization of game-related research to make it accessible to a broader audience.

Exploring how non-game researchers can engage with game studies offers a significant opportunity to bridge the gap between game studies and the broader CSCW field. By adopting key concepts and methodologies from game research, non-game researchers can enrich their work and foster interdisciplinary collaborations. For instance, scoping or systematic reviews, like this study, can provide an overview of trends, patterns, and areas of focus within game studies, acting as catalysts for deeper integration. Direct engagement with gaming communities through ethnographic methods, such as participating in games (Freeman et al. 2015), observing player interactions (McEwan and Gutwin 2016), and conducting interviews (Livingston et al. 2014) can uncover social dynamics and cooperative practices valuable for CSCW research. Additionally, analyzing online discussions on platforms like Reddit (Kou and Gui 2020b; Kou 2021; Frey et al. 2022), where players share experiences and strategies, provides rich qualitative data on community behavior and interaction. These approaches present valuable pathways for fostering a more integrated and comprehensive research field by bridging the insights of game studies with CSCW.

5.3 Gaps, opportunities, and directions

Despite the steady presence of game studies in CSCW, a significant gap remains in the diversity of game genres studied. As noted in RQ1, Sect. 4.1, much of the research focuses on popular genres like massively multiplayer online role-playing games and multiplayer online battle arena games, resulting in an overemphasis on these categories. In contrast, the mobile gaming industry, which surpasses PC and console games in size (Statista 2023), as underrepresented in our corpus, with only three studies (Aal and Hauptmeier 2019; S. Lee et al. 2020; X. Zhang et al. 2020). Diversity in game genres is critical for CSCW as different genres provide unique contexts for exploring collaboration and social dynamics. For example, massively multiplayer online role-playing games enable the study of long-term organizations and complex social structures (J. Bardzell et al. 2012) and social structures (Rapp 2021) due to their persistent worlds and complex social dynamics, while multiplayer online battle arena games facilitate the study of competition (Freeman and Wohn 2019), teamwork (Kim et al. 2017), and real-time decision-making (Kou and Gui 2020b). By concentrating on these well-studied genres, we gain valuable insights into social interaction, collaboration, and community building, but the lack of attention to other genres limits the broader potential of CSCW research.

Understudied genres offer valuable opportunities to broaden CSCW research. For instance, mobile games, including casual (Kuittinen et al. 2007)

and idle games (Alharthi et al. 2018), reveal unique gaming habits and provide nuanced contexts for exploring less-studied CSCW topics. Another gap lies in fluctuating interest tied to genre popularity. Sports games, represented by only one study in our corpus (Mandryk and Inkpen 2004), have seen a decline in popularity (Messineo 2023), leaving their distinct playstyles and group dynamics underexplored. Similarly, while League of Legends was extensively studied (eight studies), other multiplayer online battle arena games like Dota 2 (Valve Corporation 2013), which are prominent in deep reinforcement learning (OpenAI et al. 2019), were mentioned only once (Freeman and Wohn 2019). These gaps highlight opportunities for CSCW scholars to compare diverse study sites and uncover unique aspects of less-examined games and genres.

While some attention has been given to health and well-being in gaming culture, such as break reminders (X. Zhou et al. 2021) and wellness checks (Madden and Harteveld 2021), these topics remain underexplored in CSCW. This is particularly significant given the importance of players'well-being in collaborative environments. Although issues like children's safety (Ringland et al. 2015) have been addressed, the broader social well-being of players has seen limited research in CSCW, despite its recognition in fields like HCI (Blandford 2019). Massively multiplayer online role-playing games, as sociotechnical systems (Bergstrom et al. 2011), offer rich opportunities for studying well-being. Additionally, large-scale public health insights can be drawn from video games, as seen in the'Corrupted Blood'incident in World of Warcraft (Bayrak 2019; Girish 2019), where an in-game epidemic provided a model for studying health crises. Applying such analyses through a CSCW lens could inform strategies for managing global health emergencies like COVID- 19 and improve practices in collaborative work settings.

The study of finance and economics within virtual economies, such as those in Sky: Children of Light (Bisberg et al. 2022) and World of Warcraft (Wong et al. 2009; Livingston et al. 2014; Rapp 2021), offers valuable lessons for CSCW in two ways: (1) transferring financial behaviors from games to non-game contexts and (2) uncovering patterns in non-game financial systems. Virtual economies provide insights into managing resources, incentives, and market dynamics. For instance, trading mechanisms (Tan 2020) and wealth accumulation strategies (Belaza et al. 2020) in games can inform the design of more effective reward systems in professional settings. World of Warcraft's auction houses, which function as virtual marketplaces (Rettberg et al. 2008), illustrate supply and demand dynamics applicable to real-world financial contexts. Additionally, financial tech applications like Robinhood (Chaudhry and Kulkarni 2022; Welch 2022) use gamified elements inspired by game studies to influence decision-making. CSCW scholars can study similar phenomena in games to develop

models for enhancing economic cooperation, efficiency, and innovation in workplace settings.

The rise of open-world and user-generated content in games (Duan et al. 2022) calls for studies on social regulation in these environments. Concepts like player-driven governance in EVE Online (CCP Games 2003; Leavitt et al. 2016) and non-hierarchical moderation techniques (Kou et al. 2017) highlight the potential for enhancing self-regulation and community management in CSCW. This is particularly relevant as user-generated games, known for their lack of centralized governance (Kou and Gui 2023), rely on players and creators to shape interactions and enforce norms within large, dynamic communities (Lastowka 2007). Studying user-generated games offers valuable insights into self-regulated mechanisms applicable to workplace platforms like Asana (Kindig 2021) or Slack (Cutter and Tilley 2020). By examining how players govern themselves and resolve conflicts in virtual worlds, CSCW scholars can develop strategies for fostering resilient and autonomous workgroups in real-world contexts.

5.4 Implications for future CSCW game research

Efforts are needed to better integrate game studies into the broader CSCW field to enhance their resonance and impact. As discussed in Sect. 4.2, while prior video game research connects to seven key CSCW topics, we often found a lack of direct links to CSCW frameworks in sections like introductions or related works. This disconnect creates challenges for readers and scholars from adjacent fields to engage with these studies and limits their accessibility. The difficulty of aligning novel research with established CSCW principles is not new, and solutions like proposing expanded conceptual models (Cruz et al. 2012; C. P. Lee and Paine 2015) have been suggested to foster inclusivity. Despite the relevance of game studies, our corpus reveals missed opportunities for incorporating these insights into CSCW discourse, hindering cross-disciplinary advancements.

More work is needed to develop nuanced design applications that future studies can refine and adopt. As discussed in Sect. 4.3, while current research offers valuable insights into game design, many studies focus on theoretical frameworks without providing practical applications. This gap makes it challenging to implement these insights in real-world scenarios. For example, studies emphasize the importance of communication channels in high-tension gameplay, such as verbal and non-verbal cues in shooting games (Xu et al. 2011; Tang et al. 2012; Mason and Clauset 2013). Recommendations include improving support for virtual gestures or balancing game sounds (Lipovaya et al.

2018). However, a broader approach should consider casual players alongside competitive audiences. While first-person shooter and multiplayer online battle arena genres focus on competitive dynamics (Wright et al. 2002; Xia et al. 2019), CSCW scholars should explore diverse player bases to expand the potential of games as study sites.

Greater efforts are needed to explore the experiences of marginalized players and inform inclusive game design. Our analysis was limited by inconsistent demographic data in the corpus, underscoring the need for better representation in game studies. While previous research highlights the importance of inclusivity (Heron 2012; Kafai et al. 2016), our findings focused largely on general player experiences, overlooking the specific challenges faced by gender minorities, racial and ethnic minorities, LGBTQ + players, players with disabilities, economically disadvantaged players, and older adults. The predominance of male players in existing data (Lindtner et al. 2008; Wang et al. 2012; Ames and Burrell 2017), reinforcing stereotypes (Paaßen et al. 2017), while studies addressing inclusivity, such as those focusing on autistic communities (Ringland et al. 2015; Ames and Burrell 2017), remain niche and difficult to generalize. Future CSCW research should prioritize marginalized players' experiences and adopt inclusive approaches (D'Ignazio et al. 2020; Liang et al. 2021). Despite calls for action, our review highlights a persistent gap in integrating these insights into game design, leading to missed opportunities for creating truly inclusive gaming environments.

Further research is needed to explore gamification within CSCW from a game studies perspective to better understand how game elements function in non-gaming contexts. Gamification, defined as the use of game design elements in non-game contexts (Deterding et al. 2011), requires a thorough examination of these elements within games before applying them elsewhere. As highlighted in Sect. 4.3, game studies provide a rich site for understanding these components, which are collectively necessary to constitute a game (Juul 2010). Our corpus revealed only one study (Rapp 2021) reflecting on the transformability of game elements into gamification. This lack of research limits the integration of game studies into CSCW and challenges game designers and researchers to fully leverage gamification's potential for enhancing collaborative work.

6 Limitations

Our SLR research was an attempt to unfold and analyze game studies that have been conducted under the overarching area of CSCW. While we attempted a rigorous step-by-step strategy and study design to ensure replicability and reproducibility, it is not without shortcomings. First, there are game studies concerning and reflecting on CSCW that are not published in a CSCW-related

venue. We focused on CSCW-related outlets to ensure that authors were not subjective in selecting studies, using the publication outlet as proof of relevance to the field. Future work can have a broader scope and include other sources like ACM CHIPLAY and ACM CHI to capture game studies that resonate with CSCW studies. Second, while we extensively searched in three separate academic databases, these databases might not always fetch and offer consistent results. Third, our definition of video games, as discussed at the beginning, is curated based on classical video game studies, which traditionally emphasize digital games created primarily for entertainment and leisure in genres such as action, adventure, and role-playing. This focus does not include other formats like exergames, serious games, or simulation games, which have secondary or practical objectives beyond entertainment. For this reason, future work can also have a larger scope to include hybrid formats of games for a more nuanced approach to game studies. Our dataset includes publications available through November 2023. While some newer studies may have emerged since then, the core trends identified reflect longer-term patterns in CSCW. We also acknowledge the time inherent in academic review processes, which may result in publication delays even for recently completed analyses.

7 Conclusion

This systematic literature review examined how video games have been studied in CSCW, synthesizing 67 studies across 25 years. Our findings reveal that while video games have been explored through various CSCW topics, the field has yet to fully integrate video games as a fundamental context for studying collaboration and social interaction. We identified seven key themes connecting game studies to CSCW and outlined six unique facets of collaborative work that emerge in video game contexts. These facets highlight how games not only serve as valuable sites for examining CSCW theories but also present novel sociotechnical configurations that reframe traditional understandings of work and cooperation. Despite the growing recognition of games within CSCW, barriers remain between gaming and non-gaming research communities. We emphasize the need for further integration by outlining opportunities for both gaming and non-gaming scholars to engage in cross-disciplinary dialogue. By blurring the lines between these domains, CSCW researchers can leverage video games to develop richer theories of collaboration, social interaction, and digital work. Finally, we propose future research directions that explore the unique affordances of video games, fostering a more inclusive and expansive approach to CSCW scholarship.

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Author Contribution

In this research, X.G. and Y.K. supervised and guided S.M. and Z.Z. in designing the study. S.M. wrote the main manuscript text, and all authors reviewed and provided feedback to improve and polish the written material. S.M. and Z.Z. coded and analyzed the data, and, together with X.G. and Y.K., held meetings to discuss the codes and research directions.

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Data Availability

No datasets were generated or analysed during the current study.

Declarations

Competing Interests

The authors declare no competing interests.

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