

Review

Gamification of cooperation: A framework, literature review and future research agenda

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ABSTRACT

Cooperation is in many ways a meaningful behavior and understanding how cooperation can be fostered among humans is integral to solving the many global challenges we are facing. Thus, one of the major current developments exists in exploring the potential of gamification to engage people in cooperative activity. However, while the literature on this phenomenon is growing in numbers, it remains unclear how gamification motivates cooperation and how effective it is in cooperative settings. This lack of understanding obstructs us from designing gamification that appropriately supports cooperation and from comprehending what potential hurdles need to be considered. We close this gap by theorizing a framework for gamifying cooperation. Guided by this framework, we systematically review and synthesize the existing literature ($n = 51$) to understand how gamification has been previously employed to motivate cooperation and what is known about the effects of gamification in cooperative contexts. The main contribution of the present study consists in deducing three different approaches (i.e., based on individualistic, cooperative, and hybrid use of features) to motivate cooperation by gamification and in providing a strategic platform for future research by proposing 11 agenda points regarding thematic, theoretical, and methodological future research avenues for gamifying cooperative activity.

1. Introduction

Human beings as a social species rely on cooperation to survive and flourish. From everyday interactions to the greatest human endeavors, our success mostly depends on the ability to work together. The digital transformation age has set in motion an epochal shift in which individuals are increasingly interconnected via technology, for example, within local teams as well as within global communities and international organizations, exploiting new opportunities for people to collectively engage in activities and to achieve common objectives. The recent COVID-19 pandemic has seen yet another acceleration of this shift, impacting digitalization strategies, business models, information management, the management of information systems, and social interactions (Dwivedi et al., 2020). Importantly, during the pandemic, it became not only an option to interconnect and cooperate with others remotely via technology but a necessity. The trend towards a work-from-home culture poses challenges for cooperative activity, including knowledge and information management practices (Edwards,

2022). Cooperative activity is largely understood as the striving process of two or more individuals to accomplish mutual goals (Johnson & Johnson, 1996) and it is considered as a behavior that is generally superior in comparison to individualistic engagement or competition when it comes to maintaining psychological health, achieving high productivity and building prolific social relationships (Johnson & Johnson, 2005). To exploit the vast advantages of cooperative activity and to better understand the phenomenon of technology-mediated cooperation, scholars and practitioners alike are progressively exploring, largely within the designated fields of computer supported cooperative work (CSCW) and learning (CSCL), how to utilize and design information systems, such as knowledge management systems, crowdsourcing systems, project management systems, social media systems, joint virtual work and learning spaces, and other types of groupware, to effectively enable cooperation among users (Grudin & Poltrock, 2012; Johnson & Johnson, 1996). However, while cooperation is a desirable behavior that can result in extraordinary benefits for all involved, it is often challenging to motivate.

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Human behavior is largely considered to be driven by desires, extrinsic and intrinsic motivation, and the aspiration of satisfying needs (Deci & Ryan, 2008). In light of this understanding, there has been an increasing interest in exploring the intrinsic and extrinsic motivations that predict the use of utilitarian and hedonic information systems (Lowry, Gaskin, & Moody, 2015; Tamilmani, Rana, Prakasam, & Dwivedi, 2019; Wu & Lu, 2013). Online games in particular have turned into a relevant source for understanding intrinsic motivations for human cooperation. Previous game studies have tried to identify relevant features that can give rise to cooperation (Seif El-Nasr et al., 2010) and indicate that social factors are of immense importance for playing video games (Yee, 2006). Pertaining to the observed effects, prior research indicates that playing games cooperatively can impact prosocial sentiment (Dolgov, Graves, Nearents, Schwark, & Brooks Volkman, 2014; Wang & Wang, 2008), team cohesion, team performance (Keith, Anderson, Gaskin, & Dean, 2018), well-being (Laato, Islam et al., 2021), as well as team identification and team commitment (Liao, Pham, Cheng, & Teng, 2020). Mindful of these desired outcomes observed in gaming contexts, the past decade has seen a rising trend towards gamifying activities and information systems to motivate positive behaviors by accommodating to intrinsic user needs (Hamari & Koivisto, 2015; Xi & Hamari, 2019). Gamification aims at producing positive 'gameful' user experiences by affording information systems, services, or activities with game-inspired design principles (e.g., points, badges, levels, leaderboards, etc.) (Hamari, 2019; Koivisto & Hamari, 2019), thereby motivating meaningful engagement that serves both, an experiential as well as instrumental purpose (Liu, Santhanam, & Webster, 2017). Gamification can also be considered as an emergent technological, societal, cultural, or economic phenomenon through which reality is becoming more gameful (Hamari, 2019). Deterding, Dixon, Khaled, and Nacke (2011) define gamification as the use of game features in non-game settings. In the present study, we adopt this notion and explore the use of game features outside of full-fledged games except if games have been investigated to also derive implications for gamification. Ultimately, gamification has become a meaningful trend in several distinct domains, such as education (e.g., Toda, do Carmo, Da Silva, Bittencourt, & Isotani, 2019), fitness (e.g., Cotton & Patel, 2019; Hassan L, 2019), innovation (e.g., Patrício, Moreira, & Zurlo, 2018), marketing (e.g., Krishen, Dwivedi, Bindu, & Kumar, 2021) and advertising (e.g., Sreejesh, Ghosh, & Dwivedi, 2021), to name a few.

Noticeably, existing gamification literature has primarily focused on gamification design interventions that can be regarded as individualistic (e.g., personal points) or competitive (e.g., leaderboards), which naturally lead to corresponding individualistic and competitive demeanors, whereas attempts to explore how gamification motivates cooperative activity and how effective it is for this purpose have remained modest, that is until recently. In the past years, there has been an upsurge of studies that also explore the potentials of gamification in cooperative settings, such as in crowdsourcing (Morschheuser, Hamari et al., 2017), cooperative work (Morschheuser & Hamari, 2019; Riar, Hamari, & Zarnekow, 2021), collaborative learning (Knutas et al., 2019), co-creativity (Arnab, Clarke, & Morini, 2019), as well as knowledge and information management (Friedrich, Becker, Kramer, Wirth, & Schneider, 2020; Weretecki, Greve, Bates, & Henseler, 2021). Plainly, the existing knowledge that would help us move the field forward is dispersed across a sizable number of studies within various cooperative domains. This trend has now matured enough that we are confronted with a plethora of design features that are possibly relevant to motivate cooperative activity as well as a substantial number of results on the effects of gamification in cooperative settings.

However, while the corpus of literature on the use of gamification in cooperative settings is steadily growing, we lack a synthesized and comprehensive overview of the effects of gamification in cooperative settings as well as the diverse design principles by which gamification can promote cooperative activity. In consequence, there seems to be insufficient knowledge about how to effectively gamify systems to

promote cooperation among individuals and what potential pitfalls need to be avoided in order to avert time-consuming and expensive redesign of systems or possible failure of gamification projects. A better understanding of how gamification motivates cooperation would help practitioners to make better-informed design decisions when it comes to developing cooperative information systems and to achieve more effective and rewarding cooperation among team members. Therefore, it seems important to bring forward a conceptualization for gamifying cooperation, as well as to reflect on existing results in the gamification literature to build on this knowledge and capture current developments and identify relevant avenues for future research.

Accordingly, the purpose of the present study consists in conceptualizing the gamification of cooperation and in performing a systematic review of the existing empirical cooperative gamification literature to synthesize and comprehend (RQ1) *how gamification motivates cooperation* and (RQ2) *what is known about the effects of gamification in cooperative settings*. To provide the necessary groundwork, we propose a framework for gamifying cooperation by drawing on different cooperation theories and by integrating these with an established conceptualization of gamification in Section 2. Thereafter, following accustomed guidelines for performing systematic literature reviews, we present our methodological approach in Section 3. In Section 4, we synthesize the results from the analyzed corpus of literature by providing an overview of the cooperative settings and purpose for which gamification has been used (Subsection 4.1), the diverse design principles that have been used (Subsection 4.2), the theories that have been employed (Subsection 4.3), the methodological setups in the reviewed studies (Subsection 4.4.), the effectiveness of gamification (Subsection 4.5) and the outcomes (psychological, social and behavioral) that have been encountered (Subsection 4.6.). In Section 5, we discuss the results of the present study. Specifically, we reinstate our proposed framework for gamifying cooperation and discuss the theoretical implications (Subsection 5.1) before providing an in-depth discussion of the practical implications by formulating three different approaches by which gamification can motivate cooperation based on the presumptions of the proposed framework (Subsection 5.2). Thereafter, we turn our attention to a discourse on potential thematic, theoretical, and methodological future research avenues (Subsection 5.3) before we present possible limitations of our study and a brief conclusion in Section 6.

2. A conceptual framework for gamifying cooperation

Cooperation can be defined as such actions by which individuals work towards a common end (i.e., mutual goals) (Johnson & Johnson, 1996). Scholars often differentiate between cooperation, competition and individualistic behavior based on the goal relationships of people (Deutsch, 1949; Johnson & Johnson, 1996, 2005; Tjosvold, 1988). According to this conception, cooperation exists when individuals hold mutual goals and goal attainment is positively influenced by each other's actions (Deutsch, 1949; Johnson & Johnson, 1996). Competition on the other hand arises when the goals of individuals are negatively related and individualistic behavior exists when goals of individuals are unrelated and not influenced by each other's actions (Johnson & Johnson, 1996, 2005). Concepts of teamwork and collaboration are similar to cooperation in the sense that members of a group work together (i.e., they collaborate) to accomplish mutual goals and produce group outputs (Driskell, Salas, & Driskell, 2018). Typical cooperative activities can involve the exchange and synthesis of resources, information, and ideas as well as communication, providing mutual assistance, encouragement, and other sorts of support (Tjosvold, 1988). Theories of cooperation have become important for comprehending how cooperative activity emerges, how it is motivated and what barriers exist that can prevent cooperation to unfold (Chen, Chen, & Meindl, 1998; Driskell et al., 2018; Johnson & Johnson, 2005; Marks, Mathieu, & Zaccaro, 2001; Tuomela, 2005; Wiener & Doescher, 1991). For example, social interdependence theory (Johnson & Johnson, 2005) explains how

cooperation emerges based on positive goal interdependence between individuals, we-intention theory (Bagozzi & Lee, 2002; Tuomela, 2005) proposes how cooperation can be fostered based on cultivating collective-based psychological outcomes and sentiment (e.g., group norms, social identity, etc.), whereas cultural and human value driven cooperation theory postulates how cooperative interaction can emerge based on personal contingent sentiment, namely individualism and collectivism (Chen et al., 1998). Guided by these previous theoretical understandings on how cooperation can be motivated and by intertwining previous conceptualizations of gamification, we propose a framework for gamifying cooperation based on human motives, psychological motivation, goals, desires, and needs.

In Fig. 1, we present our framework for gamifying cooperation and adopt the notion from cultural and human value driven cooperation theory (Chen et al., 1998), that cooperation, which is the target behavior (see Behavioral Outcomes in the framework), can be motivated based on a person’s individualistic or collectivistic sentiment (see Motives in the upper part of the framework). The individualistic rationale presumes that the readiness of an individual to cooperate depends on the extent to which the involved actions are instrumental to attaining personal outcomes. The focus is therefore set on expected self-benefits and self-enhancement. On the other hand, the collectivistic rationale presumes that social outcomes, group values and expected collective benefits are prioritized and the main driving force behind cooperation (Chen et al., 1998). Depending on whether a person is motivated based on individualism or collectivism, he or she may have different goals and psychological needs (reflected in the framework by the arrow from Motives to Psychological Outcomes). For example, a person who is motivated on an individualistic account may want to gain recognition for engaging in cooperative behavior (i.e., Individualistic Outcomes in the framework), whereas a person motivated on a collectivistic account may have social goals and psychological needs (e.g., need for relatedness, cohesion, etc.), which is reflected in the framework as Social Outcomes. This is in line with theories of we-intention and I-intention, which posit that cooperation can emerge via multiple routes, i.e., based on individualistic psychological outcomes and based on social psychological outcomes (Bagozzi & Lee, 2002; Tuomela, 2005).

In recent years, there has been growing interest in investigating how psychological needs can be satisfied by using gamification (Xi & Hamari, 2019) and how it can be used as a form of non-monetary incentive and reinforcement to motivate user engagement, including for the purpose of motivating cooperative activity (Friedrich et al., 2020; Knutas et al., 2019; Morschheuser & Maedche, 2017; Riar et al., 2021; Riar, 2020). Hamari et al. (2014) conceptualize gamification as a way to afford

systems with game-inspired features that can produce diverse psychological outcomes which eventually translate into desirable behaviors (see the middle part of the framework Affordances, Psychological Outcomes, Behavioral Outcomes). We adopted this notion and integrated it with the considerations from cooperation theories that people can be motivated based on an individualistic and collectivistic account. In other words, via gamification users can act on their individualistic or social-psychological needs and satisfy them. More specifically, our framework proposes that the motives determine whether a person values gamification features that provide personal benefits (e.g., self-enhancement) or whether an individual prefers gamification features with social character (reflected in the framework by the arrow from Motives to Affordances). Thus, the motives, which are directly related to the psychological needs of users, determine which features an individual uses and how the individual engages with the gamified system (i.e., more individualistically, competitively, or more cooperatively).

However, in reverse, the design choices within gamified systems (i.e., the choice of particular features over others) may also affect or reshape the sentiment of an individual. More specifically, gamification may influence whether an individual is motivated based on an individualistic or collectivistic account in accordance with the gamification features that are implemented within a system. Drawing on social interdependence theory (Morschheuser & Maedche, 2017) and I-intention/we-intention theory (Morschheuser, Riar, Hamari, & Maedche, 2017; Riar, Morschheuser, Hamari, & Zarnekow, 2020), previous research indicates that the choice of employed gamification features determines users’ goal orientations (e.g., individualistic or cooperative goals) and whether gamification gives rise to individualistic or social psychological outcomes. Thus, our framework proposes that the gamification design intervention (i.e., choice of design features) determine what psychological needs can be satisfied and what psychological outcomes are evoked (see the arrow from Affordances to Psychological Outcomes), which in turn can influence (e.g., reaffirm or update) the collectivistic or individualistic sentiment and motives of a person (see the arrow from Psychological Outcomes to Motives). To put this into an example, the exposure of gamification features with social character may invoke social outcomes (e.g., relatedness, cohesion, etc.), thereby motivating or reinforcing collectivism whereas, vice versa, gamification features with self-beneficial character invoke individualistic outcomes (e.g., personal reputation), thereby motivating or reinforcing individualism.

As gamification draws inspiration from video games, it is worth looking at the games literature to understand how social interaction and

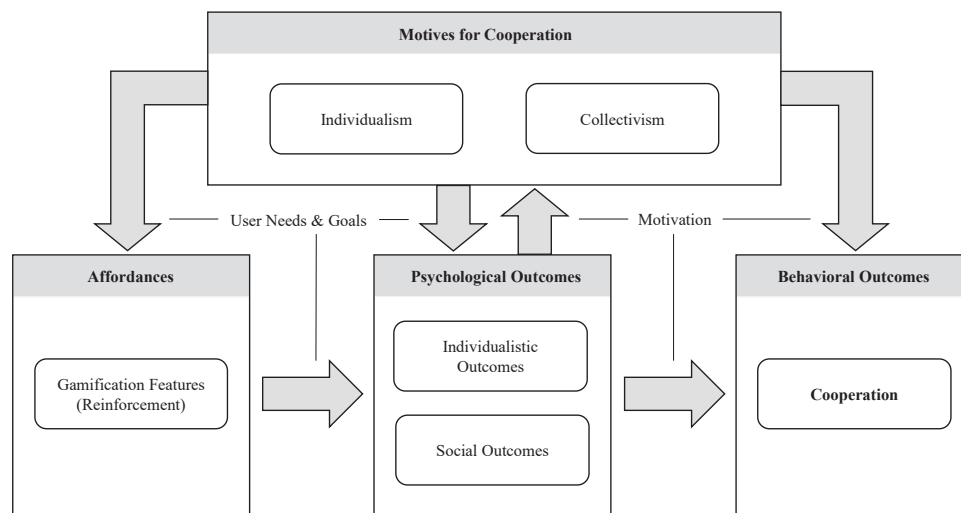


Fig. 1. Framework for gamifying cooperation (based on Hamari, Koivisto, & Sarsa, 2014).

Table 1
Overview of conditions for cooperation and sub-questions for the present study.

Conditions for cooperation	Explanation	Sub-questions for the present study*
Motives	According to cultural and human value driven cooperation theory, motives, needs and goals for engaging in cooperation can differ and depend on whether people are motivated based on individualism or collectivism (Chen et al., 1998).	<ul style="list-style-type: none"> Does gamification motivate cooperation based on personal goals and individualism or based on cooperative goals and collectivism?
Affordances (Reinforcement and incentives)	Incentives are important mechanisms for cooperation (Chen et al., 1998) and lack thereof is seen as a barrier for cooperation to emerge (Wiener & Doescher, 1991). Gamification is a way to provide reinforcement/incentives to individuals by affording systems with game-inspired features that can produce diverse psychological and behavioral outcomes (Hamari et al., 2014). In line with social interdependence theory (Johnson & Johnson, 1996), gamification can induce different goal orientations (i.e., independent, competitive, and cooperative goals) (Morschheuser & Maedche, 2017).	<ul style="list-style-type: none"> What gamification features are used to incentivize and reinforce cooperation?
Psychological & behavioral outcomes	I-intention and we-intention theory posits that cooperation can emerge based on a personal contingent route (i.e., based on individualistic motivational outcomes) and a collective contingent route (i.e., based on social motivational outcomes) (Bagozzi & Lee, 2002; Tuomela, 1995). While individualistic psychological outcomes can give rise to cooperation, social dynamics and interpersonal processes are the foundation of effective cooperation. Coordination, team cohesion, collective confidence building, communication, group identity, and trust, to name a few, are pivotal social dynamics for successful cooperative relationships (Chen et al., 1998; Driskell et al., 2018; Marks et al., 2001).	<ul style="list-style-type: none"> What individualistic and social outcomes is gamification capable of evoking to support cooperation? Is gamification effective in supporting cooperation?

* These questions represent sub-questions to the overarching research questions “How does gamification motivate cooperation?” and “What is known about the effects of gamification to motivate cooperation?” and guide parts of our data extraction from the analyzed studies.

cooperation emerges in games, and what benefits are entailed in playing games cooperatively. Games are often played in team settings, which can naturally create common ground among players. For example, teams can trigger identification processes among individuals and bring about compliance with team norms, which can strengthen overall team commitment (Liao et al., 2020). Games often allow players to engage in two-way communication, which can enable coordination as well as the cultivation of harmonious relationships and mutual understanding (Tseng, Huang, Pham, Cheng, & Teng, 2022). Prosocial game patterns, such as sharing have been suggested to influence cooperative gaming behavior (Gentile et al., 2009), whereas mutual interaction with game objects, synergies between goals or abilities have been proposed to be further relevant patterns in cooperative games (Seif El-Nasr et al., 2010). The advent of *Massively Multiplayer Online Games* (MMOG) significantly transformed the gaming landscape due to the ability of MMOGs to amass large numbers of players in highly social gaming environments where people from all over the world come together to combine their skills and cooperatively overcome challenges, jointly complete quests, and work towards mutual achievements (Cole & Griffiths, 2007). Cooperative games have also taken on more serious contexts, perhaps most prominently in education (Wang & Huang, 2021), in particular due to the potential of eliciting intrinsic motivation (Liao, Chen, & Shih, 2019). Since games have been found to bear extraordinary potential to support interpersonal relationships via prosocial patterns and group-level reward structures, it has been proposed that this potential can be conveyed as a form of gamification to reinforce social dynamics and cooperation in non-game contexts (Morschheuser et al., 2017; Riar et al., 2020).

Chen et al. (1998) stress that incentives are critical to motivating cooperation, which is also highlighted by Wiener and Doescher (1991) who postulate that a lack of reinforcement is a typical barrier for cooperation to emerge. Ultimately, gamification is regarded as an effective approach to reinforce desirable behavior via providing non-monetary incentives. However, there seem to have been no attempts to provide an overarching overview of how gamification motivates cooperation and how effective it is across different cooperative domains. Importantly, with our proposed framework for gamifying cooperation in mind, there seems to be a lack of understanding whether gamification motivates cooperation based on personal goals and individualism or based on cooperative goals and collectivism, as well as what specific gamification features are commonly used to reinforce cooperation and what individualistic outcomes and social dynamics

gamification is capable of evoking. Our framework and the sub-questions, which are summarized along with the most important conditions for cooperation in Table 1, guide our data extraction from the analyzed corpus of literature and help answer our overarching research questions ((1) “how does gamification motivate cooperation” and (2) “what is known about the effects of gamification in cooperative settings?”).

3. Methodology

Guided by the above-presented framework (Fig. 1 & Table 1), the present literature review is theory-driven and aims at identifying how gamification motivates cooperation (i.e., what interventions work) and what is known about the effects of gamification in cooperative settings (how and why does it work, in what situations, for whom, etc.). The review was executed according to well-established instructions (Brereton, Kitchenham, Budgen, Turner, & Khalil, 2007; Webster & Watson, 2002). In this section, we outline our search strategy, study selection procedure, and data extraction scheme.

3.1. Bibliographic sources and search query

To ensure an exhaustive search of the extant corpus of literature, Brereton et al. (2007) recommend performing the search within a variety of suitable bibliographic sources. Due to their prominence in the area of information systems and human-computer-interaction, as well as their index-features to a wide variety of collections and their inter-disciplinarity, we decided to execute our search within the *Web of Science* (WoS) database and within the *Association for Information Systems Electronic Library* (AISeL).

We derived (1) gamification and (2) cooperation as the key components of our research questions and constructed our search query accordingly. Since this study intends to understand the broader concept of using gamification in settings in which individuals work together, we did not make a clear cut between the concept of cooperation and related concepts such as teamwork and collaboration. All of these concepts rely on the principle that individuals engage in a mutual effort to accomplish common goals (Driskell et al., 2018; Johnson & Johnson, 1996) and thus, they have been included in our search string. In addition, we used asterisks (*) to cover varying use patterns of the search terms (e.g., gamif* to cover terms such as gamified, gamify in addition to gamification, or cooperat* to cover patterns such as cooperative, cooperate in addition to cooperation, etc.). The final search query was construed as

presented here:

gamif AND (collaborat* OR cooperat* OR collectiv* OR team*).*

3.2. Search strategy and study selection

Since performing a full-text search within AISEL and WoS would result in a large number of irrelevant studies that simply mention one of the terms (i.e., cooperation, collaboration, or teamwork) without being a central aspect of the studies, we decided to perform the search within the title, abstract and keywords in WoS and within the title, abstract and subject in AISEL. We verified our search string by manually identifying a set of relevant publications and by confirming that the search returned these publications as part of the result set in either one of the two chosen bibliographic sources. The final search was performed in January of 2021 and resulted in an initial return set of 1152 studies across the two chosen bibliographic sources (see Fig. 2). We determined the following inclusion criteria:

- Studies must be written in English
- Studies must be peer-reviewed (e.g., inclusion of journal articles, conference papers, or book chapters whereas non-peer-reviewed literature, e.g., grey literature is excluded)
- Studies must be primary literature (e.g., exclusion of meta-analysis, systematic review studies, etc.)
- Studies must be full papers (short and working papers without empirical results are excluded)
- Studies must be on gamification, i.e., in accordance with the definition by Deterding et al. (2011), we investigate studies that use game features in non-game settings (exclusion of full-fledged games except if they also discuss implications for gamification)
- Studies must specify a cooperative setting (e.g., exclusion of studies that investigate individual engagement only)
- Studies must be of empirical nature because one of the goals of this study consists in assessing the effectiveness of cooperative gamification approaches
- Studies must specify which gamification elements have been employed

In a first step, we removed non-English articles and duplicates from the returned set of literature. Second, we used the remaining above-mentioned criteria to screen the titles, abstracts, and conclusion

sections of the returned body of literature. A considerable number of studies were excluded in this step because they were either not dedicated to the topic of gamification and only mentioned it in passing or because they were of non-empirical nature. Since one of the primary goals of the present study consists in exploring the effects of gamification in cooperative contexts, non-empirical studies (i.e., studies that neither report on inferential nor descriptive results on the effects of gamification) were excluded. While in the majority of studies it became clear what methodological approach had been employed within the abstract or conclusion, we also briefly screened the methodology sections to reassure that we do not prematurely exclude any studies with empirical results. As a result, 313 studies remained. Thereafter, we applied the inclusion criteria to the full texts. In this step, we were able to make a final thorough assessment of all inclusion criteria based on the full texts and had to exclude further studies, e.g., when the context turned out not to be cooperative or when little to no information was given on the employed gamification design elements. The final pool of the present literature review consists of 51 studies (see Fig. 2).

3.3. Data extraction

An important step in the review process is the extraction of information from the primary studies. It is suggested to set up a data extraction form, which determines the properties to be systematically extracted (Brereton et al., 2007). The form aims to synthesize detailed information from the corpus of reviewed literature that is relevant for addressing the objectives (i.e., the research questions) of the present literature review. In our case, the main objectives consist in identifying how gamification can be designed to support cooperative activity and to gain a better understanding of the outcomes and effectiveness of gamification for the purpose of motivating cooperation. Thus, the form intended to gather information on the applied gamification design principles as well as the reported outcomes of cooperative-based gamification implementations. In addition, we specified properties in the extraction form to gather information on the theoretical foundations, cooperative contexts, the methodological approach, and general publication data (e.g., authors, publication venue, publication year, etc.).

4. Results

In this section, we present the results of the systematic literature review. First, we give a short overview of the general development in terms of the number of published articles on the phenomenon of gamification and cooperation in the different publication venues over the years. Importantly, guided by our research questions and framework, we summarize the contexts in which gamification has been used to motivate cooperation (Section 4.1), what gamification features have been implemented (Section 4.2) what theories (Section 4.3) and methodological setups (Section 4.4) have been employed, what has been observed in terms of the effectiveness of gamification (Section 4.5), as well as what psychological and behavioral outcomes (Section 4.6) have been observed in the reviewed literature. Specifically, Sections 4.2, 4.3 and 4.6 later support us in answering RQ1 (*how does gamification motivate cooperation?*), whereas Sections 4.1, 4.4, 4.5 and 4.6 all contribute to answering RQ2 (*what is known about the effects of gamification to motivate cooperation?*).

Research on the use of gamification to support cooperation seems to have first garnered attention around the year 2014. It has become a more emanant trend over the years, as indicated by the increasing number of published studies between 2014 and 2020 (see Fig. 3). A considerable upsurge can be observed starting in the year 2016 and it has since then remained a relevant research topic with an even further upwards trend observed in more recent years. Since we focused on peer-reviewed articles only, the publications are distributed in journal, conference and book appearances (research-in-progress, technical reports, posters, etc., are excluded from this review). Most of the studies,

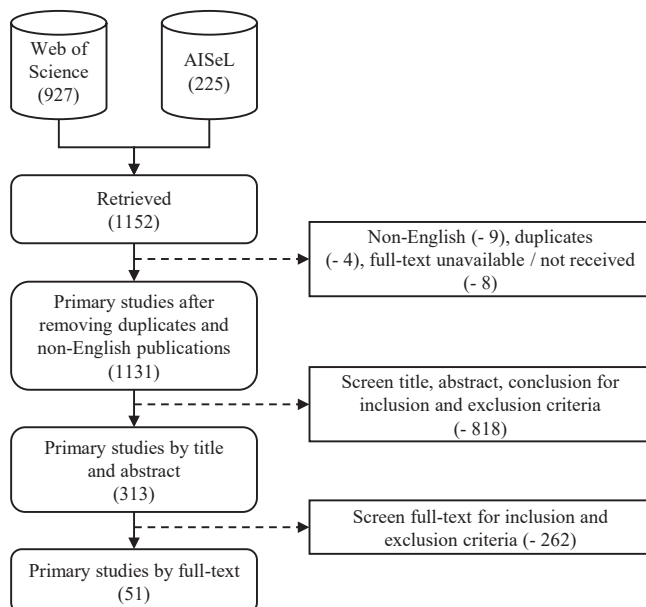


Fig. 2. Study selection procedure.

especially in recent years, have been published in journal articles, accentuating the advancement of cooperative-based gamification as a relevant research topic.

4.1. Context and purpose

The most common context in which gamification was used to motivate cooperative activity within the analyzed body of literature is education and training (in 41.2% of the studies) (see Table 2). The goals of using gamification in cooperative education and training contexts have been mainly to engage individuals in group quizzes (Felszeghy et al., 2019; Garcia-Sanjuan, Jurdi, Jaen, & Nacher, 2018; Mavridis, Tsiatsos, Chatzakis, Kitsikoudis, & Lazarou, 2015) and collaborative problem solving (Jagušt, Botički, & So, 2018; Stoeffler, Rosen, Bolsinova, & Davier, 2020), as well as to promote socialization in massive open online courses (MOOCs) or different group-based E-Learning activities (Ramírez-Donoso, Rojas-Riethmuller, Pérez-Sanagustín, Neyem, & Alario-Hoyos, 2017; Uz Bilgin & Gul, 2020). Collaborative skill development (López-Faicán & Jaen, 2020) or collaborative skill proficiency assessment (Stoeffler et al., 2020) have been further objectives. Essentially, gamification seems to be a relevant approach to promote both cooperative in-class interaction (Mader & Bry, 2019; Papadakis & Kalojiannakis, 2017) as well as interaction and socialization in online learning environments (e.g., in MOOCs) (Borrás-Gené, Martínez-Núñez, & Fidalgo-Blanco, 2016; Ramírez-Donoso et al., 2017).

The second major context for which gamification was used in the analyzed studies to support cooperation is crowdsourcing. Specifically, the reviewed literature reports on the use of gamification to motivate involvement in innovation communities, for example, for the purpose of sharing ideas and knowledge, or to involve stakeholders in new product development and co-creation activities (Leclercq et al., 2017, 2018; Morschheuser & Maedche, 2017). Relying on the use of collective intelligence and unified efforts to achieve mutual outcomes, crowdsourcing is by definition a cooperative aspiration and gamification seems to be an adequate approach to reinforce collective participation in crowdsourcing activities.

Further contexts within the analyzed body of literature to induce cooperative activity are software development, sustainability, shopping, fitness and production. In software development, gamification was used, for example, to make SCRUM practices more engaging to project teams (Marques et al., 2020) or to support collaborative requirements elicitation or prioritization (Kolpondinos & Glinz, 2017, 2020; Lombriser et al., 2016). For sustainability purposes, gamification was used to raise collective awareness (Koroleva & Novak, 2020) or to involve individuals in green IT services (Huang & Zhou, 2020) and collaborative energy-saving endeavors (Wemyss et al., 2018; Zehir et al., 2019). In the fitness context, individuals were motivated to work together instead of

Table 2
Overview of the encountered contexts for gamified cooperation.

Context	Source	#	%
Education / Training / Pedagogy	Arnab et al. (2016);Borrás-Gené et al. (2016);Chalco, Mizoguchi, and Isotani (2018);Chen, Li, and Chen (2020);Dindar, Ren, and Järvenoja (2021);Doumanis, Economou, Sim, and Porter (2019); Felszeghy et al. (2019);Garcia-Sanjuan et al. (2018);Hasan, Nat, and Vanduhe (2019); Hassan M.A (2019);Jagušt et al. (2018); Kwak et al. (2018);López-Faicán and Jaen (2020);Mader and Bry (2019);Mavridis et al. (2015);Papadakis and Kalojiannakis (2017);Ramírez-Donoso et al. (2017);Sailer and Sailer (2020);Sanina, Kutergina, and Balashov (2020);Stoeffler et al. (2020);Uz Bilgin and Gul (2020)	21	41.2
Crowdsourcing*	Afentoulidis, Szlávik, Yang, and Bozzon (2018);Bertholdo, Melo, Rozestraten, Gerosa, and O'Brien (2018);Brito, Vieira, and Duran (2015);Feng, Ye, Yu, Yang, and Cui (2018);Leclercq, Poncin, and Hammedi (2017);Leclercq, Hammedi, and Poncin (2018);Lithoxoidou et al. (2020); Morschheuser, Hamari, and Maedche (2019);Morschheuser and Maedche (2017); Morschheuser et al. (2017);Nivedhitha and Manzoor (2020);Riar et al. (2020);Suh and Wagner (2017); van Toorn, Kirshner, and Gabb (2020);Viana and Pinto (2017);Zikos et al. (2019);Zimmerling, Hoflinger, Sandner, and Welpe (2016)	17	33.3
IT / Software Development	Kolpondinos and Glinz (2017);Kolpondinos and Glinz (2020);Lombriser, Dalpiatz, Lucassen, and Brinkkemper (2016); Marques, Costa, Da Mira Silva, Gonçalves, and Gonçalves (2020)	4	7.8
Sustainability / Green IT	Huang and Zhou (2020);Koroleva and Novak (2020);Wemyss et al. (2018);Zehir et al. (2019)	4	7.8
Shopping	Lounis, Pramataris, and Theotokis (2014); Ye, Feng, Yang, Yang, and Yang (2019)	2	3.9
Work / Production	Luu and Narayan (2017);Sailer, Hense, Mayr, and Mandl (2017)	2	3.9
Fitness / Exercise	Chen and Pu (2014)	1	2.0
Sum		51	100

* Includes Knowledge Sharing, Ideation and Co-creation

individually on fitness goals (Chen & Pu, 2014), whereas in shopping, which may be a more unique context for cooperative efforts, individuals were prompted to engage in communal shopping to secure group discounts (Ye et al., 2019).

Overall, our review reveals two dominating domains for which gamification has been employed to support cooperative activity, namely education and crowdsourcing. Software development and sustainability are second in line while there are also some more unique contexts. More general literature reviews reveal a similar picture, showing that education is a front-runner domain in the gamification realm (Koivisto & Hamari, 2019). Nevertheless, it seems that the specific lens of cooperative-based gamification as a more current phenomenon is also becoming relevant in other unique contexts, and it may well transcend into even more domains in the coming years as we start to better understand how cooperation can be achieved by gamification.

4.2. Overview of gamification design features

We identified 21 different types of gamification features within the reviewed literature. Table 3 presents all identified features along with a brief description of each feature. Points and score were the most extensively used features in the primary studies (in 70.6%), followed by objective-based elements such as challenges, goals, missions, quests or

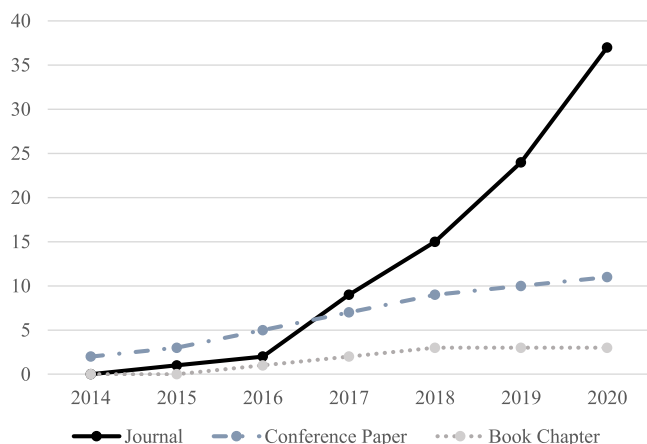


Fig. 3. Publications cumulated by venues and year.

Table 3
Overview of the encountered gamification features.

Feature	Explanation / Sources	#	%
Points / Score	<i>Provide personal (individual points/score) or group (team points/score) feedback for engaging in cooperative activity.</i> Afentoulidis et al. (2018); Arnab et al. (2016); Chalco et al. (2018); Chen and Pu (2014); Dindar et al. (2021); Doumanis et al. (2019); Feng et al. (2018); Hasan et al. (2019); Hassan M.A (2019); Huang and Zhou (2020); Jagušt et al. (2018); Kolpondinos and Glinz (2017); Kolpondinos and Glinz (2020); Koroleva and Novak (2020); Lithoxidou et al. (2020); Lombriser et al. (2016); Lounis et al. (2014); Mader and Bry (2019); Marques et al. (2020); Mavridis et al. (2015); Morschheuser et al. (2019); Morschheuser and Maedche (2017); Morschheuser et al. (2017); Nivedhitha and Manzoor (2020); Papadakis and Kalogiannakis (2017); Ramírez-Donoso et al. (2017); Riar et al. (2020); Sailer and Sailer (2020); Sanina et al. (2020); Suh and Wagner (2017); Uz Bilgin and Gul (2020); Viana and Pinto (2017); Wemyss et al. (2018); Zehir et al. (2019); Zikos et al. (2019); Zimmerling et al. (2016)	36	70.6
Challenges / Goals / Missions / Quests / Tasks	<i>Different sorts of objective-based features which require users to engage in particular (cooperative) activities to complete the objectives.</i> Afentoulidis et al. (2018); Arnab et al. (2016); Brito et al. (2015); Chalco et al. (2018); Chen et al. (2020); Dindar et al. (2021); Doumanis et al. (2019); Garcia-Sanjuan et al. (2018); Huang and Zhou (2020); Kolpondinos and Glinz (2020); Koroleva and Novak (2020); Leclercq et al. (2018); Lithoxidou et al. (2020); Lombriser et al. (2016); López-Faicán and Jaen (2020); Lounis et al. (2014); Luu and Narayan (2017); Mavridis et al. (2015); Morschheuser et al. (2019); Morschheuser and Maedche (2017); Morschheuser et al. (2017); Ramírez-Donoso et al. (2017); Riar et al. (2020); Sailer et al. (2017); Stoeffler et al. (2020); Uz Bilgin and Gul (2020); Wemyss et al. (2018); Ye et al. (2019); Zehir et al. (2019); Zimmerling et al. (2016)	30	58.8
Achievements (includes Rewards and Badges)	<i>Usually visually represented tokens given to users when they achieve a predefined goal. Can be implemented as group achievements, but cooperation can also be supported if users gain personal achievements for contributing to a collective effort.</i> Borrás-Gené et al. (2016); Chalco et al. (2018); Chen et al. (2020); Chen and Pu (2014); Dindar et al. (2021); Garcia-Sanjuan et al. (2018); Hasan et al. (2019); Hassan M.A (2019); Kolpondinos and Glinz (2020); Koroleva and Novak (2020); Lithoxidou et al. (2020); Lombriser et al. (2016); López-Faicán and Jaen (2020); Lounis et al. (2014); Marques et al. (2020); Morschheuser et al. (2019); Morschheuser and Maedche (2017); Morschheuser et al. (2017); Nivedhitha and Manzoor (2020); Papadakis and Kalogiannakis (2017); Ramírez-Donoso et al. (2017); Riar et al. (2020); Suh and Wagner (2017); Uz Bilgin and Gul (2020); Viana and Pinto (2017); Wemyss et al. (2018); Zehir et al. (2019); Zikos et al. (2019); Zimmerling et al. (2016)	29	56.9
Progress / Levels	<i>Represent advancement towards a goal. This can be individual advancement for engaging in cooperation or collective advancement towards a mutual goal.</i> Afentoulidis et al. (2018); Arnab et al. (2016); Bertholdo et al. (2018); Brito et al. (2015); Chen et al. (2020); Chen and Pu (2014); Garcia-Sanjuan et al. (2018); Hasan et al. (2019); Hassan M.A (2019); Kolpondinos and Glinz (2017); Kolpondinos and Glinz (2020); Koroleva and Novak (2020); Lithoxidou et al. (2020); Lombriser et al. (2016); Marques et al. (2020); Morschheuser and Maedche (2017); Morschheuser et al. (2017); Papadakis and Kalogiannakis (2017); Ramírez-Donoso et al. (2017); Riar et al. (2020); Sanina et al. (2020); Stoeffler et al. (2020); Suh and Wagner (2017); Uz Bilgin and Gul (2020); Viana and Pinto (2017); Wemyss et al. (2018); Zehir et al. (2019); Zikos et al. (2019)	28	54.9
Leaderboard / Ranking	<i>Enables comparison between users and drives cooperation by the desire of users to gain reputation or social status. Can also be implemented as a team leaderboard or ranking which involves inter-group competition and intra-group cooperation.</i> Afentoulidis et al. (2018); Borrás-Gené et al. (2016); Chen et al. (2020); Hasan et al. (2019); Hassan M.A (2019); Huang and Zhou (2020); Jagušt et al. (2018); Kolpondinos and Glinz (2020); Koroleva and Novak (2020); Kwak et al. (2018); Lithoxidou et al. (2020); Lombriser et al. (2016); Mader and Bry (2019); Morschheuser et al. (2019); Morschheuser et al. (2017); Riar et al. (2020); Sailer and Sailer (2020); Suh and Wagner (2017); Uz Bilgin and Gul (2020); Zehir et al. (2019); Zimmerling et al. (2016)	21	41.2
Teams	<i>Opportunity for individuals to join a group to socially interact and cooperate with each other.</i> Arnab et al. (2016); Garcia-Sanjuan et al. (2018); Huang and Zhou (2020); Kwak et al. (2018); Lithoxidou et al. (2020); López-Faicán and Jaen (2020); Luu and Narayan (2017); Mader and Bry (2019); Mavridis et al. (2015); Morschheuser et al. (2019); Morschheuser et al. (2017); Papadakis and Kalogiannakis (2017); Ramírez-Donoso et al. (2017); Riar et al. (2020); Sailer et al. (2017); Sailer and Sailer (2020); Sanina et al. (2020); Wemyss et al. (2018); Zikos et al. (2019)	19	37.3
Qualitative Feedback / Commenting	<i>Option for users to give each other feedback, thereby enabling communication, exchange of ideas or simply signaling appreciation towards each other.</i> Arnab et al. (2016); Chen and Pu (2014); Doumanis et al. (2019); Felszeghy et al. (2019); Feng et al. (2018); Garcia-Sanjuan et al. (2018); Hasan et al. (2019); Leclercq et al. (2017); Leclercq et al. (2018); Lithoxidou et al. (2020); Morschheuser and Maedche (2017); Ramírez-Donoso et al. (2017); Suh and Wagner (2017); Uz Bilgin and Gul (2020); Zimmerling et al. (2016)	15	29.4
Voting / Rating / Liking	<i>Mechanism that enables users to signal their opinion and appreciation or to collectively settle viewpoints or decide on ideas.</i> Arnab et al. (2016); Borrás-Gené et al. (2016); Doumanis et al. (2019); Kolpondinos and Glinz (2017, 2020); Leclercq et al. (2017); Leclercq et al. (2018); Lithoxidou et al. (2020); Lombriser et al. (2016); Suh and Wagner (2017); Uz Bilgin and Gul (2020); Viana and Pinto (2017); Zikos et al. (2019); Zimmerling et al. (2016)	14	27.5
User roles / Interdependent Roles / Team interdependence	<i>Roles enable users to take on an identity within a system. The identity can determine how users view themselves and their responsibilities within a team. It can create a situation of dependence between users in which the skills and efforts of different users need to be combined to accomplish a goal.</i> Arnab et al. (2016); Chalco et al. (2018); Chen et al. (2020); Garcia-Sanjuan et al. (2018); López-Faicán and Jaen (2020); Luu and Narayan (2017); Papadakis and Kalogiannakis (2017); Ramírez-Donoso et al. (2017); Sanina et al. (2020); Stoeffler et al. (2020)	10	19.6
Quiz	<i>A problem-solving task that can be defined as a team effort (i.e., team quiz) to support cooperation.</i> Felszeghy et al. (2019); Garcia-Sanjuan et al. (2018); Lombriser et al. (2016); Mader and Bry (2019); Mavridis et al. (2015); Ramírez-Donoso et al. (2017); Sailer and Sailer (2020); Wemyss et al. (2018)	8	15.7
Rules	<i>Provide guidelines for user actions and determine conditions for accomplishments, etc. A rule may specify that actions need to be completed in cooperation with others.</i> Brito et al. (2015); Chen and Pu (2014); Kolpondinos and Glinz (2017); Lithoxidou et al. (2020); Mavridis et al. (2015); Sanina et al. (2020); Uz Bilgin and Gul (2020); Zikos et al. (2019)	8	15.7
Time Limit	<i>Requires users to complete a (cooperative) task within a given amount of time.</i> Jagušt et al. (2018); Lithoxidou et al. (2020); Lombriser et al. (2016); Mavridis et al. (2015); Nivedhitha and Manzoor (2020); Sailer and Sailer (2020); Sanina et al. (2020); Viana and Pinto (2017)	8	15.7

(continued on next page)

Table 3 (continued)

Feature	Explanation / Sources	#	%
Avatar	<i>A personal visual representation of the user. Avatars may be used to represent oneself and identify others within a group.</i> Doumanis et al. (2019);Lombriser et al. (2016);Morschheuser et al. (2019);Morschheuser et al. (2017);Riar et al. (2020); Sailer et al. (2017);Uz Bilgin and Gul (2020)	7	13.7
Narrative	<i>Wields engagement with a system into a story. The narrative can set the foundation for cooperation (e.g., by telling the story of a team that must accomplish a mission together).</i> Jagušt et al. (2018);Lombriser et al. (2016);Morschheuser et al. (2017);Riar et al. (2020);Sailer et al. (2017)	5	9.8
Virtual Goods	<i>Objects, virtual currency, etc., that are often desirable for users to own and that can sometimes be traded with or gifted to other users.</i> Mavridis et al. (2015);Morschheuser et al. (2019);Suh and Wagner (2017)	3	5.9
Contest	<i>Involves a competitive edge by which users try to outperform each other but still reach a collective outcome (e.g., idea contest). Contests can also be completed as a team so that cooperating teams try to outperform other teams.</i> Borrás-Gené et al. (2016);Leclercq et al. (2018)	2	3.9
Team Events	<i>Synchronous events in which users meet to work together to accomplish a mutual goal.</i> Morschheuser et al. (2017);Riar et al. (2020)	2	3.9
Discovery / Exploration	<i>Enables users to search and encounter new facets, features, objects, tasks, etc., in a system, sparking curiosity. Can be designed so that cooperative engagement exploits the new and unknown facets of a system.</i> Doumanis et al. (2019)	1	2.0
Ownership	<i>Refers to access to or possession of certain items, components, collectives, etc., or an output of a user's own content creation that is perceived as being owned by the user.</i> Brito et al. (2015)	1	2.0
Shared Resources	<i>Resources, assets, tools, etc., that are available to a group of users and that can be cooperatively utilized.</i> Doumanis et al. (2019)	1	2.0
Virtual agent	<i>A computational character that communicates and supports a user in accomplishing a task, thus creating a cooperative link between a virtual agent and the user.</i> Stoeffler et al. (2020)	1	2.0

tasks (58.8%). Achievements and progress have been employed to roughly the same extent as the objective-based features (in 56.9% and 54.9% respectively). Design features such as points, scores, achievements, progress and levels motivate individuals by providing them with positive feedback for their participation in cooperative behavior, whereas challenges, goals, etc., give users clear (e.g., cooperative) objectives. In our review, we could observe that the implementation of all the above-mentioned features can be realized on an individualistic level by rewarding single individuals for engaging in cooperative behavior (e.g., via personal points, personal progress, etc.) (Chen et al., 2020; Feng et al., 2018; Kolpondinos & Glinz, 2020; Nivedhitha & Manzoor, 2020; Viana & Pinto, 2017), as well as on a collective level, by rewarding a group of users, for example, a team or an entire community (e.g., via community points, group progress, etc.), for their cooperative engagement (Arnab et al., 2016; Dindar et al., 2021; Lounis et al., 2014; Mavridis et al., 2015; Morschheuser et al., 2019). Similarly, objective-based features, such as challenges, missions, quests, and so forth can be predetermined as individual (Kolpondinos & Glinz, 2020; Lithoxidou et al., 2020; Lombriser et al., 2016) as well as joint activities (Luu & Narayan, 2017; Morschheuser et al., 2019; Ye et al., 2019).

Due to the cooperative nature of the contexts within the reviewed literature, it is not surprising that the option to join teams has played a role in several studies (in 37.3%). However, perhaps more surprisingly, a considerable number of the studies also report on using leaderboards (41.2%). While leaderboards or ranking mechanisms are very common and relevant gamification features in most contexts, their use seems rather controversial for cooperative contexts because they motivate individuals to perform better than others and thus arouse competition. Therefore, their application in cooperative settings needs to be carefully considered. In the reviewed literature, several studies employed leaderboards or rankings on a team level instead of on an individual level so that single user competition is avoided and instead group competition is promoted, which naturally also entails desirable cooperative interaction within the groups (Hassan M.A, 2019; Jagušt et al., 2018; Kwak et al., 2018; Mader & Bry, 2019; Sailer & Sailer, 2020).

While gamification is often implemented in a way that the system provides users automatically with positive feedback for their engagement (e.g., via points, badges, etc.), cooperation can also be achieved when users are empowered to socially interact and give each other feedback, for example, via voting, rating, liking (encountered in 27.5% of studies) as well as qualitative feedback (encountered in 29.4% of

studies). These design characteristics directly promote social interaction and thus seem to be particularly relevant for inducing cooperation. It is all the more surprising that such features have been employed in less than half of the reviewed literature.

Thirteen of the encountered features have been used in 10 or less (or less than 20%) of the reviewed studies. Naturally, not all of these features necessarily play an important role in motivating cooperation, however, there are several notable ones that may be especially relevant and even tailored for cooperative contexts. Above all, team interdependence (Arnab et al., 2016; Garcia-Sanjuan et al., 2018; López-Faican & Jaen, 2020) or interdependent roles (Luu & Narayan, 2017) seem to be promising attributes because goal attainment is dependent on cooperative activity between users who possess diverse skills that correspond to their occupied roles in the system. Further notable mentions from the set of rather uncommonly used features are team quizzes (Mavridis et al., 2015; Ramírez-Donoso et al., 2017) and synchronous team events (Riar et al., 2020), which can give users the chance for social bonding, as well as shared resources or virtual goods (Doumanis et al., 2019), that can be made available to a group of users for cooperative utilization. Such features can also be implemented to give users the opportunity for virtual gifting and thereby signal appreciation to others.

Reflecting on these observations from literature, it can be argued that some of the rather uncommon features may be just as promising or in some cases even more promising to motivate cooperation compared to some of the more popular gamification features. It is therefore remarkable that some of the more characteristically cooperative features (e.g., interdependent roles, shared resources, etc.) have not garnered more attention so far but are dwarfed by the seemingly fixated set of more prominent features. Therefore, it is relevant to expand our understanding of how we can achieve more tailored gamification features that are specifically targeted to produce collective intentions and cooperative behavior. We also observed that personal-level features (e.g., individual points, personal badges, etc.) and even features with competitive character (e.g., leaderboards) play an equally important role for motivating participation in cooperative settings as compared to group-level features (e.g., group points, group progress, etc.). Given that these approaches can be inherently different in terms of how they motivate user goals (i.e., individualistic vs. collective orientated goals) it seems crucial to better understand how such contrasting design features can apparently still achieve similar cooperative behavioral outcomes. Thus, we scrutinize this phenomenon more closely and make this a major talking point in the

Table 4
Overview of the encountered theories.

Theories/Concepts	Explanation	Sources	#	%
Motivational Affordance / Self-Determination Theory	Motivational affordance theory presupposes that the properties by which individuals interact with a system can satisfy motivational needs (Zhang, 2008), whereas self-determination theory specifies the human needs for autonomy, competence and relatedness, which are considered essential preconditions for psychological wellness (Deci & Ryan, 2008). Gamification has been argued to be capable of affording systems, similarly to video games, with features that let users experience intrinsically rewarding sensations of autonomy, competence and relatedness.	Bertholdo et al. (2018);Borrás-Gené et al. (2016); Chalco et al. (2018);Feng et al. (2018);Huang and Zhou (2020);Kolpondinos and Glinz (2020); Lombriser et al. (2016);Lounis et al. (2014);Luu and Narayan (2017);Marques et al. (2020); Morschheuser et al. (2019);Morschheuser and Maedche (2017);Sailer et al. (2017);Sailer and Sailer (2020);Suh and Wagner (2017);Van Toorn, Kirshner, and Gabb (2020);Ye et al. (2019)	17	33.3
Social Interdependence Theory	The notion of this theory is that there can be distinct interdependent relationships between individuals based on how their goals relate to each other (Johnson & Johnson, 1996, 2005). In the reviewed literature, social interdependence theory has been used to explore how different types of gamification features activate different goal orientations and interdependent relationships (i.e., cooperation, competition or individual engagement).	Dindar et al. (2021);Garcia-Sanjuan et al. (2018); Morschheuser et al. (2019);Morschheuser and Maedche (2017);Morschheuser et al. (2017); Ramírez-Donoso et al. (2017);Riar et al. (2020)	7	13.7
Flow Theory	Flow is a desirable mental state of full concentration or immersion, which comes to exist when an individual is faced with a task or challenge that is just barely matched by his or her skill or ability to overcome the challenge (Csikszentmihalyi, 1996). Gamification often specifies challenging tasks or goals and in the reviewed literature, the concept of flow was occasionally used to explain how gamification motivates participation in cooperative settings.	Bertholdo et al. (2018);Jagušt et al. (2018); Lombriser et al. (2016);López-Faican and Jaen (2020);Marques et al. (2020);Ye et al. (2019)	6	11.8
Goal-Setting Theory	Goal setting theory proposes that the setting of difficult goals can influence motivation, behavior and performance (Locke & Latham, 2006). This notion is applied to the gamification context because gamification, similar to games, is capable of defining challenging goals and may thus influence motivation, behavior and performance.	Bertholdo et al. (2018);Morschheuser et al. (2019); Morschheuser and Maedche (2017);Morschheuser et al. (2017);Riar et al. (2020)	5	9.8
Bartle's Taxonomy	This personality contingent taxonomy postulates four player types (achiever, explorer, socializer, and killer) in correspondence with general user preference patterns (Bartle, 1996). Initially proposed in a gaming context, this taxonomy has also been used to categorize users of gamified systems.	Afentoulidis et al. (2018);Kolpondinos and Glinz (2020);Zehir et al. (2019)	3	5.9
Customer Engagement	Concepts of customer engagement aim at understanding how customers can be drawn to a brand, a system, a community or other entities (Brodie, Hollebeek, Jurić, & Ilić, 2011). Gamification is viewed as an approach to promote customer engagement, for example in co-creation activities.	Leclercq et al. (2017);Leclercq et al. (2018)	2	3.9
Fogg's Behavioral Model	Fogg's behavior model comprises three elements, namely motivation, ability, and prompts, which all need to converge for a particular behavior to emerge (Fogg, 2009). It is a behavioral model which can serve as a conceptualization on how gamification shapes motivation and behavior.	Koroleva and Novak (2020);Zehir et al. (2019)	2	3.9
Hexad User Types	Similar to Bartle's taxonomy, the hexad user types typology is personality contingent and defines different user types (achievers, disruptors, socializers, philanthropists, players, and free spirits) in correspondence to user motivations in gamified systems.	Koroleva and Novak (2020);Zehir et al. (2019)	2	3.9
Social Influence Theory	Social influence theory provides a foundation for understanding how individuals are affected by significant others (Kelman, 1958). For example, people often have the urge to gain recognition from others or to adjust their behaviors to comply with social norms. Gamification can offer social components by which individuals may be influenced (e.g., recognition).	Huang and Zhou (2020);Wemyss et al. (2018)	2	3.9
We-Intention Theory	This theory suggests that individuals who are subject to we-intentions regard themselves as members of a group who perform actions collectively rather than individually (Tuomela, 1995). It has been employed to better understand how gamification can give rise to collective (we-)intentions and cooperation.	Morschheuser et al. (2017);Riar et al. (2020)	2	3.9
Broaden-and-build theory	According to this theory, subsets of positive or negative emotions can either widen (positive emotions) or narrow (negative emotions) the minds of individuals (Fredrickson, 2004). Gamification has been argued to possess the potential to address different positive emotions, thereby broadening the mind of users and supporting creative processes in cooperative settings.	Nivedhitha and Manzoor (2020)	1	2.0
Cognitive Apprenticeship Theory	This learning theory accentuates the relevance of a master teaching a skill to an apprentice (Collins, Brown, & Newman, 1988). This theory has been transferred to a gamified collaborative learning and role-taking scenario in which one individual takes on the role of the master to transfer knowledge to an apprentice.	Chalco et al. (2018)	1	2.0
Elaboration Likelihood Model	The general notion of the ELM (Petty & Cacioppo, 1986) is that, depending on the level of motivation, an individual is cognitively processing information received through a medium differently (i.e., via a central route if the individual is highly involved or sufficiently motivated, or a peripheral route if the individual is not sufficiently motivated). This concept was used to identify aspects that affect people's attitudes towards gamification in a cooperative setting.	Kwak et al. (2018)	1	2.0
Equity Theory	In its most simple form, equity theory proposes that individuals seek to maintain a balance between what they offer as a sort of input and what they receive as an output (Adams, 1963). In a gamification context, this notion has been applied to examine how mechanisms that create a win or lose situations affect user experiences in cooperative and competitive setups.	Leclercq et al. (2018)	1	2.0

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Table 4 (continued)

Theories/Concepts	Explanation	Sources	#	%
Experiential learning theory	This theory proposes that a person goes through different stages in a learning process with a main focus on experiential value (Kolb, 2015). Gamification can provide the necessary means to provide experiential value and motivate individuals throughout this learning process in cooperative settings.	Kolpondinos and Glinz (2020)	1	2.0
Goal Contents Theory	This theory postulates that the pursuit of some goals (e.g., intrinsic goals) contributes more to an individual's wellbeing than the pursuit of other goals (e.g., extrinsic goals). Based on this notion, possible benefits of implementing particular gamification design features, which introduce different (i.e., either intrinsic or extrinsic) goal settings, have been investigated.	Lounis et al. (2014)	1	2.0
Octalysis Framework	The octalysis framework (Chou, 2016) lays out eight core drives for human motivation, which can be addressed by gamification in cooperative contexts.	Zehir et al. (2019)	1	2.0
Social cognitive theory	Social cognitive theory suggests that individuals' thoughts, actions, knowledge acquisition, etc., are affected by interpersonal communication relationships and by observing others (Bandura, 2001). This understanding has been used to explain how collaborative processes of creative ideation can be supported in gamified systems.	Nivedhitha and Manzoor (2020)	1	2.0
Theory of network externalities	According to the theory of network externalities, an individual's perceived benefits increase with a higher number of other individuals in a network. Thus, benefits perceived through gamification (e.g., recognition effects) and participation in a gamified cooperative setting may be positively influenced if more peers are present in the cooperative network.	Nivedhitha and Manzoor (2020)	1	2.0
Theory of skill acquisition	Similarly to experiential learning theory, the theory of skill acquisition proposes that an individual goes through different learning stages (Dreyfus & Dreyfus, 2004). Gamification was used to offer different rewards in a cooperative setting, depending on the stage in which an individual currently resides.	Kolpondinos and Glinz (2020)	1	2.0

discussion of the present study (see Section 5).

4.3. Theoretical perspective

The by far most employed theories in the reviewed body of literature are self-determination and motivational affordance theory (in approx. 33% of the reviewed studies) (see Table 4). These theories are related in their conceptual understanding that human behavior is driven by desires and needs, and they have been important pillars for explaining how gamification motivates. The second-most employed theory in the reviewed literature is social interdependence theory (in approx. 14% of studies). Since this theory has a long history of explaining how cooperation emerges, it also seems relevant for explaining how gamification may motivate cooperation. However, as observed in the reviewed literature, this theory as well as other dedicated cooperative theories are only sparsely employed in gamification research and a long way from being on par with the more dominating theories of self-determination and motivational affordance. Therefore, it seems important that more research in the realm of gamification considers employing social interdependence theory or further cooperation theories to explain how cooperation can be achieved by gamification. Flow theory is the third-most encountered theory in the reviewed studies (in approx. 12%). Prior literature argues that flow can also be experienced collectively (i.e., social flow) (Walker, 2010), however, inquiries about social flow have not been discovered in the reviewed literature, which seems to be a gap worth addressing in future research that deals with cooperative perspectives of gamification. There have been 17 further theories, concepts, or frameworks, however, they have only been mentioned five or fewer times in the analyzed corpus of literature (see Table 4 for a full overview and a brief description of the encountered theories).

In Fig. 4, we categorized the encountered theories into several clusters in accordance with their main character. Taken together, with the exception of motivational affordance and self-determination theory, the cooperative gamification literature is diverse in terms of the employed theories, most of which have been explored only to a very limited extent thus far and accordingly need further investigation. While several of the encountered theories involve social components (e.g., social cognitive theory, social influence theory, etc.), they can hardly be

considered true cooperative theories. Therefore, holistically speaking, it seems striking that so far, there has been only a trifling use of dedicated cooperative theories, as can be seen in Fig. 4. Besides social interdependence theory, the theory of we-intentions has been one of the scarce cooperative theories in the reviewed literature to explain how gamification can address collective intentions (Morschheuser et al., 2017; Riar et al., 2020). The notion of this theory is that compared to the more traditional individual intentions, users with we-intentions regard themselves as members of a group who perform actions collectively and are thus subject to collective intentions rather than contributing to group performances individually and being subject to individual intentions (Tuomela, 1995, 2005). In addition, via the use of Bartle's taxonomy or the Hexad framework, there have been several attempts to better understand different user types and how their personality relates to preferences in terms of the use of different features in a gamified system and their corresponding behaviors (Afentoulidis et al., 2018; Koroleva & Novak, 2020; Zehir et al., 2019). Such frameworks could be relevant to further deepen our understanding with regards to the types of users that are receptive to cooperative gamification design principles and how to involve them better in cooperative activity.

4.4. Methodological setups in the reviewed literature

The majority of the analyzed studies conducted experiments (82.4%) whereas in a relatively small number of studies pure survey research was conducted (17.6%) (see Table 5). For the experimental studies, the setup mostly involved a comparison of different gamification conditions (33.3%), such as the comparison of different design approaches, the use of gamification in online vs. offline (i.e., presence) conditions or within different group sizes or group setups. In addition to investigating different gamification conditions, a considerable number also compared the effects of gamification to non-gamified conditions (25.5%). Mostly, these studies showcased that gamification led to more participation in cooperative activity and overall confirm that gamification can be an effective approach to motivate user engagement. Moreover, several studies also investigated a single gamification condition (23.5%) and assessed, among other things, how gamification was perceived by the users. The smallest number of studies conducted survey research

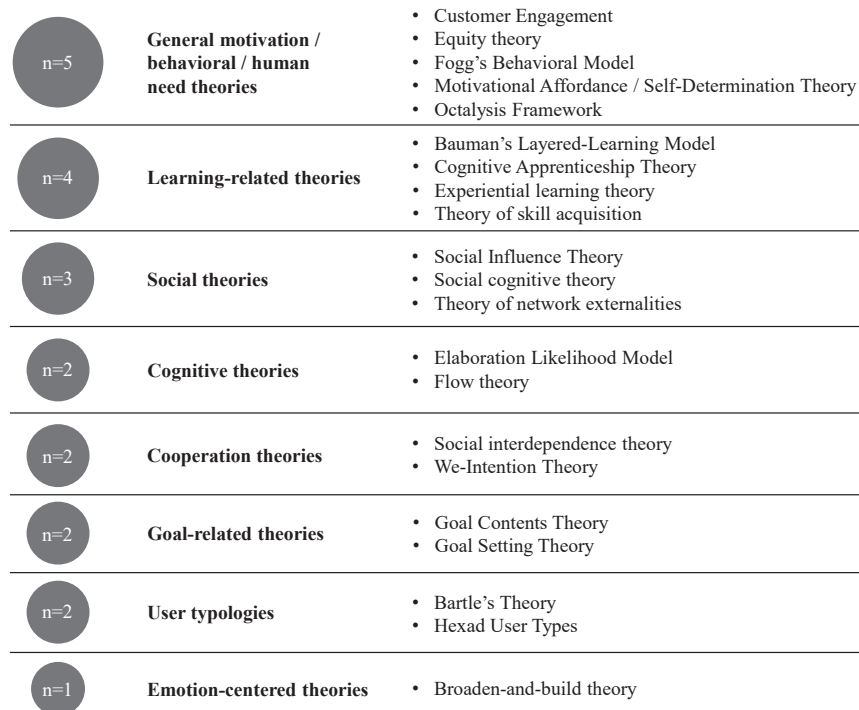


Fig. 4. Theories categorized into clusters, Note: Theories may fit into more than one cluster, but have been categorized into one main cluster to which we deem they fit best.

Table 5
Overview of the encountered methodological setups.

Methodological setup	Source	#	%
Experimental studies		42	82.4
Comparison of different gamification conditions (e.g., different designs, online vs. presence, different group setups, etc.)	Afentoulidis et al. (2018); Arnab et al. (2016); Chen and Pu (2014); Dindar et al. (2021); Doumanis et al. (2019); Felszeghy et al. (2019); Garcia-Sanjuan et al. (2018); Hassan M.A (2019); Jagušt et al. (2018); Koroleva and Novak (2020); López-Faicán and Jaen (2020); Lounis et al. (2014); Mader and Bry (2019); Morschheuser et al. (2019); Sailer et al. (2017); Sanina et al. (2020); Wemyss et al. (2018)	17	33.3
Comparison of gamified vs. non-gamified condition	Bertholdo et al. (2018); Brito et al. (2015); Chalco et al. (2018); Chen et al. (2020); Kolpondinos and Glinz (2020); Lombriser et al. (2016); Marques et al. (2020); Morschheuser et al. (2019); Morschheuser and Maedche (2017); Papadakis and Kalogiannakis (2017); Sailer and Sailer (2020); Uz Bilgin and Gul (2020); Van Toorn et al. (2020)	13	25.5
Single gamified condition (e.g., one gamified system with pre- and post-survey)	Hasan et al. (2019); Kolpondinos and Glinz (2020); Leclercq et al. (2017); Leclercq et al. (2018); Lithoxidou et al. (2020); Luu and Narayan (2017); Mavridis et al. (2015); Stoeffler et al. (2020); Viana and Pinto (2017); Zehir et al. (2019); Zikos et al. (2019); Zimmerling et al. (2016)	12	23.5
Survey research (e.g., SEM)	Borrás-Gené et al. (2016); Feng et al. (2018); Huang and Zhou (2020); Kwak et al. (2018); Morschheuser et al. (2017); Nivedhitha and Manzoor (2020); Riar et al. (2020); Suh and Wagner (2017); Ye et al. (2019)	9	17.6
Sum		51	100

(17.6%), usually employing structural equation modeling (SEM) which allows for drawing complex relationships between gamification and psychological as well as behavioral outcomes. Since the present literature review only focuses on empirical studies, no pure case studies or design studies were included.

4.5. Effects of gamification

As revealed in Table 6, a slight majority of the screened literature (56.9%) reported primarily on positive results, whereas the remaining studies (43.1%) reported on a mix of positive, neutral, non-significant, and in a few cases also negative or adverse effects. Overall, the results indicate that gamification can be an effective approach to motivate participation in cooperative activity. However, since there is also a significant number of studies that report on mixed results, there is apparently also a certain level of ambiguity in terms of whether and

under what circumstances gamification is effective for the purpose of motivating cooperation. Some of the reviewed literature hints at why gamification can sometimes be ineffective to motivate cooperative activity. For example, in one study it was argued that the target group (i.e., competitive athletes) was in favor of competitive design features rather than cooperative features (Arnab et al., 2016). On the other hand, several studies reported on results directly opposing this, indicating that cooperative design choices were preferred over competitive (Zimmerling et al., 2016) or individualistic (Felszeghy et al., 2019) configurations. Yet another study found no considerable differences in user preferences between purely cooperative or competitive design strategies, but rather that a mix of both was most preferable (Morschheuser et al., 2019). This implies that research is in dire need to understand the circumstances better (e.g., the context, target group, etc.), under which one or the other gamification approach is more or less effective and preferable.

Table 6
Overview of the encountered results and methodology.

Results	Mainly Positive Results	Blend of positive, neutral, non-significant or negative results	#	%
Descriptive	Borrás-Gené et al. (2016); Brito et al. (2015); Hassan M.A (2019); Kolpondinos and Glinz (2020); Lithoxidou et al. (2020); Viana and Pinto (2017)	Mader and Bry (2019); Zehir et al. (2019); Zikos et al. (2019)	9	17.6
Inferential	Chen and Pu (2014); Dindar et al. (2021); Felszeghy et al. (2019); Feng et al. (2018); Garcia-Sanjuan et al. (2018); Hasan et al. (2019); Kolpondinos and Glinz (2017); Koroleva and Novak (2020); Kwak et al. (2018); Leclercq et al. (2017); López-Faican and Jaen (2020); Lounis et al. (2014); Morschheuser et al. (2019); Morschheuser et al. (2017); Nivedhitha and Manzoor (2020); Ramírez-Donoso et al. (2017); Sailer et al. (2017); Sanina et al. (2020); Stoeffler et al. (2020); Suh and Wagner (2017); Van Toorn et al. (2020); Wemyss et al. (2018); Ye et al. (2019)	Afentoulidis et al. (2018); Arnab et al. (2016); Bertholdo et al. (2018); Chalco et al. (2018); Chen et al. (2020); Doumanis et al. (2019); Huang and Zhou (2020); Jagušt et al. (2018); Leclercq et al. (2018); Lombriser et al. (2016); Luu and Narayan (2017); Marques et al. (2020); Mavridis et al. (2015); Morschheuser et al. (2017); Papadakis and Kalogiannakis (2017); Riar et al. (2020); Sailer and Sailer (2020); Uz Bilgin and Gul (2020); Zimmerling et al. (2016)	42	82.4
#	29	22	51	–
%	56.9	43.1	–	100

Not only the target group but also the group size may play a role for the effectiveness of cooperative gamification as indicated by [Mader and Bry \(2019\)](#), who found that small groups were more receptive to team-based gamification compared to large groups or communities. Arguably, this has to do with the fact that meaningful social relationships are more likely established in smaller groups compared to larger communities. Thus, in smaller groups, in which users can more easily fathom with whom they are cooperating, features of cooperative nature may also be more relevant and more severely used. Moreover, special attention needs to be paid to potential adverse effects that can emerge from certain design decisions. For example, one study found that competitive design had demotivating effects on users ([Zimmerling et al., 2016](#)) whereas several other studies indicate that desirable behavioral outcomes (e.g., cooperation) can, under circumstances, be canceled out if features of cooperative, competitive or individualistic nature are used simultaneously ([Afentoulidis et al., 2018](#); [Leclercq et al., 2018](#); [Morschheuser et al., 2017](#); [Riar et al., 2020](#)).

4.6. Outcomes of gamification

4.6.1. Psychological outcomes

With regard to the psychological outcome variables, it was mostly analyzed how gamification can motivate engagement in cooperative activity via providing users with intrinsically fulfilling (e.g., fun and enjoyable) experiences (in 33.3% of studies). Being intrinsically motivated means that users engage in an activity for its own sake (e.g., because it is interesting, fun, enjoyable, satisfying, etc.) and not because it is enforced by external rewards ([Deci & Ryan, 2008](#)). Gamification has been consistently argued to possess the ability to invoke intrinsically rewarding outcomes ([Xi & Hamari, 2019](#)) and it is by definition an approach that aims at enhancing services and information systems with gameful affordances that make their use more appealing ([Hamari, 2019](#)). It seems all the more plausible why a considerable number of the analyzed studies explained how gamification motivates engagement in cooperative activity via the lens of intrinsic motivational outcomes. As [Table 7](#) reveals, there have been several further outcomes that are relevant for explaining participation in gamified cooperative settings. Gamification can, for example, affect perceptions related to usability and user experience (each encountered in 11.8% of studies) as much as it can shape attitudes towards a system or towards cooperation (in 9.8% of studies). All of these aspects are well-known determinants for the adoption of information systems and constituents of prominent adoption models, such as the technology acceptance model (TAM) ([Davis, Bagozzi, & Warshaw, 1989](#)). The screened literature further relied on the notion that gamification can support perceptions of immersion (e.g., temporal immersion, emotional immersion, and spatial immersion), which can support overall user involvement and adoption of cooperative systems ([Chen et al., 2020](#); [Doumanis et al., 2019](#)). The emotional efficacy of gamification has also been of interest in several of the analyzed

primary studies. [López-Faican and Jaen \(2020\)](#) found that gamification can elicit different emotional responses, such as curiosity and enthusiasm whereas [Morschheuser et al. \(2017\)](#) found that the prospect of cooperating with others via game-like features may invoke positive anticipated emotions, which can shape cooperative intentions. On the other hand, [Leclercq et al. \(2018\)](#) express the need to be wary of potential negative emotional responses of cooperating individuals, such as anger or irritation, that may emerge if they perceive that others are misusing competitive mechanics. These and other potential issues indicate that gamifying cooperative activity is not a straightforward venture, but one that requires careful consideration in terms of which design principles should be used and which ones should be avoided to mitigate potential drawbacks or unwanted effects.

4.6.2. Social outcomes

Social dynamics are important preconditions for cooperation ([Chen et al., 1998](#); [Driskell et al., 2018](#)) and given that one of the overarching objectives of the present study is to get a better understanding of how gamification motivates cooperation, an intriguing question is what social outcomes gamification is capable of evoking. The observations from the reviewed studies are summarized in [Table 8](#). In particular, the analyzed literature reports that gamification can support individuals to make social connections, establish social bonds and cultivate social relatedness (e.g., via features that connect users, motivate common goals, allow for communication, or that establish otherwise common ground between users) ([Dindar et al., 2021](#); [Feng et al., 2018](#); [Leclercq et al., 2018](#); [Sailer & Sailer, 2020](#); [Sailer et al., 2017](#); [Ye et al., 2019](#)). For example, social relatedness is an important aspect of self-determination theory and a crucial determinant for motivation. Further theoretical sound social determinants that have been encountered in the reviewed literature to motivate cooperative activity are cooperative goals, group norms, social identity and joint commitment, which are all aspects that can be invoked by cooperative features (rather than individualistic features) and that have been argued to be crucial prerequisites to activate cooperative intentions rather than individualistic intentions ([Morschheuser et al., 2017](#); [Riar et al., 2020](#)). The reviewed literature also reveals that gamification can support group cohesion. [Uz Bilgin and Gul \(2020\)](#) show that cohesion was higher in a gamified scenario compared to a non-gamified group setting. Interestingly, [Kwak et al. \(2018\)](#) found that team leaderboards played a role in motivating group cohesion, indicating that cohesion can be cultivated if a cooperating group stands in competition with another group.

According to [López-Faican and Jaen \(2020\)](#) and [Stoeffler et al. \(2020\)](#), a cooperative-based gamified setting can also help develop social or collaborative skills. The study by [Stoeffler et al. \(2020\)](#) is unique in the sense that cooperation takes place between a user and a virtual agent rather than between humans, giving it an interesting perspective as to how gamification can also be employed to motivate cooperation between humans and computer-based (virtual) agents. By investigating

Table 7
Overview of the encountered psychological outcomes.

Outcomes	Sources	#	%
Intrinsic motivation / Fun / Satisfaction/ Enjoyment / Playfulness	Chalco et al. (2018);Dindar et al. (2021);Doumanis et al. (2019); Felszeghy et al. (2019);Feng et al. (2018);Garcia-Sanjuan et al. (2018); Leclercq et al. (2018);López-Faican and Jaen (2020);Lounis et al. (2014); Luu and Narayan (2017);Mader and Bry (2019);Morschheuser et al. (2019);Morschheuser and Maedche (2017);Sailer and Sailer (2020); Sanina et al. (2020);Suh and Wagner (2017);Ye et al. (2019)	17	33.3
Perceived Usability	Brito et al. (2015);Doumanis et al. (2019);Lithoxoidou et al. (2020); Ramírez-Donoso et al. (2017);Viana and Pinto (2017);Zikos et al. (2019)	6	11.8
User / work experience	Garcia-Sanjuan et al. (2018);Leclercq et al. (2018);Lithoxoidou et al. (2020);Nivedhitha and Manzoor (2020);Ramírez-Donoso et al. (2017); Zikos et al. (2019)	6	11.8
Attitude	Felszeghy et al. (2019);Mavridis et al. (2015);Morschheuser et al. (2017); Papadakis and Kalogiannakis (2017); Uz Bilgin and Gul (2020)	5	9.8
Emotions	Doumanis et al. (2019);Leclercq et al. (2017);Lombriser et al. (2016); López-Faican and Jaen (2020); Morschheuser et al. (2017)	5	9.8
Intentions	Huang and Zhou (2020); Morschheuser and Maedche (2017); Morschheuser et al. (2017);Riar et al. (2020);Zimmerling et al. (2016)	5	9.8
Cognitive	Doumanis et al. (2019);Leclercq et al. (2017);Leclercq et al. (2018); Lombriser et al. (2016)	4	7.8
Preferences / perception of gamification	Borrás-Gené et al. (2016);Chen and Pu (2014);Felszeghy et al. (2019); Garcia-Sanjuan et al. (2018)	4	7.8
Pragmatic / Utilitarian / Usefulness perceptions	Leclercq et al. (2018);Morschheuser et al. (2019);Zikos et al. (2019)	3	5.9
Creativity	Lombriser et al. (2016);Nivedhitha and Manzoor (2020)	2	3.9
Immersion	Chen et al. (2020);Doumanis et al. (2019)	2	3.9
Self-efficacy	Feng et al. (2018);Sanina et al. (2020)	2	3.9
Willingness to Recommend System	Morschheuser et al. (2019);Sanina et al. (2020)	2	3.9
Information Processing	Kwak et al. (2018)	1	2.0
Perceived choice	Chalco et al. (2018)	1	2.0
Self-presentation	Feng et al. (2018)	1	2.0

how gamification can under circumstances lead to social overload, Huang and Zhou (2020) provide another rare perspective, namely that of potential negative social outcomes in gamified cooperative settings. The authors argue that cooperative-based gamification can lead to social pressure and consequently social overload if individuals perceive that they exert too much effort on social interaction and on maintaining social relationships or if they feel pressure to reciprocate cooperative behavior. This brings attention to possible detrimental effects and raises the question what other possible negative aspects can be related to cooperative gamification design. So far, there has been little research that explores the possible detrimental outcomes of cooperative gamification implementations.

The study by Huang and Zhou (2020) further reveals that the rather self-centered social outcome of recognition is a core driver for the use of a cooperative system, whereas, for example, Riar et al. (2020) found that altruism can be an important factor as well. This raises several intriguing questions, such as how gamification can address both of these

Table 8
Overview of the encountered social outcomes.

Outcomes	Sources	#	%
Relatedness / Social Bonds / Social Connection	Dindar et al. (2021);Feng et al. (2018); Leclercq et al. (2018);Sailer et al. (2017); Sailer and Sailer (2020);Ye et al. (2019)	6	11.8
Cohesion	Kwak et al. (2018);Uz Bilgin and Gul (2020)	2	3.9
Collaborative skills	López-Faican and Jaen (2020);Stoeffler et al. (2020)	2	3.9
Altruism	Riar et al. (2020)	1	2.0
Collective Awareness	Koroleva and Novak (2020)	1	2.0
Cooperative Goals	Riar et al. (2020)	1	2.0
Group Norms	Morschheuser et al. (2017)	1	2.0
Joint Commitment	Morschheuser et al. (2017)	1	2.0
Recognition	Huang and Zhou (2020)	1	2.0
Social Identity	Morschheuser et al. (2017)	1	2.0
Social Overload	Huang and Zhou (2020)	1	2.0

motivational counterparts (i.e., self-interest and altruism), if they can persist simultaneously, if one is more preferable to motivate cooperative activity or under what circumstances one or the other motivational outcome should be targeted by gamification to motivate cooperation. These results and questions highlight that designing cooperative gamification requires a good understanding of how different gamification design features address different motivational outcomes that can potentially lead to different demeanors.

4.6.3. Behavioral outcomes

Concerning the behavioral outcomes, the reviewed literature primarily investigated how gamification affects user participation and contribution in cooperative settings (see Table 9). More precisely, studies commonly assessed if and how the exploitation of gamification results in higher acceptance or more extensive usage of cooperative systems, increased individual contribution to group performances or to community objectives as well as increased social interaction and collaboration. Depending on the context, cooperative engagement can take different forms. It can mean sharing ideas in crowdsourcing endeavors, engaging in collaborative learning, exchanging know-how and information in knowledge integration ventures, working together on fitness goals, collaborating on projects, and so on. A significant number of the analyzed studies also examined if the use of gamification can increase performance, e.g., in terms of better academic achievements (Hassan M.A, 2019; Uz Bilgin & Gul, 2020), higher quantity of user output (Lombriser et al., 2016), better physical performance (Chen & Pu, 2014) better team performance (Kwak et al., 2018), etc. Several studies also investigated the potential of gamification to enhance the quality of contributions or cooperation, and if cooperative-based gamification can bring about behavioral change, for example, in terms of more environmentally friendly behavior (Wemyss et al., 2018). Overall, the reviewed literature indicates that gamification can bring about different cooperative behaviors (e.g., participation in crowdsourcing, cooperative learning, communication, knowledge and idea sharing, etc.) enhanced performance outcomes, and quality of (cooperative) contribution.

5. Discussion

The objectives of this study have been to conceptualize gamified cooperation as well as to reflect on the existing knowledge from literature to determine how gamification has been previously employed to motivate cooperation and to explore what is known about the effects of gamification in cooperative settings. To address these objectives, we first developed a framework to theorize the gamification of cooperation (Fig. 1), and second, we conducted a comprehensive systematic review of the empirical cooperative-based gamification literature (n = 51).

Table 9
Overview of the encountered behavioral outcomes.

Outcomes	Sources	#	%
Engagement / Participation / System usage / Contribution / Increased social interaction / Collaboration	Afentoulidis et al. (2018); Arnab et al. (2016); Bertholdo et al. (2018); Borrás-Gené et al. (2016); Chalco et al. (2018); Chen et al. (2020); Chen and Pu (2014); Feng et al. (2018); Garcia-Sanjuan et al. (2018); Hasan et al. (2019); Hassan M.A (2019); Kolpondinos and Glinz (2017, 2020); Leclercq et al. (2017); Leclercq et al. (2018); Lithoxidou et al. (2020); López-Faican and Jaen (2020); Mader and Bry (2019); Marques et al. (2020); Morschheuser et al. (2019); Ramirez-Donoso et al. (2017); Suh and Wagner (2017); Van Toorn et al. (2020); Viana and Pinto (2017); Wemyss et al. (2018); Ye et al. (2019); Zikos et al. (2019)	27	52.9
Performance	Chalco et al. (2018); Chen et al. (2020); Chen and Pu (2014); Dindar et al. (2021); Doumanis et al. (2019); Felszeghy et al. (2019); Garcia-Sanjuan et al. (2018); Hassan M.A (2019); Jagust et al. (2018); Kolpondinos and Glinz (2017); Kwak et al. (2018); Lombriser et al. (2016); Mavridis et al. (2015); Papadakis and Kalogiannakis (2017); Ramirez-Donoso et al. (2017); Sailer and Sailer (2020); Sanina et al. (2020); Uz Bilgin and Gul (2020); Van Toorn et al. (2020); Viana and Pinto (2017)	20	39.2
Quality of Contribution / Collaboration	Afentoulidis et al. (2018); Chen et al. (2020); Garcia-Sanjuan et al. (2018); Lombriser et al. (2016); Suh and Wagner (2017); Viana and Pinto (2017)	6	11.8
IT Acceptance / Adoption	Lithoxidou et al. (2020); Marques et al. (2020); Zikos et al. (2019)	3	5.9
Behavioral Change	Wemyss et al. (2018); Zehir et al. (2019)	2	3.9

The present study is to our knowledge one of the first that provides a structured overview of the contexts in which gamification is used to support cooperative activity (Section 4.1), what gamification features have been the most prevailing in cooperative settings (Section 4.2), what theories (Section 4.3) as well as methodologies (Section 4.4) have so far governed the empirical cooperative-based gamification literature, and what effects have been observed of using gamification in cooperative settings (Section 4.5 & Section 4.6).

While in the reviewed studies, gamification has been predominantly used in educational and crowdsourcing settings, several further applicable contexts have been encountered in which gamification can support cooperative engagement, such as in sustainable behavior, fitness, shopping, software development as well as other work-related scenarios, indicating the multidisciplinary virtue of gamification for the purpose of motivating cooperation.

With regards to the used gamification features, it became apparent that well-established and proven features such as points, score, challenges, achievements, progress, and levels as well as leaderboards and rankings have been the most prevailing, whereas more unique and specifically tailored cooperative features have been less of a focus point. This is surprising and at the same time calls for further investigation into how collective, individualistic, and competitive structures can support

cooperation. Generally speaking, the reviewed literature reveals that there is not the one right approach to achieve cooperation by gamification, but that there are different options, which we scrutinize below in Section 5.2. *Practical implications.*

In terms of the employed theories, we found that self-determination and motivational affordance theory dictate inquiries into the effects of cooperative-based gamification, while dedicated cooperative theories are still rare and unquestionably require more attention in future research. The encountered methodologies reach from SEM studies to experimental setups in which gamified platforms have been compared to non-gamified platforms and setups in which different gamification designs have been compared to each other. Our review helped structure the existing theoretical and methodological efforts of the empirical cooperation-based gamification literature and points the way for further research in Section 5.2. *Future Research Agenda.*

5.1. Theoretical implications

One of the main objectives of the present literature review has been to explore how gamification motivates cooperation (RQ1). Based on our proposed framework for gamifying cooperation, which we introduced in the background section (Fig. 1), as well as the observations from the reviewed studies, we are able to formulate three different approaches by which gamification can motivate cooperative activity based on whether gamification is designed to yield (1) personal goals and benefits (see 5.2.1 *Individualistic Approach*), (2) cooperative goals and benefits (see 5.2.2 *Collective Approach*) or (3) a combination of both (see 5.2.3 *Hybrid Approach*). An illustration of the design approaches in accordance with our proposed framework for gamifying cooperation is provided in Fig. 5. It shows the dynamics (indicated as arrows) between the user motives, gamification design, psychological outcomes and behavioral outcomes that have been theorized in our framework and reaffirmed by the results of our literature review. Fig. 5 indicates that the users' sentiment (i.e., individualism or collectivism) determine the use and preference of particular gamification features (i.e., individualistic, collective, or a hybrid of both) by which the users can satisfy their specific (e.g., intrinsic) needs. For example, the individualistic motives or needs (e.g., need for self-enhancement, recognition, etc.) can be satisfied via individualistic design features, such as personal points, individual achievements, leaderboards, and so on. On the other hand, collectivistic motives and needs (e.g., need for relatedness, cohesion, etc.) can be satisfied via socializing features and other cooperative-based features that create a "we"-feeling, such as team interdependence, mutual goals, team achievements, and so on (subsumed under the collectivistic design approach). At the same time, we theorized that in reverse, the gamification design features can influence individualistic or collectivistic sentiment, which is why in Fig. 5, the arrows from the psychological outcomes, which are invoked by gamification, lead back to the motives (i.e., the psychological outcomes that gamification can give rise to, influence, reaffirm or update user motives). The results of our review show that the aspects of our framework are addressed by the screened literature, supporting the tenacity of the framework. At the same time, the framework represents an important theoretical foundation that paves the way for future research on gamifying cooperative activity. For example, it lays the foundation to investigate the interplay between gamification affordances and the motives of individuals to cooperate as well as how gamification can give rise to cooperation via different routes, namely based on individualism as well as collectivism and the corresponding individualistic and social-psychological outcomes.

Pertaining to the effects of gamification (RQ2), we found that the majority of the analyzed studies reported on positive oriented results, demonstrating that gamification can give rise to manifold psychological and intrinsically rewarding outcomes, such as enjoyment, satisfaction, positive experiences and emotions, to name a few. Importantly, we also encountered several crucial social outcomes that gamification is capable of evoking, namely relatedness, cohesion, group norms, altruism, joint

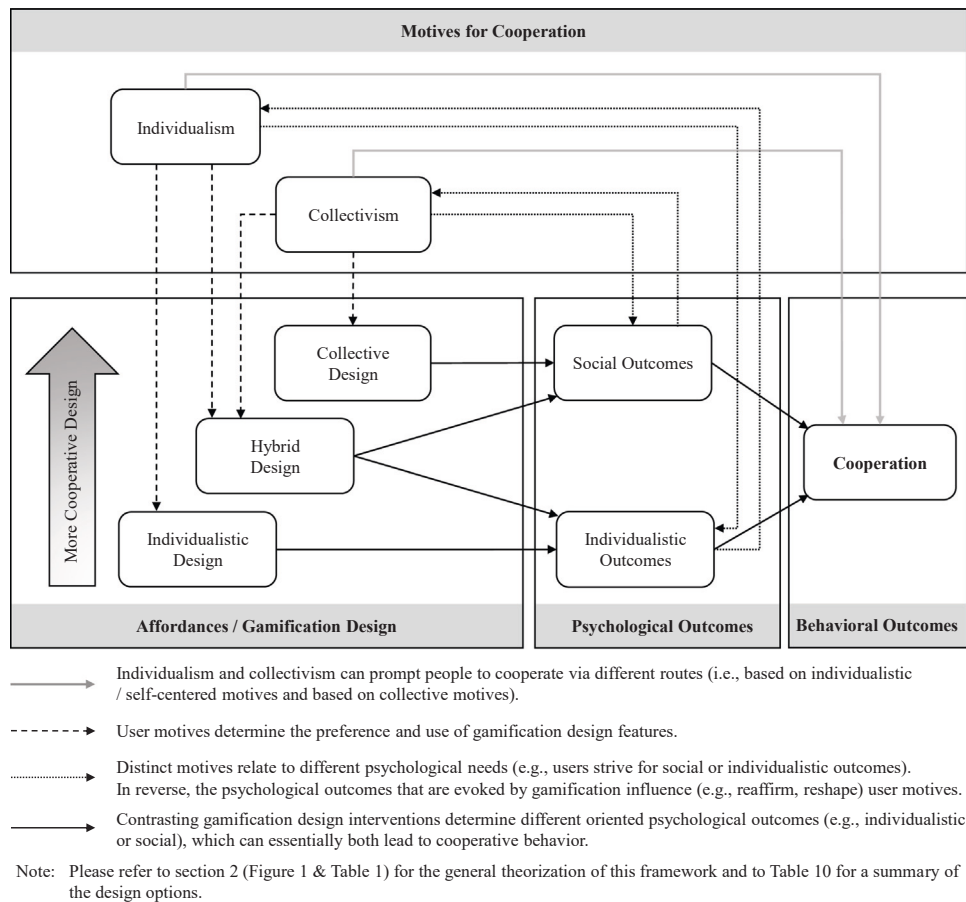


Fig. 5. Design approaches in accordance with our framework for gamifying cooperation.

commitment, cooperative skills, mutual goals, and further relevant social dynamics. These psychological and social outcomes can transcend into stronger interpersonal connections, enhanced social interaction, higher acceptance of cooperative systems and increased participation in cooperative activity. However, we also encountered that gamification did not always work as intended, as indicated in the considerable number of studies that report on a mix of positive, non-significant, neutral or in a few cases even unfavorable effects. This comes to show that gamifying cooperative activity is challenging and requires careful consideration of potential pitfalls, some of which we discuss below in the practical implications.

5.2. Practical implications

In the following, we utilize our proposed framework and integrate it with the results of our literature review to formulate three different options to motivate cooperation by gamification, including their strengths and weaknesses. A summary of the proposed design options as well as their strengths and potential weaknesses is provided in Table 10. In Table 11, we categorize each study from our literature review into one of the three proposed approaches by analyzing their design choices based on the understanding of our framework for gamifying cooperation.

5.2.1. Individualistic approach

As observed in the reviewed literature, gamification often motivates individuals on a personal level, namely by motivating personal goals and providing personal benefits when individuals display cooperative behavior (e.g., via personal points, personal badges, personal achievements, etc.). These individualistic features not only motivate personal

goals but can occasionally even spark competition, because users may compare scores, levels or other achievements. These design choices can arguably seem paradoxical considering the general objective to engage users in cooperative activity. Nevertheless, as indicated by previous groundwork on individualistic motives for cooperation (Chen et al., 1998) and as observed in several of the reviewed studies, this approach can be adequate to motivate engagement in diverse cooperative systems and scenarios. Thus, the seemingly most straightforward way to engage people in cooperation via gamification is to rely on some of the most prominent features, which commonly provide a personal benefit and address individual motivations. From the body of reviewed literature, 25.5% of studies employed such an individualistic approach (see Table 11). It has been predominantly used in crowdsourcing contexts and the majority of studies found this approach to be effective to increase cooperative engagement (see Fig. 6). Many crowdsourcing systems rely on motivating engagement via personal reputation mechanics and thus it is not surprising that this individualistic approach has been well embraced in this and other fields. Nevertheless, it is important to consider that there can also be potential drawbacks with this design option. Foremost, with this approach, cooperation is based on self-centered motivation and individualism. Thus, true cooperative mindsets and social dynamics often fall short (Morschheuser et al., 2017; Riar et al., 2020), which can prevent users from establishing sincere cooperative relationships or perceiving intrinsically fulfilling social outcomes such as relatedness, group norms, social identity, etc. Instead, a culture of individualism is cultivated in which users get rewarded for individually contributing to a collective outcome. Despite these potential shortcomings, this individualistic approach might be especially desirable for users who value autonomy and affordances by which they can address personal competence needs, which are important needs that

Table 10
Summary of the proposed design approaches.

	Individualistic	Collective	Hybrid
Motives	Motivates individuals to engage in cooperation based on individualism (i.e., personal or self-centered benefits and goals)	Motivates individuals to engage in cooperation based on collectivism (i.e., collective benefits and goals)	Motivates individuals to engage in cooperation based on a blend of personal and collective benefits and goals
Design (Reinforcement / incentives for cooperation)	<ul style="list-style-type: none"> • Personal avatar • Personal points • Personal badges • Individual progress • Individual achievements • ... 	<ul style="list-style-type: none"> • Team progress • Team challenges • Shared resources • Team achievements • Interdependent roles • ... 	<ul style="list-style-type: none"> • Team competition • Individual and team goals • Individual and team progress • ...
Psychological outcomes	Weak focus on social dynamics and instead more targeted towards individualistic outcomes, e.g., <ul style="list-style-type: none"> • Self-efficacy • Self-presentation • Personal competence • Personal usefulness • Individual recognition • ... 	Usually cultivates social dynamics between individuals, e.g., <ul style="list-style-type: none"> • Altruism • Cohesion • Social bonds • Group norms • Social identity • Joint Commitment • Collective efficacy • ... 	Involves both, focus on social dynamics and individual outcomes.
Strengths	Straightforward design using established gamification design features	Cultivates collectivism, social dynamics, stronger social ties, and more genuine cooperative relationships	Provides a multitude of motivational facets by addressing both, personal and collective motivational dimensions
Potential weaknesses	Can cultivate individualism, self-centered motivation, and competition rather than collectivism and sincere cooperative mindsets	Negligence of well-established and often desirable (individualistic / competitive) design features	Risk of motivating conflicting goal orientations and may interfere with the emergence of cooperative intentions or disrupt cooperative behavior of collectivistic individuals

drive human behavior according to self-determination theory (Deci & Ryan, 2008) and which have consistently been argued to be motivational outcomes that can be addressed by gamification (Xi & Hamari, 2019). In line with suggestions on how to gamify information systems, it is necessary that practitioners first seek to understand their target group before gamifying a system (Morschheuser, Hassan, Werder, & Hamari, 2018). If practitioners conclude that their target group enjoys individual engagement, personal achievements and competition, this individualistic design approach can be fitting to motivate cooperation by

Table 11
Categorization of the reviewed literature into the proposed approaches.

Approach	Sources	#	%
Individualistic	Arnab et al. (2016)*; Chen et al. (2020); Feng et al. (2018); Hasan et al. (2019); Kolpondinos and Glinz (2017, 2020); Lombriser et al. (2016); Morschheuser et al. (2019)*; Nivedhitha and Manzoor (2020); Suh and Wagner (2017); Van Toorn et al. (2020); Viana and Pinto (2017); Zimmerling et al. (2016)	13	25.5
Collective	Arnab et al. (2016)*; Bertholdo et al. (2018); Dindar et al. (2021); Felszeghy et al. (2019); Garcia-Sanjuan et al. (2018); Jaguš et al. (2018); López-Faicán and Jaen (2020); Lounis et al. (2014); Luu and Narayan (2017); Mavridis et al. (2015); Morschheuser et al. (2019)*; Ye et al. (2019)	12	23.5
Hybrid	Afentoulidis et al. (2018); Borrás-Gené et al. (2016); Brito et al. (2015); Chalco et al. (2018); Chen and Pu (2014); Doumanis et al. (2019); Hassan M.A (2019); Huang and Zhou (2020); Koroleva and Novak (2020); Kwak et al. (2018); Leclercq et al. (2017); Leclercq et al. (2018); Lithoxidou et al. (2020); Mader and Bry (2019); Marques et al. (2020); Morschheuser et al. (2019)*; Morschheuser and Maedche (2017); Morschheuser et al. (2017); Papadakis and Kalogiannakis (2017); Ramírez-Donoso et al. (2017); Riar et al. (2020); Sailer et al. (2017); Sailer and Sailer (2020); Sanina et al. (2020); Stoeffler et al. (2020); Uz Bilgin and Gul (2020); Wemyss et al. (2018); Zehir et al. (2019); Zikos et al. (2019)	29	56.9

* highlights studies that can be categorized into more than one design (e.g. when they compared the effectiveness of different design options to accomplish cooperative activity)

gamification.

5.2.2. Collective approach

The collective approach is perhaps more intuitive compared to the individualistic approach in the sense that the focus is set on gamification features with actual cooperative virtue instead of individualistic traits. According to cooperation theories, collectivism and sincere cooperation emerge when people are involved in interpersonal processes and relationships in which social dynamics can evolve and when individuals work towards common goals (Chen et al., 1998; Driskell et al., 2018; Johnson & Johnson, 1996; Marks et al., 2001). To achieve this, the reviewed literature mentions specific cooperative features such as teams, team tasks, shared resources, and interdependent roles. In addition, several of the reviewed studies address the notion of common goals (Garcia-Sanjuan et al., 2018; López-Faicán & Jaen, 2020; Lounis et al., 2014; Sailer et al., 2017) and provide empirical support that cooperative types of features invoke cooperative goal structures, which can ultimately induce collective intentions rather than individualistic intentions (Morschheuser et al., 2017; Riar et al., 2020). Therefore, it is recommended to shift the design focus from features that only benefit single users (e.g., individual score, individual progress, individual achievements, etc.) to team or community-level features (e.g., team score, team progress, team achievements, etc.) because in this circumstance, a group is more likely to develop collective goals (Morschheuser et al., 2017; Riar et al., 2020). Essentially, the reviewed literature indicates that cooperative-based gamification design principles can give rise to various social outcomes and dynamics, such as social identity, group norms, joint commitment (Morschheuser et al., 2017), altruism (Riar et al., 2020), cohesion (Kwak et al., 2018; Uz Bilgin & Gul, 2020), and relatedness (Dindar et al., 2021; Sailer & Sailer, 2020; Sailer et al., 2017; Ye et al., 2019). 23.5% of the studies from our review used a collective approach (see Table 11) across domains such as education, crowd-sourcing, work or production and shopping (see Fig. 6). The results were mostly positive; however, several studies also report on partial non-significant results. One consideration is that cooperative gamification features and a collective approach may be more suitable and more meaningful for smaller groups instead of larger groups (Mader & Bry, 2019). Therefore, one recommendation is to give users within larger

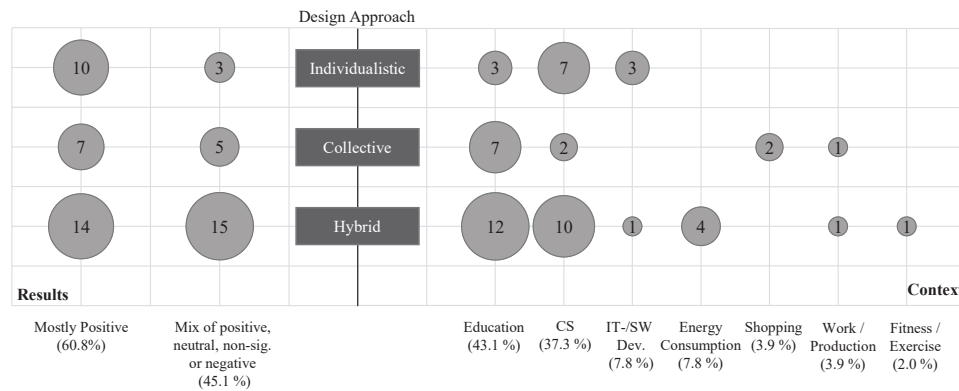


Fig. 6. Design approaches in correspondence with the results and contexts from the analyzed studies.

cooperative communities the option to establish sub-groups, in order to enhance the prospect of generating stronger interpersonal relationships between them and to foster social dynamics that can ultimately encourage cooperative activity. A possible downside of this design option is that individualistic features, which are often desirable to users, are missing and it may thus not be as well-received for a target group that generally prefers individualistic engagement and competition. For example, the results in the study by [Arnab et al. \(2016\)](#) indicate that individualistic-competitive gamification features have been more effective than cooperative features because the target group simply preferred competition. However, for a context in which it is important to maintain a collectivistic culture and for which it is important to maintain cohesion and positive attitudes towards each other, it may be more appropriate to implement a collective design approach because it does not spark individualism or competition. One prominent example would be organizational contexts, where cohesion between employees should be maintained rather than inspiring a competitive environment that may cause friction within teams. Thus, a collective design approach has been argued to be superior in comparison to individualistic-oriented designs when it comes to motivating social dynamics and sincere cooperative intentions ([Morschheuser et al., 2017](#); [Riar et al., 2020](#)). In consequence, this collective approach should be better suited and the recommended design choice when it comes to contexts and circumstances in which the goal is to cultivate cooperation based on collectivism rather than individualism.

5.2.3. Hybrid approach

In addition to individualistic and collective design interventions, there are often hybrid forms in which gamification features with both individualistic and collective traits are being used simultaneously. As observed in the present review, this option seems to be particularly aspiring with more than half of the analyzed studies (56.9%) employing such a hybrid form (see [Table 11](#)). Therefore, despite the cooperative settings, there seems to be great reliance on blending individualistic or even competitive features into the mix of cooperative features, arguably because such design characteristics are just as much a source of fun as cooperative features. This hybrid form of gamification has been employed in almost all of the encountered contexts (i.e., education, crowdsourcing, energy consumption, IT-/Software development, work/production and fitness/exercise) (see [Fig. 6](#)). Several of the reviewed studies make a distinction and compare more competitive, individualistic, and cooperative designs, as well as a combination of both, in order to assess the effectiveness of the different design interventions and to establish which design is more preferable to users ([Afentoulidis et al., 2018](#); [Arnab et al., 2016](#); [Chen & Pu, 2014](#); [Jagušć et al., 2018](#); [Morschheuser et al., 2019](#); [Zimmerling et al., 2016](#)). Some of these studies indicate that a hybrid form was better received than pure cooperation or pure individualistic/competitive designs ([Chen & Pu, 2014](#); [Morschheuser et al., 2019](#)). One argument in favor of using hybrid

design structures is that it can provide more multifaceted motivational dimensions in comparison to the collective or individualistic approach. For example, while the individualistic design option implements features that motivate individuals on a personal level, it often lacks social motivational facets whereas the collective design option focuses on social features but neglects potential features that address individualistic motivational dimensions. Thus, the hybrid option seems a very promising solution to satisfy the multitude of motivational needs of users because it allows them to engage with individualistic features and to follow personally rewarding motives (e.g., to gain personal recognition) while at the same time the exposure of cooperative features allows them to engage in socially rewarding interaction with others. However, despite these advantages, there are certain pitfalls and potential disadvantages with this hybrid form, and it may also be the most challenging to implement. This is also reflected in the relatively high number of studies that reported on a mix of positive and non-significant or neutral results when using hybrid forms (see [Fig. 6](#)). Several of the analyzed studies pointed out that blending gamification features of different nature (i.e., cooperative, individualistic, and competitive) can under circumstances negatively impact user engagement ([Afentoulidis et al., 2018](#); [Leclercq et al., 2018](#); [Morschheuser et al., 2017](#)). One explanation is that with the exposure of individualistic and competitive features, users can get caught up in individualistic and competitive motives and may thus be motivationally distracted from the cooperative goal. This is in line with indications from within the body of reviewed literature, in which it was argued that different types of features stimulate different goal orientations that can interfere with the emergence of cooperative intentions ([Morschheuser et al., 2017](#); [Riar et al., 2020](#)). Further support for this notion is provided by theories of cooperation and social systems, which suggest that if individualists see a conflict between their self-interest and the group interest, they will prioritize the self-centered goals over the group goals ([Chen et al., 1998](#); [Parsons, 1951](#)). On the other hand, motivational issues may also arise for individuals who cooperate based on a collectivistic account. Previous literature suggests that if people with collectivistic sentiment perceive that others act selfishly, they may feel less inclined to cooperate themselves ([Fehr & Fischbacher, 2003](#)). Therefore, the exposure of individualistic and competitive features in a cooperative setting can have potential negative impacts on the engagement of people with collectivistic mindsets, specifically if they perceive that others predominantly act individualistically rather than reciprocating cooperative behavior. Possibilities to counteract this issue could involve creating synergies between user goals ([Seif El-Nasr et al., 2010](#)) or making prosocial interaction more transparent than behavior that reflects more self-centered motivation in a gamified system. Accordingly, systems should highlight the contribution to a collective performance and let users express appreciation towards each other for their cooperative contributions (e.g., via liking, predefined positive short comments, gifting, etc.). This way, even if the behavior was originally sparked by self-interest, individuals may

experience socially rewarding feedback and possibly enjoyment for helping or for having contributed to a collective outcome. The exposure and emphasis on such prosocial features can potentially bring users to form cooperative goals and value these goals more than strictly personal goals (Riar et al., 2020). Moreover, it is recommended that competition should take place on a team level rather than on an individual level. The reviewed literature suggests that competition on an individual level can be discouraging (Zimmerling et al., 2016) and that users prefer winning or losing together rather than individually (Leclercq et al., 2018). Team performance within competitive (team-)settings has been found to increase cohesion on an inner-group level (Kwak et al., 2018) and thus, social benefits seem very much attainable with a hybrid approach. Therefore, with its multitude of motivational facets, the hybrid approach represents a very promising option to motivate engagement in cooperative settings, provided the mentioned pitfalls and design challenges are considered and accordingly dealt with.

5.3. Future research agenda

5.3.1. Thematic agenda

Our review revealed two dominating contexts in which gamification is used to support cooperation, namely education and crowdsourcing. The growing number of blended learning approaches or entire shifts towards online teaching to better accommodate geographically dispersed students as well as the recent COVID-19 pandemic are all circumstances that make it not only relevant to enable individuals to socialize and work together but also to motivate them to do so, e.g., by means of gamification. Especially in educational contexts, with formats that entirely rely on online teaching and learning, students run the risk of becoming less interconnected in comparison to the social experience in physical classrooms. Therefore, to counteract social disconnection between students, research should continue to inquire about how social interaction and cooperative activity can be achieved by gamification in online learning spaces. The same applies to crowdsourcing, which is an inherently cooperative endeavor in itself and for which gamification will likely continue to be of relevance in the coming years. However, there is also the need to expand our horizon in terms of the domains in which cooperative-based gamification can be employed and should be investigated. For example, cooperative-based gamification can be used to motivate individuals to work towards common health or fitness goals rather than doing so individually (Chen & Pu, 2014). Gamification has been employed to motivate people to work together toward sustainability goals (Huang & Zhou, 2020; Wemyss et al., 2018; Zehir et al., 2019) as well as in information systems that aim at raising collective awareness (Koroleva & Novak, 2020). Meanwhile, organizations continue to integrate gamification within their systems and processes to support cooperative endeavors, for example, within software development teams, production teams, and other departments (Riar et al., 2021). Despite various benefits in terms of cultivating a more cohesive environment or motivating diverse social dynamics that can result in better communication, performance, prosperity and achievements for the greater good, our review shows that the specific lens of employing and investigating cooperative-based gamification in these and related settings remains unassuming.

Agenda Point 1: *Future research should delve into emerging and less pristine domains and contexts in which cooperative-based gamification can be of value (e.g., for the purpose of tackling emerging grand challenges that require cooperative efforts, such as the COVID-19 pandemic, environmental and sustainability issues, health and exercise, collective awareness, etc.).*

One consideration for designing effective gamification is that people can be inherently different in terms of their preferences in accordance with their personalities and needs. A plethora of personality as well as human need concepts exist, from the big five personality traits to human need theories such as self-determination theory (Deci & Ryan, 2008), which purpose is to explain human behavior, and which can be of great relevance to get to the bottom of user preferences. For example, in the

light of self-determination theory, individuals who have greater needs for relatedness may appreciate a collective design approach, whereas people with greater needs for autonomy or competence, may find individualistic or hybrid design interventions more appealing. In the reviewed literature, only a few studies consider user type frameworks, such as Bartle's theory (e.g., Afentoulidis et al., 2018; Zehir et al., 2019) or the hexad user types framework (Koroleva & Novak, 2020). From game research, we understand that personality-related aspects can be highly relevant to predict, for example, interdependence between players (Huang, Cheng, Huang, & Teng, 2018). Therefore, it seems necessary that the role of user personality is also explored in cooperative gamification contexts. For example, future research should seek to better understand how different personalities and user types relate to preferences and acceptance of different gamification design interventions to motivate cooperation. One possibility to tackle this may exist in exploring personality and human need frameworks in combination with best-worst scaling methods (Berger & Jung, 2021) by which design preferences can be mapped with the corresponding user types.

Agenda Point 2: *Future research should investigate the acceptance and preference of distinct gamification design interventions in correspondence with personality and human need frameworks.*

Directly related to the above-mentioned Agenda Point 2, it becomes increasingly necessary that systems can be customized by users to better fulfill their specific needs or that systems dynamically adapt to user preferences. Today, gamification approaches are largely dictated by one-size-fits-all approaches which do not take into account that different individuals have different preferences and needs. Recently, tailored gamification has emerged as a trend that considers various techniques (e.g., user modeling, adaptation, etc.) to provide an individualized experience to users in correspondence with their personal preferences (Klock, Gasparini, Pimenta, & Hamari, 2020). Our review found little indication of adaptive mechanisms that would cultivate cooperation. Therefore, future research should explore the potential of tailored gamification as an emerging trend, to better personalize gamified cooperative systems and accommodate to the diverse user needs and preferences. Our framework for gamifying cooperation provides a step towards such attempts by proposing different routes for motivating cooperation by gamification, namely via an individualistic and collectivistic route. Specifically, adaptive mechanisms may be based on user modeling approaches that capture users' tendencies towards individualistic or collectivistic motives and steer the exposure of either individual-based or social-based gamification design features accordingly.

Agenda Point 3: *Future research should explore mechanisms of adaptive/tailored gamification to accommodate different user needs and motives for cooperation in a system.*

The majority of the analyzed studies focused on the positive effects of gamification. Nevertheless, several studies also indicate that there may be unintended consequences of gamification in cooperative settings. For example, problems may occur when employing hybrid design structures in which individualistic features may cause motivational distraction from the cooperative goals (Morschheuser et al., 2017; Riar et al., 2020). There may be problems in terms of social overload that users may experience if they perceive that they have to engage in and continuously reciprocate cooperative behavior (Huang & Zhou, 2020). There may also be emotional distress if individuals perceive that others misuse competitive gamification mechanics (Leclercq et al., 2018). However, these perspectives have been rare in the reviewed literature. Arguably, most studies focus on positive results to demonstrate the effectiveness of gamification in cooperative settings, nevertheless, it seems relevant that we also explore potential negative outcomes of using gamification in cooperative settings because this may also result in purposeful implications on how to avoid potential pitfalls when designing cooperative gamification.

Agenda Point 4: *Future research should explore the potential adverse effects of using gamification in cooperative settings.*

A trend that persists for some time but which has garnered renewed attention in recent years due to some profound technological breakthroughs is the exploration of cooperative interaction between humans and computational agents, in which disciplines of human-computer interaction and artificial intelligence (AI) are combined (Terveen, 1995). AI-driven virtual agents can assist users with solving problems and achieving computer-mediated tasks. Only one study within our review explored the use of gamification to support human-computer cooperation, in which a virtual agent helps a user to accomplish a goal (i.e., Stoeffler et al., 2020), whereas all other studies focused on human-human cooperation. Gamification could become increasingly relevant to overcome cognitive and emotional barriers in cooperation with intelligent virtual agents. Previous gamification research in fields such as education and training has shown that gameful solutions are particularly effective in conveying knowledge and supporting learning (Koivisto & Hamari, 2019). Future research may thus explore how gamification could support humans in understanding the inner working principles of artificial intelligence to increase trust and adoption of AI-based systems (Dwivedi et al., 2021). Further, designers of gamification solutions enrich technologies with design aspects from games that afford opportunities for satisfying intrinsic human needs such as the need for competence, achievement, autonomy, or being meaningfully connected with others (Hamari & Koivisto, 2015; Xi & Hamari, 2019). Thus, gamification can make the interaction between humans and AI-based virtual agents and autonomous systems more immersive, interesting, and fun to support cooperation between humans and such systems in business and private contexts (Cao, Duan, Edwards, & Dwivedi, 2021; Dwivedi et al., 2021; Glikson & Woolley, 2020). Due to these potentials and the fact that research within this field shows promise but remains limited, we deem it a worthwhile and intriguing venture for future research to investigate the use and the effects of gamification in cooperative interaction between humans and computational agents.

Agenda Point 5: *Future research should explore the potential of gamification for human-computer cooperation (i.e., cooperation between human users and intelligent virtual agents or autonomous systems).*

Our review revealed that gamification is capable of giving rise to several behavioral outcomes, for example, in terms of increased engagement in cooperative activity, or the initial adoption of cooperative gamified systems (see Table 9). Noticeably missing from our review are insights into how gamification can motivate continued cooperative activity. While gamification research in general has investigated the phenomenon of loyalty (e.g., Hollebeek, Das, & Shukla, 2021) and continued use (e.g., Hamari & Koivisto, 2013, 2015; Hassan L, 2019), we found little insights within the reviewed body of literature pertaining to the design characteristics that may be effective in retaining cooperative activity between users or for achieving continued use of gamified cooperative platforms. Previous studies outline several social motivational aspects that may influence continued use, such as recognition, reciprocal benefits, and social influence (Hamari & Koivisto, 2013). A glance into games research provides further relevant insights into gamer loyalty and continued use. Specifically, in virtual worlds and games, a wide spectrum of determinants for continued use have been investigated, ranging from individualistic features, such as the option to customize personal avatars (Teng, 2021) and expectation of character growth (Teng, 2018), to competitive gaming team functions (Liao, Cheng, Shiau, & Teng, 2021) as well as social play habits (Li & Suh, 2021) and several further social aspects, such as social presence (Mäntymäki & Riemer, 2014), interpersonal influence or subjective norms (Mäntymäki, Merikivi et al., 2014). Given that user retention is vital to ensure longstanding success of information systems and since games are the core of and inspiration for gamified systems, it seems necessary to adopt the existing knowledge from games and transfer it to gamified contexts to empirically explore which gamification design interventions (i.e., individualistic, competitive, cooperative, or hybrid characteristics) affect retaining user cooperation, loyalty and continued use of gamified systems.

Agenda Point 6: *Future research should explore which gamification design characteristics (e.g., individualistic, competitive, cooperative, or hybrid options) are most suitable and most effective in retaining user cooperation, loyalty or continued use of gamified systems.*

5.3.2. Theoretical and conceptual agenda

Interestingly, we encountered in our review that the majority of studies explained the use of gamified cooperative systems by focusing on individual motives, whereas the exploration of social motives remains modest. More specifically, there seems to be a great reliance on using gamification to motivate cooperation based on individualism where users achieve individual goals and are personally rewarded for participating in cooperative activity. This is striking because when we draw parallels to game research, we find pertinent guidance on the use of appropriate cooperative features (Seif El-Nasr et al., 2010) and important implications on the social benefits and outcomes of social play, such as cohesion (Keith et al., 2018), altruism (Wang & Wang, 2008), team norms, team commitment (Liao et al., 2020) and social identity in gaming teams (Laato & Kordyaka, 2021; Liao et al., 2020). Our review reveals that only a limited number of studies employed dedicated cooperative theories and explored how gamification can be used to motivate cooperation based on social motives and collectivism. Among these limited encounters are social interdependence theory (Dindar et al., 2021; Garcia-Sanjuan et al., 2018; Morschheuser et al., 2017; Ramírez-Donoso et al., 2017; Riar et al., 2020) and we-intention theory (Morschheuser et al., 2017; Riar et al., 2020), which have been utilized to explain how gamification can give rise to various social dynamics and collective intentions. In particular, to better understand how cooperation based on social dynamics, collectivism and cooperative intentions can be fostered by gamification, we need to employ dedicated cooperation theories and explore more frequently design interventions that resemble the above-outlined collective approach (see Section 5.2.2), which emphasizes on gamification features with cooperative traits (e.g., teams, team points, cooperative goals, interdependence, etc.).

Agenda Point 7: *Future research should employ dedicated cooperation theories and explore how gamification can cultivate social dynamics, motivate cooperation based on collectivism and cooperative intentions.*

Another potential avenue for future research consists in broadening our view in terms of relevant moderating effects. For example, the concept of individualism and collectivism is often discussed in relation to culture (Chen et al., 1998). Specifically, there have been indications that individualism, collectivism, social processes, and collective intentions are contingent on an individual's cultural upbringing (Bagozzi & Lee, 2002; Chen et al., 1998), which poses the question if preferences of the different gamification design options discussed in the present study (i.e., individualistic, collective or hybrid) are also culturally contingent. Other possible moderators for social dynamics and social actions may be related to gender (Shen, Lee, Cheung, & Chen, 2010) and the experience level of users (Shen, Cheung, Lee, & Chen, 2011). For example, it is possible that individualistic design features are especially relevant in early system use phases because the novel stimuli of receiving positive feedback for performing cooperative actions in the system may be personally rewarding and thereby support onboarding processes. However, previous literature suggests that novel stimuli afforded by such individualistic features may wear off swiftly and thus they often only provide short-term motivation (Hamari et al., 2014). On the other hand, in the beginning phase of using a system, individuals may not be socially connected with others in a meaningful way yet, but as these meaningful connections develop, cooperative features which provide a new motivational dimension in terms of socially rewarding experiences, may become more relevant with time. Within the reviewed literature, moderating effects were only sparsely investigated. To better understand the conditions under which distinct gamification design interventions work better or worse, it seems necessary to consider and explore potential moderating effects.

Agenda Point 8: *Future research should explore different moderating*

effects (e.g., cultural aspects, experience, age, gender, etc.).

5.3.3. Methodological agenda

Naturally, not all gamification features are suitable to motivate cooperative activity. In fact, most features seem more fitting to motivate individualistic engagement or competition. Our review reveals that common individualistic types of features (e.g., personal points) are frequently implemented as team features (e.g., team points) in cooperative settings, however, investigations into specifically customized cooperative gamification features are still rare. Prior literature implies that gamification design features need to be carefully selected in accordance with the target task or behavior that is intended to be achieved (Liu et al., 2017; Morschheuser et al., 2018). While cooperation may be induced via a more self-rewarding route by using individualistic features, it is striking that only limited attempts have been made to design specific cooperative features that can be more effective in addressing social outcomes. As discussed in Section 5.2.2. under the collective approach, designing cooperative gamification features may have several advantages over individualistic design interventions, including cultivating team cohesion, social identity, or stronger interpersonal ties. Therefore, it is essential that future research explores and more carefully deduces features (e.g., based on cooperation theory, human need frameworks, etc.) that are specifically crafted for invoking cooperative behavior based on collective sentiment as opposed to individual or competitive sentiment.

Agenda Point 9: *Future research should design and explore specifically customized cooperative gamification features that are capable of cultivating collective sentiment.*

According to Hamari et al. (2014), gamification works by giving rise to diverse psychological outcomes that translate into behavioral outcomes. We adopted this notion and integrated it into our framework for gamifying cooperation. However, as observed in the present review, most studies only investigate the relationships between the psychological outcomes and the behavioral outcomes in a gamification setting whereas the preceding relationships between the design features and psychological outcomes are usually not directly explored. Moreover, only a few studies focused on single or only a very limited number of gamification features (e.g., Bertholdo et al., 2018; Kwak et al., 2018; Morschheuser & Maedche, 2017; Van Toorn et al., 2020), whereas the vast majority of studies employ a large number of features and assess the effects of the holistic gamification design. This makes it often difficult to deduce which particular gamification design features contribute to achieving the cooperative target behavior and which features may be less relevant. Therefore, in addition to investigating the effects of holistic gamification design approaches, it seems important that future studies opt more frequently to investigate the effects of single or only a few gamification design features because this gives us a more accurate understanding in terms of the design features that are particularly relevant for motivating cooperative activity.

Agenda Point 10: *Future research should explore the effects of single gamification features on social dynamics and cooperation.*

Our review reveals that only a few studies employed an experimental setup in which distinct design options were compared to each other (e.g., Arnab et al., 2016; Morschheuser et al., 2019). We believe that such an experimental setup can be beneficial to gain a more in-depth understanding of how effective different design interventions (e.g., individualistic, collective or hybrid) are and which one fits best with which target group, context, or domain. In certain circumstances, it is of utmost importance that a cohesive atmosphere is maintained between individuals (e.g., within organizational contexts) and thus, a collective approach seems often, if not always, the preferable choice in these settings. In other situations, it may be more admissible to use an individualistic or hybrid approach, for example, in knowledge sharing communities which often thrive if users can gain reputation for their engagement, or in innovation contests, which often entail a competitive edge even though a collective outcome is achieved. However, there is a

lack of empirical research that investigates these and similar assumptions. Especially, there seems to be little empirical research that investigates different design structures across different target groups or contexts to identify which option may be best suited for what target group or for what context and why. Thus, it seems necessary that future research employs experimental setups in which different design interventions are compared, especially across different user groups as well as contexts.

Agenda Point 11: *Future research should employ experimental setups in which distinct gamification design interventions (e.g., individualistic, cooperative and hybrid) are investigated, especially across various target groups, contexts, etc., in order to assess the effects and suitability of the distinct designs for different target groups, situations and contexts.*

5.3.4. Limitations of this review

One limitation of this study is that the literature review part considers only empirical work and thus literature with other methodological approaches (e.g., case studies or pure design studies) are not part of our review. Thus, future reviews could complement this one by focusing specifically on methodological different studies to provide an even more comprehensive picture of the application of gamification in cooperative settings. In addition, we focused only on peer-reviewed articles and articles written in English. Therefore, grey literature with potentially relevant results as well as results from literature in languages other than English remain absent from this study and could therefore potentially be included in future reviews on the phenomenon of gamification and cooperation. Although we considered various search terms to cover a large spectrum of literature that employed gamification in cooperative settings, it is possible that studies that investigate this phenomenon under yet other terms than the ones used in our search query were not found. However, the diverse results of the present literature review could already significantly contribute to a better understanding of the application of gamification in cooperative settings.

6. Conclusion

Against the background that research has, for a long time, mainly focused on how gamification motivates individual and competitive engagement, there has been a dearth of understanding about the potential of gamification to motivate collective engagement. While this gap has been acknowledged in the scientific community, a missing overarching conceptual understanding and a lack of overview of the existing results in the literature prevented us from fully comprehending how gamification can be used to motivate cooperation and how effective it is across various cooperative domains. In the present article, we closed this gap by conceptualizing gamified cooperation, and by conducting a systematic review (n = 51) of the empirical cooperative-based gamification literature. The results of our study contribute to the ongoing conversation about gamification and cooperation in several ways. Foremost, we answered our first research question “*how does gamification motivate cooperation?*”, by (1) proposing a framework for gamifying cooperation, (2) by synthesizing the gamification design elements encountered within the reviewed literature, and (3) by formulating three different gamification design approaches (i.e., individualistic, collective and hybrid) to motivate cooperation as well as their strengths and potential weaknesses. The proposed framework as well as our implications concerning the three different design approaches can serve as groundwork for understanding how gamification can be designed to motivate cooperation via the different routes of individualism and collectivism. Regarding our second research question “*what is known about the effects of gamification in cooperative contexts?*”, we encountered that majority of studies report positive results, while there have also been neutral, negative, or ambiguous results, which we thoroughly addressed as potential drawbacks within the discussion of the different design approaches. Specifically, we also provided an overview of the various psychological and social outcomes that gamification is capable

of evoking, and which are critical determinants for influencing cooperative activity. In addition, we presented an overview of the diverse contexts in which gamification was used to motivate cooperation and structured the theoretical groundwork that has governed investigations into gamified cooperative activity. We concluded our study by outlining eleven agenda points pertaining to possible thematic, theoretical, and methodological avenues for further inquiry on gamifying cooperative activity, thereby paving the way for future research on this phenomenon.

Declarations of interest

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