Electronic Commerce Research and Applications 68 (2024) 101465

Contents lists available at ScienceDirect

Electronic Commerce Research and Applications

journal homepage: www.elsevier.com/locate/elerap

Gamification on digital platform: A *meta*-analysis of affordance on behavior from value perspective

Furong Jia [a], Xueqi Bao [b,*], Jie Yu [c]

[a] HeXie Management Research Centre, Xi'an Jiaotong-Liverpool University, China
[b] School of Statistics and Data Science, Ningbo University of Technology, China
[c] Business School, University of Nottingham Ningbo China, China

ARTICLE INFO

Keywords:
Gamification
Meta-analysis
Affordance
Digital platform

ABSTRACT

Gamification has become a widely applied technique in the digital platform sector. Despite prior research exploring gamification in various contexts from different angles, an integrated empirical study has yet to draw cohesive conclusions from these findings. This study, utilizing data from 34 papers (N = 35,856), has developed a *meta*-analytic framework comprised of 17 paths. Through this framework, we have identified immersion, achievement, and social as core gamification affordance constructs, as well as functional value, emotional value, and social value as perceived value constructs, and we have also designated user behavior as the outcome, utilizing the stimulus-organism-response (SOR) framework. The research results indicate that emotional value has a profound effect on behavior, with context, platform, and country moderating to the gamification mechanism. This study has significant implications for the further advancement of gamification in the digital platform.

1. Introduction

Gamification has been widely adopted in many areas by its nature that integrates game elements in the non-game context to achieve the organization desired outcomes (Deterding et al., 2011a; Hamari and Koivisto, 2015; Schöbel et al., 2020). Corporations like Starbucks, Nike, and eBay have successfully utilized gamification to improve business and customer engagement. According to industry estimates that the global gamification market size is expected to reach $95.5 billion by 2030, growing at a CAGR(compound annual growth rate) of 25.6 % ("Gamification Market Size, Growth | Report Forecast - 2030", 2022). As a result, gamification has become an important topic of research in IS academics due to its tremendous market promise and economic benefits. Accordingly, the studies regarding gamification are evolutionary which poses a heat research direction (Bizzi, 2023; Hamari et al., 2014). Digital platforms are online systems that facilitate user interaction, collaboration, and the exchange of information or services (De Reuver et al., 2018). These platforms serve various functions, including social networking, e-commerce, and content distribution. Specifically, digital platforms integrating gamification designs cater to e-commerce, knowledge dissemination, and digital marketing. This integration enhances user experience and platform utility (Zhang et al., 2023). The combination of gamification and platform functionality simplifies interactions while invigorating them by tapping into the motivational potential of gamification affordances. For instance, educational platforms leverage gamification elements through quizzes, badges, or progress tracking to elevate the learning experience and engage students. Similarly, e-commerce platforms utilize gamification to incentivize purchases, foster customer loyalty, and stimulate engagement with various affordances.

Current literature primarily concentrates on examining the consequences of gamification (e.g., purchase intention, online learning, knowledge sharing, brand engagement and healthcare APP use intention), however, what gamification affordances could influence these consequences are inconsistent in various contexts among the previous literature (Donnermann et al., 2021; Feng et al., 2022; Wang et al., 2022; Yang and Li, 2021). Gamification affordance are the gameful elements that enable and encourage users to immerse in gamification mechanism (Cheikh-Ammar, 2018; Gibson, 1977; Karahanna et al., 2018). For instance, the implementation of a "share" and "chat" buttons offer users the opportunity to cultivate and develop social connections within their gamification communities. While existing literature reviews provide valuable insights from individual studies, not much have employed a multilevel measurement model that integrates a comprehensive range of

* Corresponding author at: 201 Fenghua Road, Jiangbei District, Ningbo, Zhejiang, China.
E-mail address: xueqi.bao@nbut.edu.cn (X. Bao).

https://doi.org/10.1016/j.elerap.2024.101465
Received 29 April 2023; Received in revised form 8 October 2024; Accepted 6 November 2024
Available online 14 November 2024

gamification affordances, perceived values, and behavioral outcomes (Hamari et al., 2014; Zhang et al., 2023). For example, previous research has frequently emphasized affordances like rewards, points, and leaderboards, which are primarily driven by an achievement-oriented perspective (Hamari, 2017; Suh et al., 2017). In contrast, other studies argue that social affordances, such as self-expression and user interactions, are crucial for triggering psychological outcomes in gamification (Donnermann et al., 2021; Huang and Zhou, 2020; Shi et al., 2022; Yang and Li, 2021). Additionally, competitive affordances like competition and cooperation are highlighted in other literature (Riar et al., 2022; Santhanam et al., 2016). Consequently, a consistent and systematic construct of gamification affordances for digital platforms is yet to be established, necessitating a summary and extraction of these affordances.

Extant literature on gamification requires a more comprehensive view to clarify whether (and how) the parallel structural constructs of perceived values in the mechanism influence user behavior. Taking a closer look to the gamification literature, for example, some researchers adopt classic motivation theory (e.g., self-determination theory and self-regulation theory) to explain the mediating mechanism of gamification on behavior, such as why people use gamification and how to extend individuals' continued use intention with a motivation perspective (Bittner and Shipper 2014; Mekler et al. 2013; Xi and Hamari 2019). That stream describes individuals' intrinsic and extrinsic perspectives which filled the gap in the literature as well as explained the psychological elements of individuals to adopt new technology (Bravo et al., 2021; Mitchell et al., 2020). Specifically, intrinsic motivations are employed to elucidate how gamification affordances positively influence behavior by enhancing self-esteem, knowledge sharing contribution, and fostering a sense of virtual community (Feng et al., 2022). Meanwhile, extrinsic motivations are hired to explain the mechanism with financial incentives (Ariely et al., 2009; Friedrich et al., 2020). Others stream followed IS theory (e.g., the technology acceptance model or the unified theory of acceptance and use of technology) to understand the convenience of accepting gamification, such as individuals' perceived usefulness or ease of use (Hess et al., 2014; Venkatesh et al., 2012). However, not so much research has empirically tested the various perceived values as mediating roles on user behavior in gamification studies (Shi et al., 2022). In addition, most of the research studies have utilized an individual study approach rather than employing a *meta*-analysis research method. Therefore, despite the valuable insights provided by individual studies, the full mechanism by which gamification affects behavior through perceived values remains elusive by *meta*-analysis of quantitative syntheses (Koivisto and Hamari, 2014; Shi et al., 2022). Hence, there is a need for research which observes from more comprehensive perspectives, such as perceived value (Koivisto and Hamari, 2014; Sweeney and Soutar, 2001), then, organizes and combines these dimensional constructs of perceived value and compares various effects of values.

Moreover, the influence of moderators has been overlooked (e.g., culture factors, contextual factors), when compared to the attention given to mediating mechanisms (e.g., self-determination theory and self-regulation theory), to which the literature has devoted less attention. However, this research has raised several questions regarding moderators. For instance, different cultures moderate perceived values towards user behaviors leads to varying outcomes. A recent empirical study has found that no significant differences in the levels of social-related affordance recorded across different cultures (Sailer and Homner, 2020), conversely, the other study showed the opposite phenomenon that culture has profound effect on user behavior (Gerdenitsch et al., 2020). In addition, the impact of gamification varies across diverse digital platforms and contexts, necessitating further research with *meta*-analysis (Bai et al., 2020). Despite their potential influence on the effectiveness of gamification affordances in digital platforms, these factors have not received sufficient investigation.

Hence, we propose the research questions:

RQ1. What are the core affordances of gamification and its effects on user behaviors?

RQ2. What is the key mechanism of gamification concerning user behaviors based on its affordances?

RQ3. What are the moderating factors influencing the gamification mechanism?

For answering these following research questions, the coherent and comprehensive affordance construct and perceived value construct that should be raised to examine the relationships among gamification affordances, perceived values, and behaviors. Meta-analysis derives from previous literature with effect sizes which could match the requirements of completely summarizing and measuring these relationships (Ou et al., 2023; Sailer and Homner, 2020). Hence, we build a *meta*-analysis framework to analyze the relationships among selected variables (affordances, perceived values, and behaviors) which collected from previous literature and test these relationships. The remainder of this paper is organized as follows. First, a literature review of gamification is demonstrated. Second, the research model and hypotheses are proposed. Third, we illustrate the method of literature retrieving and eligibility criteria, coding process and data analysis. As followed, the result is presented and discussed. As last, we state the theoretical contributions and practical contributions, and provide future directions for future studies.

2. Literature review

2.1. Overview of gamification on digital platforms

Gamification refers to the application of game elements and mechanics in non-game contexts to engage and motivate users (Huotari and Hamari, 2017; Xi and Hamari, 2019). It involves incorporating game-like features, such as points, badges, leaderboards, challenges, and rewards, into digital platforms to enhance user experience, encourage desired behaviors, and promote user engagement (Ashraf et al., 2016; García-Jurado et al., 2021). Over the span of years, gamification has emerged as a rapidly growing area of research that has widespread applications in information system design in various fields, such as education (Aparicio et al., 2019), healthcare (Lee et al., 2017), and marketing (Poncin et al., 2017). Gamification plays a crucial role in driving user engagement and involves the design of systems, services, organizations, and activities that aim to deliver positive experiences similar to those found in games, thereby influencing user behavior and cognitive processes (Hamari and Koivisto, 2015). This is often achieved by implementing game mechanics or other gameful designs in the target environment with insight drawn from game design (Deterding et al. 2011a). Through motivational affordances, gamification design can deliver better interactive services and experiences for users, generating user value (Hsu and Chen, 2018). Research of gamification usually concentrates on either the experiential or game design facet (Deterding et al., 2011a). Nevertheless, throughout the literature, the assumption has been that gamification can fulfill users' inherent needs and lead to user behavior, regardless of the focus on the motivational sides of game mechanics and affordances (Granic et al., 2014).

Previous research has established the existence of a positive correlation between various gamification characteristics and the fulfillment of intrinsic needs (Bormann and Greitemeyer 2015; Van Roy and Zaman 2019). However, these studies only present a limited perspective, as they focus on a small number of gamification features and entailed intrinsic psychology needs. Furthermore, past research has shown that gamification can enhance consumer behavior in various perspective, such as boosting customer loyalty and customer satisfaction in customer relationship management (Hwang and Choi, 2020). Additionally, Wolf et al. (2020) found that gamification can improve marketing effectiveness by fostering user commitment, willingness to pay, and customer referrals. In addition, the adoption of product innovations can be facilitated through the incorporation of gamification techniques (Müller-Stewens

et al., 2017). Therefore, gamification has been researched in various contexts of digital platforms. Nevertheless, despite the absence of identified key affordances and inner mechanism, this research aims to utilize the stimulus-organism-response (SOR) framework in order to uncover the fundamental mechanism of gamification as it relates to user behaviors.

2.2. The stimulus-organism-response framework

The present *meta*-analysis seeks to develop a comprehensive *meta*-analytic model for studying gamification on digital platforms, employing the stimulus-organism-response (SOR) framework as introduced by Mehrabian and Russell (1974). The SOR framework is a robust analytical tool that effectively captures customers' reactions to novel technological environments. It owes its conceptual roots to Mehrabian and Russell's (1974) seminal work, which laid the foundation for extensive research on the impact of environmental factors on consumer behavior (Kaltcheva and Weitz, 2006). Its widespread adoption in information systems research underscores its utility and versatility. The SOR framework comprises three key elements, namely stimulus (external triggers that prompt responses of individuals), organism (individuals' affective, cognitive, or normative evaluations of the external triggers), and response (individuals' behavioral outcomes of reactions). Based on the SOR framework, our proposed research model integrates gamification affordances and their primary outcomes of behaviors (refer to Fig. 1). This model posits that three gamification affordances (namely immersion, achievement, and social) are anticipated to impact behaviors (outcome), mediated by perceived value (functional value, emotional value, and social value).

2.3. Gamification affordance

In the gamification literature, gamification elements employed in digital platforms including achievement elements such as points and scores, leaderboards and rankings, badges, levels, progress. Social elements such as share with friends, feedback in group. Immersion elements such as avatars and virtual characters and narrative storytelling. These elements are typically grouped into three main categories: immersion, achievement, and social affordances (Koivisto and Hamari, 2019).

Immersion-related gamification mechanics encompass storytelling, avatars, role-playing, and other elements, which are designed to promote user immersion in self-directed pursuits that cultivate inquisitiveness and ultimately elevate their level of engagement (Goes et al., 2016). Extant research studies have demonstrated that attributes linked to immersion frequently stimulate heightened cognitive involvement in self-directed ideations (Stefanou et al., 2004). Avatars and customization offer users flexibility and autonomy, while story or narrative elements in gamification enhances the experience by giving users a sense of purpose and voluntary participation (Kim et al., 2015). Consequently, the incorporation of immersion-related characteristics into gamification mechanism could result in an increased level of user freedom, engagement, and commitment.

Achievement-related affordance pertains to game functions allowing users to obtain specific accomplishments by gaining power, progress, symbolic status within the gamification, and competing against other players, such as points-scoring, levels, and badges (Groening and Binnewies, 2019). In the realm of gamification research, points typically serve as a means to gauge users' behavioral patterns and to provide detailed feedback (Sailer et al., 2013). Likewise, levels serve to aggregate points or specific actions, thereby reflecting users' overall progress on the platform (Gatautis et al., 2016), while unlocking badges or accumulating them can motivate goal-oriented behavior (Hamari, 2017). By allowing users to incrementally attain pyramidally challenging goals, their status and sense of accomplishment can be heightened (Morschheuser et al., 2017). Therefore, achievement affordance enables to provide users with a motivational impetus of mental stimulus to repeatedly engage with the systems (Sailer et al., 2017). Integrating multiple achievement affordances have been shown to enhance users' competitive spirit while serving as tangible benchmarks of their progression and level of engagement.

Social-related gamification mechanics contains social networking features such as chats with friends, blogs sharing, and peer ratings. Social-related affordance promotes the establishment of social connections and strengthens users' sense of belonging by facilitating frequent communication, knowledge sharing, and reciprocal assistance (Francisco-Aparicio et al., 2013). In addition, it could be effective in strengthening interpersonal relationships and enhancing social participation (Shiau et al., 2018), then ultimately drive internal desire of users to perform well (Peng et al., 2012). Therefore, social-related affordance enables to satisfy the psychological requirements by helping users to build social relationships with others within the gamification system or service.

2.4. Perceived value

Based on the findings of the gamification literature *meta*-analysis, we outline psychological organism to gamification affordances from the perspective of customer value perception, including functional value, emotional value, and social value.

Functional value pertains to the value derived from the acquisition of high-quality products at reasonable prices (Bolton and Drew, 1991). To be specific, the primary influential factor in determining functional value is the economic benefit that customers can obtain, which in turn, positively influences their behavioral intentions (Wang et al., 2013). Customers typically aim to minimize their expenses, time, and effort when engaged in shopping activities, further highlighting the importance of functional value on purchase intention (Hamari, 2013; Shi et al., 2016; Zhao et al., 2020). In this sense, users who anticipate getting tangible rewards tend to have a greater intention to participate.

Emotional value is rooted in the sentiments and emotions that are triggered and aroused by engaging with the gamification mechanics design on a digital platform, such as experiencing amusement and entertainment. Previous research has demonstrated that when a product or service incites customer emotions, their behavior is likely to be impacted (Shi et al., 2016). Additionally, the constructive influence of emotional value on consumer behavior is amplified in hedonic conditions, as customers anticipate having an enjoyable time (Kim et al., 2011; Kwon and Brinthaupt, 2015).

Social value is concerned with strengthening the image of the

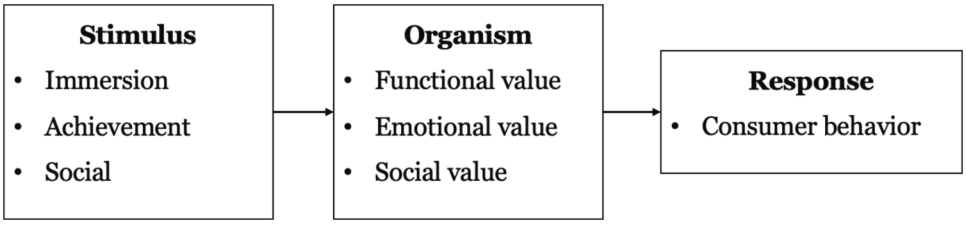

Fig. 1. Proposed structural model based on SOR framework.

individual in society, fostering a sense of connectedness within social groups, and achieving social recognition (Sweeney and Soutar, 2001). Engaging in gamification activities on digital platforms has a profound effect on consumers, not only from the perspective of advertisements and promotions but also through a shared sense of participation with peers (Zhao et al., 2019). The aforementioned feeling has the potential to elicit customer engagement by fostering socialization among individuals who share similar interests, thereby satisfying their social needs (Chiu et al., 2014). Similarly, Jang et al. (2018) indicated that greater levels of social value can be attained through forging friendships and exchanging experiences within gamification systems, ultimately leading to increased purchase intention.

2.5. User behavior

Recent literature found that gamification on digital platforms has been commonly observed to result in various consumer behaviors, such as active customer engagement with the co-creation community (Leclercq et al., 2018), brand engagement in online brand communities (Xi and Hamari, 2020), purchase intention on online travel agencies platform (Shi et al., 2022), user retention in mobile payment (Zhang et al., 2023), viewing and purchasing behavior in live streaming (Zheng et al., 2023). User behavior can be described as a comprehensive concept that encompasses both behavioral intention and behavior. This idea draws upon psychological perspectives, as well as perspectives on behavioral engagement and usage (Fan et al., 2022). In this study, user behavior includes behavioral intention and behavior that refer to the intention and behavior of users to adopt, use, purchase, engage of gamification on the digital platforms.

3. Conceptual model and hypotheses

3.1. Organism to response

In this *meta*-analysis, we based on previous literature and then list functional value, emotional value, and social value as the core perceived values of users. The response of users to environmental stimuli is contingent upon their cognitive and affective reactions which follows the framework of stimulus-organism-response (SOR). User engagement with environmental stimuli results in the formation of both cognitive and affective perceptions, and we concluded with literature as functional, emotional and social perspectives (Sheth et al., 1991; Sweeney and Soutar, 2001). Perceived value relates to the assessment made by users concerning the worth of products or services offered to them (Babin et al., 1994; Hess et al., 2014). Functional value refers to the perceived usefulness derived from an alternative's functional capability such as monetary or physical advantages (Bridges and Florsheim, 2008). Emotional value pertains to an array of affective states or sentiments, such as happiness, and enthusiasm, which are linked with the act of consumption (Mullins and Sabherwal, 2020). Social value refers to a product is gauged by its potential to improve an individual's social welfare, such as enhancing one's social status (Kim et al., 2011; Shi et al., 2016). When users of gamification in digital platform exposures in the environmental stimuli, the perceived values arise and trigger positive consumer behavior such as purchase intention (Zhang et al., 2023). In this sense, we propose functional, emotional, and social values positively affect user behavior.

H1a. Functional value positively affects user behavior.

H1b. Emotional value positively affects user behavior.

H1c. Social value positively affects user behavior.

3.2. Stimuli to organism

Gamification is a strategic approach that utilizes motivational opportunities to encourage gameful experiences, leading to positive behavioral outcomes for users (Deterding et al. 2011a). Previous literature has shown that the implementation of affordances in gamification should align with those present in games to achieve desired results (Deterding et al., 2011b). This study suggests that achievement, immersion, and social affordances are the most effective stimulus in this regard. Contemporary studies indicate that affordances play a vital role in shaping individuals' perceived value and in eliciting positive behavioral patterns (Dzandu et al., 2022; Torres et al., 2022). However, there is a calling for research method of *meta*-analysis to detect the relationships of affordances and perceived values which integrates these three types of affordances (Koivisto and Hamari, 2019; Xi and Hamari, 2019). In detail, what specific gamification affordances can effectively influence perceived values are not clear (Torres et al., 2022).

Achievement-related affordance refers to the various challenges, goals, or objectives that are presented to users, providing them with opportunities to accomplish or succeed in the gamified context (Lee et al., 2015). It empowers the user to experience a sense of fulfillment and receive incentive upon the successful completion of various tasks within gamification (Hwang and Choi, 2020; Yang and Li, 2021). Previous literature suggests that achievement could trigger intrinsic and extrinsic motivations (Feng et al., 2022). Meanwhile, the perceived utility and meaningfulness of user interactions with the gamification system can be significantly enhanced when they are able to achieve rewards or trophies as a result of their active participation (Bitrián et al., 2021; Gatautis et al., 2016). For example, users acquire achievement-related affordance such as winner badges and points which in returns with monetary rewards and benefits. Therefore, the achievement-related affordance could enrich the perceived utilitarian value, and we assume that achievement-related affordance positively affects functional value. As the previous literature confirms that achievement-related affordance brings flow experience and entertainment phenomenon thereby elicits intrinsic motivation (Cameron et al., 2005). The emotional value perception of customers can be strongly influenced by their perception of fun and entertainment, which has the ability to operate positive emotions and boost their inner feelings (Kim et al., 2015; Ruiz-Mafe et al., 2018). Consistent with previous literature, we propose that achievement-related affordance positively affects emotional value.

H2a. Achievement-related affordance positively affects functional value.

H2b. Achievement-related affordance positively affects emotional value.

Immersion-related affordance (i.e., stories, narratives, avatars and virtual worlds) refers to feeling of the user that they are part of the virtual environment (Witmer and Singer, 1998), and allows users to modify their personal images in gamification and set personalized interface (Bormann and Greitemeyer, 2015; Fan et al., 2022). For example, in the e-commerce gamification realm, the incorporation of immersive components enables users to visually establish their identity as innovators of online shopping expertise, while also recognizing and acknowledging fellow users (Alexiou et al., 2020; Feng et al., 2022). The integration of these immersion elements can effectively bolster a user's self-affirmation as a solver for answering others confusion. Gamification mechanics that are centered around user immersion, such as tailored avatars and customized homepages, are intended to heighten the flow experience for online consumers, as opposed to cultivating their external incentives (Jahn et al., 2021). Meanwhile, extant literature has proven that immersion gamification elements could elicit external motivations (Mitchell et al., 2020). As an example, to enhance the engagement level of immersion-related elements, gamification designers employ functional advantages such as discounts or coupons to entice users to adopt immersion-related affordance. Based on the above reasoning, this research proposes that immersion-related affordance positively affects functional value and emotional value.

H3a. Immersion-related affordance positively affects functional value.

H3b. Immersion-related affordance positively affects emotional

value.

Research has substantiated the noteworthy impact that social gamification possibilities have on altering the psychological and behavioral outcomes of individuals in diverse gamification scenarios (Huang and Zhou, 2020). Social-related affordance refers to the perceived or potential actions or opportunities for social interaction and communication that are provided by the environment or context (Carvalho, 2020). It enables users interact with users and incorporate social qualities into their interactions (Karahanna et al., 2018). This *meta*-analysis generalized and concluded previous literature that social-related related affordance brings positive emotions such as pleasure and contentment. In addition, social-related affordance nudges users to obtain extrinsic rewards with social attributes (Dzandu et al., 2022). Therefore, this research propose that social-related affordance positively affect functional value, emotional value and social value.

H4a. Social-related affordance positively affects functional value.

H4b. Social-related affordance positively affects emotional value.

H4c. Social-related affordance positively affects social value.

3.3. Stimuli to response

The notion of affordance pertains to the objective and intrinsic capabilities presented by a given environment to an individual (Oliver, 2005). Providing affordance within a gamification context allows for a seamless fusion of users into the enjoyable gamification experience, as exemplified. With this in mind, Gibson defines affordances as implicit hints within an environment that indicate various action potentialities within said environment (Gibson, 2014, 1977). Hence, this research hires the gamification affordances as stimuli which combines affordance lenses and SOR framework. Achievement-related, immersion-related and social-related affordance as the key affordances in gamification context, enables users produce positive behaviors, such as customer engagement, customer loyalty and continued use intention of gamification (Xi and Hamari, 2020). Therefore, this research propose that achievement-related, immersion-related and social-related affordance positively affects user behavior.

H5a. Achievement-related affordance positively affects user behavior.

H5b. Immersion-related affordance positively affects user behavior.

H5c. Social-related affordance positively affects user behavior.

4. Moderating effect

A moderator analysis was undertaken to investigate whether the proposed moderators could account for the variability observed in the correlations. Specifically, the I 2 values and Q statistic were utilized to identify the presence of moderators. It was found that an I 2 value of more than 75 % and a significant Q value indicated high heterogeneity in the results of the studies and emphasized the necessity of the moderator analysis (Higgins and Thompson, 2002; Huedo-Medina et al., 2006). To examine the effect size of moderators, a subgroup analysis was conducted with random-effects model. The significance of moderators was evaluated using two metrics: Q between statistics and 95 % CIs. We employed the metafor package in R software for the estimation of effect sizes and moderator analysis. For both theoretically contributory and with enough samples in literature, we selected important moderators of country, context, and platform.

Country. Each country exhibits a unique culture that corresponds with a specific cultural orientation. But in the research, we generally distinguish as collectivistic and individualistic cultures. Many scholars have confirmed the culture has an influence on individuals' behavior (Karahanna et al., 2005). The aspect of cultural diversity that holds significant weight in social conduct across various cultures globally is the extent to which individualism or collectivism is emphasized. Therefore, the relationships observed in our study may vary depending on the country of origin (i.e., western countries and eastern countries). In individualistic cultures, personal ambitions, attitudes, and values of groups such as families, colleagues, or compatriots primarily steer people's social behavior (Triandis et al., 1990). On the other hand, collectivistic cultures prioritize goals, attitudes, and values shared with a group of people in determining social behavior (Triandis, 1988). Countries such as China and Korea place a significant emphasis on the validation of their social identity and recognition within their communities of friends and family. Consequently, individuals in these societies of eastern countries are more inclined to participate in social events and uphold positive behaviors that align with the cultural norms and expectations. The inherent purpose of gamification lies in enhancing engagement levels, which often necessitates assistance from others in social settings. However, as a result of individualistic cultural influences, western countries may not place as much emphasis on seeking recognition from one's social circle. Therefore, this research proposes that the impact of social-related affordance on user behavior is observed to hold a greater degree of significance in eastern nations as compared to their western counterparts.

H6. The effects of social-related affordance on user behavior are stronger in eastern countries than on western countries.

Contextual moderators. As the literature illustrated that gamification has been utilized in various contexts. The present *meta*-analysis elucidates various contextual factors for revealing the heterogeneity of gamification (i.e., digital platforms and contexts) that may potentially impact the consistencies observed in the relationships among the study variables. Platform encompasses the various platforms, systems, and applications that users employ. For example, we hired platform as e-commerce platform, knowledge-based platform, and service-based platform. Meanwhile, context pertains to the particular domain wherein gamification is utilized which education, marketing and service.

In addition, gamification users may have different usage patterns due to varying technological features across platforms (Sadana and Sharma, 2021). For instance, within the educational context, it is worth noting that learners may prioritize the benefits associated with achieving learning outcomes offered by utilizing the immersive affordances. Specifically, it has been observed that the immersive experiences which enable a sense of presence and facilitate by advanced technology such as learning zoom and face to face teaching video have the potential to significantly enhance learner motivation and overall effectiveness in the educational process. Therefore, leveraging these immersive affordances can serve as a highly functional tool for learners to achieve optimal performance in their learning pursuits (Shi et al., 2022). However, in the knowledge sharing platform, users may emphasize on social-related affordance to attract and invite more experts to answer the questions. It is presumable that the level of affordance and perceived value, and behavior might also be distinct from platforms and contexts. Due to the complex framework of gamification with multiple paths, this research selected key paths of immersion-related affordances → functional value, social-related affordances → functional value, and functional value → behavior to execute the moderating effects.

H7. Contextual moderators could moderate gamification mechanism within various contexts and platforms.

5. Method

5.1. Literature retrieving and eligibility criteria

This *meta*-analysis study was conducted following the guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement (Tricco et al., 2018). In the field of social sciences, the PRISMA framework offers significant benefits by providing thorough, transparent, and comprehensive documentation for systematic reviews. This aligns well with the requirements for effective decision-making in systematic literature reviews. Consequently, PRISMA is particularly valuable and applicable in the social sciences, especially

within the domain of systematic literature reviews on gamification. We summarize and merge several constructs that bear similar connotations but vary the manipulations as a single construct, as per previous studies. In detail, this *meta*-analysis framework includes four independent variables and one dependent variables. Following IS *meta*-analysis research, we searched the literature on Science Direct, Web of Science, and EBSCO (see Table 1), and with a combination of keywords as follows: ("gamification" OR "gamified" OR "gamif" OR "gaming") AND ("digital platform" OR "e-commerce" OR "electronic commerce" OR "marketing" OR "Knowledge platforms") (Sailer and Homner, 2020; Seaborn and Fels, 2015). The primary studies were obtained by searching for these keywords in the title, abstract, and keywords of the selected databases. We retrieved 522 papers after deleting the duplicates (see Fig. 2), and we further screened them to ensure that each research meets the following inclusion criteria: (1) undertakes empirical research related to gamification in digital platforms, in particular, e-commerce platform; (2) reports the statistical data such as sample size and offers the path coefficient, Pearson correlation that can be converted to correlation; and (3) is an English-language paper published in a qualified journal in Social Sciences Citation Index journal, and ABS list journal. Besides, studies were excluded when meet these requirements: (1) no specifications of gamification affordances and elements; (2) non-empirical studies. We ultimately coded from 34 papers (see Fig. 2). Fig. 2. illustrates the PRISMA flow chart used to identify studies for detailed systematic search.

5.2. Coding

Two PhD candidates were entrusted with the coding process, adhering to independent code standards that aligned with the coding criteria. The resulting 90 % coding consistency agreement rate exemplifies the meticulousness of the coding procedures employed during the analysis. The study descriptors encompassed fundamental details regarding the primary studies, including the title of the article titles, first authors, sample sizes, and effect sizes. In specific, we collected and coded the sample size, *t*-test, F-test, path coefficient, and Pearson correlation reported in previous papers. Given the gamification features and elements are not consolidated in various literature, we extracted similar elements as consistent affordances and averaged estimates of the same relationships but recorded estimates separately when affordances were independent of each other (Bai et al., 2020).

5.3. Effect size and data analyze

In line with the *meta*-analysis procedure, we adopted R to calculate effect sizes into correlations(r) (Assink and Wibbelink, 2016). However, the included literature may report in different standards (e.g., correlations or β coefficients). Thus, this research followed the formula to convert all reported statistics to Pearson's correlations (Pearson's r) (Peterson and Brown, 2005; Rosenthal and DiMatteo, 2001). For the studies which lack parts of path coefficients or correlations, we followed the previous *meta*-analysis literature to convert existing statistics data to correlations. Using random-effect models, we adopted the sample-weighted r value of each relationship as the effect sizes. In addition, homogeneity test with Q values and I2 values was used to examine the heterogeneity in the effect size of each relationships (Borenstein et al., 2009). Then, the relationships of overall correlations between gamification affordances and behaviors, and, gamification affordance and perceived values, as well as perceived values and behaviors are estimated by weighting each observed correlation which relied on the sample sizes. In case the measurement error of multiple studies, we used Hunters and Schmidt's methods the reliability values of factors in each study were used to correct the measurement error (Schmidt, 2015; Schmidt and Hunter, 2004).

6. Results of overall relationships

This *meta*-analysis comprised 34 studies, encompassing a combined sample size of 35,856 participants, and 93 independent correlations. The results of the sample-weighted mean effect sizes were interpreted following the comparing thresholds for correlation that a correlation coefficient of 0.10 is regarded as a weak level; a correlation coefficient ranged from 0.30 to 0.49 represents a moderate level; a correlation coefficient of 0.50 or higher means strong level (Cohen, 1992). Table 2. illustrates the r-weighted of each relationship.

6.1. Effects of gamification affordances

Considering the effect of gamification affordances on behavior, achievement-related affordance on behavior (r-weighted = 0.432), immersion-related affordances on behavior (r-weighted = 0.338), social-related affordances on behavior (r-weighted = 0.299). Hence, achievement-related affordance plays an important role in affecting individuals' behavior.

6.2. Effects of functional value, emotional value, and social value

Regarding the perceived values as the mediators, we found that social-related affordance significantly affects social value (r-weighted = 0.652). In functional value aspect, achievement-related affordance positively influences functional value (r-weighted = 0.420), immersion-related affordance positively influences functional value (r-weighted = 0.389), social-related affordances positively influence functional value (r-weighted = 0.409). In emotional value aspect, achievement-related affordance positively influences emotional value (r-weighted = 0.437), immersion-related affordances positively affect emotional value (r-weighted = 0.347), social-related affordance positively influences emotional value (r-weighted = 0.470). Given the limit of literature, we only could connect social-related affordance to social value. Social-related affordance positively influences social value (r-weighted = 0. 652).

6.3. Effect of functional value, emotional value, and social value

We found that functional value positively influences consumer behavior (r-weighted = 0. 446), emotional value positively affects consumer behavior (r-weighted = 0. 532), and social value positively influences consumer behavior (r-weighted = 0. 379).

6.4. Publication bias

Due to studies with significant results are more likely to attain published opportunities than non-significant results which may lead to publication bias (Lin and Chu, 2018; Thornton and Lee, 2000). Therefore, for avoiding publication bias in this research, we examined the fail-safe N by Rosenthal approach (Rosenthal and DiMatteo, 2001). In detail,

Table 1
Literature retrieving terminology and Number of records retrieved from databases.

Search keywords
(a) Gamification: "gamification" OR "gamified" OR "gameful" OR "gamif" OR "gaming"
(b) Digital platform: "digital platform" OR "e-commerce" OR "electronic commerce" OR "marketing" OR "Knowledge platforms"

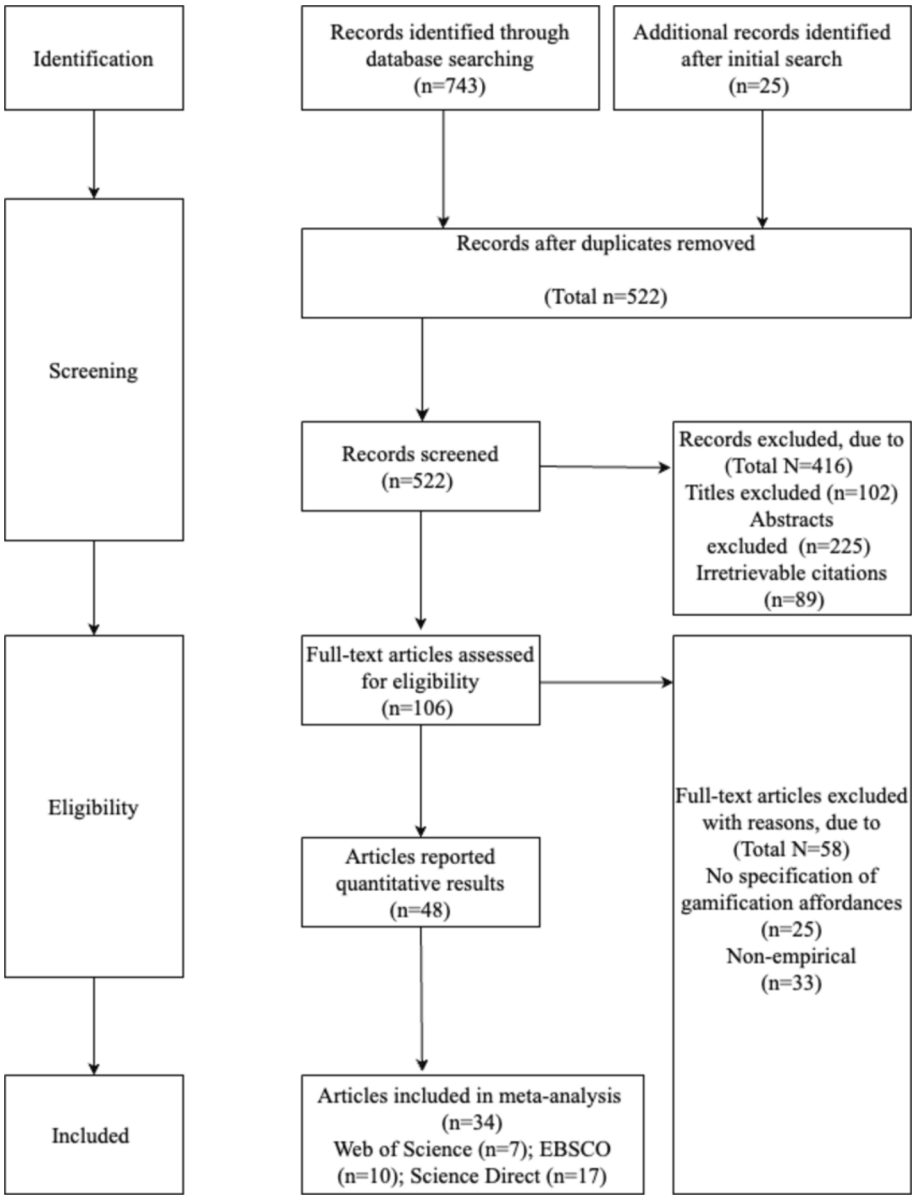

Fig. 2. The PRISMA flow chart used to identify studies for detailed analysis.

we followed Rosenthal approach to estimate fail-safe N with 5 k + 10 that k refers to the number of studies examining each given relationship (Orwin, 1983; Rosenthal, 1979). The threshold of fail-safe N is 1, when fail-safe N ratio is higher than 1 which reveals there is no publication bias. The fail-safe N ratio of this *meta*-analysis ranks from 8.63 to 143.99, which are higher than 1. Therefore, there is no publication bias in this research. In addition, the study revealed that the vulnerability of aggregated relationships differs in relation to potential missing studies. For instance, the estimated associations of gamification affordance and behaviors would necessitate between 523 and 2773 studies with null effect sizes for overturning. However, the estimation of the correlation between gamification affordances and perceived values only requires a range of 233 to 1584 studies to render the results non-significant. Hence, compared to the estimated associations of gamification affordance and behaviors, the estimated correlations between gamification affordances and perceived values are more susceptible to publication bias.

7. Results of moderators

For moderating the relationship between social-related affordances to social value, country of samples significantly moderated the association between social-related affordances and social value (Qbetween = 12.454, $p < 0.001$). As shown in Table 3, the correlation between social-related affordances and social value for the studies with more east countries (r = 0.77, 95 % CI [0.86,1.31], k = 2) were significantly stronger than for those with west countries (r = 0.38, 95 % CI [0.06,0.70], k = 1). In addition, platform could moderate the relationship between social-related affordances to functional value, (Qbetween = 18.422, $p < 0.001$), as well as, functional value on behavior (Qbetween = 8.804, $p < 0.05$). Functional value on behavior was stronger in e-commerce platform (r = 0.71, 95 % CI [0.46,0.97], k = 2). Surprisingly, the relationship between social-related affordances influence and functional value was stronger in knowledge-based platform - than in other platforms (r = 0.62, 95 % CI [0.52,0.72], k = 1). Lastly, immersion-related affordance and functional value was stronger in education context which compared with marketing and service contexts (r = 0.67, 95 % CI [0.57,0.77], k = 1). Table 3. demonstrates the moderating effects.

Table 2
Summary of descriptive statistics and relationships.

Variable relationship	Relationships identified	No. of raw effects	Total N	r-weighted	95 % Confidence interval		Z value (two_tailed)	Heterogeneity Test		Fail-safe N
					Lower bound	Upper bound			I2	
M → Y	**Mediators on outcomes**									
	H1a. Functional value → Behavior	10	4381	0. 446	0.206	0.595	4.04	347.154***	97.41 %	2756
	H1b. Emotional value → Behavior	15	6493	0. 532	0.407	0.733	6.85	594.521***	97.65 %	12,239
	H1c. Social value → Behavior	6	1946	0.379	0.321	0.493	9.27	17.810**	71.93 %	678
X → M	**Antecedents on mediators**									
	H2a. Achievement → Functional value	6	2043	0. 420	0.324	0. 552	7.54	33.377***	85.02 %	867
	H2b. Achievement → Emotional value	7	2934	0. 437	0.374	0.556	10.00	35.915***	83.29 %	1584
	H3a. Immersion → Functional value	4	1116	0. 389	0.179	0. 614	3.57	38.424***	92.19 %	259
	H3b. Immersion → Emotional value	3	1452	0. 347	0.215	0. 621	4.03	26.723***	92.52 %	233
	H4a. Social → Functional value	5	1455	0. 409	0.306	0. 536	7.19	19.169***	79.13 %	473
	H4b. Social → Emotional value	6	2349	0. 470	0. 399	0.653	8.13	45.100***	88.91 %	1332
	H4c. Social → Social value	3	1029	0.652	0.400	1.304	3.70	95.119***	97.90 %	748
X → Y	**Antecedents on outcomes**									
	H5a. Achievement → Behavior	8	3340	0.432	0.259	0.810	3.80	446.596***	98.43 %	2659
	H5b. Immersion → Behavior	5	1761	0. 338	0.246	0.697	4.10	80.184***	95.01 %	523
	H5c. Social → Behavior	15	5557	0. 299	0.245	0.437	6.98	151.899***	91.44 %	2773

Note. R = Estimated effect size (Pearson's r); k = number of studies; N = total sample size for all studies combined; 95 %CI = lower and upper limits of 95 % confidence interval for effect size; Q, I 2 = measure of homogeneity; Fail-safe N = statistics for fail-safe N test.

Table 3
Results of moderator analysis.

Aggregated Relationship	Moderator	Q between	Subgroups	k	r	95 % CI
H6. Social-related affordances →Behavior	Country	12.454***	Eastern countries	2	0.77	[0.86 1.31]
			Western countries	1	0.38	[0.06 0.70]
H7. Immersion-related affordances → Functional value	Context	37.861***	Education	1	0.67	[0.57 0.77]
			Marketing	2	0.32	[0.24 0.41]
			Service	1	0.22	[0.09 0.35]
H7. Social-related affordances →Functional value	Platform	18.422***	E-commerce platform	1	0.29	[0.14 0.44]
			Knowledge-based platform	1	0.62	[0.52 0.72]
			Service-based platform	3	0.39	[0.32 0.46]
H7. Functional value →Behavior	Platform	8.804*	E-commerce platform	2	0.71	[0.46 0.97]
			Knowledge-based platform	2	0.20	[-0.05 0.46]
			Service-based platform	5	0.38	[0.22 0.55]

Note. R = Pearson's r; 95 %CI = lower and upper limits of 95 % confidence interval for effect size. *p < 0.05, **p < 0.01, ***p < 0.001.

8. Discussion

Despite various studies that have examined the relationship between gamification affordances, elements and following behaviors or intentions, only a few considerations have been taken by a *meta*-analysis method *(*Borenstein et al., 2009; Fan et al., 2022; Sailer and Homner, 2020*)*. In particular, this *meta*-analysis research combines and concludes the previous gamification literature to answer the research question by estimating the relationships between gamification affordances (e.g., achievement, immersion, social) and behaviors, and mediators of perceived values (e.g., emotional, functional and social). The study includes 34 primary studies with sample sizes and effect sizes. The results reveal that gamification affordances are positively related to behaviors. The results could help practitioners to design more reasonable and useful gamification dynamics.

The overall results demonstrate the positive influence of gamification affordances on perceived values and behavior, revealing detailly how gamification affordances affect various perceived values of users and behaviors. As the previous literature suggests that gamification affordances influence perceived values and consumer behaviors, however, the detailed mechanism is not clear (Torres et al., 2022). This study has obtained estimates of the effect sizes of the relationships between them that verify the mechanism and indicate achievement, immersion, and social are the essential affordances in gamification. Thus, we have added to some findings that perceived values as the psychology mechanism to explain affordance positively affect individual behavior with three perceived values in gamification context.

Generally, extant studies have discovered the influence of gamification affordances on perceived values such as rewards, points and leaderboards (Hwang and Choi, 2020; Mekler et al., 2013). Thus, previous literature failed to conceptualize affordances and integrate them into a single construct. In this meta study, we proposed four three gamification affordances and revel the innate influence on each perceived value and behavior. Then, we have provided the *meta*-analysis results that gamification affordance positively affects behaviors via perceived values. Interestingly, compared with other affordances,

social-related affordance has a profound effect on emotional value. These findings encourage practitioners to design more interactivity between users in the gamification (e.g., communication box, teams-forming mechanism and sharing button). In addition, this enriches the previous literature that social-related affordances could effectively trigger emotional value perceptions of consumers. Meanwhile, we found that emotional value has a higher effect compared with functional value and social value. Consequently, this study not only elucidates the workings of gamification on digital platforms but also identifies the key constituents for enhancing user behaviors.

9. Theoretical contributions and practical contributions

9.1. Theoretical contributions

The results from our *meta*-analysis offer significant insights for refining the gamification framework, particularly by elucidating the direct impact of perceived values on individual behavior. In addressing Research Questions 1, 2, and 3, we meticulously selected key gamification affordances in digital platforms and constructed a comprehensive framework. This framework is designed to explain how gamification affordances influence consumer response, and to identify which moderators could amplify the efficacy of these mechanisms. Consequently, our study confirms the viability and internal coherence of the mediating mechanisms within the Stimulus-Organism-Response (SOR) framework, as evidenced through the evaluation of both internal and external perceived values. From a theoretical standpoint, this research makes three substantial contributions to the existing body of literature on gamification and digital platforms.

First, our study significantly enriches the gamification literature by examining the role of emerging gamification technologies in influencing user behaviors. Although a systematic review of existing gamification studies, including those in education (Sailer and Homner, 2020), has summarized the progress and applied theories in this field, there remains a gap in understanding the mechanisms that enhance perceived values and behaviors. Previous narrative and systematic reviews have provided insights into specific research advancements, yet they lack a comprehensive *meta*-analysis that elucidates the overall impact of gamification on user behavior within digital platforms. Furthermore, the effects of gamification affordances on these outcomes appear to be inconsistently reported across different contexts in the extant literature. Addressing these shortcomings, our study bridges this knowledge gap by offering a more nuanced understanding of gamification affordances on digital platforms through the lens of technology affordance theory. We integrate previous research findings and develop a theoretical model that connects gamification affordances with perceived values and user behaviors.

Secondly, our study significantly advances the understanding of how users' psychological responses are shaped, by elucidating the mediating role of both internal and external perceived values. Subsequently, we have ranked the relative significance of each mediating factor that emotional value has the profound effect on individual behaviors in digital platform. Finally, this research offers more substantial conclusions in response to certain disputed discoveries. Surprisingly, there is inconsistently with previous literature that emotional value, as the internal perceived value has the most profound effect on user behavior. Extant literature concentrates on the influence of functional value on consumer behavior, and acknowledges its superior influence over other perceived values (Shi et al., 2022; Xiao and Kim, 2009). Our understanding is that the fundamental workings mechanism of gamification involves fostering feelings of joy and happiness, consequently generating significant emotional worth in users. Hence, this emotional value of users serves as a vital catalyst for encouraging positive user behavior. Therefore, our study provides more concrete conclusions and addresses certain controversial findings in the existing literature, highlighting the primary influence of emotional value over other perceived values in user responses to gamification.

Thirdly, our research sheds light on the moderating effects of country-specific cultural factors and contextual factors. In detail, our *meta*-analysis yields notable, unexpected results as we examine the impact of moderators for RQ3 on the operating mechanism of gamification digital platforms. These findings may prompt further investigation into innovative subjects and hypotheses. For example, within the realm of immersion-related affordance on functional value, the education context stands out as the primary vehicle for achieving this outcome compared to other contexts. Specifically, considering the relationship between immersion-related affordance and functional value that education context has the profound effect on moderating/influencing this relationship which is not match with the previous literature (Majuri et al., 2018). Based on this intriguing finding, it can be inferred that education users compared with users in other platforms are primarily motivated by achievements such as learning points and leaderboards (Cao et al., 2023; Richter et al., 2015), whereas customers in marketing platforms tend to place less emphasis on small monetary rewards (i.e., account credits or occasional discounts) but intrinsic psychology motivations such as from competition-related affordance and cooperation-related affordance (Santhanam et al., 2016). It represents that user in education platform emphasizes learning achievement and entailed functional value by immersed learning environment than users in other platforms. Therefore, this *meta*-analysis research has deduced that the context of education plays an integral role in influencing immersion-related affordance on functional value, by providing learners with a scenario for engaging in enticing learning activities. Furthermore, the *meta*-analysis conducted in this study explores the various country factors that significantly impact the relationship between social-related affordances and social value. The findings reveal that the effects of social-related affordances on social value may vary across distinct cultural segments. Moreover, the limited research examining the role of individual culture and collectivism culture features in shaping social value emphasizes the necessity for further empirical studies in this field.

9.2. Practical contributions

In terms of practical implications, our research is beneficial for gamification industry and design. From the perspective of gamification industry trends, this research highlights several trends and future prospects. While we believe the future of gamification is promising, we also observe certain dark sides. Some gamification affordances may not achieve the expected outcomes, particularly in the case of social affordances, which may fail to sufficiently enhance users' perceived social value. This suggests that social affordances could lead to privacy concerns for users (Huang and Zhou, 2020; Jia and Yu, 2024). Although users have engaged with social-related gamification affordances, certain design affordances and mechanisms have proven inefficient, resulting in negative effects that disrupt users' continued participation. Therefore, it is crucial for industry practitioners to collect real-world data and reexamine these dark sides to refine gamification affordances and better align them with enterprise goals. As gamification becomes more widespread, regulatory frameworks may also need to evolve to protect users from exploitative practices, especially regarding data privacy and transparency. Without such measures, users may seek only short-term rewards, neglecting long-term engagement. Thus, one key trend is the shift from short-term incentives to mechanisms that foster long-term user engagement and loyalty. Gamification affordance design should balance immediate gratification with sustainable interest to prevent users from disengaging once rewards lose their appeal. Furthermore, as user preferences and motivations differ, future gamification affordance designs should focus on personalization. Tailoring gamification affordances to different user groups can enhance engagement, minimize negative effects, and ensure that the system resonates with a diverse audience. The industry must rethink outdated design patterns, as not all affordances are suitable, in fact, contribute to the dark side of

gamification.

From the gamification system design perspective, first, gamification practitioners can align themselves with conventional gamification affordances and develop more dynamic social perspectives. It is noteworthy that the impact of achievement-related affordance on social value surpasses that of social-related affordance. Therefore, gamification designers could combine achievement elements with social attributes such as communicate within leaderboards to indirectly improve social value, and behaviors of users. Besides, providing a social mechanism to share stories or experiences related to their achievements, fostering a narrative-driven community around users successes. Secondly, emotional value is a crucial perceived value for individuals, and gamification designers should incorporate emotional values such as enjoyment and flow mechanism to increase engagement in gamification activities. Hence, gamification designers have the potential to enhance engagement in gamification activities by incorporating entertaining elements that transform mundane routines into enjoyable and stimulating experiences, thereby facilitating amusement and entertainment enjoyment. More interestingly, compared with other affordances and perceived values, social-related affordance has a profound effect on social value. These findings encourage practitioners to design more interactivity between users in the gamification (e.g., communication box, teams-forming mechanism and sharing button). For example, in the knowledge-sharing platform, there could be more social-related gamification design such as inviting expert to answer questions to improve sense of community which represents the emotions and recognitions of this platform.

10. Conclusion and future directions

This study contributes significantly to the field of gamification, both practically and theoretically. It presents the first *meta*-analysis of gamification on digital platforms and develops a theoretical framework that offers valuable insights into this emerging field. To ensure accuracy and consistency in our findings, we meticulously collected and coded data from 34 relevant literature sources that support empirical evidence for this framework. Our analysis suggests that affordances (achievement-related affordances, functional-related affordances and immersion-related affordances), and perceived values (emotional value, functional value and social value) are key factors that can influence behavior, and gamification designers can leverage these insights to create more effective mechanisms that can enhance desired behaviors in individuals within corporations. Despite the advantages of our study, it also has some limitations. First, we developed a theoretical framework and verified the moderators among aggregated relationships. Future studies should account for more contextual or demographic variables as moderators to better understand the nuances of gamification. Second, our sample size was smaller compared to other *meta*-analyses, which is attributed to the fact that gamification is still an emerging field. Therefore, future studies could expand the sample size by including more completed literature and providing valuable insights into *meta*-analysis research.

For future studies, there are opportunities and suggestions for researchers to establish more through gamification mechanics and form perfect engagement experience. Concerning the negative effects of gamification in digital platforms, this *meta*-analysis offers insight for upcoming studies by addressing inquiries from prior literature that gamification commonly has positive effect on consumer behavior but lack of the entailed adverse influence, thus underscoring the necessity for further examination (Liu et al., 2017; Santhanam et al., 2016). The results disclosed in this study present convincing proof of the negative influence of gamification to be gained by delving more comprehensively into future studies. Specifically, gamification also poses a potential threat to digital platforms, as the cost of usage may negatively impact consumer engagement and ultimately lead to adverse effects for the platforms. Besides, gamification has been seen as effective tool for promoting engagement (Xi and Hamari, 2020; Zhang et al., 2023), future study may explore more details of affordance and compare its specific effects on behavior and inner mechanism beyond perceived values. For example, can competition yield better results than cooperation in motivating individuals intrinsically, given the complex gamification designs in a particular context?

There is a need to broaden the gamification design and research scope which has become apparent. Despite its prevalent use in marketing, e-commerce, education, and service, there is a lack of exploration into additional research areas (Abou-Shouk and Soliman, 2021; Buckley and Doyle, 2017; Hamari et al., 2014). For instance, beyond young generations and non-disabled people, elderly and disabled population as well as require entailed and tailored gamification design such as aging education and health industry for disabled people. In addition, the current state of gamification design and mechanic appears to be homogenous (Schöbel et al., 2020), overlooking the potential for comprehensive design to enhance meaningful engagement. Notably, the gamification features a similar affordance that warrants further examination. Therefore, it is strongly recommended by this *meta*-analysis that designs incorporate greater diversity in order to fulfill the crucial prerequisite of novelty, which acts as a driving force compelling user to adopt gamification practices.

CRediT authorship contribution statement

Furong Jia: Writing – review & editing, Writing – original draft, Methodology, Investigation, Data curation, Conceptualization. **Xueqi Bao:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Jie Yu:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

Appendix A. . The characteristics of included studies in the meta-analysis

ID	Journal	First Author	Year	Sample Size (N)	Title	Context	Platform	Method	Country Region	Database
1	International Journal of Information Management	Whittaker	2021	387	'Go with the flow' for gamification and sustainability marketing	Marketing	Service-Based Platforms	Survey	Australia	Science Direct
2	Journal of Business Research	Wang	2023	378	Customers' help-seeking propensity and decisions in	Marketing	E-Commerce	Survey	Asia	EBSCO

(*continued on next page*)

(*continued*)

ID	Journal	First Author	Year	Sample Size (N)	Title	Context	Platform	Method	Country Region	Database
					brands' self-built live streaming E-Commerce: A mixed-methods and fsQCA investigation from a dual-process perspective					
3	Journal of Business Research	Xi	2020	524	Does gamification affect brand engagement and equity? A study in online brand communities	Marketing	Brand Platform	Experiment	Asia	EBSCO
4	International Journal of Information Management	Xi	2019	824	Does gamification satisfy needs? A study on the relationship between gamification features and intrinsic need satisfaction	Marketing	Brand Platform	Experiment	Asia	Science Direct
5	Journal of Business Research	Bitrián	2021	276	Enhancing user engagement: The role of gamification in mobile apps	Service	Service-Based Platforms	Survey	America	EBSCO
6	Journal of Business Research	Hwang	2020	191	Having fun while receiving rewards?: Exploration of gamification in loyalty programs for consumer loyalty	Marketing	E-Commerce	Experiment	America	EBSCO
7	International Journal of Information Management	Xu	2022	387	How gamification drives consumer citizenship behaviour: The role of perceived gamification affordances	Marketing	E-Commerce	Survey	Asia	Science Direct
8	International Journal of Information Management	Hassan	2019	167	How motivational feedback increases user's benefits and continued use: A study on gamification, quantified-self and social networking	Service	Service-Based Platforms	Survey	European	Science Direct
9	International Journal of Information Management	Köse	2019	562	Is it a tool or a toy? How user's conception of a system's purpose affects their experience and use	Service	Knowledge-Based Platforms	Survey	European	Science Direct
10	Technological Forecasting and Social Change	Zhou	2023	320	Understanding the dark side of gamified interactions on short-form video	Marketing	E-Commerce	Survey	Asia	Science Direct
11	Decision Support Systems	Zhang	2023	447	How to improve user engagement and retention in mobile payment: A gamification affordance perspective	Service	Service-Based Platforms	Survey	Asia	Science Direct
12	Journal of Interactive Marketing	Leclercq	2018	160	The Boundaries of Gamification for Engaging Customers: Effects of Losing a Contest in Online Co-creation Communities	Service	Service-Based Platforms	Experiment	Other	Science Direct
13	Tourism Management	Shi	2022	343	Gamification in OTA platforms: A mixed-methods research involving online shopping carnival	Service	e-Commerce	Mixed	Asia	Science Direct
14	Electronic Commerce Research and Applications	García-Jurado	2021	253	Does gamification engage users in online shopping?	Service	Service-Based Platforms	Survey	Africa	EBSCO
15	Computers in Human Behavior	Hsu	2018	242	How gamification marketing activities motivate desirable consumer behaviors: Focusing on the role of brand love	Marketing	Service-Based Platforms	Survey	Asia	WoS
16	Computers in Human Behavior	Feng	2018	295	Gamification artifacts and crowdsourcing participation: Examiningthe mediating role of intrinsic motivations	Service	Knowledge-Based Platforms	Survey	Asia	WoS
17	Technological Forecasting and Social Change	Feng	2022	386	How do gamification mechanics drive solvers' Knowledge contribution? A study of collaborative knowledge crowdsourcing	Service	Knowledge-Based Platforms	Survey	Asia	Science Direct
18	International Journal of Information Management	Hamari	2015	200	Why do people use gamification services?	Service	Service-Based Platforms	Survey	European	Science Direct
19	Technology in Society	Hsu	2021	457	Advocating recycling and encouraging environmentally friendly habits through gamification: An empirical investigation	Marketing	Service-Based Platforms	Survey	America	Science Direct

(*continued on next page*)

(*continued*)

ID	Journal	First Author	Year	Sample Size (N)	Title	Context	Platform	Method	Country Region	Database
20	Information Technology & People	Chang	2022	478	AI-powered learning application use and gratification: an integrative model	Education	Knowledge-Based Platforms	Survey	Asia	EBSCO
21	Information & Management	Wu	2020	317	Effects of the design of mobile security notifications and mobile app usability on users' security perceptions and continued use intention	Service	Service-Based Platforms	Experiment	America	Science Direct
22	Computers in Human Behavior	Yang	2017	323	Examining the impact of gamification on intention of engagement and brand attitude in the marketing context	Marketing	E-Commerce	Survey	Other	WoS
23	Information & Management	Aparicio	2019	215	Gamification: A key determinant of massive open online course (MOOC) success	Education	Knowledge-Based Platforms	Survey	Other	Science Direct
24	Information Technology & People	Wong	2022	419	Gamified money: exploring the effectiveness of gamification in mobile payment adoption among the silver generation in China	Service	Service-Based Platforms	Survey	Asia	EBSCO
25	Computers in Human Behavior	Rodrigues	2017	219	How does the web game design influence the behavior of e-banking users?	Service	Service-Based Platforms	Survey	European	WoS
26	Computers in Human Behavior	Jahn	2021	332	Individualized gamification elements: The impact of avatar and feedback design on reuse intention	Service	Service-Based Platforms	Experiment	European	WoS
27	Information Technology & People	Alexiou	2022	133	Narrative and aesthetics as antecedents of perceived learning in serious games	Education	Education	Survey	Europe	EBSCO
28	Computers in Human Behavior	Rodrigues	2016	427	Playing seriously_How gamification and social cues influence bank customers to use gamified e-business applications	Service	Service-Based Platforms	Survey	Europe	WoS
29	Journal of Destination Marketing & Management	Abou-Shouk	2021	327	The impact of gamification adoption intention on brand awareness and loyalty in tourism: The mediating effect of customer engagement	Service	E-Commerce	Survey	Africa	Science Direct
30	Information & Management	Li	2022	330	The puzzle of experience vs. memory: Peak-end theory and strategic gamification design in M−commerce	Marketing	E-Commerce	Experiment	Asia	Science Direct
31	Psychology&Marketing	Torres	2022	229	Value dimensions of gamification and their influence on brand loyalty and word_of_mouth: Relationships and combinations with satisfaction and brand love	Marketing	E-Commerce	Mixed	Other	EBSCO
32	Tourism Management Perspectives	Thirumaran	2021	539	Virtual pets want to travel: Engaging visitors, creating excitement	Service	Service-Based Platforms	Survey	Africa	Science Direct
33	Computers in Human Behavior	Yu	2022	1586	Why do people play games on mobile commerce platforms? An empirical study on the influence of gamification on purchase intention	Marketing	E-Commerce	Survey	Asia	WoS
34	Internet Research	Baptista	2017	326	Why so serious? Gamification impact in the acceptance of mobile banking services	Service	Service-Based Platforms	Survey	America	EBSCO

Appendix B. . Construct definitions and aliases

Construct	Definition	Alias(es)
Stimulus		
Immersion affordance	"Immersion affordance" refers to feeling of the user that they are part of the virtual environment (Witmer and Singer, 1998). It is the users' affective affordance experienced over time.	**Focused attention**: It is the feeling of absorption while interacting with the system, or the ability to ignore the disturbing effects of the environment (O'Brien, 2018).

(*continued on next page*)

(*continued*)

Construct	Definition	Alias(es)
Achievement affordance	"Achievement affordance" refers to the various challenges, goals, or objectives that are presented to users, providing them with opportunities to accomplish or succeed in the gamified context (Lee et al., 2015).	**Competence**: It refers to the need to feel effective and capable in one's actions and pursuits (Deci and Ryan, 2012).
Social affordance	"Social affordance" refers to the perceived or potential actions or opportunities for social interaction and communication that are provided by the environment or context (Carvalho, 2020). They are the features or properties of a situation that allow individuals to engage in social behaviors and interactions.	**Self-expression affordance**: It refers to the affordance that enables users to develop their unique self-identities by allowing them to be distinguishable from others (Suh et al., 2017).**Identity affordance**: It refers to the affordance that enables users to establish their unique identity among others (S. Shi et al., 2022), which provide users with more social resources and enhance their social well-being (Hammedi et al., 2019).**Interactivity affordance**: It refers to affordance that enables users to communicate with each other (Du et al., 2020).
Organism		
Functional value	"Functional value" refers to the value obtained through good deals and high-quality products (Bolton and Drew, 1991).	**Include:** perceived usability, perceived ease of use, perceived usefulness, utilitarian value, price value
Emotional value	"Emotional value" refers to the feelings and emotions evoked through interaction with the gamification on the digital platform (Shi et al., 2016).	**Include:** hedonic value, entertainment, leisure, flow, enjoyment
Social value	"Social value" refers to the reinforcement of individuals' image among the society, establishing social bonds, and gaining social consensus (Sweeney and Soutar, 2001).	**Include:** relatedness, social bonds
Outcomes		
User Behavior	User behavior can be described as a comprehensive concept that encompasses both behavioral intention and behavior. This idea draws upon psychological perspectives, as well as perspectives on behavioral engagement and usage (Fan et al., 2022). In this study, user behavior includes behavioral intention and behavior that refer to the intention and behavior of users to adopt, use, purchase, engage of gamification on the digital platforms.	**Include:** Behavioral engagement, continued use, purchase intention, adoption intention

Data availability

Data will be made available on request.

References

Abou-Shouk, M., Soliman, M., 2021. The impact of gamification adoption intention on brand awareness and loyalty in tourism: The mediating effect of customer engagement. J. Destin. Mark. Manag. 20, 100559. https://doi.org/10.1016/j.jdmm.2021.100559.

Alexiou, A., Schippers, M.C., Oshri, I., Angelopoulos, S., 2020. Narrative and aesthetics as antecedents of perceived learning in serious games. Inf. Technol. People 35, 142–161. https://doi.org/10.1108/ITP-08-2019-0435.

Aparicio, M., Oliveira, T., Bacao, F., Painho, M., 2019. Gamification: A key determinant of massive open online course (MOOC) success. Inf. Manag. 56, 39–54.

Ariely, D., Bracha, A., Meier, S., 2009. Doing good or doing well? image motivation and monetary incentives in behaving prosocially. The American Economic Review 99, 544–555.

Ashraf, A.R., Thongpapanl, N. (Tek), Spyropoulou, S., 2016. The connection and disconnection between e-commerce businesses and their customers: Exploring the role of engagement, perceived usefulness, and perceived ease-of-use. Electronic Commerce Research and Applications 20, 69–86. https://doi.org/10.1016/j.elerap.2016.10.001.

Assink, M., Wibbelink, C.J., 2016. Fitting three-level meta-analytic models in R: a step-by-step tutorial. The Quantitative Methods for Psychology 12, 154–174. https://doi.org/10.20982/tqmp.12.3.p154.

Babin, B.J., Darden, W.R., Griffin, M., 1994. Work and/or fun: measuring hedonic and utilitarian shopping value. J. Consum. Res. 20, 644–656. https://doi.org/10.1086/209376.

Bai, S., Hew, K.F., Huang, B., 2020. Does gamification improve student learning outcome? Evidence from a meta-analysis and synthesis of qualitative data in educational contexts. Educ. Res. Rev. 30, 100322. https://doi.org/10.1016/j.edurev.2020.100322.

Bitrián, P., Buil, I., Catalán, S., 2021. Enhancing user engagement: the role of gamification in mobile apps. J. Bus. Res. 132, 170–185. https://doi.org/10.1016/j.jbusres.2021.04.028.

Bittner, J.V., Shipper, J., 2014. Motivational effects and age differences of gamification in product advertising. J. Consum. Mark. 31, 391–400. https://doi.org/10.1108/JCM-04-2014-0945.

Bizzi, L., 2023. Why to gamify performance management? consequences of user engagement in gamification. Inf. Manag. 60, 103762. https://doi.org/10.1016/j.im.2023.103762.

Bolton, R.N., Drew, J.H., 1991. A multistage model of customers' assessments of service quality and value. J. Consum. Res. 17, 375–384.

Borenstein, M., Hedges, L.V., Higgins, J.P.T., Rothstein, H.R., 2009. Introduction to meta-analysis. Wiley. https://doi.org/10.1002/9780470743386.

Bormann, D., Greitemeyer, T., 2015. Immersed in virtual worlds and minds: effects of in-game storytelling on immersion, need satisfaction, and affective theory of mind. Soc. Psychol. Personal. Sci. 6, 646–652.

Bravo, R., Catalán, S., Pina, J.M., 2021. Gamification in tourism and hospitality review platforms: how to R.A.M.P. up users' motivation to create content. Int. J. Hosp. Manag. 99, 103064. https://doi.org/10.1016/j.ijhm.2021.103064.

Bridges, E., Florsheim, R., 2008. Hedonic and utilitarian shopping goals: the online experience. J. Bus. Res. 61, 309–314. https://doi.org/10.1016/j.jbusres.2007.06.017.

Buckley, P., Doyle, E., 2017. Individualising gamification: an investigation of the impact of learning styles and personality traits on the efficacy of gamification using a prediction market. Comput. Educ. 106, 43–55. https://doi.org/10.1016/j.compedu.2016.11.009.

Cameron, J., Pierce, W.D., Banko, K.M., Gear, A., 2005. Achievement-based rewards and intrinsic motivation: a test of cognitive mediators. J. Educ. Psychol. 97, 641. https://doi.org/10.1037/0022-0663.97.4.641.

Cao, Y., Gong, S.Y., Wang, Y.Q., Zheng, Q., Wang, Z., 2023. How to provide competitors in educational gamification: the roles of competitor level and autonomous choice. Computers in Human Behavior 138, 107477. https://doi.org/10.1016/j.chb.2022.107477.

Carvalho, E., 2020. Social Affordance.

Cheikh-Ammar, M., 2018. The IT artifact and its spirit: a nexus of human values, affordances, symbolic expressions, and IT features. Eur. J. Inf. Syst. 27, 278–294. https://doi.org/10.1080/0960085X.2018.1436025.

Chiu, C.-M., Wang, E.T., Fang, Y.-H., Huang, H.-Y., 2014. Understanding customers' repeat purchase intentions in B2C e-commerce: the roles of utilitarian value, hedonic value and perceived risk. Inf. Syst. J. 24, 85–114.

Cohen, J., 1992. Statistical power analysis. Curr. Dir. Psychol. Sci. 1, 98–101. https://doi.org/10.1111/1467-8721.ep10768783.

De Reuver, M., Sørensen, C., Basole, R.C., 2018. The digital platform: a research agenda. J. Inf. Technol. 33, 124–135. https://doi.org/10.1057/s41265-016-0033-3.

Deci, E.L., Ryan, R.M., 2012. Self-determination theory. Handbook of Theories of Social Psychology 1, 416–436.

Deterding, S., Dixon, D., Khaled, R., Nacke, L., 2011a. From game design elements to gamefulness: defining" gamification". In: In: Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments, pp. 9–15.

Deterding, S., Sicart, M., Nacke, L., O'Hara, K., Dixon, D., 2011b. Gamification. Using Game-Design Elements in Non-Gaming Contexts, in: CHI'11 Extended Abstracts on Human Factors in Computing Systems. pp. 2425–2428.

Donnermann, M., Lein, M., Messingschlager, T., Riedmann, A., Schaper, P., Steinhaeusser, S., Lugrin, B., 2021. Social robots and gamification for technology supported learning: an empirical study on engagement and motivation. Computers in Human Behavior 121, 106792. https://doi.org/10.1016/j.chb.2021.106792.

Du, H.S., Ke, X., Wagner, C., 2020. Inducing individuals to engage in a gamified platform for environmental conservation. Ind. Manag. Data Syst. 120, 692–713.

Dzandu, M.D., Hanu, C., Amegbe, H., 2022. Gamification of mobile money payment for generating customer value in emerging economies: the social impact theory perspective. Technol. Forecast. Soc. Chang. 185, 122049. https://doi.org/10.1016/j.techfore.2022.122049.

Fan, X., Jiang, X., Deng, N., 2022. Immersive technology: a meta-analysis of augmented/virtual reality applications and their impact on tourism experience. Tour. Manag. 91, 104534. https://doi.org/10.1016/j.tourman.2022.104534.

Feng, Y., Yi, Z., Yang, C., Chen, R., Feng, Y.e., 2022. How do gamification mechanics drive solvers' Knowledge contribution? a study of collaborative knowledge crowdsourcing. Technol. Forecast. Soc. Chang. 177, 121520.
Francisco-Aparicio, A., Gutiérrez-Vela, F.L., Isla-Montes, J.L., Sanchez, J.L.G., 2013. Gamification: analysis and application. New Trends in Interaction, Virtual Reality and Modeling 113–126.
Friedrich, J., Becker, M., Kramer, F., Wirth, M., Schneider, M., 2020. Incentive design and gamification for knowledge management. J. Bus. Res. 106, 341–352. https://doi.org/10.1016/j.jbusres.2019.02.009.
Gamification Market Size, Growth | Report Forecast - 2030 [WWW Document], n.d. URL https://www.alliedmarketresearch.com/gamification-market (accessed 3.3.23).
García-Jurado, A., Torres-Jiménez, M., Leal-Rodríguez, A.L., Castro-González, P., 2021. Does gamification engage users in online shopping? Electron. Commer. Res. Appl. 48, 101076. https://doi.org/10.1016/j.elerap.2021.101076.
Gatautis, R., Banytė, J., Piligrimienė, Ž., Vitkauskaitė, E., Tarutė, A., 2016. The impact of gamification on consumer brand engagement. Transform. Bus. Econ. 15, 173–191.
Gerdenitsch, C., Sellitsch, D., Besser, M., Burger, S., Stegmann, C., Tscheligi, M., Kriglstein, S., 2020. Work gamification: effects on enjoyment, productivity and the role of leadership. Electron. Commer. Res. Appl. 43, 100994. https://doi.org/10.1016/j.elerap.2020.100994.
Gibson, J.J., 1977. The theory of affordances. Hilldale, USA 1, 67–82.
Gibson, J.J., 2014. The Ecological Approach to Visual Perception: Classic Edition. Psychology Press, New York. https://doi.org/10.4324/9781315740218.
Goes, P.B., Guo, C., Lin, M., 2016. Do incentive hierarchies induce user effort? Evidence from an online knowledge exchange. Inf. Syst. Res. 27, 497–516.
Granic, I., Lobel, A., Engels, R.C., 2014. The benefits of playing video games. Am. Psychol. 69, 66.
Groening, C., Binnewies, C., 2019. "Achievement unlocked!" - the impact of digital achievements as a gamification element on motivation and performance. Computers in Human Behavior 97, 151–166. https://doi.org/10.1016/j.chb.2019.02.026.
Hamari, J., 2013. Transforming homo economicus into homo ludens: a field experiment on gamification in a utilitarian peer-to-peer trading service. Electronic Commerce Research and Applications, Social Commerce- Part 2 (12), 236–245. https://doi.org/10.1016/j.elerap.2013.01.004.
Hamari, J., 2017. Do badges increase user activity? A field experiment on the effects of gamification. Computers in Human Behavior 71, 469–478.
Hamari, J., Koivisto, J., Sarsa, H., 2014. Does gamification work?–a literature review of empirical studies on gamification, in: 2014 47th Hawaii International Conference on System Sciences. Ieee, pp. 3025–3034.
Hamari, J., Koivisto, J., 2015. Why do people use gamification services? Int. J. Inf. Manag. 35, 419–431.
Hammedi, W., Leclercq, T., Poncin, I., 2019. Customer engagement: the role of gamification. Handbook of Research on Customer Engagement 164–184.
Hess, T.J., McNab, A.L., Basoglu, K.A., 2014. Reliability generalization of perceived ease of use, perceived usefulness, and behavioral intentions. Mis Quarterly 38, 1–28. https://doi.org/10.25300/MISQ/2014/38.1.01.
Higgins, J.P., Thompson, S.G., 2002. Quantifying heterogeneity in a meta-analysis. Stat. Med. 21, 1539–1558. https://doi.org/10.1002/sim.1186.
Hsu, C.-L., Chen, M.-C., 2018. How does gamification improve user experience? An empirical investigation on the antecedences and consequences of user experience and its mediating role. Technol. Forecast. Soc. Chang. 132, 118–129.
Huang, J., Zhou, L., 2020. Social gamification affordances in the green IT services: perspectives from recognition and social overload. Internet Res. https://doi.org/10.1108/INTR-03-2020-0121.
Huedo-Medina, T.B., Sánchez-Meca, J., Marin-Martinez, F., Botella, J., 2006. Assessing heterogeneity in meta-analysis: Q statistic or I^2 index? Psychol. Methods 11, 193. https://doi.org/10.1037/1082-989X.11.2.193.
Huotari, K., Hamari, J., 2017. A definition for gamification: anchoring gamification in the service marketing literature. Electron. Mark. 27, 21–31.
Hwang, J., Choi, L., 2020. Having fun while receiving rewards?: Exploration of gamification in loyalty programs for consumer loyalty. J. Bus. Res. 106, 365–376.
Jahn, K., Kordyaka, B., Machulska, A., Eiler, T.J., Gruenewald, A., Klucken, T., Brueck, R., Gethmann, C.F., Niehaves, B., 2021. Individualized gamification elements: the impact of avatar and feedback design on reuse intention. Computers in Human Behavior 119, 106702. https://doi.org/10.1016/j.chb.2021.106702.
Jang, S., Kitchen, P.J., Kim, J., 2018. The effects of gamified customer benefits and characteristics on behavioral engagement and purchase: evidence from mobile exercise application uses. J. Bus. Res. 92, 250–259.
Jia, F., Yu, J., 2024. Disentangling e-commerce gamification affordances on recommendation acceptances from a perceived value perspective. Inf. Technol. People.
Kaltcheva, V.D., Weitz, B.A., 2006. When should a retailer create an exciting store environment? J. Mark. 70, 107–118.
Karahanna, E., Evaristo, J.R., Srite, M., 2005. Levels of culture and individual behavior: an investigative perspective. Journal of Global Information Management (JGIM) 13, 1–20. https://doi.org/10.4018/jgim.2005040101.
Karahanna, E., Xu, S.X., Xu, Y., Zhang, N.A., 2018. The needs–affordances–features perspective for the use of social media. MISQ/ 42, 737–756. https://doi.org/10.25300/MISQ/2018/11492.
Kim, H.-W., Gupta, S., Koh, J., 2011. Investigating the intention to purchase digital items in social networking communities: a customer value perspective. Inf. Manag. 48, 228–234.
Kim, K., Schmierbach, M.G., Chung, M.-Y., Fraustino, J.D., Dardis, F., Ahern, L., 2015. Is it a sense of autonomy, control, or attachment? Exploring the effects of in-game customization on game enjoyment. Computers in Human Behavior 48, 695–705.
Koivisto, J., Hamari, J., 2014. Demographic differences in perceived benefits from gamification. Computers in Human Behavior 35, 179–188. https://doi.org/10.1016/j.chb.2014.03.007.
Koivisto, J., Hamari, J., 2019. The rise of motivational information systems: a review of gamification research. Int. J. Inf. Manag. 45, 191–210.
Kwon, H.J., Brinthaupt, T.M., 2015. The motives, characteristics and experiences of US Black Friday shoppers. J. Glob. Fash. Market. 6, 292–302.
Leclercq, T., Hammedi, W., Poncin, I., 2018. The boundaries of gamification for engaging customers: effects of losing a contest in online co-creation communities. J. Interact. Mark. 44, 82–101.
Lee, Z.W., Cheung, C.M., Chan, T.K., 2015. Massively multiplayer online game addiction: instrument development and validation. Inf. Manag. 52, 413–430.
Lee, C., Lee, K., Lee, D., 2017. Mobile healthcare applications and gamification for sustained health maintenance. Sustainability 9, 772.
Lin, L., Chu, H., 2018. Quantifying publication bias in meta-analysis. Biometrics 74, 785–794.
Liu, D., Santhanam, R., Webster, J., 2017. Toward Meaningful Engagement: a framework for design and research of Gamified information systems. MIS Q. 41. https://doi.org/10.25300/MISQ/2017/41.4.01.
Majuri, J., Koivisto, J., Hamari, J., 2018. Gamification of education and learning: A review of empirical literature, in: Proceedings of the 2nd International GamiFIN Conference, GamiFIN 2018. CEUR-WS.
Mehrabian, A., Russell, J.A., 1974. An approach to environmental psychology. the MIT Press.
Mekler, E.D., Brühlmann, F., Opwis, K., Tuch, A.N., 2013. In: Do Points, Levels and Leaderboards Harm Intrinsic Motivation? an Empirical Analysis of Common Gamification Elements. and Applications, pp. 66–73.
Mitchell, R., Schuster, L., Jin, H.S., 2020. Gamification and the impact of extrinsic motivation on needs satisfaction: Making work fun? J. Bus. Res. 106, 323–330. https://doi.org/10.1016/j.jbusres.2018.11.022.
Morschheuser, B., Werder, K., Hamari, J., Abe, J., 2017. How to gamify? Development of a method for gamification, in. In: Proceedings of the 50th Annual Hawaii International Conference on System Sciences (HICSS), pp. 4–7.
Müller-Stewens, J., Schlager, T., Häubl, G., Herrmann, A., 2017. Gamified information presentation and consumer adoption of product innovations. J. Mark. 81, 8–24.
Mullins, J.K., Sabherwal, R., 2020. Gamification: a cognitive-emotional view. J. Bus. Res. 106, 304–314. https://doi.org/10.1016/j.jbusres.2018.09.023.
O'Brien, H.L., 2018. A holistic approach to measuring user engagement. New Directions in Third Wave Human-Computer Interaction: Volume 2-Methodologies 81–102.
Oliver, M., 2005. The problem with affordance. E-Learning and Digital Media 2, 402–413. https://doi.org/10.2304/elea.2005.2.4.402.
Orwin, R.G., 1983. A fail-safe N for effect size in meta-analysis. J. Educ. Stat. 8, 157–159.
Ou, M., Zheng, H., Kim, H.K., Chen, X., 2023. A meta-analysis of social media fatigue: drivers and a major consequence. Computers in Human Behavior 140, 107597. https://doi.org/10.1016/j.chb.2022.107597.
Peng, W., Lin, J.-H., Pfeiffer, K.A., Winn, B., 2012. Need satisfaction supportive game features as motivational determinants: an experimental study of a self-determination theory guided exergame. Media Psychol. 15, 175–196.
Peterson, R.A., Brown, S.P., 2005. On the use of beta coefficients in meta-analysis. J. Appl. Psychol. 90, 175. https://doi.org/10.1037/0021-9010.90.1.175.
Poncin, I., Garnier, M., Mimoun, M.S.B., Leclercq, T., 2017. Smart technologies and shopping experience: are gamification interfaces effective? The case of the Smartstore. Technol. Forecast. Soc. Chang. 124, 320–331.
Riar, M., Morschheuser, B., Zarnekow, R., Hamari, J., 2022. Gamification of cooperation: a framework, literature review and future research agenda. Int. J. Inf. Manag. 67, 102549. https://doi.org/10.1016/j.ijinfomgt.2022.102549.
Richter, G., Raban, D.R., Rafaeli, S., 2015. Studying gamification: the effect of rewards and incentives on motivation. Gamification in Education and Business. Springer 21–46.
Rosenthal, R., 1979. The file drawer problem and tolerance for null results. Psychol. Bull. 86, 638. https://doi.org/10.1037/0033-2909.86.3.638.
Rosenthal, R., DiMatteo, M.R., 2001. Meta-analysis: recent developments in quantitative methods for literature reviews. Annu. Rev. Psychol. 52, 59–82. https://doi.org/10.1146/annurev.psych.52.1.59.
Ruiz-Mafe, C., Chatzipanagiotou, K., Curras-Perez, R., 2018. The role of emotions and conflicting online reviews on consumers' purchase intentions. J. Bus. Res. 89, 336–344. https://doi.org/10.1016/j.jbusres.2018.01.027.
Sadana, M., Sharma, D., 2021. How over-the-top (OTT) platforms engage young consumers over traditional pay television service? An analysis of changing consumer preferences and gamification. Young Consumers. https://doi.org/10.1108/YC-10-2020-1231.
Sailer, M., Homner, L., 2020. The Gamification of Learning: a Meta-analysis. Educ Psychol Rev 32, 77–112. https://doi.org/10/gf6rss.
Sailer, M., Hense, J., Mandl, H., Klevers, M., 2013. Psychological perspectives on motivation through gamification. Ixd&a 19, 28–37.
Sailer, M., Hense, J.U., Mayr, S.K., Mandl, H., 2017. How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. Computers in Human Behavior 69, 371–380.
Santhanam, R., Liu, D., Shen, W.-C.-M., 2016. Research Note—gamification of technology-mediated training: Not all competitions are the same. Inf. Syst. Res. 27, 453–465. https://doi.org/10.1287/isre.2016.0630.
Schmidt, F.L., 2015. History and development of the Schmidt–Hunter meta-analysis methods. Res. Synth. Methods 6, 232–239. https://doi.org/10.1002/jrsm.1134.
Schmidt, F.L., Hunter, J., 2004. General mental ability in the world of work: occupational attainment and job performance. J. Pers. Soc. Psychol. 86, 162. https://doi.org/10.1037/0022-3514.86.1.162.

Schöbel, S.M., Janson, A., Söllner, M., 2020. Capturing the complexity of gamification elements: a holistic approach for analysing existing and deriving novel gamification designs. Eur. J. Inf. Syst. 29, 641–668.
Seaborn, K., Fels, D.I., 2015. Gamification in theory and action: a survey. Int. J. Hum Comput Stud. 74, 14–31. https://doi.org/10.1016/j.ijhcs.2014.09.006.
Sheth, J.N., Newman, B.I., Gross, B.L., 1991. Why we buy what we buy: a theory of consumption values. J. Bus. Res. 22, 159–170. https://doi.org/10.1016/0148-2963(91)90050-8.
Shi, S., Chen, Y., Chow, W.S., 2016. Key values driving continued interaction on brand pages in social media: an examination across genders. Computers in Human Behavior 62, 578–589.
Shi, S., Leung, W.K.S., Munelli, F., 2022. Gamification in OTA platforms: a mixed-methods research involving online shopping carnival. Tour. Manag. 88, 104426. https://doi.org/10.1016/j.tourman.2021.104426.
Shiau, W.-L., Dwivedi, Y.K., Lai, H.-H., 2018. Examining the core knowledge on facebook. Int. J. Inf. Manag. 43, 52–63.
Stefanou, C.R., Perencevich, K.C., DiCintio, M., Turner, J.C., 2004. Supporting autonomy in the classroom: ways teachers encourage student decision making and ownership. Educ. Psychol. 39, 97–110.
Suh, A., Cheung, C.M., Ahuja, M., Wagner, C., 2017. Gamification in the workplace: the central role of the aesthetic experience. J. Manag. Inf. Syst. 34, 268–305. https://doi.org/10.1080/07421222.2017.1297642.
Sweeney, J.C., Soutar, G.N., 2001. Consumer perceived value: the development of a multiple item scale. J. Retail. 77, 203–220.
Thornton, A., Lee, P., 2000. Publication bias in meta-analysis: its causes and consequences. J. Clin. Epidemiol. 53, 207–216. https://doi.org/10.1016/S0895-4356(99)00161-4.
Torres, P., Augusto, M., Neves, C., 2022. Value dimensions of gamification and their influence on brand loyalty and word-of-mouth: relationships and combinations with satisfaction and brand love. Psychol. Mark. 39, 59–75. https://doi.org/10.1002/mar.21573.
Triandis, H., 1988. Collectivism v. Individualism: A Reconceptualisation of a Basic Concept in Cross-cultural Social Psychology. In: Verma, G.K., Bagley, C. (Eds.), Cross-Cultural Studies of Personality, Attitudes and Cognition. Palgrave Macmillan UK, London, pp. 60–95. https://doi.org/10.1007/978-1-349-08120-2_3.
Triandis, H.C., McCusker, C., Hui, C.H., 1990. Multimethod probes of individualism and collectivism. J. Pers. Soc. Psychol. 59, 1006. https://doi.org/10.1037/0022-3514.59.5.1006.
Tricco, A.C., Lillie, E., Zarin, W., O'Brien, K.K., Colquhoun, H., Levac, D., Moher, D., Peters, M.D., Horsley, T., Weeks, L., 2018. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann. Intern. Med. 169, 467–473. https://doi.org/10.7326/M18-0850.
Van Roy, R., Zaman, B., 2019. Unravelling the ambivalent motivational power of gamification: a basic psychological needs perspective. Int. J. Hum Comput Stud. 127, 38–50.
Venkatesh, V., Thong, J.Y., Xu, X., 2012. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Q. 157–178. https://doi.org/10.2307/41410412.
Wang, H.-Y., Liao, C., Yang, L.-H., 2013. What affects mobile application use? The roles of consumption values. International Journal of Marketing Studies 5, 11.
Wang, L., Sun, Y., Luo, X., 2022. Game affordance, gamer orientation, and in-game purchases: a hedonic–instrumental framework. Inf. Syst. J. https://doi.org/10.1111/isj.12384.
Witmer, B.G., Singer, M.J., 1998. Measuring presence in virtual environments: a presence questionnaire. Presence 7, 225–240.
Wolf, T., Weiger, W.H., Hammerschmidt, M., 2020. Experiences that matter? The motivational experiences and business outcomes of gamified services. J. Bus. Res. 106, 353–364.
Xi, N., Hamari, J., 2019. Does gamification satisfy needs? A study on the relationship between gamification features and intrinsic need satisfaction. Int. J. Inf. Manag. 46, 210–221. https://doi.org/10.1016/j.ijinfomgt.2018.12.002.
Xi, N., Hamari, J., 2020. Does gamification affect brand engagement and equity? A study in online brand communities. J. Bus. Res. 109, 449–460.
Xiao, G., Kim, J.-O., 2009. The investigation of Chinese consumer values, consumption values, life satisfaction, and consumption behaviors. Psychol. Mark. 26, 610–624. https://doi.org/10.1002/mar.20291.
Yang, H., Li, D., 2021. Exploring the inverted-U relationship between gamification achievement and health management performance. Computers in Human Behavior 121, 106805. https://doi.org/10.1016/j.chb.2021.106805.
Zhang, L., Shao, Z., Benitez, J., Zhang, R., 2023. How to improve user engagement and retention in mobile payment: a gamification affordance perspective. Decis. Support Syst., 113941
Zhao, Z., Chen, M., Zhang, W., 2019. Social community, personal involvement and psychological processes: a study of impulse buying in the online shopping carnival. J. Electron. Commer. Res. 20, 255–272.
Zhao, Y., Wang, L., Tang, H., Zhang, Y., 2020. Electronic word-of-mouth and consumer purchase intentions in social e-commerce. Electron. Commer. Res. Appl. 41, 100980. https://doi.org/10.1016/j.elerap.2020.100980.
Zheng, S., Chen, J., Liao, J., Hu, H.-L., 2023. What motivates users' viewing and purchasing behavior motivations in live streaming: a stream-streamer-viewer perspective. J. Retail. Consum. Serv. 72, 103240.