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Gamification approaches to the early stage of innovation

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Despite the growing adoption and acceptance of gamification approaches among firms, the relationship between gamification and the early stage of innovation is confusing and deserves further attention in order to produce added-value exploratory knowledge. This paper puts forward the idea that gamification approaches can support the early stage of innovation by making a cross-comparison of published case studies of firms where gamification was used to address innovation challenges, e.g. use of gamification elements and tools that support the generation of ideas for developing new product concepts or entering new markets. In order to understand and clarify the relationship between gamification and the early stage of innovation, the paper proposes an analytical framework that provides a consistent and organized picture of the use of gamification approaches for innovation purposes. Research findings provide a conceptualization of gamification in the context of the early stage of innovation and demonstrate significant outcomes of these types of approaches with regard to the various forms of engagement, team spirit, consensus building, knowledge transfer, creative thinking and productivity.

1 | INTRODUCTION

The early stage of innovation, also known as the front-end of innovation, precedes the new product development and commercialization stages of the innovation process and includes activities such as opportunity analysis and identification, idea generation and selection, and concept development (Koen et al., 2001). This stage influences significantly the outcomes of innovation, and therefore, any improvement may have a positive impact on the success rate of new products and services (Khurana & Rosenthal, 1998; Riel, Neumann, & Tichkiewitch, 2013; Wowak, Craighead, Ketchen, & Hult, 2016). Due to its importance for the success of the innovation process, there is a significant body of literature on the challenges facing the early stage, particularly the one that explores new ways to overcome the shortage of high-potential ideas entering the execution process (Koen et al., 2001). One of the strongest arguments from this research stream is that creative and engaging approaches, both structured and flexible, are essential for a better management of the front-end of innovation activities, particularly the ones related to the process of turning ideas into products and services and supporting the underlying decision-making process (Eling, Griffin, & Langerak, 2014; Zimmerling, Hoflinger, Sandner, & Welpe, 2016).

Gamification approaches use game-based elements in non-game contexts to encourage users to perform desired behaviors (Deterding, Dixon, Khaled, & Nacke, 2011) and to develop possible solutions that overcome the encountered difficulties when managing the early stage of innovation through making these activities more structured, engaging and game-like. In fact, it has been noticed that many organizations are becoming increasingly receptive to incorporating games into day-to-day processes They are consciously experimenting with different forms of game-like approaches which promote creative thinking and permit getting the work done in relation to traditional processes (Butler, Olaison, Sliwa, Sørensen, & Spoelstra, 2011; Sorensen & Spoelstra, 2012).

This research complements the emergent body of literature on design games in product and change management, Lego Serious Play in strategy, and serious games in management education (Roth, Schneckenberg, & Tsai, 2015). This line of research has shown that integrating gamification into innovation is a promising research avenue, particularly in ideation (Agogué, Levillain, & Hooge, 2015; Kavaliova, Virjee, Maehle, Kleppe, & Nisar, 2016), continuous innovation (Hyypiä & Parjanen, 2015), and serious play (Schulz, Geithner, Woelfel, & Krzywinski, 2015). These studies suggest that there is a need to research and further validate the actual value of gamification

in relation to innovation, considering, in particular, its mechanics (rules) and participants' motivation (Brandt, Messeter, & Binder, 2008; Kavaliova et al., 2016).

In spite of previous studies that have empirically substantiated the advantages of using game elements during the early stage of innovation, it is still hard to find a well-defined link between the gamification concept and innovation challenges, and this is amplified by the lack of a clear definition in relation to similar and somewhat overlapping concepts like serious games, playful design and design games. This circumstance prevents researchers and practitioners from fully understanding the application domains and the impact of gamification approaches on innovation, particularly in its early stage.

This paper aims to provide a consistent and organized picture of the use of gamification for innovation purposes. More specifically, its main goals are: (1) to conceptualize the gamification approach to innovation by extracting from general game/play approaches what is specifically targeted at business motivations; (2) to illustrate how gamification can contribute to supporting challenges and complex tasks that firms need to perform throughout the early stage of innovation; and (3) to display different outcomes that are generated by gamification when addressing the early stage of innovation challenges.

The methodology used to achieve these goals was based on a systematic mapping of relevant practices in the context of gamification approaches to innovation, grounded on inductive theory using a cross-comparison of representative case studies. The basic procedure for data collection comprised a comprehensive search of the academic literature and a review of published case studies retrieved from databases that matched the search criteria.

This paper emphasizes its main results in three distinct categories. First, it provides a conceptualization of the use of gamification in the context of innovation, underlining the key characteristics of the early stage of innovation that can be better managed by gamification approaches. Second, it provides a new analytical framework, adapted from Hoshin Kanri Matrix X that can be used to identify patterns and gaps linked to gamification approaches to innovation. This framework was developed so that cases can be read in a structured and coherent manner, synthesizing the nature of findings and making the connections between each of the building blocks of gamification approaches to innovation more visible. It provides structure, transparency, trustworthiness and a more reliable cross-comparison of several cases in a story-telling manner that can also be applied to further studies, particularly to the research of other complex business applications of gamification. Third, it presents a set of research propositions derived from the conceptualization of gamification in the context of innovation, which open up opportunities for further research and advances in this emergent field of knowledge.

2 | LITERATURE REVIEW

2.1 | Early stage of innovation challenges

In fast-changing competitive environments, a growing number of firms are facing increased pressure to innovate. Designing new and breakthrough solution portfolios for existing and emerging market needs is a very complex process that often requires two components, simultaneously: novelty, i.e. new product, service, process, technology or business model; and market use, i.e. acceptance by markets, governments and society (Chiva, Ghauri, & Alegre, 2014; Lal, 2015; Pla-Barber & Alegre, 2007; Yu & Si, 2012; Zucchella & Siano, 2014).

This paper focuses on the early stage of the innovation process that takes place prior to the new product development and commercialization stages (Koen, Bertels, & Kleinschmidt, 2014). Its relevance comes from the fact that the ability to overcome the complexity and to positively influence innovation outcomes is highest in the early stage of the innovation process (Khurana & Rosenthal, 1998).

It starts with ideation that includes insights discovery (data collection on users' emergent needs and clarification of deep insights), idea generation, idea selection and development, and ends with the decision, positive or negative, to develop a new product/service (Kurkkio, Frishammar, & Lichtenthaler, 2011; Riel et al., 2013; Wowak et al., 2016).

Early stage activities are more unpredictable and unstructured than those performed at the new product development stage in a stage-gate process (Cooper, 2014; Koen et al., 2001). In fact, the front end of innovation and particularly ideation, which is the fuzziest element of this early stage of innovation, is typically characterized by informal relationships between stakeholders, a high degree of complexity and uncertainty, tacit knowledge-intensive conflicting organizational pressures and permanent discovery of what customers hope to accomplish (Christensen, Hall, Dillon, & Duncan, 2016; Florén & Frishammar, 2012; van den Ende, Frederiksen, & Prencipe, 2014; Zimmerling et al., 2016). Moreover, it is characterized by a broad range of activities, such as identifying customer needs and demands, and performing an economic analysis of the concepts that require greater coordination of functions (Ulrich & Eppinger, 2012).

While considerable research has been carried out in the area of early stage of innovation, the link between this particular stage of the innovation process and gamification has not been extensively considered.

2.2 | Gamification approaches

Gamification can be defined as the use of game-designed elements in non-gaming contexts to encourage users' motivation, enjoyment and engagement, particularly when performing a difficult and complex task or when trying to achieve a set goal (Deterding et al., 2011; Galetta, 2013; Harwood & Garry, 2015; Piligrimiene, Dovaliene, & Virvilaite, 2015; Robson, Plangger, Kietzmann, McCarthy, & Pitt, 2015).

On a business level, gamification can be applied to many different business functions including marketing and sales, human capital and customer service, with different impacts inside and outside the firm's boundaries (Piligrimiene et al., 2015; Robson, Plangger, Kietzmann, McCarthy, & Pitt, 2014; Ruhi, 2015).

Effective gamification approaches attempt to encourage users' engagement, amusement, and enjoyment toward various activities. This can lead users to experience very diverse behaviors (Baumeister, Vohs, Nathan, & Zhang, 2007; Watson & Spence, 2009) and emotions, both positive (e.g. excitement, amazement, surprise or triumph) and negative (e.g. disappointment or fear). All this leads to the creation

of user enjoyment and motivation as well as a fun atmosphere (Robson et al., 2015).

Gamification can motivate people to change their behaviors and achieve the desired states when it taps into key motivational drivers of human behavior through a balanced mix of reinforcements that can be both extrinsic (i.e. prizes, money, status or fame, points and badges, trophies, fear of failure or punishment, penalties and even progress bars) and intrinsic (i.e. sense of fun and enjoyment, belonging to a group, mastery, purpose in the work carried out, learning from an activity, personal achievement or more responsibility, autonomy and power) (Dale, 2014; Hamari & Koivisto, 2015; Robson et al., 2015; Smith & Popa, 2015). These motivators can be achieved by embedding gaming mechanics— inspired by human desires and needs—into traditional work activities, thereby turning routine tasks into a game (Conaway & Garay, 2014; Galetta, 2013).

Gamification is a recent concept and should not be confused with others, such as play, traditional games or even reward systems and loyalty programs that merely persuade people to perform actions in order to earn points (Ruhi, 2015). Games introduce an explicit or implicit set of rules and an element of extrinsic motivation or work in a playful context that is free, different from real life, and usually characterized by satisfaction, enjoyment, fun, and other hedonic aspects (Holbrook, Chestnut, Oliva, & Greenleaf, 1984; Kultima, Niemelä, Paavilainen, & Saarenpää, 2008). Therefore, games are a subcategory of play. While play refers to a good mix of fun and voluntary actions, games must conform to an explicit or implicit set of rules for objectives to be achieved (Roth et al., 2015).

Conceptually, gamification relates to traditional games, typically associated with a well-defined set of rules and regulations aimed at the achievement of objectives and competitive elements, and not so much to play or playfulness, i.e. a large variety of voluntary actions that are the result of intrinsic motivation (Koivisto & Hamari, 2014; Ruhi, 2015). Gamification is different from traditional games as these are typically focused on an entertainment value, while the former is focused on a business value and is used to advance goals outside of the game (Koivisto & Hamari, 2014; Ruhi, 2015).

Deterding et al. (2011) developed a framework that differentiates between play, games and gamification. It compares gamification with other related approaches, i.e. serious games, playful design, and toys/pure play via two dimensions: playing/gaming and parts/whole. The play/game dimension has already been discussed, in particular, with regard to the set of rules and goals that distinguishes these two concepts. The parts/whole dimension differentiates gamification from serious games.

Serious games can be defined as video or computer-based games for one or multiple players designed, from square one, for non-recreational or non-entertainment environments (e.g. in areas as diverse as education, health, engineering, and military) that have a learning objective and allow for the simulation of real-world situations without incurring eventual costs and risks (Agogué et al., 2015; Borges, Durelli, Macedo, & Isotani, 2014; Deterding et al., 2011; Meijer, 2015; Simões, Redondo, & Vilas, 2013). Gamification refers to the use of parts of game design elements rather than whole elements, like full-fledged games used in serious games. Thus, gamification uses parts of game elements in the work environment with the purpose of changing or inducing behaviors, e.g. to engage employees in a certain task and not for simulation or educational purposes.

Table 1 provides a conceptualization of game/play approaches based on three distinctive dimensions, i.e. adding motivation to the game elements and game environment dimensions. The pure play and the gamification concepts are clearly outlined in relation to these dimensions. However, this conceptualization shows that there is a need for further clarification regarding playful design and serious games concepts because some confusion between these concepts and gamification still exists. As mentioned in the introduction, one of the goals of this paper is to bridge the research gap between gamification and playful design/serious games.

In fact, the differences between gamification and serious games are getting blurred in relation to the motivation dimension, which is expressed by the growing number of serious games, not only for training and education, but also for business processes like innovation (Groh, 2012). Serious games combine a simulation of reality and a role-playing activity that induce an immersive experience in which participants take actions that may adequately support, not only learning, but also business processes (Agogué et al., 2015).

Furthermore, the distinction between gamification and playful design is still unclear when assessing the rule system/environment dimension. In fact, game elements with clear rules and procedures have been used in non-game contexts by design games (a type of playful design game) for a long time (Gudiksen, 2015). Typically, design games involve a diverse group of stakeholders, not only designers and potential users but also additional players that collaborate and contribute to explore and present design options (Brandt et al., 2008). A design game uses game tools and techniques that allow stakeholders to collectively conduct a design assignment in a playful, collaborative and participative manner and to do so in an engaging environment, thereby producing outcomes that may affect them far

TABLE 1 Conceptualization of game/play approaches

		Dimensions						
		Environment		Game Elements		Motivation		
		Enjoyment/ Fun	Rules System	Parts	Whole/Full-Fledged	Entertainment	Business	Learning/ Simulation
Game/Play Approaches	Pure Play/Toys	Yes	No	No	Yes	Yes	No	No
	Playful Design	Yes	No, but may have	Yes	No	No	Yes	No
	Serious Games	Yes	Yes	No	Yes	No	No, but may have	Yes
	Gamification	Yes	Yes	Yes	No	No	Yes	No

beyond the game (Kauppinen, Luojus, & Lahti, 2016; van Amstel & Garde, 2016).

Finally, the gamification concept should not be confused with video games and limited to digital technology alone. Although many examples of gamification are based on digital tools (such as IT systems, web-based and mobile-based applications, as well as virtual environment, e.g. virtual reality/augmented reality), it can also include non-digital tools, such as board games, card decks and Lego bricks (Deterding et al., 2011).

2.3 | Gamification elements and outcomes

Designing inspiring and meaningful gamification experiences for users is not easy and requires the support of comprehensive frameworks. Werbach and Hunter (2015) developed a framework called "Game Elements and Hierarchy" characterized by three core elements: dynamics, which provide motivations (e.g. narrative, progression, and social interaction); mechanics, which provide basic procedures that drive player involvement and engagement (e.g. challenges, competition, cooperation, rewards, and turns); and components, which are the concrete evidence of mechanics and dynamics (e.g. achievements, avatars, badges, gifting, leaderboards, points, and virtual goods).

The benefits of implementing a comprehensive gamification framework encompass important hedonic outcomes, such as engagement, enjoyment and playfulness, fun and learning experiences (Cardador, Northcraft, & Whicker, 2017; Gatautis, Vitkauskaite, Gadeikiene, & Piligrimiene, 2016; Hamari & Koivisto, 2015; Harwood & Garry, 2015; Holbrook et al., 1984). Regardless of the value of engagement and motivation, gamification is much more than just a set of entertaining exercises and teamwork activities with no targets and organized outputs (Agogué et al., 2015; Dale, 2014; Kalinauskas, 2014). In fact, the benefits of gamification go beyond the hedonic elements as they also include utilitarian and social benefits. The utilitarian benefits encompass increased productivity among employees (Hamari & Koivisto, 2015), cognitive, functional, creative problem-solving, time to action, usefulness and ease of use (Gatautis et al., 2016; Hamari & Koivisto, 2015; Harwood & Garry, 2015; Stock, Oliveira, & Von Hippel, 2015), improved customer loyalty (Lucassen & Jansen, 2014), and accelerated product development processes (Agogué et al., 2015). The social benefits encompass people's reactions during interactive situations, recognition, social influence, and self-esteem (Hamari & Koivisto, 2015; Harwood & Garry, 2015).

3 | METHODOLOGY

3.1 | Research design

The research methodology was grounded on an inductive approach using a cross-comparison of published case studies, which supports the goal of getting insights from firms where gamification was used to foster the innovation process. The roadmap for building theories from case study research (Eisenhardt, 1989) was used to devise a theory on gamification approaches to innovation. The first step consisted in collecting data on relevant studies of gamification approaches to innovation, i.e. cases of firms where gamification was used to foster the innovation process. Then, a systematic mapping was carried out for similar themes. Only after capturing all relevant published case studies was it possible to establish comprehensive categories and shape hypotheses developed on how gamification can be applied to drive forward the innovation process (Eisenhardt, 1989). This procedure was structured into three phases. First, a comprehensive analysis of the academic literature was carried out in the context of gamification approaches to innovation. Second, the publications identified during the research were reviewed. Third, the data was classified, cross-compared, and analyzed.

3.1.1 | Phase 1—Search of academic literature

The inclusion criteria used in the search of academic literature was built on exploratory studies that illustrate gamification approaches across the phases of the early stage of innovation (discovery, idea generation, idea development, and the decision to develop a new product/service). The search covered publications from selected electronic databases published and indexed until April 2017. The search of keywords/terms included synonyms or similar meanings of "gamification approach to innovation".

Of the 553 articles identified and screened, only 119 were considered to be potentially suitable for retrieval. Most of the articles were discarded from this analysis based on the following exclusion criteria: (a) publications completely beyond the scope of gamification approach to innovation, i.e. those that discuss "serious games", "video games", or "playful tools" in innovation-related areas or that discuss gamification approaches in areas other than innovation (e.g. training and education, human capital, marketing and advertising or operations); (b) publications that show a potential gamification approach to innovation, but do not provide enough information on the findings; (c) publications not written in English; (d) incomplete or duplicate publications (when retrieved from different databases).

3.1.2 | Phase 2—Screening of publications

After reading the abstracts of the 119 publications retrieved, 60 publications were considered to be potentially suitable for more detailed analysis, which included reading the full text. Although these publications investigated the use of games in innovation contexts, many of them did not meet the inclusion criteria. In fact, only 15 of the 60 publications provided exploratory studies, delivering relevant information on how gamification can be used across the phases of early stage innovation. The publications that were selected provided in-depth knowledge on the research objective and served as the theoretical foundation for mapping the different gamification approaches to innovation applied throughout the early stage of innovation.

3.1.3 | Phase 3—Classification and analysis

Some of the 15 publications provided more than one exploratory study of gamification approaches to innovation, but not all of them met the inclusion criteria. In fact, of the 15 publications selected, 17 case studies and one survey were considered. These studies, hereafter called cases, are referenced as: (1) Brandt et al. (2008); (2) Hyypiä and Parjanen (2015); (3) Schulz et al. (2015); (4) Scheiner (2015); (5) Kavaliova et al. (2016); (6) Zimmerling et al. (2016); (7) Agogué et al.

(2015); (8) Brandt et al. (2008); (9) Gudiksen (2015); (10) Roos, Victor, and Statler (2004); (11) Vagn, Jensen, and Broberg (2016); (12) Grienitz and Schmidt (2012); (13) van Amstel and Garde (2016); (14) Kauppinen et al. (2016); (15) Schulz et al. (2015); (16) Patricio (2017); (17) Meijer (2015); and (18) Vagn et al. (2016). A cross-comparison was carried out, highlighting the similarities and the differences found between these 18 cases.

The comparative case study analysis was particularly useful for identifying and breaking down the building blocks of gamification approaches to innovation as well as for explaining how the combination of these factors influence the success of an intervention, i.e. how better gamification approaches can address concrete innovation contexts (Goodrick, 2014).

3.2 | Concept outline of gamification approaches to innovation

An analytical framework, based on the Hoshin Kanri Matrix X, was developed in order to read the data extracted from full text readings in a structured and coherent manner so as to make this cross-comparison possible (see Figure 1). Due largely to this method, it was possible to get a clear picture of all 18 cases, identify patterns and gaps, and understand the value of gamification approaches to innovation.

The gamification approaches to the early stage of innovation analytical framework (see Figure 1), based on the Hoshin Kanri Matrix X method, made it possible to link each of the four building blocks of gamification approaches to innovation that emerged from the analysis: (1) innovation challenges; (2) game elements; (3) tools; and (4) outcomes.

This framework can be interpreted by taking the example of case 2. A large firm from the wood and forestry industry was challenged to generate ideas and co-create knowledge with a customer (1—challenge building block). This challenge was addressed by a gamification approach with game elements, i.e. dynamics, mechanics and components (2—elements building block) using a board game called Innotin (3—tools building block). In this particular case, gamification delivered several outcomes (4—outcomes building block) linked to engagement and motivation, team spirit, cognitive/knowledge building, creative thinking and productivity, which contributed to the generation of ideas.

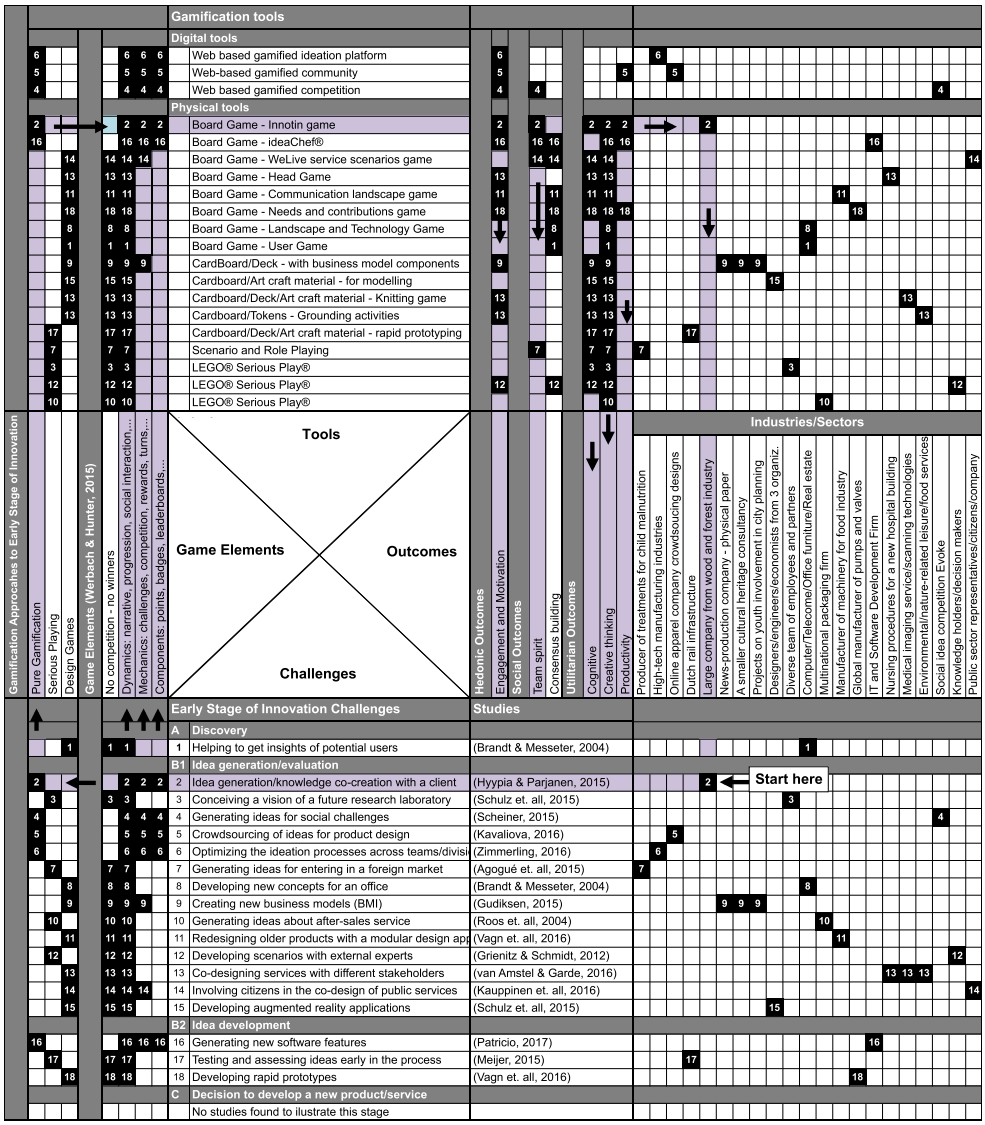

FIGURE 1 Gamification approaches to early stage of innovation analytical framework [Colour figure can be viewed at wileyonlinelibrary.com]

The typology of gamification approaches to innovation that results from the use of this analytical framework goes beyond that which is described in the literature (see Table 1) and includes Gamification along with the following new concepts: Design Games and Serious Playing approaches (see Table 2).

Design Games is an extension of Playful Design incorporating implicit or explicit rule systems. Serious Playing is an extension of Serious Games focusing on business value rather than education. This new conceptualization clarifies what is under the radar of gamification approaches to innovation and leaves little room for ambiguity in relation to the differences between gamification and playful design and serious games concepts. Design Games and Serious Playing do the same as Gamification does with regards to the dimensions used in conceptualizing game/play approaches. The main differences between them are highlighted throughout the cross-comparison between the cases (see Discussion section).

Thus, the proposed definition of gamification approaches to innovation has a broader scope and includes not only "gamification" but also "design games" and "serious playing" approaches which are implemented through digital (e.g. computer software, web-based, and mobile apps) and/or non-digital tools (e.g. board games, card decks, art craft materials, and Lego bricks). Yet, it excludes full-fledged games, entire playful systems with no game structure, or game systems that force users to step out completely from the innovation practice (e.g. pure simulations or even video games).

This framework not only synthesizes the nature of the findings but also describes the connections between each of the building blocks of gamification approaches to innovation. All the innovation challenges were grouped around the following phases of the early stage of innovation as shown in Figure 1: (A) discovery; (B1) idea generation/evaluation; (B2) idea development; and (C) decision to develop a new product/service. Most of the innovation challenges illustrated by the cases were related to (B1) and (B2). No challenges were considered to fit into phase (C). The only challenge that fits into (A) concerns obtaining insights from users (case 1). The challenges that fit into phase (B1) are grouped as cases 2–15. Although further information is necessary (e.g. the nature of the project plans) in order to fully justify this selection, the challenges that were considered to fit into phase (B2) are grouped as cases 16–18.

Different game elements, which, to some extent, incorporate evidence of game dynamics (e.g. narrative and progression), mechanics (e.g. competition, cooperation, and rewards), and components (e.g. badges, leaderboards, and points) of the game elements and hierarchy framework (Werbach & Hunter, 2015) were identified and assessed for each type of approach and tools. While gamification approaches to innovation have the same profile regarding the game/play dimensions (see Table 2), the same kind of game elements was not found in all of them. Certain game elements are commonly used in some approaches yet in others they are more distinctive, as illustrated in the next section. Game elements can be described in relation to the typology of gamification approaches for design and innovation (gamification, serious playing, and design games) and tools (web-based platforms, board games, cardboard/deck/art craft material, scenario/role playing, and LEGO® Serious Play®).

The types of gamification outcomes observed in the cross-comparison of cases fit into the generic groups that were found in the literature review. The typical outcomes generated by gamification approaches to innovation are: (1) hedonic, which encompass motivation and engagement; (2) social, which encompass team spirit and consensus building; and (3) utilitarian, which encompass cognitive, creative thinking, and productivity. In each specific case, all or some of these outcomes are integrated, depending on the type of game elements and tools used to address the innovation challenge.

Consequently, gamification approaches to the early stage of innovation can be defined as gamification, design games, or serious playing approaches, incorporating game elements (dynamics, mechanics, and components) and explicit goals which are used across the phases of discovery, idea generation/evaluation, idea development and decision to develop a new product/service. Therefore, from an innovation perspective, gamification definition is extended to design games and serious playing approaches, which provide further support to address complex innovation tasks and creativity requirements of this particular process.

4 | DISCUSSION

4.1 | Game elements and tools for innovation

4.1.1 | Gamification approaches

This type of approach can be found in cases 2, 4, 5, and 6—phase of generation and evaluation of ideas (B1)—and in case 16—phase of development of ideas (B2):

- Generating ideas and co-creating knowledge with a customer—A firm wanted to explore the innovation potential of its network of customers and distribution channels. The knowledge co-creation project with the customer generated an idea for a potential environmentally friendly packaging solution (case 2).
- Generating ideas for social challenges—This case concerned an idea competition for addressing urgent social challenges, such as

TABLE 2 Conceptualization of gamification approaches to early stage of innovation

		Dimensions						
		Environment		Game Elements		Motivation		
		Enjoyment/Fun	Rules System	Parts	Whole/Full-Fledget	Entertainment	Business	Learning/Simulation
Gamification Approaches to Innovation	Design Games	Yes	Yes	Yes	No	No	Yes	No
	Serious Playing	Yes	Yes	Yes	No	No	Yes	No
	Gamification	Yes	Yes	Yes	No	No	Yes	No

food security, power shift, water crisis, the future of money, empowering women, and urban resilience (case 4).

- Crowdsourcing of ideas for product design—The submission of designs by external contributors through an open online call allowed the firm to innovate in line with the demands of its consumers (case 5).
- Optimizing the ideation processes across teams/divisions—At a time when outcomes are acknowledged to be highly uncertain, the goal was to build on non-monetary motivational stimuli within the firm's boundaries (case 6).
- Testing new software features—The process of involving a cross-functional team in the development of new features led to a complete rethinking of the software application roadmap (case 16).

In all these cases (2, 4, 5, 6, and 16) there is some evidence of dynamics, mechanics and, components. In comparison with the other gamification approaches, gamification is the only one that promotes a competitive game environment with individual and/or team winners.

Dynamics—These high-level design patterns are typically exhibited in gamification approaches and tools through game rules and constraints (cases 2, 4, 5, 6, and 16). Game dynamics raise significant emotions in the form of recognition, happiness, excitement, competitiveness, and motivation capable of generating ideas in a fun and constructive environment (cases 2, 4, 5, and 16). Reporting a coherent experience with a narrative is not the key driver in gamification approaches since, only in one case (case 4) was the background information story communicated in a multifaceted way (e.g. short stories, blog entries, and a comic strip).

Mechanics—Game mechanics are what drive player involvement and engagement. The most visible mechanics in gamification approaches are challenges, competition, and feedback. Most of the cases are characterized by questions that require some effort to reach solutions (time, skill, and creativity), such as design submissions, the completion of idea building blocks, or social challenges (cases 2, 4, 5, and 16).

Components—Key components of gamification approaches involve points (cases 2, 4, 5, 6, and 16), achievements (cases 5, 6, and 16) and badges (cases 4 and 6). Points are a game component typically given for a specific performance (e.g. reaching a new level in missions or quests) that results in an increase in intrinsic motivation when goals are realistic and challenging (cases 4 and 6). Point-based scoring introduces excitement and competitiveness because, in order to achieve defined game objectives, a player must win or increase the status.

Gamification digital tools, such as IT and web-based applications, can be created specifically to fully support an innovation process, e.g. an ideation platform (case 6). Or they may be created just to add features and game elements to existing platforms, which is the case in the crowdsourcing web-based apparel store (case 5) and the social idea competition (case 4). The other type of gamification tool is offered by board games (games that are played on a table) which can be used to support the generation of ideas—as in the case of Innotin (case 2)—and to test and develop ideas with ideaChef® (case 16). The latter supports convergent thinking by narrowing down a number of potential solutions to a 'best fit' solution. This provides an engaging and more efficient way of selecting and developing ideas to be further pursued (Patricio, 2017).

4.1.2 | Serious playing approaches

This type of approach can be found in cases 3, 7, 10, and 12—phase of generation and evaluation of ideas (B1)—and in case 17—phase of development of ideas (B2):

- Conceiving the vision of a future research laboratory—It described the generation of ideas regarding the future vision of a research laboratory that emerged from the various groups of participants, including user groups (case 3).
- Generating ideas for entering a foreign market—In this case, the goal was to stimulate the generation of ideas from a perspective other than that traditionally held by the firm, using a role-play setting and the discussion of different scenarios (case 7).
- Generating ideas on after-sales service—In this case, the firm generated new insights and perspectives on a potentially serious challenge to their after-sales technical service business (case 10).
- Developing scenarios with external experts—The goal was to enhance imagination and creativity for the generation of future scenarios with external experts, and achieve a common understanding of these scenarios and opportunities for action (case 12).
- Testing and assessing ideas early on in the process—The firm supported the rapid systems development (prototyping) by testing hypotheses on differences and improvements (case 17).

Game mechanics and components are generally absent from these serious playing approaches. For instance, no challenges or competition mechanics were found in all these serious playing approaches. In fact, one of the distinctive characteristics of serious playing is role of the narrative in game dynamics.

Two serious game approaches—the ProRail low-tech games (case 17) and an ideation game (case 7)—were considered in this category as they are much closer to the concept of serious playing. In contrast to typical serious games, these two approaches are not rich data computer games focused on a learning process, but rather on the innovation process itself. In both cases, the generation of ideas is based entirely on a full game approach that takes the participant out of the innovation process. The richness of the collaborative experience reported by participants and the use of tools, such as scenario and role-playing and cardboard/art craft materials, puts the game narrative very much in line with the LEGO® Serious Play® approach.

These two approaches still comply with other characteristics of serious games, such as the testing of underlying assumptions, concepts, and prototypes in an environment that simulates the real world and the role-playing game dynamics. In all of these, the narrative is very much influenced by the simulation of a concrete challenge/scenario in which participants play their own roles or create fictitious profiles in order to gain insights and stimulate the generation of ideas (cases 7 and 17).

Serious playing tools share some of the characteristics of serious games but they differ in the approach as they do not force users to

completely step out of the process. Even in simulation-based cases, like the ProRail low-tech games, which represent system components (e.g., trains, passengers, infrastructures, and timetables), they supported rapid systems development (prototyping) but in a context of concrete work process (case 17). In a very similar situation, a serious play tool was used to support ideation in a small and medium-size enterprise (SME). This provided participants with specific profiles and a description of a challenging but realistic context with the aim of developing innovative proposals (case 7). In these situations, scenario/role playing and analogic materials were used (such as a pen and an object, sponges, and wooden sticks) to support the generation of ideas. The other application of serious playing, i.e. LEGO® Serious Play®, was used fundamentally to generate new insights concerning concepts and scenarios (cases 3, 10, and 12).

4.1.3 | Design games approaches

This type of approach can be found in cases 1—phase of discovery (A); in cases 8, 9, 11, 13, 14, and 15—phase of generation and evaluation of ideas (B1); and in case 18—phase of development of ideas (B2):

- Understanding users' experience and getting inspiration concerning their problems—In a project carried out by a computer manufacturer, a telecom provider, an office furniture firm, and a real estate company, game materials based on ethnographic video-recordings helped the participants get insights into the specific real-life world of potential users (case 1).
- Developing new concepts for an office—The setup of collaborative concept design activities with multiple stakeholders enhanced their ability to express and negotiate ideas (case 8).
- Creating new business models (Business Model Innovation)—It described how to foster new business models by re-examining and challenging their underlying assumptions (case 9).
- Redesigning older products with a modular design approach—Another example of cross-functional generation of concepts in a firm with very ad-hoc and customer driven R&D processes that wanted to adopt a more collaborative and structured approach in order to work proactively on issues and on the development of new products (case 11).
- Co-designing services with different stakeholders—The objective was to co-design three services: medical imaging diagnosis, hospital care, and environmental education/leisure, with a diverse group of stakeholders (customers and the people who deliver the services) who play an active role in the ideation and creation of shared products (case 13).
- Involving citizens in the co-design of public services—By providing a creative and challenging process, it gave citizens the power and motivation to express their needs and wishes for new types of public services which they would like to benefit from use in the future (case 14).
- Developing augmented reality applications—It enabled the creative development of new product concepts of augmented reality technologies that went beyond existing views (case 15).
- Developing rapid prototypes—Based on the ideas submitted to a specific challenge, teams delivered several product prototypes (case 18).

A strong narrative with an appealing story characterizes all design games and is a common aspect among the serious playing approaches. In fact, the narrative is the common ground for approaches and tools based on cardboard/deck/art craft materials. In all these cases, social interaction is typically based on role-playing and on the illustration of stories created by participants (cases 9, 13, and 15). Participants' involvement in role-playing and in generating their own personas enables a structured group discussion on the key activities and a physical representation of the people, products, and environments involved in the workday context.

Design games based on cardboard/deck/art craft material are an "easy-to-use" approach, which facilitates the generation of concrete and more self-explanatory ideas. Nevertheless, it has some limitations. First, it requires drawing craft skills in order to be able to express thoughts in a visual manner. Second, non-material aspects, such as software, are difficult to express (case 15). The meaning and the explanatory power of cardboard/deck/art craft materials are more concrete and focused on a task, albeit supported by the storytelling process. This allows for the leveling out of all contributions and making sure that everyone's opinion is understood.

In contrast to cardboard/deck/art craft material, board games rely on rules and constraints that are combined with emotions and convincing narratives (cases 1, 8, 11, 13, 14, and 16). Elements of game boards, such as playing or persona cards, guidelines for collaboration and processes, are used to support the brainstorming of ideas for a concrete challenge or problem.

As with serious playing, design games approaches are generally used to facilitate workshop sessions and other group activities. The tools used in design game approaches are typically custom-made/tailored board games (games that are played on a table although sometimes using elements different from the ones used by gamification tools) or cardboard/deck/art craft material.

4.2 | Gamification approach to innovation outcomes

4.2.1 | Hedonic outcomes

It is possible to observe outcomes of gamification in the form of fun, enjoyment, motivation, and engagement, particularly in the case of gamification approaches that provide feedback, challenges, and competition mechanics. Virtual awards, such as game points, contribute toward higher motivation and engagement when giving immediate feedback, not only for the completion of a task, but also for the quality of contributions. Higher motivation and engagement can also be reached by employing gamification elements such as status, addiction, self-development, and inspiration, as well as social character elements, like the feeling of being needed or of belonging to a community and the strengthening of relationships with other participants in the generation of ideas (cases 4 and 5). The accomplishment of a task should be sufficiently challenging (e.g. confront business assumptions) to involve and motivate participants in both idea generation and development (cases 4, 9, 11, 16, and 18).

The feeling of involvement is higher when participants are inspired by a specific innovation challenge and positive stress linked to the achievement of a difficult goal, i.e. the hard fun of playing the game (cases 4, 5, 11, and 18). Also, the feeling of involvement and motivation is higher when participants are inspired by competition which leads to a higher creative performance in idea generation.

4.2.2 | Social outcomes

Social outcomes of gamification are observed in the form of team spirit and consensus building. These outcomes are produced by the use of physical tools, in particular board games. The reduced social distance between participants encouraged interaction amongst them. Trust and loyalty towards the team are key elements that express the sense of team spirit provided by gamification approaches (cases 2, 4, 7, 14, and 16).

The establishment of strong ties and commitment amongst team members has the power to convert ideas into successful projects or prototypes and ultimately contributes toward the shaping of an innovation-supportive culture. Building actionable consensus regarding the best direction to take is one of the most important social outcomes of gamification approaches (cases 1, 8, 11, 12, 14, 16, and 18).

Gamification simplifies the complexity of work and decisions by facilitating a common understanding of ideas. It also helps to reach a common conclusion, getting everyone on the same page and carrying out actions in the same direction (case 16). By obtaining consensus on the chosen ideas, participants gain increased ownership of the solutions and an incentive to contribute toward continuous innovation (cases 11, 12, and 18).

4.2.3 | Utilitarian outcomes

Utilitarian outcomes of gamification are observed in the form of creative thinking, cognitive outcomes, and productivity. All gamification approaches based on physical tools enhance creative thinking in many different ways (cases 1, 2, 3, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18), as they spur participants to bring hidden insights to the surface (case 10). Creating a space for inspiration improves the participants' ability to contribute creatively and generates original ideas and prototypes with concrete results in terms of innovation potential. Challenging participants' creativity does not have a temporary effect because it provides the environment for a permanent discussion and expression of latent thoughts (case 14) in other settings and future time frames.

Physical tools make ideas more tangible, supporting experimentation and joint visionary thinking (cases 1 and 8) while expanding the range of possibilities for new ideas, options, problems, and solutions (case 13). This can be accomplished by a diverse team of participants provided with the necessary know-how and background to develop ideas beyond existing concepts and products (cases 3 and 15). Case 10 concluded that game approaches support more creative thinking than do other competitive approaches, such as executive education programs and retreats.

Cognitive outcomes of gamification are observed in the form of knowledge building. These outcomes—related to the acquisition, understanding, and organization of knowledge—are more explicit with reference to the gamification of physical tools (cases 2, 3, 7, 9, 11, 12, 13, 14, 15, 16, 17, and 18). Gamification approaches can facilitate the transfer of explicit knowledge to others in a collaborative manner.

Participants from diverse backgrounds and varying degrees of professional expertise exchange knowledge, insights, and competencies in order to reach commonly-held added value concepts. The build-up of an open, playful, and creative environment allows participants to think, share, listen to others, and incorporate new knowledge into their own model (cases 3 and 15).

Gamification approaches play an effective role in managing the knowledge exchange process across different phases. It supports the identification of knowledge gaps, new actors with whom to interact and collaborate, as well as information flow between key innovation stakeholders. The fact that participants dive into different concepts without knowing in advance the final results, removes relevant knowledge yet it discloses relevance in irrelevant knowledge (cases 7, 11, and 18). Besides fostering knowledge transfer, gamification supports new ways of thinking and learning while playing.

Productivity outcomes are not too visible and widespread among the different gamification approaches. Nevertheless, it is possible to find some evidence of productivity gains and accelerated time to market (cases 2, 5, 16, and 18). The increased number and quality of contributions is a good indicator of productivity gains generated by game approaches. When participants are more focused on the most relevant activities, they perform better with fewer resources, i.e. time and people.

In conclusion, managing the early stage of innovation with gamification approaches helps firms increase their chances of success by addressing their challenges better. The observed outcomes of gamification approaches illustrate how the key characteristics of the early stage of innovation can be enhanced (see Table 3).

Having participants more motivated and engaged in innovation strengthens their relationships with other stakeholders and creates a strong sense of belonging in their team and community. Complexity

TABLE 3 Conceptualization of gamification approaches to innovation

		Outcomes		
		Hedonic	**Social**	**Utilitarian**
Characteristics of early stage of innovation	Informal relationships between stakeholders	Engagement and motivation	Team spirit	
	High degree of complexity and uncertainty			Creative thinking
	Tacit knowledge-intensive conflicting organizational pressures		Consensus building	Cognitive
	Permanent discovery of what customers hope to accomplish			Creative thinking

and uncertainty cannot be eradicated but can be mitigated by a creative problem-solving mindset. The transfer of more explicit knowledge to others, in a more collaborative and open environment, overcomes the limitations of tacit knowledge mechanisms, and conflict is managed with consensus building that fundamentally encourages interaction and reduces the social distance between participants. And finally, creative thinking improves the participants' ability to find unmet customer needs.

4.3 | Proposition development

Based on the discussion of the findings, the following set of propositions on how gamification can be used throughout the early stage of innovation is outlined.

4.3.1 | Relationship between the challenges and the phases of the early stage of innovation

Most of the innovation challenges fit into the generation and evaluation of ideas (cases 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15) and the development of ideas (cases 16, 17, and 18).

- Proposition #1—Gamification approaches to innovation, in general, are mostly used for idea generation and development.

4.3.2 | Relationship between challenges and gamification tools

Each of the three innovation challenges that fit into the idea development phase uses a different type of gamification approach to innovation, namely gamification (case 16), serious playing (case 17), and design games (case 18), which are supported by physical tools alone, i.e. cardboard/deck/art craft material and board games.

- Proposition #2—Challenges related to the idea development phase of the early stage of innovation are always addressed by physical tools no matter the type of gamification approach used by the firm.

4.3.3 | Relationship between game approaches and game elements

Both serious playing and the design games approaches are characterized by no competition elements and strong game dynamics, essentially narratives. With the exception of two design games approaches (cases 9 and 14), none of them use any game mechanics or components.

- Proposition #3—Serious playing and design games approaches rely fundamentally on game dynamics to generate and develop ideas.

No matter the type of tools or phases of the early stage of innovation, gamification (cases 2, 4, 5, 6, and 16) is the only gamification approach to innovation that uses competition features along with a combination of the three game elements categories, i.e. dynamics, mechanics, and components at the same time.

- Proposition #4—The gamification approach is the most complete game approach regarding the use of game dynamics, mechanics, components, and competition features.

4.3.4 | Relationship between gamification approaches, tools, and outcomes

Gamification is the only approach where it is possible to observe hedonic outcomes in the form of motivation and engagement, using either digital tools (cases 4, 5, and 6) or board games (cases 2 and 16). Gamification approaches include game mechanics and components that contribute very much toward engaging and motivating participants.

- Proposition #5—Motivation and engagement outcomes are observed particularly in gamification approaches.

Social outcomes, such as team spirit and consensus building, are mostly observed in gamification approaches to innovation that use physical tools (cases 1, 2, 7, 8, 11, 12, 14, 16, and 18), in particular board games (cases 1, 2, 8, 11, 14, 16, and 18).

- Proposition #6—Gamification approaches to innovation that use board games can lead to more social outcomes in the form of team spirit and consensus building.

As for consensus building, cognitive and creative thinking outcomes can be observed only in gamification approaches to innovation supported by physical tools (cases 1, 2, 3, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, and 18). Creative thinking is observed in all gamification approaches to innovation supported by physical tools.

- Proposition #7—Gamification approaches to innovation that use physical tools with strong game dynamics can lead to more utilitarian outcomes in the form of creative thinking and cognitive/knowledge building.

Both digital and analogic tools are used to facilitate gamification approaches. In contrast, the other two approaches, serious playing and design games, are completely analogic. Serious playing uses LEGO® Serious Play®, scenario/role playing and cardboard/art craft material. Design games employ a combination of cardboard/deck and art craft material as well as board games.

- Proposition #8—Analogic gamification tools are more suited to serious playing and design games approaches to innovation.

5 | CONCLUSION

This paper provides a structured and coherent manner of analyzing the use of gamification throughout the early stage of innovation by making a cross-comparison of firms' case studies where gamification was used to address concrete innovation challenges and these firms

had benefited from this new approach. The Gamification Approaches to Innovation Analytical Framework provides a rich data visualization of these cases, which facilitates the generation of several insights on how gamification elements and tools can be used to address concrete challenges and enhance the early stage of innovation.

This explorative study argues that gamification can support firms in becoming better at performing complex innovation tasks and at managing challenges hindering the early stage of innovation by providing a more creative, engaging, structured, and flexible approach. In fact, it was observed that gamification approaches to innovation create a space for inspiration, improve creativity and the generation of high potential ideas. Having participants that are more involved and motivated by game dynamics with clear challenges and rules provides a more structured and timely process, which increases engagement within the early stage of innovation. Furthermore, the open and collaborative environment provided by gamification also allows for greater flexibility on the part of participants to think, listen, and share ideas.

Moreover, this paper illustrates that beyond the hedonic outcomes, i.e. motivation and engagement, gamification approaches to innovation also generate relevant social outcomes in the form of team spirit and consensus building, as well as utilitarian outcomes in the form of cognitive, creative thinking, and productivity.

The connections between the characteristics of the early stage of innovation and their outcomes for innovation, based on a sample of 15 published articles, encourage researchers to proceed with further studies on how firms can apply gamification successfully throughout the early stage of innovation.

In order to validate and enhance the findings of this conceptualization, two main avenues for further research are suggested. The first avenue is based on the propositions derived from the conceptualization of gamification approaches to innovation. Empirical findings of the selected cases support a set of propositions that can be considered starting points for further studies. When looking at the use of gamification approaches throughout a firm's early stage of innovation, the vast majority fitted into the idea generation and development phases. Therefore, further research is necessary in order to assess the impact of gamification on discovery as well as on other phases where existing knowledge is scarce. Findings also suggest the need for further research on the use of gamification tools, which could improve the robustness of the research propositions. And, it would be very stimulating to address, for instance, an innovation challenge with a mixed approach of digital and physical tools.

The second avenue concerns the analytical framework that was developed for this study. Although it was originally designed for studying gamification approaches to innovation, it might be applicable to other environments. Potential areas of application are exploratory studies where researchers need to make a cross-comparison of relevant published cases so as to understand the contributions of gamification approaches to other business processes.

Besides the above-mentioned theoretical contribution, this article also has implications for practitioners, especially innovation managers and other professionals engaged in the innovation process. A better understanding of the contributions of various gamification approaches to innovation can provide valuable insights for the innovation strategy decision-making process. Moreover, it can even contribute toward mitigating some of the inherent risks of subsequent stages, i.e. new product/service development and commercialization.

This paper offers valuable exploratory insights regarding gamification approaches to innovation. However, this concept is clearly focused on firms and businesses, excluding situations where gamification may not have a business goal, or goals related to video games and pure play environments. Nevertheless, the relevance of the results drawn from the limited number of published studies can be considered representative of gamification approaches to innovation. Future research could examine other types of approaches that firms might implement in order to foster innovation.

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