MIS Quarterly

RESEARCH COMMENTARY

TOWARD MEANINGFUL ENGAGEMENT: A FRAMEWORK FOR DESIGN AND RESEARCH OF GAMIFIED INFORMATION SYSTEMS[1]

De Liu
Carlson School of Management, University of Minnesota,
Minneapolis, MN 55455 U.S.A. {deliu@umn.edu}

Radhika Santhanam
Price College of Business, University of Oklahoma,
Norman, OK 73019 U.S.A. {Radhika@ou.edu}

Jane Webster
Smith School of Business, Queen's University,
Kingston ON K7L 3N6 CANADA {jane.webster@queensu.ca}

Gamification, an emerging idea for using game design elements and principles to make everyday tasks more engaging, is permeating many different types of information systems. Excitement surrounding gamification results from its many potential organizational benefits. However, few research and design guidelines exist regarding gamified information systems. We therefore write this commentary to call upon information systems scholars to investigate the design and use of gamified information systems from a variety of disciplinary perspectives and theories, including behavioral economics, psychology, social psychology, information systems, etc. We first explicate the idea of gamified information systems, provide real-world examples of successful and unsuccessful systems, and, based on a synthesis of the available literature, present a taxonomy of gamification design elements. We then develop a framework for research and design: its main theme is to create meaningful engagement for users; that is, gamified information systems should be designed to address the dual goals of instrumental and experiential outcomes. Using this framework, we develop a set of design principles and research questions, using a running case to illustrate some of our ideas. We conclude with a summary of opportunities for IS researchers to extend our knowledge of gamified information systems, and, at the same time, advance existing theories.

Keywords: Gamified systems, instrumental, experiential outcomes, design, persuasive technologies, hedonic systems, intrinsically motivating systems, task–technology fit

Introduction

Gamification in information systems utilizes elements drawn from game designs to make tasks more engaging for employees and consumers and to improve organizational outcomes. Gamification helps make monotonous tasks more enjoyable (Thiebes et al. 2014), can result in organizational benefits such as cost savings and performance improvements (Penenberg 2013), and is expected in the workplace by some users such as Generation Y (Burke and Hiltbrand 2011). For example, the company DirectTV uses game mechanics such as points, contests, and social recognition to stimulate interest in training among its 800-person Information Technology (IT)

[1]Paulo Goes was the accepting senior editor for this paper.

The appendices for this paper are located in the "Online Supplements" section of the *MIS Quarterly*'s website (http://www.misq.org).

department.[2] Gamification designs are also incorporated in consumer products such as Ford Fusion and Toyota Prius to motivate drivers to improve fuel economy (Greenwald 2014; Pegoraro 2012). Further, gamification is being used as an incentive for Internet users to generate content (such as on Quora, Stackoverflow, and Coursera) and gamification platforms and portals exist for organizations to gamify their systems.[3] Thus, organizations are applying gamification designs in a variety of ways to engage and steer employees and consumers toward targeted goals.

In 2011, Gartner predicted that gamified information systems and services (hereafter referred to as *gamified systems*) would become an integral part of organizational systems such as consumer goods marketing and customer retention, with 70% of Global 2000 organizations having at least one gamified application (Burke 2011). Despite the hype and expectations for growth, several reports of failed gamification attempts have emerged, with titles such as "game over for gamification," that give us some pause.[4] For example, to motivate housekeepers to become more efficient at DisneyLand and Paradise Pier Hotels, public monitors displayed leaderboards showing efficiency numbers in green for the quickest employees and in red for others. Many employees did not like this, felt they were being controlled, and called it an "electronic whip."[5]

Despite several failed accounts, gamified applications are seen as having potential: corporations continue to invest in gamified designs, with some estimates suggesting market growth of 48% by 2019, with enterprise gamification having the highest market share (Technavio 2015). Practitioners note that failed reports tend to be fewer and should be seen in light of noted gamification design successes such as those introduced by eBay, Four Square, WalMart, and others.[6] Further, the failed attempts highlight that proper design choices and processes need to be undertaken to develop gamified systems. It is not just a matter of adding PBL (points, badges, and leaderboards) to any digital task but to carefully design gamified systems that will foster desired behaviors (Burke 2012). (See Appendix A for more examples of successful and unsuccessful gamification applications in organizations.)

The natural follow-up questions are: What sets apart good gamification designs from poor ones? How should the effectiveness of gamification designs be evaluated? What theories can inform the development of good designs? Answers to such questions would benefit gamification designers, providers, and project owners/managers. Although gamification research has often appeared in other outlets such as education and computer science, we argue that these questions are best addressed by Information Systems (IS) researchers. Given the past richness of IS research on related systems such as intrinsically motivating software, persuasive systems, and hedonic systems (Bui et al. 2015), IS researchers have the appropriate background to research gamified systems and to develop principles for design and use that can lead to the success of gamified systems in organizations. In addition, IS researchers have expertise in designing and evaluating technology systems from a diverse set of disciplinary perspectives (economics, management, computer science, psychology, engineering, human–computer interaction, and systems design, to name a few).

Although IS researchers have drawn attention to gamification research (Chang et al. 2008; Cheong et al. 2013; Hamari and Koivisto 2013; Kankanhalli et al. 2012; Merhi 2012; Shang and Lin 2013), current empirical studies are limited in scope. Thus, to provide a comprehensive picture of the potential for gamification research and to accelerate this research, we write this commentary. To do so, we first elaborate on the concept of gamification and provide a real-world working example. We then point out the many inconsistencies in current definitions of gamification-related terms used in the popular trade press and the literature. We suggest a taxonomy of terms that make up the components of a gamified system. Next, we propose a framework for gamification design and research and draw on it to develop theory-based design principles and research questions to help drive future research and practice.

Gamification Background

The term *gamification*, initially coined by Nick Pelling in 2002, started to gain popularity in academic circles around 2010. One of the earliest and most popular definitions is that provided by Deterding et al. (2011), who simply define gamification as "the use of game design elements in non-game contexts." This definition describes the means (use of game design elements) and the application context (non-game) of gamification in broad terms. A few subsequent definitions describe more specific means, goals, and application contexts

[2]http://www.citeworld.com/social/22534/directv-game-jive-thrive-sparkologee.

[3]For example, Bunchball (http://www.bunchball.com) and Enterprise Gamification (http://enterprise-gamification.com).

[4]http://www.cmo.com/articles/2012/10/24/game-over-for-gamification.html.

[5]http://enterprise-gamification.com/mediawiki/index.php?title=Disneyland_Leaderboard_for_House_Keeping_Staff.

[6]https://blog.captainup.com/how-2-of-the-biggest-companies-utilise-gamification-to-succeed/.

of gamification. For example, Fitz-Walter et al. (2011, p. 1) define gamification as "adding game elements to an application to motivate use and enhance the user experience." Other definitions include "the use of game design elements (e.g., points, leaderboards and badges) in non-game contexts … to promote user engagement" (Mekler et al. 2013, p. 1138), "the use of game-based elements such as mechanics, aesthetics, and game thinking in non-game contexts aimed at engaging people, motivating action, enhancing learning, and solving problems" (Borges et al. 2014, p. 216), and "a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation" (Huotari and Hamari 2012, p. 19). The common themes that emerge from the various definitions over the past decade are that gamified systems must have specific user engagement and instrumental goals, and the way to achieve these is by the selection of game design elements. What is not stated in these definitions and other descriptions is how these design elements should be chosen for specific tasks, and how they interact among themselves and create the desired user interactions that engage the user and lead to the intended instrumental goals. As we explain in more depth later, gamification design principles and approaches to create these user interactions and obtain gamification goals are not available, and need to be developed through research and testing.

In addition to no clear single definition of gamification, there is also a great deal of confusion between gamification and several related terms such as game-based learning (GBL), serious games, and simulation games. Specifically, these game-inspired designs predate gamification and may apply game design elements to non-game contexts. One notable distinction, however, is that these earlier designs are essentially full-fledged games, whereas gamification is about adding a game layer to a non-game target system (Santhanam et al. 2016). More importantly, a full-fledged game modeled after a real-world system often needs to sacrifice some, if not all, functionality of the real-world system to maintain the game's entertainment value.[7] Consequently, full-fledged games are often used *separately from*, rather than *as part of*, real-world systems. Gamification, on the other hand, is incorporated into real-world systems without sacrificing their functionality (e.g., a gamified training course maintains the functions of a conventional one). This distinction gives gamification a distinct value proposal from its predecessors and introduces additional complexities and unique challenges in designing these systems. To highlight this distinction, we define gamification as *the incorporation of game design elements into a target system while retaining the target system's instrumental functions.* We note that gamification can be about modifying the design of an existing system or the creation of a new system that incorporates game design elements from the very beginning.

Gamification requires the use of *gamification design elements*; however, it is not automatically clear what gamification design elements represent. Some researchers describe them by examples, such as Mekler et al.'s (2013, p. 1138) "points, leaderboards, and badges"; others have introduced taxonomies. One popular taxonomy among industry professionals is MDA (mechanics, dynamics, and aesthetics) (Hunicke et al. 2004). Alternative taxonomies include Borges et al.'s (2014) mechanics, aesthetics, and game thinking and Deterding et al.'s (2011) interface design patterns, mechanics, design principles, conceptual models, and design methods. A recent literature review suggests that the existing taxonomies lack rigor and need further development (Bui et al. 2015).

We believe a taxonomy is useful for illustrating the scope and nature of gamification and would help facilitate gamification design and research efforts. In response to this gap, we reviewed gamification and game design elements for the past 10 years in industry, conference, and journal publications from information systems, human–computer interaction, and related disciplines. This review demonstrated that terms are used inconsistently and that there is little consensus on what gamification design elements should include (see Appendix B for examples). For instance, while some practitioners describe game mechanics in terms of building blocks and features such as points and badges, academics tend to describe them in terms of rules and processes that govern the sequence of events. Further, some consider game dynamics as elements, while others view them as the "emergent behavior of the game and player" (Ralph and Monu 2015, p. 9). Thus, based on our extraction of common elements and drawing from earlier taxonomies (e.g., Bui et al. 2015), we suggest a taxonomy that includes the following two broad categories: *gamification objects* and *mechanics*.

Gamification objects are the basic building blocks of a gamified system, which typically include items, characters, scripts, visual assets, and so on. Some gamification objects, such as images, audios, videos, animations, and multimedia, are primarily used to creating sensory experiences (such objects are called aesthetics in some taxonomies). Others are primarily used to create cognitive experiences, such as stories, puzzles, and plots, called narratives in some taxonomies (Andersen et al. 2011). We note that in addition to creating sensory or cognitive experiences, many gamification objects may also be functional. For example, gold coins can provide

[7]For example, a learning game may address certain learning topics or forms of learning, but not others, or a hotel management game may operate entirely within a simulated universe rather than in the real world.

sensory experiences for their aesthetic designs, while at the same time being used as a currency for in-game trading.[8]

Gamification mechanics refer to the rules that govern the interaction between users and game objects (Teh et al. 2013). For example, in a system that uses points to provide user feedback, a game mechanic could be the rules for giving points (i.e., how and when the points are awarded to the user). Similarly, mechanics may prescribe the rules for chance elements, user choices, levels, leaderboards, badges, guilds, trading, and social interactions. Gamification mechanics, plus actions taken by users, result in user–system interactions (called play patterns or game dynamics in the gaming literature).

We also note that gamification design elements need not be exclusive to games. In fact, many objects and mechanics find use in non-game contexts, such as loyalty programs, classrooms, and online communities (McGonigal 2011). Consequently, considering game elements on their own is not sufficient to effectively "gamify" an instrumental system. As stated earlier, we need to not only take these elements into account, but also consider principles guiding their design and use, their effects on user–system interactions, and the overall goals for the target system. Some of these principles could be developed based on practice and prior IS research, such as information system use and user satisfaction. However, because gamified systems represent an emerging type of information system making use of newer gaming technologies to lead to both experiential and instrumental outcomes, many of the design principles will need to be developed using suitable theoretical foundations that can speak directly to user motivations and engagement with systems. In order to do so, we first develop a framework for designing and researching gamified workplace systems.

Development of a Framework for Gamification Design and Research

We present our framework for the research and design of gamified systems in Figure 1. This framework is grounded at the individual and group levels of analysis, although it has implications for organizational-level outcomes. As shown, we highlight the two overarching goals of a gamified system, which we refer to as meaningful engagement, made up of experiential and instrumental outcomes. We use the term meaningful engagement to emphasize the dual outcomes of gamification design: the design should not only result in enjoyable experiences and foster engagement but should also enhance instrumental task outcomes. In contrast, traditional IS are designed with an overall goal of helping users complete tasks, whether making an online purchase, completing a purchase order, or preparing an inventory list (Li et al. 2013). Employees also tend to pay more attention to instrumental job-related benefits from IS use, and this is reflected in IS research with perceived usefulness as an important construct to be evaluated (Brown and Venkatesh 2005). However, there is now a growing recognition of experiential values of IS such as fulfillment, enjoyment, satisfaction, and meaningfulness (Tomaselli et al. 2015; Wu and Liu 2007). For gamified systems, this is not just an added benefit but should be a clear design goal: only then can the main purpose of gamifying work systems be achieved.

The identification of instrumental goals is fairly straightforward and depends on the work context for which the IS was developed. But experiential outcomes are less clear. Drawing on past research, one could conceptualize experiential outcomes in the form of flow, cognitive absorption, enjoyment, joy, and other similar outcomes (Agarwal and Karahanna 2000; Santhanam et al. 2016; Webster and Martocchio 1993). However, additional outcomes such as attention, arousal, and cognitive effort could also represent experiential outcomes for tasks such as learning, online shopping, and decision making, because these can be seen as representing engagement levels of the user (Bui et al. 2015; Deng and Poole 2010; Hess et al. 2006; Kanfer and Ackerman 1989; Park et al. 2007). Whatever the choice of experiential outcomes, the key is to identify them along with the intended instrumental outcomes and design accordingly.

After identifying the overall system outcomes, we move to the middle of our framework where the nature of user–system interactions is considered. As described above, user–system interactions are the dynamics resulting from gamification elements coming together with user actions. These have been described as the "run-time behavior of the mechanics acting on player inputs and each other's outputs over time" (Hunicke et al. 2004, p. 2) and the "emergent behavior of both the game and the player during player-game interaction" (Ralph and Monu 2015, p. 5). Often, user–system interactions are seen as something that the user does. However, this represents a rather limited view given the level of interactivity involved in current systems (Liu and Shrum 2002). In gamified systems,

[8]The fact that some gamification objects can have both aesthetic/narrative value and serve a functional purpose has often created confusion in taxonomies for gamification design elements, because some people may emphasize the aesthetic/narrative value of a game design element, say a badge, and classify it as a gamification object while others may emphasize its function (using badges to reward certain behavior) and classify it as a game mechanic (which we discuss next). In our taxonomy, gamification objects can be building blocks for game mechanics, so it is possible that a gamification design element could be a gamification object (badge as an aesthetic item) as well as a part of a gamification mechanic (giving badges as a way of conferring rewards), depending on the emphasis.

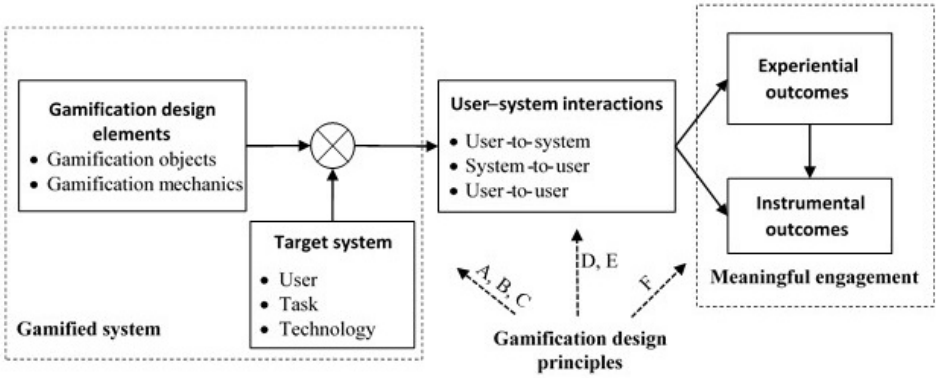

Figure 1. Framework for Design and Research of Gamified Systems

the manner in which the system sets up game-like interactions and presents feedback influences the quality of user–system interactions, and must be attended to in design. As shown in the framework, user–system interactions also include system–user communications as well as user interactions with other users.

Moving to the left-hand side of our framework, we see that gamification design elements need to fit with the target, or instrumental, system: the choice of elements will depend on the user, task, and technology platform. For example, tasks that do not involve other users or users who do not favor social comparisons will not be helped by choosing leaderboards as design elements. As we highlight in the framework, we find that gamification design elements are not limited to PBL and can be viewed in multiple categories. Further, design elements should be chosen such that they can create desired user–system interactions and resulting outcomes. Thus, design elements represent the building blocks that are chosen during design decisions that can have a great impact on the success of the system.

Finally, tying the framework together are *gamification design principles,* or high-level design rules and formulas for designers. For example, in the gaming literature, design principles such as user onboarding, keeping outcomes uncertain, frequent rewards, immediate feedback, and supporting different player styles have been suggested (Bartle 1996). These principles could be interconnected with gamification objects and mechanics; for example, to make badges work, one needs an object (e.g., a badge as a visual component), a mechanic governing the rules for awarding badges, and a principle suggesting that there should be different badges for different user styles and stages.

In order to understand the different components in our framework, we describe a real-world gamified system currently in use, developed by a small startup specializing in digital wellness solutions for small- and medium-sized companies. After observing failures of many wellness programs, this startup was determined to make them more engaging using gamification. Thus, their system, which we call *HealthyMe,* uses a variety of gamification elements. First, *HealthyMe* incorporates daily goals as opposed to monthly ones for wellness activities such as running, biking, and snow shoveling. Progress toward goals is featured as a dial and bar chart on a user's dashboard. *HealthyMe* will display achievements on the user's home screen (such as "Marathon Biker") whenever specific criteria are met. It rewards employees with "wins" (whenever a user reaches a daily goal) and weekly cash incentives based on how many wins the user has achieved. It also uses a personal virtual coach to send tips, encouragements, and reminders to employees. The virtual coach uses information from a personality survey to tailor his message content and style. For example, one employee may receive "Get going! You've fallen off this week, but you can still get back on track," whereas another may get "You're almost there. You may be glad to know you're doing better than 67% of Americans." The system has also incorporated social features: users can follow one another, be notified of each other's activities and achievements, and give "kudos" to each other. Finally, employees can quickly set up teams to engage in team-based challenges. Table 1 highlights several gamification design elements integrated into the system, along with the design principles used.

Although the startup carefully chose a set of gamification elements to include in *HealthyMe*, not all of them worked as intended. For example, some employees set goals and then

Table 1. Gamification Design in HealthyMe

Gamified Systems	**Gamification objects**	• *virtual coach:* a virtual coach named "Kevin" has a stock of wellness tips and narratives written by a behavioral psychologist • *rewards:* badges for users achieving certain in-app or wellness activity milestones (e.g. "Epic workout" or "Celebrity") • *pie charts*: a pie chart illustrates a user's total "wins" after log-in • *bar charts:* a bar chart displays a user's recent wellness activities in a visually pleasing way • *activity stream*: an activity stream shows a user's and his/her friends' recent activities
	Gamification mechanics	• *conferring rewards*: for each daily goal reached, an individual receives a "win" • *giving kudos*: friends can give kudos for the wellness activities logged by an individual • *social networking*: allows a user to add friends to receive updates and receive kudos from friends • *forming teams*: individuals can quickly form teams to work together toward team goals • *providing cash incentives*: cash incentives are given each week as a function of wellness activities completed
Implemented gamification design principles		• *timely feedback:* makes it easy to monitor progress towards goals and get notified in real time • *frequent rewards*: instead of giving monthly vouchers, weekly cash rewards are used • *personalized goals*: users choose their own daily and long-term goals • *personalized messages*: measures users' personality traits and customizes wellness messages accordingly • *social support*: encourages users to give each other positive encouragement (via kudos and comments); also leverages team-based challenges
Meaningful Engagement	**Desirable Experiential Outcomes**	• enjoyment from wellness activities • improved engagement with the app • feeling more positive about wellness activities • anticipation and curiosity about wellness activities
	Desirable Instrumental Outcomes	• for companies: reduced healthcare expenditures • for individuals: reduced healthcare expenditures, weight loss, improved fitness, reduced stress, better toning, heathier, better vital signs

forgot about them. Others formed teams, but did little with them. Our interviews with the organization suggest that it was unsure about some of its design choices: for example, should users be allowed to enter their own goals or choose from a given list? Should the virtual coach be adaptive to user behaviors? Should users be permitted to see and comment on all of their colleagues' wellness activities? Is a leaderboard a good idea? Clearly, some scientifically validated guidelines would be helpful in designing their gamified systems.

Because gamification is an emerging type of system, there are few use cases, and a paucity of practice-based wisdom that can guide the development of successful systems. Even then, many of the gamification principles in practice are derived as offshoots of full-fledged game designs and are not easily mapped to gamification in the work context. For example, principles such as "voluntary participation" (McGonigal 2011) or getting "some celebrity endorsements" (Kapp 2013, p. 263) are not as relevant and suitable to work contexts because work systems are often mandated for employees and endorsements are only appropriate for some types of consumer systems. Even those branded as universal principles can be applied only in certain situations. For example, Groh (2012, p. 41) refers to the relatedness principle as the "universal need to interact and be connected with others." However, as we propose later, this principle is not needed in all situations, but is very helpful in other cases (e.g., when cooperation is the intended user dynamic). Similarly, competition between users is suggested as another universal principle (Suh 2015), but again we suggest below that it is only useful in specific situations. Perhaps this is because these principles were derived primarily from full-fledged games, with experiential outcomes being given more importance than instrumental outcomes.

For gamification designs to be successful, particularly in the work context where both instrumental and experiential out-

Table 2. A Sampling of Theoretical Perspectives for Gamification Research*

Disciplinary Perspectives	Theories	Descriptions
Behavioral Economics	Prospect theory, hyperbolic discounting	Prospect theory states that people make decisions based on the potential losses and gains rather, defined relative to a reference point, than on reference-independent final outcomes, and that people evaluate these losses and gains using heuristics (Kahneman and Tversky 1979). Hyperbolic discounting refers to an intertemporal choice pattern that people display higher discount rates over shorter time horizons, implying a declining (hyperbolic) discount rate.
Neoclassical Economics	Agency theory	Agency theory is concerned with problems that arise between principles (e.g., managers) and their agents (e.g., employees) when their interests are not perfectly aligned. When agents hold private information or can take "hidden actions", the problems of "adverse selection" and "moral hazard" arise respectively (Hart and Hölmstrom 1987). To remedy these issues, agency theory examines the effectiveness of various incentive contracts, such as outcome- vs. behavior-based incentives, individual versus team-based incentives, tournament versus absolute-performance incentives, and asset ownership.
Information Systems	Media characteristics	Users' choice of a type of medium depends on such influences as the task, the ambiguity of the message, situational constraints, and the cues of the media (George et al. 2013) and this choice can influence their task performance (e.g., Daft et al. 1987).
	Social cognitive theory	Originating in psychology (Bandura 1986, 2001), social cognitive theory views human functioning as the product of a dynamic interplay of personal, behavioral, and environmental influences. Standing at the very core of social cognitive theory are self-efficacy beliefs (e.g., Compeau and Higgins 1995), or people's judgments of their capabilities to organize and execute courses of action to attain designated types of performance. Self-efficacy beliefs provide the foundation for human motivation, well-being, and personal accomplishment: unless people believe that their actions can produce the outcomes they desire, they have little incentive to act or to persevere in the face of difficulties.
Marketing	Optimal stimulation	Several frameworks and theories address optimal stimulation-seeking behaviors. For example, Wablers et al. (1990) suggest that each individual has a uniquely determined, homeostatic degree of stimulation or an "optimal stimulation level" with which he/she is comfortable. When the environment is deficient in providing stimulation at this level, one tends to seek complexity or novelty. Conversely, when the environment provides more stimulation than desired, the individual will engage in behavior to reduce stimulation. Thus, the individual is viewed as adapting to his/her environment so as to maintain a balance between actual and optimal levels of stimulation.
Organizational Behavior	Job characteristics theory	Job characteristics theory (Hackman and Oldham 1976)is concerned with increasing employees' motivation, satisfaction, and performance through enriching job characteristics. According to the theory, certain job characteristics increase the probability that individuals experience positive psychological states from work: skill variety, task identity and task significance shape the experienced meaningfulness, autonomy affects experienced responsibility, and feedback contributes to knowledge of results.
Psychology	Flow theory	Flow, a state representing the extent of pleasure and involvement in an activity (Csikszentmihalyi 1975), is a multidimensional construct encompassing perceptions of user control, attention focus, arousal of curiosity, and intrinsic interest (Webster and Martocchio 1993). Flow will be enhanced when users are optimally challenged; in contrast, if the interaction is too demanding it may produce anxiety, and if it is not challenging enough, boredom may result (Csikszentmihalyi 1975).
	Self-determination theory	Self-determination theory (SDT) is an empirically based theory of human motivation, that focuses on types, rather than amount, of motivation that affect performance, problem-solving, psychological health and well-being (Deci and Ryan 2002). SDT distinguishes between autonomous and controlled motivation. With the former, people experience volition, or a self-endorsement of their actions, while in the latter, they experience pressure to think, feel, or behave in particular ways. Three main intrinsic needs involved in self-determination include the need for competence, autonomy, and psychological relatedness. Cognitive evaluation theory (Deci and Ryan 1985), considered a subtheory of SDT, states that inter-personal events and structures (e.g., rewards, communications, feedback) that provide *feelings of competence* during action can enhance intrinsic motivation for that action. Such competence enhancing feedback will be effective only when the person has the autonomy to engage in the behavior, but not otherwise.

Table 2. A Sampling of Theoretical Perspectives for Gamification Research (Continued)

Disciplinary Perspectives	Theories	Descriptions
Social Psychology	Social comparison theory	Social comparison theory as originally proposed by Festinger (1954) states that people have an innate drive to evaluate their opinions and abilities, and when objective means are not available, they evaluate by comparison with others. Particularly in the case of evaluating abilities, people have a tendency to drive upward, meaning they tend to compare themselves with people who have higher abilities.
	Social influence & norms	Social influence has received significant research attention. For example, Fulk et al.(1990) developed the social influence model of technology use, proposing that group norms and coworker and supervisor attitudes and behaviors influence technology use: it has received widespread support (Kraut et al. 1998; Schmitz and Fulk 1991; Trevino et al. 2000). For instance, when individuals identify and categorize themselves within a particular social group, their behavior will be guided by the norms of that group (Terry and Hogg 1996). When norms are activated, such as through providing normative feedback in the workplace (Siero et al. 1996), this can affect behaviors (Cialdini et al. 1991; Schultz 1999).

Note: This table provides a small sample of potential theoretical perspectives. Many more theories from Information Systems and other disciplines could be included, but it is not possible to enumerate all of them here. Further, although we associate each theory with a discipline, we acknowledge that some theories span multiple disciplines, such as social cognitive theory.

comes are important, we need to develop gamification design principles. We submit that this represents a rich domain in which IS researchers can make important contributions through developing theory-driven principles leading to successful outcomes for organizations. Before presenting the principles in the next section, we briefly outline in Table 2 how a sampling of different disciplinary perspectives can inform gamification research in the workplace. For example, the behavioral economics literature speaks to designing incentives, setting optimal rewards for effort, and related issues. Turning to psychology, theories that address both intrinsic and extrinsic motivation, such as self-determination theory, could be used to develop principles. Thus, to help develop gamification research further, we draw on these perspectives in the next section to offer suggested principles and research questions. We further discuss how gamification research and design could inform and expand the underlying theories in our discussion section.

Theoretically Derived Design Principles

One of the fundamental goals of gamification is to make an otherwise mundane or boring task more appealing and engaging. Thus, we must start with examining the task and the purpose of gamification in relation to this task. Therefore, we draw on the literature from task–technology fit (TTF), in which TTF is viewed as "the correspondence between task requirements, individual abilities, and the functionality of the technology … a more accurate label for the construct would be task–individual–technology fit" (Goodhue and Thompson 1995, p. 218). We extend this view for gamified systems to include not only individuals, tasks, and technologies, but also three other important considerations: the desired user–system interactions (such as competition versus cooperation), the expected recurrence of system use, and the dual outcomes of gamification. That is, we suggest that there needs to be a fit between the game design elements and all of these attributes, and propose this general principle to guide design:

> **General Principle***: Game design elements incorporated in a target system must match the intended purpose of the system.*

Although this overall principle would find support from the body of past TTF research (Goodhue 1995; Goodhue and Thompson 1995), it is at too high a level to be directly applicable to design practice. Hence, we draw on theoretical perspectives from information systems, psychology, economics, management, and marketing to unpack different dimensions of "fit" and develop more specific principles to help guide future design and research. Based upon each of these principles, we also present illustrative questions that need further investigation. These research questions are just a starting point, and future researchers will need to draw on our principles to develop hypotheses targeted to their own research projects.

Task Congruence Principle

Industry reports have suggested that gamification can benefit a large variety of different tasks by drawing attention to them

and making them more interesting. A task can be described in terms of desirable outcomes (what it does) and behavioral requirements (how it is done) (Wood 1986). We will address outcomes in the meaningful engagement subsection later; here we focus on alignment between gamification and behavioral requirements of target tasks.

The issue of relevant task characteristics has been studied in other contexts but rarely in gamification. For example, the work design literature studies characteristics of tasks that can lead to job satisfaction, intrinsic work motivation, and reduced turnover. According to the job characteristics model, there are five fundamental characteristics: skill variety, task identity, task significance, autonomy, and feedback (Hackman and Oldham 1976; Parker et al. 2001).[9] Task characteristics are also indirectly addressed in the intrinsic motivation literature. Malone (Malone 1981; Malone and Lepper 1987) suggests that tasks offering uncertain outcomes and varied challenge levels are more interesting. Self-determination theory further reiterates the importance of task autonomy and competence-promoting feedback (Deci and Ryan 1985). Although the work design and intrinsic motivation literatures have provided insights into task characteristics that can promote engagement and satisfaction, little research has explored how gamification design elements can assist such goals, nor have they have examined the interaction between task and design elements.

When we bring tasks and gamification design elements together, it is clear that a one-size-fits-all approach is unlikely to succeed. Both tasks and gamification design elements need to be complementary: they must work together to be more effective. Our main argument is that gamification elements must be congruent with the task in the following ways. First, the chosen gamification elements might compensate for the deficiencies in the task design. For example, if the task lacks feedback, a gamified system that provides immediate and accurate feedback is likely to be effective. Second, the chosen gamification elements must be compatible with the task. For example, gamification elements such as points and levels may not be suitable for a task that lacks quantifiable performance measures, or a fantasy of being a conqueror may not be suitable for a knowledge-sharing task, but it may match a sales task. To summarize, we propose

> **Gamification Principle A**: *To be effective, gamification design elements must be congruent with the target task.*

Because of the many possible gamification elements, opportunities exist for exploring the mapping of elements and task characteristics within the general principle of gamification–task congruence. Next, we discuss a few possible directions as illustrations.

One of the most popular uses of gamification is to enhance task feedback. The importance of feedback is already underscored in existing theories (Hackman and Oldham 1976; Malone 1982; Ryan and Deci 2000). Unlike games, many organizational tasks do not provide adequate feedback, making this a fruitful direction for applying gamification. Many familiar elements, such as points, levels, and leaderboards, are used to provide feedback. For instance, the *HealthyMe* system not only displays the total number of "wins" of a user once the user logs into the app but also engages users proactively by sending periodic e-mails or mobile push notifications. In another example of gamification, people who obeyed the speed limit were given positive feedback in the form of a digital "thumbs up," along with an entry to a lottery funded by traffic fines.[10] In another application, designers of the Nissan Leaf use playful signage and growth of virtual trees on the car's dashboard to reward drivers who drive in an ecologically friendly manner.[11]

In choosing appropriate gamification design elements for providing feedback, many interesting questions come up: for instance, is it better to design the feedback to be visually appealing or dramatic? How immediate, how often, and what type of feedback (i.e., positive or negative, relative or absolute, public or private) should be given (Santhanam et al. 2016)? Many gamification elements make it easier to provide more feedback, but is more always better? At least in some cases, gamification feedback elements such as points and leaderboards are seen as exploitive and "pointsification," rather than delivering value (Robertson 2016). In sum, much research is still required on how to effectively use gamification design elements to improve task feedback.

> **RQ A-**1: *How could gamification design elements be used to improve task feedback?*

Another popular use of gamification is to enhance task stimulation. For instance, a challenge for *HealthyMe* is that many wellness activities are routine and there may be little variation in the feedback that users receive. The question is: How should stimulation be designed to increase the excitement around these routine activities? This stimulation can be

[9] Another task characteristic—complexity—has been extensively studied in the task–technology fit literature (Wood 1986; Zigurs and Buckland 1998). The focus there concerns how information systems should fit with the complexity of group tasks they support.

[10] https://www.thestar.com/news/world/2010/12/09/speed_camera_lottery_pays_drivers_for_slowing_down.html.

[11] https://www.youtube.com/watch?v=eYePx4AqhnI.

sensory-based such as a novel sound or animation, or cognition-based, such as suspense, humor, and fantasy (Garris et al. 2002; Malone and Lepper 1987). According to optimal stimulation theory, individuals have a tendency to seek an optimal level of stimulation (Steenkamp and Baumgartner 1992; Wablers et al. 1990): when the environment is under-stimulating, they will seek stimulation through seeking new information, variety, or risky choices. Thus it would appear that many stimulation-oriented game elements, such as fantasy themes, sound effects, visuals, animation, virtual worlds, narratives, puzzles, and chance draws, could be used to enhance the appeal of organizational tasks. Indeed, anecdotal successes have been reported on using gamification to enhance task stimulation (e.g., Microsoft's Ribbon Hero). However, it is not yet clear whether these design elements would engender the same level of engagement and emotional appeal in non-game tasks as they do in games.

One of the challenges is that gamification elements may seem artificial and out of place for real-world tasks, thus losing their stimulation power. One should also be aware of the danger of stealing attention from the task. In education research, for example, it has been found that when learning is embedded in a highly stimulating game environment, students often pay attention to the game stimulation and do not learn as much (Young et al. 2012). This naturally leads to issues of when and how much of gamification stimulation should be introduced in a given task environment. In sum, creating stimulation using gamification elements may not be straightforward. Hence, we put forward the following question as a useful research direction:

> **RQ A-**2: *How and when should gamification design elements be used to increase task stimulation?*

Personalization Principle

Personalization represents an important dimension in the design of current day information systems because of its important role in increasing personal relevance (Brusilovski et al. 2007; Delone and McLean 2003; Fan and Poole 2006). Many e-commerce systems are designed to leverage user-specific data to develop customized models for clusters of users, and use this information to personalize the system. Research findings indicate that users are more receptive to such personalized designs and perceive the system as being of higher quality (Delone and McLean 2003; Tam and Ho 2006). Similarly, gamified systems would be better received if they were personalized. Prior research in digital games indicates that game players exhibit clear preferences for personalization. For example, based on preferences for different types of in-game interactions, one may classify game players as achievers (who seek challenges and points), explorers (who seek information and experiment with new objects), socializers (who seek other players and empathize), and killers (who like to conquer and destroy opponents) (Bartle 1996; Yee 2006). More recent studies on game-playing behaviors identify gender differences in user motivations to play (Koivisto and Hamari 2014). Therefore, given that research on games shows clear user differences in motivation and preferences for game playing, we think it is appropriate that gamification design elements should match individual users. Thus, we suggest

> **Gamification Principle B**: *Gamification design elements must match users' characteristics.*

Although game-based research has identified broad categories of player behaviors, they have mostly been in entertainment settings. Therefore, we turn to IS research on individual differences to identify user characteristics that could be used to personalize a gamified system. For a long time, IS research has emphasized the role of individual differences in influencing users' beliefs and outcomes of interactions with technology artifacts (Gefen and Straub 1997; Sun and Zhang 2006). Individual characteristics, such as need for achievement, goal orientation, personal innovativeness, self-efficacy beliefs, computer anxieties, and playfulness, can play a significant role in technology use (Agarwal and Prasad 1999; Kuhlman and Marshello 1975; Martocchio and Webster 1992; Thiebes et al. 2014; Zweig and Webster 2004). Demographic differences in age, gender, and technology experience also affect technology use (Hackbarth et al. 2003). Although IS research has identified many such individual differences, the type and impact of individual differences may vary depending on the nature of the work system. For example, learning style is important in e-learning training systems (Klašnja-Milićević et al. 2011), personal innovativeness with IT, or the propensity of an individual toward adopting a new IT, affects telemedicine technology use by physicians (Agarwal and Prasad 1999; Yi et al. 2006), and computer self-efficacy impacts the use of digital library and information retrieval systems (Thong et al. 2002).

Because gamified systems are emergent, the types of individual differences that improve gamification outcomes still need to be determined. For the *HealthyMe* system, standard personality surveys are used as the basis for message personalization. But specific guidelines do not exist on which dimensions of personality matter the most when it comes to designing persuasive wellness messages. Further, could a match of age and gender of the online personal coach with the user lead to better engagement with *HealthyMe*? Perhaps people with higher computer playfulness, which describes a person's cognitive spontaneity in technology interactions,

might find gamified systems more engaging. Research studies should examine the type and importance of such individual differences in fostering engagement. Thus, we ask:

> **RQ B-1**: *Which individual traits should be attended to in personalization design?*

Personalization strategies can be achieved in different ways and using different criteria (Fan and Poole 2006). While the previous research question speaks to personalization with individual characteristics, gamified systems can also track user interactions with the system and adapt to their dynamic states. In fact, an oft-used approach in web-based personalization is to infer users' intent through cookies, click stream, or hover behaviors, in order to support efficient information seeking. For gamified systems, a user's dynamic state could change rapidly. Recent studies suggest that the novelty of gamification may wear off and people may not continue to feel engaged or excited (Koivisto and Hamari 2014). Apart from the waning of novelty effects, users may become skilled or there could be other maturation effects. These dynamics suggest that it is necessary to personalize gamified systems to keep pace with users, such as by varying the challenges or the type and level of the stimulation. According to flow theory and optimal stimulation theory (Wablers et al. 1990), optimal levels of challenge and stimulation exist and evolve for each user. While existing theories provide general directions, a critical design decision is what to track and how to adapt to keep users meaningfully engaged, especially when tracking and adaptive designs can be costly to implement. We therefore ask

> **RQ B-2**: *How should gamified systems best adapt to user behaviors to keep them meaningfully engaged?*

From research findings on persuasive systems and recommendation agents, another way to implement personalization could be in terms of system feedback and messages (Fogg 2003; Komiak and Benbasat 2006). There are several aspects of system messages that can be personalized. As per self-determination theory, people have innate needs for competence and performance feedback, which serves as an important way to help them obtain competence evaluations (Deci and Ryan 2000). For example, consider a call center that provides specific feedback to employees on their call volumes. If the system provides tailored recommendations to employees on ways to improve their volumes based on their specific performance levels, it might afford effective competence evaluation to motivate performance. Moreover, the language and tone of messages, even the formats and media of messages, can be chosen to provide effective persuasion, creating positive feelings and greater engagement (Fogg 2003): users differ in their reception to these message cues and formats (Daft et al. 1987; Jiang et al. 2010). One way to personalize gamified systems is to give users choices on the format of messages (as with gameffective.com's customer service system) and when they receive them. Therefore, the extent to which these personalization strategies are effective should be investigated

> **RQ B-3**: *Will users be more engaged with gamified systems that provide personalized feedback and message formats?*

Technology Affordance Principle

Turning to technology next, we need to consider the alignment between the technology used in the target system and the choice of gamification design elements. Characteristics of target system technologies are likely to play significant roles in the choice of gamification design elements. For example, very granular information captured by the target system would enable precise measurement of user actions and performance, thus facilitating the application of feedback elements (such as points and badges). High volume and velocity information would be important for implementing gamification designs that rely on tight feedback loops. Thus, big data technologies could have a significant impact on gamification. Further, more interactive system interfaces would enable the use of more direct controls, such as gesture-based controls. Or, if a current target system already supports a social network, certain social gamification elements could then be leveraged.

Even though gamification may be appealing, it may simply be infeasible without the proper technology infrastructure in the target system. Take *HealthyMe* as an example. Two kinds of technologies might affect gamification design features: mobile interfaces and wearable technologies. That is, when employees have access to *HeathyMe* through their smart phones, they can log their activities as they happen and receive push notifications of friend activities immediately. In addition, wearable technologies such as Fitbit would greatly simplify *HealthyMe* activity logging and enable real-time feedback; for example, a "virtual race" for employees working out at different places would be possible. Thus, we propose that the relationship between the target system technology and gamification is one of technology affordance, that is, target system technologies enable and facilitate gamification design elements. Therefore, we propose

> **Gamification Principle C**: *Gamification design elements must fit with the target system technologies.*

An important question for information researchers is how choices of gamification design elements interact with target system technologies and jointly determine the success of gamification. As we have argued, the facilitating role of target system technologies should not be underestimated. However, it is not trivial to choose gamification design elements that are appropriate for different types of target system technologies. For *HealthyMe*, one of the challenges concerns logging one's wellness activities on an online website that is tedious and easy to forget. Consequently, the organization is rolling out a mobile interface so that users can do activity logging on their smart phones and they plan to integrate their system with wearable devices such as Fitbit. However, it is not yet clear how the system design should adapt to these technology changes in order to make the best use of them. Therefore, by investigating the types of target system technologies that promote the success of gamification initiatives, we can make recommendations to organizations on their technology-readiness for gamification. Hence, we ask

> **RQ C-1**: *How does the choice of gamification design elements interact with target system technologies in affecting the success of gamification initiatives?*

Dynamism Principle

Not only must the gamification designer consider the fit with the individual, task, and technology, gamification elements must produce desired user–system interactions. Given the highly interactive nature of gamified systems, interaction design is a crucial aspect of gamification, as highlighted by recent gamification conferences.[12] Consistent with Neeli (2012), we propose that the organization needs to determine its planned user interactions, such as the extent to which the organization wants to encourage collaboration versus competition between employees. As diagrammed in Figure 1, these interactions might be between the user and the system or between users through a multiuser system.

Many potential types of user–system interactions exist, both at the individual and social levels. For individuals, challenging interactions, in which skills are matched with the requirements for action (Csikszentmihalyi 1975; Malone 1981), have been the most-studied user–system interaction (Bui et al. 2015). Other intended interactions, such as aesthetic or narrative experiences (Ralph and Monu 2015), hold potential for design. Social interactions present many more opportunities for design (Martin and Dowson 2009). Although competition has been the most studied multiuser interaction (Bui et al. 2015), cooperation might be encouraged (Burke and Hiltbrand 2011). Thus, we propose that elements be chosen to match intended interactions:

> **Gamification Principle D**: *Gamification design elements must match desired user–system interactions.*

Many research questions could be developed around the different types of intended user–system interactions. We first present research questions around individual user–system interactions and then turn to multiuser interactions. Beginning with individual interactions, one way to encourage desired user–system interactions is through social influence (Fulk et al. 1990). For example, when a gamified system connects individuals to a community of others who do similar tasks, it can expose them to various forms of social influence, including both normative influence (e.g., norms) and informational influence (Cialdini and Goldstein 2004). Social influence has been leveraged in applications such as customer call handling, transcribing, and learning new software. How to calibrate social influence has been the subject of investigation in both gamification (Hamari and Koivisto 2015) and broader contexts (Aral and Van Alstyne 2007).

Several gamification design elements can support social influence, including the use of kudos, comments, follows, the creation of social profiles, and the publication of individual or aggregate statistics. Such elements can harness individuals' desire for image or reputation. For example, *HealthyMe* displays friends' summary statistics (e.g., total wins and calories) and uses kudos to cultivate positive social support among its users. However, a range of other social activities could be leveraged: for example, the system could share more information with others (such as goals) so that they could more effectively communicate with each other.

Gamification provides many digital objects and mechanics to make use of image and reputation motivations of individuals, such as badges, dashboards, kudos, and virtual gifts. Behavioral economics research on charitable giving and other prosocial behaviors helps explain why image motivation is a strong driving force (Ariely et al. 2009; Bénabou and Tirole 2006). This research would benefit from other literature such as the design of online communications (e.g., Li et al. 2012), user-generated content platforms (e.g., Kane et al. 2014), and prosocial charitable giving (e.g., Ariely et al. 2009). However, because gamification deals with a broad range of tasks and uses a large variety of gamification elements, there are

[12] http://www.commercelab.ca/stephen-anderson-sandbox-environments-and-why-playfulness-is-the-future.

also unique challenges and opportunities. For example, research on prosocial behavior has found that monetary rewards may undermine image motivation (Fudenberg and Levine 2006). Nevertheless, we know little about how nonmonetary rewards (such as badges) interact with both image and intrinsic motivation (Chen and Zhu 2014; Goes et al. 2016) or the effect of these elements when the tasks, themselves, provide little sense of achievement. Hence, we ask

> **RQ D-1**: *How should gamification design elements be used to facilitate social influence on user–system interactions?*

Another example of a desired user–system interaction might be narrative interactions or "interpreted narratives" (Ralph and Monu 2015). That is, the gamified system could include embedded narrative elements (such as story lines) that interact with the user to result in interpreted, or experiential, narratives (Ralph and Monu 2015). Narratives, also referred to as story-telling, can help the user develop strong connections with the system, become a springboard for action, and are increasingly used in business (Woodside 2010). Through the use of attractive visuals, the serial and temporal nature of stories can stimulate, evoke curiosity, and engage the user. The narrative paradigm states that humans like to experience, understand, and communicate with stories, with coherence and fidelity being important facets of any narrative (Fisher 1985).

Narratives have been applied and researched in communication, sociology, and education, among others (Spector-Mersel 2010), and often appear in games. However, they have found fewer applications in gamified systems. The fundamental nature of narratives has not changed much over the years, but the means of communicating stories, from verbal, to written, to video, and current digital formats have generated interest and use in many other applications such as media and advertising. Digital formats, along with the unfolding of a story, can generate sound and visual effects that can be powerful (Barrett 2006; Stutts and Barker 1999). For example, in marketing, narratives can closely connect the user's sense of self with the brand, create brand loyalty, and influence attitudes and purchasing behaviors (Edson Escalas 2004). In gamification design, many questions can be asked regarding narratives: How should we create narratives to enhance user experiences? Should the user be made part of a story line? Should fantasy elements be present? Research on narrative theory and curiosity could help address these questions (Loewenstein 1994). Hence, we ask

> **RQ D-2**: *What gamification design elements contribute to engaging narrative interactions?*

Turning to user–user interactions, let us first focus on competition, an oft-pursued multiuser dynamic in gamification. In this case, the designer could encourage it through public feedback elements, such as leaderboards, badges, or prizes. These gamification design elements can harness users' competitive instincts, induce social comparison processes (Festinger 1954), and result in greater engagement. However, as several authors have noted, not all competitions are the same (Epstein and Harackiewicz 1992; Liu et al. 2013). For example, applying social cognitive theory in educational contexts, researchers have found that losing a competition can decrease a learner's self-efficacy and learning outcomes (e.g., Santhanam et al. 2016). Hence researchers have proposed alternative competition designs (Chen et al. 2012; Cheng et al. 2009). Given that there may not be a one-size-fits-all design for competition, the types of gamification design elements used to induce competition, and how they are presented, can have a significant impact on outcomes. Therefore, we ask

> **RQ D-3**: *How should gamification design elements be applied to encourage competition between users?*

Although competition is often encouraged in gamified systems, it may not be appropriate in some working environments, such as when it creates privacy concerns or unwanted animosity among coworkers (Thiebes et al. 2014). For example, *HealthyMe* was designed to avoid person-to-person competition for such reasons. In contrast to competition, collaboration represents a group working "together to solve a riddle, resolve a problem, or overcome a challenge. The concept behind this is to engage multiple people who feed off the energy of others in the group to keep moving forward" (Burke and Hiltbrand 2011, p.13).

If cooperation is the desired interaction between individuals, then one way to achieve it is through moving the competition just described between individuals to the team level. Through doing so, group members will cooperate among themselves to try to beat other teams. For example, *HealthyMe* uses between-team competitions to increase excitement and engagement with the system. This could rally individuals to work together to solve problems and overcome challenges, facilitating synergy and increasing motivation (Thiebes et al. 2014).

In this view, relatedness between team members can provide a nurturing social environment though which other needs can be better met. The team environment can also provide social reinforcements: for example, colleagues can help set expectations, monitor progress, and provide feedback, which also help individuals engage in their tasks (Martin and Dowson 2009). Recently, the term *coopetition* has been used to high-

light this positive and necessary role of cooperation and competition between organizational members, in which a coopetition represents the joint occurrence of cooperation and competition across functional areas within a firm (Luo et al. 2006). Therefore, we ask

> **RQ D-4**: *How should gamification design elements be used to encourage cooperation between team members and competition between teams?*

Another way to encourage cooperation is through utilizing social support elements. In this view, relatedness reflects our innate psychological needs for contact, support, and wanting to form a community with other human beings (Deci and Ryan 1985). Having a sense of relatedness can improve engagement: for example, students who feel a sense of belonging and relatedness with parents, teachers, and peers exhibit a higher degree of engagement in school work (Furrer and Skinner 2003; Skinner and Belmont 1993). Not surprisingly, social interaction elements are widely used in games and players indicate preferences for using them (Baek 2005; Bartle 1996; Yee 2006). What is less clear, though, is which social design elements are more or less appropriate for work-related systems. Thus, we ask

> **RQ D-5**: *How should social support design elements be applied to encourage cooperation between users?*

Recurrence Principle

Consistent with Suh (2015), we suggest that the expected recurrence of system use represents another important consideration that is often overlooked in gamification research. Will the user interact with the gamified system intermittently (and/or over the short term), or frequently over a longer period of time? If the former, then one option is to utilize external rewards, as they represent a very effective way of motivating behaviors (Deci and Ryan 2000). If recurring interactions are expected, then other design elements may be more appropriate. This is because the effects of extrinsic rewards tend to decrease over time (Magni et al. 2010). Further, unless rewards are given through the life of the system, withdrawing such rewards could result in reduced or stopped behaviors, as demonstrated in a study of a gamified enterprise social networking system (Thom et al. 2012). In contrast, for recurring interactions with the system, designers can focus on design elements that keep users intrinsically motivated, for example, by creating dynamic challenges (Csikszentmihalyi 1975; Moneta and Csikszentmihalyi 1996) or by including dynamic sensory stimulation (Wablers et al. 1990). Therefore,

> **Gamification Principle E***: Gamification design elements must match the expected recurrence of system use.*

For nonrecurring use of a system, there are several options. For example, for infrequent use, designers can rely on novel sensory elements, such as by making steps sound like piano keys to encourage the use of stairs.[13] Or, as we know from decades of research, external motivators also work well in the short term. However, how should these external motivators be structured? From prospect theory in behavioral economics (Kahneman 2003; Kahneman and Tversky 1979), we know that people display diminishing sensitivity to gains and losses and are more sensitive to losses than to gains. Further, when offered a larger reward in exchange for waiting a fixed period of time, they act more impulsively when the offer is imminent than distant: this time-inconsistent hyperbolic discounting (Laibson 1997; O'Donoghue and Rabin 1999) helps explain behaviors such as procrastination, skipping exercise, smoking, and overconsumption (Hamari et al. 2012). Findings from behavioral economics could have many implications for gamification rewards design: for example, this research suggests that frequent but smaller rewards are more effective than a large distal reward. However, few of these ideas have been tested in gamification research. Therefore, we question

> **RQ E-1**: *For nonrecurring use of a system, what types of gamification elements best motivate behaviors?*

For more recurring use of a system, some would suggest that that external rewards will also motivate behaviors. This is because extrinsic incentives can induce initial actions that allow new habits to form. For instance, Charness and Gneezy (2009) showed that money can induce habit formation in the context of exercise.

Others propose that designers should rely less on extrinsic motivators, as their effects diminish over time (Thiebes et al. 2014). Instead, they should move to design elements that will keep the user intrinsically motivated over time. These might be progression elements such as quests or levels that challenge the user. Challenge represents a source of intrinsic motivation (Deci and Ryan 1985), and can be used to explain why these types of game design elements can be leveraged to motivate users. Similarly, flow theory argues that to keep users motivated, there needs to be a match between the user and the system (Csikszentmihalyi 1975). Therefore, to keep a system optimally challenging implies that it is varying: elements such as levels need to be adjusted as the user gains

[13] https://www.youtube.com/watch?v=2lXh2n0aPyw.

more experience with the system. For instance, providing progressive disclosure, or adjusting the levels of difficulty based on the increasing skills of the users, helps to maintain challenge (Thiebes et al. 2014). Thus, we ask

> **RQ E-2**: *For recurring use of a system, what types of gamification elements best motivate behaviors?*

Meaningful Engagement: The Dual Outcome Principle

As seen in our framework, we identify two main outcomes: experiential and instrumental. Enhanced experiential outcomes coupled with high levels of instrumental outcomes result in *meaningful engagement*. This is because the premise behind using gamified systems in organizations is improved experiential outcomes resulting in better instrumental outcomes (Burke and Hiltbrand 2011; Kankanhalli et al. 2012; Penenberg 2013). Although some research has supported this positive link (Nel et al. 1999; Webster and Ahuja 2006), it should not always be assumed. For example, in game-based learning systems, users often seem engaged, but they may bypass information that is nonessential to game play and instead focus on what affords entertainment rather than education (Young et al. 2012). These types of findings led to gamification approaches, in which game elements comprise only a part of the instrumental system, and thus should not dominate user interactions (Lee and Hammer 2011).

But even with gamification approaches, the dual outcome may not be achieved. For instance, a shallow gamification design could result in a situation in which the user focuses on collecting points or badges and places far less attention on completing the instrumental task. Consequently, we use the term meaningful engagement to emphasize the dual outcomes of gamification design: the design should not only foster experiential outcomes but also enhance instrumental task outcomes. Therefore, we propose that

> **Gamification Principle F**: *To create meaningful engagement in gamified systems, enhanced experiential outcomes should be associated with higher levels of instrumental outcomes.*

Nevertheless, there is no clear answer to the most relevant experiential outcomes and how should they should be evaluated (Brien and Toms 2010; Tomaselli et al. 2015). A variety of experiential outcomes exist, including enjoyment, engagement, flow, fun, satisfaction, happiness, task involvement, etc. (Hamari et al. 2014; Tomaselli et al. 2015). We propose that the most appropriate experiential outcomes should depend on the context. In an online purchasing context, this could mean website involvement; in learning, it could mean focused attention; in customer service, it could mean satisfying experiences; in online forums, it could mean a gratifying social status (Brien and Toms 2010; Jiang et al. 2010). The experiential outcome of flow is often assessed in gamification designs (Bui et al. 2015), but it is unlikely that users can be totally immersed in many of their organizational tasks (Tomaselli et al. 2015). Thus, an arbitrary choice of experiential outcomes may result in flawed designs. Instead, we should choose experiential outcomes to fit the task context. Hence, we ask

> **RQ F-1**: *Which experiential outcomes best fit different task contexts?*

While gamification designs in general should lead to experiential outcomes, certain design elements are more appropriate for a given experiential outcome. For example, from aesthetic theory (Beardsley 1982), we know that visually attractive interfaces and sensory elements could be one way to create pleasurable feelings and satisfaction. If deep curiosity is the desired experiential outcome, then narrative-based design elements could be an appropriate choice. If the intended experiential outcome is social connectedness, then design elements such as virtual gifts and social feedback could be chosen, as is the case with *HealthyMe*. Hence, we question

> **RQ F-2**: *What design elements will lead to specific types of experiential outcomes?*

Turning to instrumental outcomes, we can also ask what types of design elements will lead to desired instrumental outcomes. One common method is to choose elements (such as badges) that reward desired outcomes. While it may seem simple, the alignment of rewards to outcomes requires considerable thought, as misalignment can easily occur. For example, in some online learning portals, badges are assigned for completion of a module rather than for learning well. This would not be appropriate when the quality of learning, rather than quantity, is the goal.

Because many gamification designs follow a pattern of rewarding users for certain behaviors, we expect that many of the misalignment issues described in agency theory from economics would arise in gamification contexts. One of the phenomena examined by agency theory is "moral hazard" in the principle–agent framework (Grossman and Hart 1983; Hölmstrom 1979). Due to imperfect monitoring, a misaligned reward scheme can lead to an agent's gaming of the system at the cost of the principal. For example, a *HealthyMe* user could over-report workouts to get higher cash rewards or to appear fit. This literature recommends that large incentives should be avoided in environments in which some aspect of the out-

come (e.g., quantity) is measured but not other parts (e.g., quality) (Hölmstrom and Milgrom 1991). While many insights from agency theory are applicable to gamification contexts, there are also issues and challenges. For example, there is much less discussion of nonmonetary rewards in this literature. Nor does it address the choice between monetary and nonmonetary rewards. We therefore ask

> **RQ F-3**: *How should we align gamification design elements with desirable instrumental outcomes?*

Generally, it is often assumed that instrumental outcomes are fairly standardized and easy to evaluate, such as higher sales, more calls, and greater purchases. However, gamified systems are also meant to create behavioral changes, such as more earth-friendly energy use and more participation in corporate wellness programs (Hamari et al. 2014). Therefore, it would be helpful to specifically state these expected behavioral outcomes so that the goals of gamification are clear. For example, if the desired instrumental outcome is more participation, then what should the experiential outcome be that will lead to higher participation? Because gamified systems are emergent systems being applied in novel ways, investigations into typical outcome pairings would be useful. Hence, we ask

> **RQ F-4**: *What should be the typical pairings between experiential and instrumental outcomes?*

Discussion

Gamification designs offer rich possibilities to develop new designs of information systems that can engender more involved consumers and more engaged and productive employees. We offer a framework as well as principles for creating effective designs. We hope that this will lead to a more nuanced understanding of the design and impact of gamified systems.

Our discussion of gamification design principles and sample research questions, as summarized in Table 3, establishes that varied disciplinary theories are necessary to conduct research. Rather than viewing research on gamified systems as a separate domain of investigation, we view it as an information system design paradigm that connects well with several existing IS literature streams, such as intrinsically motivating, hedonic, and persuasive systems, technology adoption and use, media characteristics, online and virtual communities, and user-generated content. Further, we view gamification as a lens through which several theoretical perspectives (such as intrinsic motivation, work design, self-determination theory, agency theory) from multiple disciplines can come together in solving design problems.

Because of the multidisciplinary nature of gamification research, it provides opportunities for theoretical advancements by raising new issues that span the boundaries of existing theories. For example, many rewards in gamification, such as badges, are intangible and sometimes considered extrinsic because they are not part of the original task. However, they are not the same as tangible extrinsic rewards often studied in economics, nor the same as the intrinsic rewards studied in psychological theories. Yet, they are unmistakably a key part of digital games, which are considered the poster child for intrinsic motivation. Hence, one of the theoretical challenges is how to conceptualize these rewards and perhaps extend the existing intrinsic–extrinsic framework.

Moreover, because gamification designers can choose from a variety of elements, such as intrinsic, extrinsic, and social rewards, other issues can arise. For example, existing research has closely studied when and how extrinsic rewards crowd out intrinsic motivation (Bénabou and Tirole 2003, 2006; Deci and Ryan 1985). But a gamification perspective exposes several new issues. For example: (1) How do different kinds of rewards interact with each other (e.g., how do social rewards affect intrinsic motivation)? (2) How should we choose between different kinds of rewards (e.g., between monetary versus nonmonetary rewards)? (3) To what extent do extrinsic and intrinsic motivation impact task performance (e.g., are experiential outcomes more affected by intrinsic motivators and instrumental outcomes by extrinsic motivators, or is it a matter of individual differences)? Answers to these and other questions will help expand our theoretical understanding of intrinsic and extrinsic motivation while also providing insights into more effective gamification designs.

Another potential theoretical advancement that gamification research should make would be to connect the vast economic literature on agency theory with the psychological literatures on intrinsic motivation. The literature on agency theory is more concerned with the use of pecuniary incentives in nonvoluntary contexts (although there is growing attention to nonprofit organizations). By contrast, the literature on intrinsic motivation theory focuses more on the use of nonpecuniary motivations, such as the need for challenge, stimulation, self-determination, and social image, in schools and voluntary contexts (although there is considerable research on job design and work engagement) (Fehr and Falk 2002; Festré and Garrouste 2015). Gamification represents a potential intersection area between agency and intrinsic motivation theories because of their differing emphases; a recent

Table 3. Summary of Gamification Design Principles and Sample Research Questions

Gamification Design Principles	Sample Research Questions
A. Task Congruence Principle *To be effective, gamification design elements must be congruent with the target task.*	**RQ A-1**: How could gamification design elements be used to improve task feedback? **RQ A-2**: How and when should gamification design elements be used to increase task stimulation?
B. Personalization Principle *Gamification design elements must match users' characteristics.*	**RQ B-1**: Which individual traits should be attended to in personalization design? **RQ B-2**: How should gamified systems best adapt to user behaviors to keep them meaningfully engaged? **RQ B-3**: Will users be more engaged with gamified systems that provide personalized feedback and message formats?
C. Technology Affordance Principle *Gamification design elements must fit with the target system technologies.*	**RQ C-1**: How does the choice of gamification design elements interact with target system technologies in affecting the success of gamification initiatives?
D. Dynamism Principle *Gamification design elements must match desired user–system interactions.*	**RQ D-1**: How should gamification design elements be used to facilitate social influence on user–system interactions? **RQ D-2**: What gamification design elements contribute to engaging narrative interactions? **RQ D-3**: How should gamification design elements be applied to encourage competition between users? **RQ D-4**: How should gamification design elements be used to encourage cooperation between team members and competition between teams? **RQ D-5**: How should social support design elements be applied to encourage cooperation between users?
E. Recurrence Principle *Gamification design elements must match the expected recurrence of system use.*	**RQ E-1**: For nonrecurring use of a system, what types of gamification elements best motivate behaviors? **RQ E-2**: For recurring use of a system, what types of gamification elements best motivate behaviors?
F. Meaningful Engagement: The Dual-Outcome Principle *To create meaningful engagement in gamified systems, enhanced experiential outcomes should be associated with higher levels of instrumental outcomes.*	**RQ F-1**: Which experiential outcomes best fit different task contexts? **RQ F-2**: What design elements will lead to specific types of experiential outcomes? **RQ F-3**: How should we align gamification design elements with desirable instrumental outcomes? **RQ F-4**: What should be the typical pairings between experiential and instrumental outcomes?

review suggests that the two theory traditions are quite disjoint (Festré and Garrouste 2015). Nevertheless, gamification researchers are well positioned to mitigate the gaps between the two theories with fresh examples and multiple theoretical perspectives. For example, recent gamification studies have drawn from both tournament theory (a subtheory of agency theory) and intrinsic motivation theory to study the competition element of gamified systems (Liu et al. 2013; Santhanam et al. 2016).

The study of gamification can also provide new ideas on the role of technology artifacts in influencing human behaviors and motivation. There is a rich body of literature in human–computer interaction (HCI) which informs us on how the interface and interaction modalities can impact users (e.g., Seaborn and Fels 2015). Investigations into new forms of technologies and their impacts on individuals' affect and emotions are taking place (e.g., Zhang 2013). Some of the affordances of gamified systems such as wearable technologies and sensory stimulation are relatively new and offer more opportunities to extend this HCI research on affect and emotions (e.g., Korn 2012).

Enterprise gamified systems often involve users connecting and interacting with one another, which points to the need for more research on the motivational aspects of social interactions, social relatedness, and group behaviors. For instance, there are different views on the motivating effects of social relatedness (Martin and Dowson 2009). In one view, relatedness reflects an innate psychological need for human connec-

tion, and in another view, relatedness is a proxy for extrinsic social reinforcements (e.g., social actors such as managers and colleagues can help set expectations, monitor progress, and provide feedback). Thus far, research on the motivational value of relatedness is scant in gamification contexts and offers another excellent opportunity for future research.

We suggest that gamification research can be addressed using different methodological paradigms, such as design science, economics, and behavioral approaches, and multiple methodologies can be leveraged. For example, to address the relationship between experiential and instrumental outcomes, data analytics on user behaviors could be combined with laboratory experimentation methods to study the impact of gamified systems on user engagement and performance. Indeed, the few existing research studies in gamification in IS utilize a variety of research methods, including laboratory experimentation (Liu et al. 2013), field experimentation (Bapna et al. 2014), archival data analysis (Chen and Zhu 2014; Li et al. 2012), and questionnaires and interviews (Hsu et al. 2013). Particularly, the design and evaluation of IT artifacts, a key paradigm for IS research, is receiving more attention as we better understand ways to conduct and publish such research (Goes 2014; Gregor and Hevner 2013; Hevner et al. 2004). Currently, gamification objects have low application and solution maturity and thus offer an excellent opportunity to contribute to new knowledge by proposing and validating novel gamification designs. Thus, both from a theoretical and a methodological perspective, gamification research can integrate and contribute to the technical, behavioral, economic, social, organizational—in short the multidisciplinary—knowledge streams in IS.

In this commentary, we have predominately focused on the potential benefits of gamified systems. But this perspective overlooks its dark side. For example, researchers have cautioned that game-playing activities may lead to addictive tendencies (Cohen 2011; Sun et al. 2015). Could gamification lead to similar concerns, or, as some researchers have suggested, offer a way to cure digital addictions (Jiang et al. 2015)? Another potential issue concerns any mandatory use of gamified systems in organizations; this too can lead to negative effects if employees feel that they have little control over their work (Mollick and Rothbard 2014). A third issue relates to possible perceptions of electronic monitoring at work. Gamified systems require close monitoring of employee interactions to provide timely and accurate feedback and rewards; some employees may feel that their privacy is being violated, just as they do with presence awareness systems (Webster 1998). Thus, we should not view gamification as a risk-free endeavor; instead, we need to understand the conditions under which it will create unwanted consequences.

From a practice perspective, we suggest several trends and future prospects for gamification. From an industry perspective, many successful applications and designs continue to be created, with reports insisting that "it's not game over for gamification."[14] Industry experts agree that the ambitious expectations and hype that Gartner (Burke 2012) criticized has given way to more tempered expectations and the realization that shallow gamification designs with just points, badges, and leaderboards will not lead to required behavior changes (Fogel 2015; Herger 2015). Instead, deeper thinking on gamification designs, as we suggest in this commentary, is seen by industry as having true value to create digital engagement that can improve customer retention, employee performance, and achieve other important corporate objectives (Rimon 2014; Rohan 2015; Technavio 2015). Further, corporations have suggested that we focus more holistically on enterprise outcomes and goals, not just on individual applications like loyalty programs and e-learning (Burke 2012; Fogel 2015; Herger 2015).

From a systems design perspective, the growth and experiences in gamification applications will lead to situations in which experiential outcomes, as outlined in our framework, become a part of systems design goal and thinking. That is, gamification design may eventually become part of design thinking, integrated into the design process. In fact, we may not even talk about gamification in the future. We suggest that gamification will permeate many system designs and that gamification elements will be more seamlessly integrated and well-accepted. It may become less commonplace to talk about gamification. Instead, the lessons learned from current ongoing designs will stay, and new lessons will be learned as we move into areas of high velocity, granular data, wearables, instruments, IoT (internet of things), machine learning, predictive analytics, and digital experimentation.

Moreover, from an academic perspective, gamification research will provide us with more information and deeper understanding of human behaviors and motivations to engage in competition, collaboration, status seeking, etc., in ways that we did not consider earlier. This, in turn, will lead to gamification designs that deeply personalize customer and employee experiences. This trend is most evident in learning and education where gamification and artificial intelligence methods are being used to develop software that engages learners of different backgrounds and preparation (Garcia-Cabot et al. 2015; Sabourin et al. 2013), resulting in better software designs that learn and adapt to the user.[15] We already see

[14]http://www.mycustomer.com/experience/engagement/why-its-not-game-over-for-gamification.

[15]http://www.gamification.co/2016/04/01/24719/.

scholarly discussions on system designs that include hedonic outcomes (e.g., Li et al. 2013; Lowry et al. 2015; Lowry et al. 2013). Overall, the future of gamification research and practice, even if it includes some failed attempts, will not only better inform us on human motivations, but will allow us to design digital systems that are more interactive and engaging than they are today. All this points to the need for more academic research around the development of design guidelines, which we hope our commentary has energized.

Conclusion

Gamified information systems reflect an increasing convergence between instrumental and experiential technology systems. By using technologies and ideas from digital gaming, gamification proponents posit that we can reengineer real-world systems to make them more engaging and productive. Addressing meaningful engagement through both instrumental and experiential benefits has become a necessity in a large number of information systems research topics, such as enterprise content management, online communities, environmental and health management applications, social media, and user-generated content platforms. The drive to make this happen provides a unique opportunity for researchers to understand the challenges and benefits of dual-purpose technology systems. Gamification offers innovative ideas for information systems design, novel perspectives for research, and new pedagogy to entice information systems students. We believe that information systems researchers, with their strong grounding in systems design and research, will make important contributions to both the study of gamified information systems and underlying theories of human motivation and behavior. Most of all, gamification represents an engaging research area, as researchers with different backgrounds converge on what McGonigal (2011) calls "happiness engines."

Acknowledgments

We thank the senior editor and the reviewers for guiding us in developing this research. The paper also benefitted from discussions with other researchers and presentations at HEC Montreal. We thank the Social Sciences Research Council of Canada for their financial support.

References

Agarwal, R., and Karahanna, E. 2000. "Time Flies When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage," *MIS Quarterly* (24:4), pp. 665-682.

Agarwal, R., and Prasad, J. 1999. "Are Individual Differences Germane to the Acceptance of New Information Technologies?," *Decision Sciences* (30:2), pp. 361-391.

Andersen, E., Liu, Y.-E., Snider, R., Szeto, R., and Popović, Z. 2011. "Placing a Value on Aesthetics in Online Casual Games," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Vancouver, BC, Canada, pp. 1275-1278.

Aral, S., and Van Alstyne, M. 2007. "Network Structure and Information Advantage," in *Proceedings of the Academy of Management Conference*, Philadelphia, PA.

Ariely, D., Bracha, A., and Meier, S. 2009. "Doing Good or Doing Well? Image Motivation and Monetary Incentives in Behaving Prosocially," *American Economic Review* (99:1), pp. 544-555.

Baek, S. 2005. "Exploring Customer Preferences for Online Games," *International Journal of Advanced Media and Communication* (1:1), pp. 26-40.

Bandura, A. 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory*, Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. 2001. "Social Cognitive Theory: An Agentic Perspective," *Annual Review of Psychology* (52:1), pp. 1-26.

Bapna, R., Gupta, A., Jung, J., and Sen, S. 2014. "Analyzing the Impact of Incentive Structure on the Diffusion of Mobile Social Games: A Randomized Field Experiment," Working Paper, University of Minnesota.

Barrett, H. C. 2006. "Researching and Evaluating Digital Storytelling as a Deep Learning Tool," in *Proceedings of the Society for Information Technology & Teacher Education International Conference*, Chesapeake, VA, pp. 647-654.

Bartle, R. 1996. "Hearts, Clubs, Diamonds, Spades: Players Who Suit MUDs," *Journal of MUD research* (1:1), pp. 19-36.

Beardsley, M. C. 1982. *The Aesthetic Point of View: Selected Essays*, Ithaca, NY: Cornell University Press.

Bénabou, R., and Tirole, J. 2003. "Intrinsic and Extrinsic Motivation," *Review of Economic Studies* (70:3), pp. 489-520.

Bénabou, R., and Tirole, J. 2006. "Incentives and Prosocial Behavior," *American Economic Review* (96:5), pp. 1652-1678.

Borges, S. S., Durelli, V. H. S., Reis, H. M., and Isotani, S. 2014. "A Systematic Mapping on Gamification Applied to Education," in *Proceedings of the 29th Annual ACM Symposium on Applied Computing*, Gyeongju, Korea: ACM Press, pp. 216-222.

Brien, H. L. O., and Toms, E. G. 2010. "The Development and Evaluation of a Survey to Measure User Engagement," *Journal of the American Society for Information Science and Technology* (61:1), pp. 50-69.

Brown, S., and Venkatesh, V. 2005. "Model of Adoption of Technology in Households: A Baseline Model Test and Extension Incorporating Household Life Cycle," *MIS Quarterly* (29:3), pp. 399-426.

Brusilovski, P., Kobsa, A., and Nejdl, W. 2007. *The Adaptive Web: Methods and Strategies of Web Personalization* (Vol. 4321), New York: Springer Science & Business Media.

Bui, A., Veit, D., and Webster, J. 2015. "Gamification—A Novel Phenomenon or a New Wrapping for Existing Concepts?," in *Proceedings of the 36th International Conference on Information Systems*, Fort Worth, TX.

Burke, B. 2011. "Gamification Primer: Life Becomes a Game," Gartner Inc.

Burke, B. 2012. "Gamification: Engagement Strategies for Business and IT," Gartner Inc.

Burke, M., and Hiltbrand, T. 2011. "How Gamification Will Change Business Intelligence," *Business Intelligence Journal* (16:2), pp. 8-17.

Chang, K. T. T., Koh, A. T. T., Low, B. Y. Y., Onghanseng, D. J. S., Tanoto, K., and Thuong, T. S. T. 2008. "Why I Love This Online Game: The MMORPG Stickiness Factor," in *Proceedings of the 29th International Conference on Information Systems*, Paris, France.

Charness, G., and Gneezy, U. 2009. "Incentives to Exercise," *Econometrica* (77:3), pp. 909-931.

Chen, W., and Zhu, K. 2014. "Engaging the Wisdom of Crowds : Structural Analysis of Dynamic User Contributions in Online Communities," Working Paper, University of Arizona.

Chen, Z. H., Chou, C. Y., Biswas, G., and Chan, T. W. 2012. "Substitutive Competition: Virtual Pets as Competitive Buffers to Alleviate Possible Negative Influence on Pupils," *British Journal of Educational Technology* (43:2), pp. 247-258.

Cheng, H. N. H., Wu, W. M. C., Liao, C. C. Y., and Chan, T.-W. 2009. "Equal Opportunity Tactic: Redesigning and Applying Competition Games in Classrooms," *Computers & Education* (53:3), pp. 866-876.

Cheong, C., Cheong, F., and Filippou, J. 2013. "Using Design Science Research to Incorporate Gamification into Learning Activities," in *Proceedings of the 2013 Pacific Asia Conference on Information Systems*, Jeju Island, Korea, pp. 156-171.

Cialdini, R. B., and Goldstein, N. J. 2004. "Social Influence: Compliance and Conformity," *Annual Review of Psychology* (55:1), pp. 591-621.

Cialdini, R. B., Kallgren, C. A., and Reno, R. R. 1991. "A Focus Theory of Normative Conduct: A Theoretical Refinement and Reevaluation of the Role of Norms in Human Behavior," *Advances in Experimental Social Psychology* (24:C), pp. 201-234.

Cohen, A. M. 2011. "The Gamification of Education," *Futurist* (45:5), pp. 16-17.

Compeau, B. D. R., and Higgins, C. A. 1995. "Computer Self-Efficacy: Development of a Measure and Initial Test," *MIS Quarterly* (19:2), pp. 189-211.

Csikszentmihalyi, M. 1975. *Beyond Boredom and Anxiety*, San Francisco: Jossey-Bass.

Daft, R. L., Lengel, R. H., and Trevino, L. K. 1987. "Message Equivocality, Media Selection, and Manager Performance: Implications for Information Systems," *MIS Quarterly* (11:3), pp. 355-366.

Deci, E. L., and Ryan, R. M. 1985. *Intrinsic Motivation and Self-Determination in Human Behavior*, New York: Plenum Press.

Deci, E. L., and Ryan, R. M. 2000. "The 'What' and 'Why' of Goal Pursuits: Human Needs and the Self-Determination of Behavior," *Psychological Inquiry* (11:4), pp. 227-268.

Deci, E. L., and Ryan, R. M. 2002. *Handbook of Self-Determination Research*, Rochester, NY: University of Rochester Press.

Delone, W. H., and McLean, E. R. 2003. "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update," *Journal of Management Information Systems* (19:4), pp. 9-30.

Deng, L., and Poole, M. S. 2010. "Affect in Web Interfaces: A Study of the Impacts of Web Page Visual Complexity and Order," *MIS Quarterly* (34:4), pp. 711-730.

Deterding, S., Dixon, D., Khaled, R., and Nacke, L. 2011. "From Game Design Elements to Gamefulness: Defining 'Gamification,'" in *Proceedings of the 15th International Academic MindTrek Conference on Envisioning Future Media Environments*, New York: ACM Press, pp. 9-15.

Edson Escalas, J. 2004. "Narrative Processing: Building Consumer Connections to Brands," *Journal of Consumer Psychology* (14:1-2), pp. 168-180.

Epstein, J. A., and Harackiewicz, J. M. 1992. "Winning Is Not Enough: The Effects of Competition and Achievement Orientation on Intrinsic Interest," *Personality and Social Psychology Bulletin* (18:2), pp. 128-138.

Fan, H., and Poole, M. S. 2006. "What Is Personalization? Perspectives on the Design and Implementation of Personalization in Information Systems," *Journal of Organizational Computing and Electronic Commerce* (16:3-4), pp. 179-202.

Fehr, E., and Falk, A. 2002. "Psychological Foundations of Incentives," *European Economic Review* (46:4-5), pp. 687-724.

Festinger, L. 1954. "A Theory of Social Comparison Processes," *Human Relations* (7:2), pp. 117-140.

Festré, A., and Garrouste, P. 2015. "Theory and Evidence in Psychology and Economics about Motivation Crowding Out: A Possible Convergence?," *Journal of Economic Surveys* (29:2), pp. 339-356.

Fisher, W. R. 1985. "The Narrative Paradigme: In the Beginning," *Journal of Communication* (35:Autumn), pp. 74-89.

Fitz-Walter, Z., Tjondronegoro, D., and Wyeth, P. 2011. "Orientation Passport: Using Gamification to Engage University Students," in *Proceedings of the 23rd Australian Computer-Human Interaction Conference*, New York: ACM Press, pp. 122-125.

Fogel, G. 2015. "Will 80% of Gamification Projects Fail? Giving Credit to Gartner's 2012 Gamification Forecast," Gameeffective.com (http://gameffective.com/gamification-basics/will-80-of-gamification-projects-fail/; retrieved May 1, 2016).

Fogg, B. J. 2003. *Persuasive Technology: Using Computers to Change What We Think and Do*, San Francisco: Morgan Kaufmann Publishers.

Fudenberg, D., and Levine, D. K. 2006. "A Dual-Self Model of Impulse Control," *American Economic Review* (96:5), pp. 1449-1476.

Fulk, J., Schmitz, J., and Steinfield, C. 1990. "A Social Influence Model of Technology Use.," in *Organizations and Communication Technology*, J. Fulk and C. Steinfield (eds.), Newbury Park, CA: Sage, pp. 117-141.

Furrer, C., and Skinner, E. 2003. "Sense of Relatedness as a Factor in Children's Academic Engagement and Performance," *Journal of Educational Psychology* (95:1), pp. 148-162.

Garcia-Cabot, A., De-Marcos, L., and Garcia-Lopez, E. 2015. "An Empirical Study on M-Learning Adaptation: Learning Performance and Learning Contexts," *Computers & Education* (82:March), pp. 450-459.

Garris, R., Ahlers, R., and Driskell, J. E. 2002. "Games, Motivation, and Learning: A Research and Practice Model," *Simulation & Gaming* (33:4), pp. 441-467.

Gefen, D., and Straub, D. 1997. "Gender Difference in the Perception and Use of E-Mail: An Extension to the Technology Acceptance Model," *MIS Quarterly* (21:4), pp. 389-400.

George, J. F., Carlson, J. R., and Valacich, J. S. 2013. "Media Selection as a Strategic Component of Communication," *MIS Quarterly* (37:4), pp. 1233-1251.

Goes, P. B. 2014. "Editor's Comments: Design Science Research in Top Information Systems Journals," *MIS Quarterly* (38:1), pp. iii-viii.

Goes, P. B., Guo, C., and Lin, M. 2016. "Do Incentive Hierarchies Induce User Effort? Evidence from an Online Knowledge Exchange," *Information Systems Research* (27:3), pp. 497-516.

Goodhue, D. L. 1995. "Understanding User Evaluations of Information Systems," *Management Science* (41:12), pp. 1827-1844.

Goodhue, D., and Thompson, R. 1995. "Task–Technology Fit and Individual Performance," *MIS Quarterly* (19:2), pp. 213-236.

Greenwald, M. 2014. "Gamification in Everything: The Range and When and Why It's So Effective," *Forbes*, September 15.

Gregor, S., and Hevner, A. 2013. "Positioning and Presenting Design Science Research for Maximum Impact," *MIS Quarterly* (37:2), pp. 337-355.

Groh, F. 2012. "Gamification: State of the Art Definition and Utilization," in *Proceedings of the 4th Seminar on Research Trends in Media Informatics*, Ulm, Germany, pp. 39-46.

Grossman, S. J., and Hart, O. D. 1983. "An Analysis of the Principal–Agent Problem," *Econometrica* (51:1), pp. 7-45.

Hackbarth, G., Grover, V., and Mun, Y. Y. 2003. "Computer Playfulness and Anxiety: Positive and Negative Mediators of the System Experience Effect on Perceived Ease of Use," *Information & Management* (40:3), pp. 221-232.

Hackman, J. R., and Oldham, G. R. 1976. "Motivation Through the Design of Work: Test of a Theory," *Organizational Behavior and Human Performance* (16:2), pp. 250-279.

Hamari, J., Huotari, K., and Tolvanen, J. 2012. "A Brief Look at the Microeconomics of Gamification," in *The Gameful World*, S. P. Walz and S. Deterding (eds.), Cambridge, MA: MIT Press, pp. 139-161.

Hamari, J., and Koivisto, J. 2013. "Social Motivations to Use Gamification: An Empirical Study of Gamifying Exercise," in *Proceedings of the 21st European Conference on Information Systems*, Utrecht, Netherlands, pp. 1-12.

Hamari, J., and Koivisto, J. 2015. "'Working Out for Likes': An Empirical Study on Social Influence in Exercise Gamification," *Computers in Human Behavior* (50), pp. 333-347.

Hamari, J., Koivisto, J., and Sarsa, H. 2014. "Does Gamification Work? A Literature Review of Empirical Studies on Gamification," in *Proceedings of the 47th Hawaii International Conference on System Sciences*, Los Alamitos, CA: IEEE Computer Society Press, pp. 3025-3034.

Hart, O., and Hölmstrom, B. 1987. "The Theory of Contracts," in *Advances in Economic Theory, Fifth World Congress*, T. Bewley (ed.), Cambridge. England: Cambridge University Press, pp. 71-155.

Herger, M. 2015. "Gamification Industry Report 2015: Enterprise-Grade Gamification, Engagement, Behavior Modification Platform Evaluation, Comparison, and Ranking," Enterprise Gamification Consultancy.

Hess, T. J., Fuller, M. A., and Mathew, J. 2006. "Involvement and Decision-Making Performance with a Decision Aid: The Influence of Social Multimedia, Gender, and Playfulness," *Journal of Management Information Systems* (22:3), pp. 15-54.

Hevner, A., March, S., Park, J., and Ram, S. 2004. "Design Science in Information Systems Research," *MIS Quarterly* (28:1), pp. 75-105.

Hölmstrom, B. 1979. "Moral Hazard and Observability," *The Bell Journal of Economics* (10:1), pp. 74-91.

Hölmstrom, B., and Milgrom, P. 1991. "Multitask Principal–agent Analyses: Incentive Contracts, Asset Ownership, and Job Design," *Journal of Law, Economics, and Organization* (7:Sp), pp. 24-52.

Hsu, S. H., Chang, J.-W., and Lee, C.-C. 2013. "Designing Attractive Gamification Features for Collaborative Storytelling Websites," *Cyberpsychology, Behavior, and Social Networking* (16:6), pp. 428-435.

Hunicke, R., LeBlanc, M., and Zubek, R. 2004. "MDA: A Formal Approach to Game Design and Game Research," in *Proceedings of the Workshop on Challenges in Game AI*, pp. 1-5.

Huotari, K., and Hamari, J. 2012. "Defining Gamification: A Service Marketing Perspective," in *Proceeding of the 16th International Academic MinTrek Conference*, New York: ACM, pp. 17-22.

Jiang, J., Phalp, K., and Ali, R. 2015. "Digital Addiction: Gamification for Precautionary and Recovery Requirements," in *CEUR Workshop Proceedings* (Vol. 1342), pp. 224-225 (http://ceur-ws.org/Vol-1342/04-Posters.pdf).

Jiang, Z., Chan, J., Tan, B., and Chua, W. 2010. "Effects of Interactivity on Website Involvement and Purchase Intention," *Journal of the Association for Information Systems* (11:1), pp. 34-59.

Kahneman, D. 2003. "Maps of Bounded Rationality: Psychology for Behavioral Economics," *American Economic Review* (93:5), pp. 1449-1475.

Kahneman, D., and Tversky, A. 1979. "Prospect Theory—Analysis of Decision under Risk," *Econometrica* (47:2), pp. 263-292.

Kane, G. C., Alavi, M., Labianca, G., and Borgatti, S. P. 2014. "What's Different About Social Media Networks? A Framework And Research Agenda," *MIS Quarterly* (38:1), pp. 275-304.

Kanfer, R., and Ackerman, P. L. 1989. "Motivation and Cognitive Abilities: An Integrative/Aptitude–Treatment Interaction Approach to Skill Acquisition," *Journal of Applied Psychology* (74:4), pp. 657-690.

Kankanhalli, A., Taher, M., Cavusoglu, H., and Kim, S. H. S. 2012. "Gamification: A New Paradigm for Online User Engagement," in *Proceedings of the 33rd International Conference on Information Systems*, Orlando, FL.

Kapp, K. M. 2013. *The Gamification of Learning and Instruction Fieldbook: Ideas into Practice*, San Francisco: John Wiley & Sons.

Klašnja-Milićević, A., Vesin, B., Ivanović, M., and Budimac, Z. 2011. "E-Learning Personalization Based on Hybrid Recommendation Strategy and Learning Style Identification," *Computers & Education* (56:3), pp. 885-899.

Koivisto, J., and Hamari, J. 2014. "Demographic Differences in Perceived Benefits From Gamification," *Computers in Human Behavior* (35:2014), pp. 179-188.

Komiak, S. Y. X., and Benbasat, I. 2006. "The Effects of Personalization and Familiarity on Trust and Adoption of Recommendation Agents," *MIS Quarterly* (30:4), pp. 941-960.

Korn, O. 2012. "Industrial Playgrounds: How Gamification Helps to Enrich Work for Elderly or Impaired Persons in Production," in *Proceedings of the 4th ACM SIGCHI Symposium on Engineering Interactive Computing Systems*, New York: ACM, pp. 313-316.

Kraut, R. E., Rice, R. E., Cool, C., and Fish, R. S. 1998. "Varieties of Social Influence: The Role of Utility and Norms in the Success of a New Communication Medium," *Organization Science* (9:4), pp. 437-453.

Kuhlman, D. M., and Marshello, A. F. 1975. "Individual Differences in Game Motivation as Moderators of Preprogrammed Strategy Effects in Prisoner's Dilemma," *Journal of Personality and Social Psychology* (32:5), pp. 922-931.

Laibson, D. 1997. "Golden Eggs and Hyperbolic Discounting," *Quarterly Journal of Economics* (112:2), pp. 443-478.

Lee, J. J., and Hammer, J. 2011. "Gamification in Education: What, How, Why Bother?," *Academic Exchange Quarterly* (15:2), pp. 146-151.

Li, X., Hsieh, J. J. P.-A., Rai, A., and Rai, A. 2013. "Motivational Differences Across Post-Acceptance Information System Usage Behaviors: An Investigation in the Business Intelligence Systems Context," *Information Systems Research* (24:3), pp. 659-682.

Li, Z., Huang, K.-W., and Cavusoglu, H. 2012. "Can We Gamify Voluntary Contributions to Online Q&A Communities? Quantifying the Impact of Badges on User Engagement," Working Paper, National University of Singapore.

Liu, D., Li, X., and Santhanam, R. 2013. "Digital Games and Beyond: What Happens When Players Compete?," *MIS Quarterly* (37:1), pp. 111-124.

Liu, Y., and Shrum, L. J. 2002. "What Is Interactivity and Is It Always Such a Good Thing? Implications of Definition, Person, and Situation for the Influence of Interactivity on Advertising Effectiveness," *Journal of Advertising* (31:4), pp. 53-64.

Loewenstein, G. 1994. "The Psychology of Curiosity: A Review and Reinterpretation," *Psychological Bulletin* (116:1), pp. 75-98.

Lowry, P. B., Gaskin, J. E., and Moody, G. D. 2015. "Proposing the Multimotive Information Systems Continuance Model (MISC) to Better Explain End-User System Evaluations and Continuance Intentions," *Journal of the Association for Information* (16:7), pp. 515-579.

Lowry, P. B., Hammer, B., Gaskin, J. E., Roberts, T. L., Twyman, N. W., Hammer, B., and Roberts, T. L. 2013. "Taking 'Fun and Games' Seriously: Proposing the Hedonic-Motivation System Adoption Model (HMSAM)," *Journal of the Association for Information Systems* (14:11), pp. 617-671.

Luo, X., Slotegraaf, R. J., and Pan, X. 2006. "Cross-Functional 'Coopetition': The Simultaneous Role of Cooperation and Competition Within Firms," *Journal of Marketing* (70:2), pp. 67-80.

Magni, M., Susan Taylor, M., and Venkatesh, V. 2010. "'To Play or Not to Play': A Cross-Temporal Investigation Using Hedonic and Instrumental Perspectives to Explain User Intentions to Explore a Technology," *International Journal of Human–Computer Studies* (68:9), pp. 572-588.

Malone, T. W. 1981. "Toward a Theory of Intrinsically Motivating Instruction," *Cognitive Science* (5:4), pp. 333-369.

Malone, T. W. 1982. "Heuristics for Designing Enjoyable User Interfaces: Lessons From Computer Games," in *Proceedings of the 1982 Conference on Human Factors in Computing Systems*, York: ACM Press, pp. 63-68.

Malone, T. W., and Lepper, M. R. R. 1987. "Making Learning Fun: A Taxonomy of Intrinsic Motivations for Learning," in *Cognative and Affective Process Analysis*, R. E. Snow and M. J. Farr (eds.), Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 223-253.

Martin, A. J., and Dowson, M. 2009. "Interpersonal Relationships, Motivation, Engagement, and Achievement: Yields for Theory, Current Issues, and Educational Practice," *Review of Educational Research* (79:1), pp. 327-365.

Martocchio, J. J. J., and Webster, J. 1992. "Effects of Feedback and Cognitive Playfulness on Performance in Microcomputer Software Training," *Personnel Psychology* (45:3), pp. 553-578.

McGonigal, J. 2011. *Reality Is Broken: Why Games Make Us Better and How They Can Change the World*, New York: The Penguin Press.

Mekler, E. D. E., Brühlmann, F., Opwis, K., and Tuch, A. N. 2013. "Disassembling Gamification: The Effects of Points and Meaning on User Motivation and Performance," in *CHI 2013 Extended Abstracts on Human Factors in Computing Systems*, New York: ACM Press, pp. 1137-1142.

Merhi, M. 2012. "Examining the Adoption of Online Game Using the Uses and Gratifications Theory," in *Proceedings of the 18th Americas Conference on Information Systems*, Seattle, WA.

Mollick, E. R., and Rothbard, N. 2014. "Mandatory Fun: Gamification and the Impact of Games at Work," The Wharton School Research Paper Series, University of Pennsylvania.

Moneta, G. B., and Csikszentmihalyi, M. 1996. "The Effect of Perceived Challenges and Skills on the Quality of Subjective Experience," *Journal of Personality* (64:2), pp. 275-310.

Neeli, B. K. 2012. "A Method to Engage Employees Using Gamification in BPO Industry," in *2012 Third International Conference on Services in Emerging Markets*, Mysore, India: IEEE, pp. 142-146.

Nel, D., Van Niekerk, R., Berthon, J.-P., and Davies, T. 1999. "Going With the Flow: Web Sites and Customer Involvement," *Internet Research* (9:2), pp. 109-116.

O'Donoghue, T., and Rabin, M. 1999. "Doing It Now or Later," *American Economic Review* (89:1), pp. 103-124.

Park, D. H., Lee, J., and Han, I. 2007. "The Effect of On-Line Consumer Reviews on Consumer Purchasing Intention: The Moderating Role of Involvement," *International Journal of Electronic Commerce* (11:4), pp. 125-148.

Parker, S. K., Wall, T. D., and Cordery, J. L. 2001. "Future Work Design Research and Practice: Towards an Elaborated Model of Work Design," *Journal of Occupational and Organizational Psychology* (74:4), pp. 413-440.

Pegoraro, R. 2012. "Gamification: Green Tech Makes Energy Use a Game—and We All Win," *Arstechnica* (http://arstechnica.com/features/2012/02/gamification-green-tech-makes-energy-use-a-gameand-we-all-win/; retrieved May 1, 2016).

Penenberg, A. L. 2013. *Play at Work: How Games Inspire Breakthrough Thinking*, New York: Penguin.

Ralph, P., and Monu, K. 2015. "Toward a Unified Theory of Digital Games," *The Computer Games Journal* (4:1-2), pp. 81-100.

Rimon, G. 2014. "Why Conventional Wisdom about Enterprise Gamification Is Flat out Wrong," *Gameeffective.com* (http://gameffective.com/gamification-basics/conventional-enterprise-gamification-wisdom-is-flat-out-wrong/; retrieved May 1, 2016).

Robertson, M. 2016. "Can't Play, Won't Play," *Hideandseek.net* (http://hideandseek.net/2010/10/06/cant-play-wont-play/; retrieved May 1, 2016).

Rohan, M. 2015. "Gamification Market by Solution (Consumer Driven and Enterprise Driven), Applications (Sales and Marketing), Deployment Type (On-Premises and Cloud), User Type (Large Enterprise, SMBs), Industry and Region—Global Forecast to 2020," Markets and Markets.com (http://www.marketsandmarkets.com/top-market-reports.asp)

Ryan, R. M., and Deci, E. L. 2000. "Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being," *The American Psychologist* (55:1), pp. 68-78.

Sabourin, J. L., Shores, L. R., Mott, B. W., and Lester, J. C. 2013. "Understanding and Predicting Student Self-Regulated Learning Strategies in Game-Based Learning Environments," *International Journal of Artificial Intelligence in Education* (23:1-4), pp. 94-114.

Santhanam, R., Liu, D., and Shen, W. C. M. 2016. "Gamification of Technology-Mediated Training: Not All Competitions Are the Same," *Information Systems Research* (27:23), pp. 453-465.

Schmitz, J., and Fulk, J. 1991. "Organizational Colleagues, Media Richness, and Electronic Mail: A Test of the Social Influence Model of Technology Use," *Communication Research* (18:4), pp. 487-523.

Schultz, P. W. 1999. "Changing Behavior with Normative Feedback Interventions: A Field Experiment on Curbside Recycling," *Basic and Applied Social Psychology* (21:1), pp. 25-36.

Seaborn, K., and Fels, D. I. 2015. "Gamification in Theory and Action: A Survey," *International Journal of Human Computer Studies* (74), pp. 14-31.

Shang, S. S. C., and Lin, K. Y. 2013. "An Understanding of the Impact of Gamification on Purchase Intentions," in *Proceedings of the 19th Americas Conference on Information Systems*, Chicago, Illinois.

Siero, F. W., Bakker, A. B., Dekker, G. B., and van den Burg, M. T. C. 1996. "Changing Organizational Energy Consumption Behavior Through Comparative Feedback," *Journal of Environmental Psychology* (16:3), pp. 235-246.

Skinner, E. A., and Belmont, M. J. 1993. "Motivation in the Classroom: Reciprocal Effects of Teacher Behavior and Student Engagement Across the School Year," *Journal of Educational Psychology* (85:4), pp. 571-581.

Spector-Mersel, G. 2010. "Narrative Research: Time for a Paradigm," *Narrative Inquiry* (20:1), pp. 204-224.

Steenkamp, J.-B. E. M., and Baumgartner, H. 1992. "The Role of Optimum Stimulation Level in Exploratory Consumer Behavior," *Journal of Consumer Research* (19:3), pp. 434-448.

Stutts, N. B., and Barker, R. T. 1999. "The Use of Narrative Paradigm Theory in Assessing Audience Value Conflict in Image Advertising," *Management Communication Quarterly* (13:2), pp. 209-244.

Suh, A. 2015. "Applying Game Design Elements in the Workplace," in *Proceedings of the 36th International Conference of Information Systems*, Fort Worth, TX.

Sun, H., and Zhang, P. 2006. "The Role of Moderating Factors in User Technology Acceptance," *International Journal of Human Computer Studies* (64:2), pp. 53-78.

Sun, Y., Zhao, Y., Jia, S. Q., and Zheng, D. Y. 2015. "Understanding the Antecedents of Mobile Game Addiction: The Roles of Perceived Visibility, Perceived Enjoyment and Flow," in *Proceedings of the 19th Pacific-Asia Conference on Information Systems*, Marian Bay Sands, Singapore, pp. 1-12.

Tam, K. Y., and Ho, S. Y. 2006. "Understanding the Impact of Web Personalization on User Information Processing and Decision Outcomes," *MIS Quarterly* (30:4), pp. 865-890.

Technavio. 2015. "Global Gamification Market 2015-2019," *Technavio Report*, December.

Teh, N., Schuff, D., Johnson, S., and Geddes, D. 2013. "Can Work Be Fun? Improving Task Motivation and Help-Seeking Through Game Mechanics," in *Proceedings of the 34th International Conference on Information Systems*, Milan, Italy.

Terry, D. J., and Hogg, M. A. 1996. "Group Norms and the Attitude Behavior Relationship: A Role for Group Identification," *Personality and Social Psychology Bulletin* (22:8), pp. 776-793.

Thiebes, S., Lins, S., and Basten, D. 2014. "Gamifying Information Systems-A Synthesis of Gamification Mechanics and Dynamics," in *Proceedings of the 20th European Conference on Information Systems*, Tel Aviv, Israel.

Thom, J., Millen, D. R., Dimicco, J., and Street, R. 2012. "Removing Gamification from an Enterprise SNS," in *Proceedings of the 2012 ACM Conference on Computer Supported Cooperative Work*, New York: ACM Press, pp. 1067-1070.

Thong, J. Y. L., Hong, W., and Tam, K. Y. 2002. "Understanding User Acceptance of Digital Libraries: What Are the Roles of Interface Characteristics, Organizational Context, and Individual Differences?," *International Journal of Human-Computer Studies* (57:3), pp. 215-242.

Tomaselli, F. C., Sanchez, O. P., and Brown, S. A. 2015. "How to Engage Users through Gamification: The Prevalent Effects of Playing and Mastering over Competing," in *Proceedings of the 36th International Conference on Information Systems*, Fort Worth, TX.

Trevino, L. K., Webster, J., and Stein, E. W. 2000. "Making Connections: Complementary Influences on Communication Media Choices, Attitudes, and Use," *Organization Science* (11:2), pp. 163-182.

Wablers, R. G., Etzel, M. J., Wahlers, R. G., and Etzel, M. J. 1990. "A Structural Examination of Two Optimal Stimulation Level Measurement Models," *Advances in Consumer Research* (17:1), pp. 415-426.

Webster, J. 1998. "Desktop Videoconferencing: Experiences of Complete Users, Wary Users, and Non-Users," *MIS Quarterly* (22:3), pp. 257-286.

Webster, J., and Ahuja, J. S. 2006. "Enhancing the Design of Web Navigation Systems: The Influence of User Disorientation on Engagement and Performance," *MIS Quarterly* (30:3), pp. 661-678.

Webster, J., and Martocchio, J. J. 1993. "Turning Work into Play: Implications for Microcomputer Software Training," *Journal of Management* (19:1), pp. 127-146.

Wood, R. E. 1986. "Task Complexity: Definition of the Construct," *Organizational Behavior and Human Decision Processes* (37:1), pp. 60-82.

Woodside, A. G. 2010. "Brand-Consumer Storytelling Theory and Research: Introduction to a Psychology & Marketing Special Issue," *Psychology and Marketing* (27:6), pp. 531-540.

Wu, J., and Liu, D. 2007. "The Effects of Trust and Enjoyment on Intention to Play Online Games," *Journal of Electronic Commerce Research* (8:2), pp. 128-140.

Yee, N. 2006. "Motivations for Play in Online Games," *Cyber Psychology & Behavior* (9:6), pp. 772-775.

Yi, M. Y., Jackson, J. D., Park, J. S., and Probst, J. C. 2006. "Understanding Information Technology Acceptance by Individual Professionals: Toward an Integrative View," *Information & Management* (43:3), pp. 350-363.

Young, M. F., Slota, S., Cutter, A. B., Jalette, G., Mullin, G., Lai, B., Simeoni, Z., Tran, M., and Yukhymenko, M. 2012. "Our Princess Is in Another Castle: A Review of Trends in Serious Gaming for Education," *Review of Educational Research* (82:1), pp. 61-89.

Zhang, P. 2013. "The Affective Response Model: A Theoretical Framework of Affective Concepts and Their Relationships in the ICT Context," *MIS Quarterly* (37:1), pp. 247-274.

Zigurs, I., and Buckland, B. K. B. 1998. "A Theory of Task/Technology Fit and Group Support Systems," *MIS Quarterly* (22:3), pp. 313-334.

Zweig, D., and Webster, J. 2004. "Validation of a Multidimensional Measure of Goal Orientation," *Canadian Journal of Behavioural Science* (36:3), pp. 232-243.

About the Authors

De Liu is an associate professor of Information Decision Sciences Systems at Carlson School of Management, University of Minnesota. He received his Ph.D. from University of Texas at Austin. His general research interests lie in combining economic thinking with sociological and psychological perspectives in analyzing and designing mechanisms for digital markets and platforms. His current research deals with economics of Internet auctions and contests, gamification, social media and social commerce, crowdfunding and Internet finance. His research has appeared in *Information Systems Research*, *Journal of Marketing*, *Journal of Market Research*, and *MIS Quarterly*. He currently serves as an associate editor for *Information Systems Research* and *Journal of Organizational Computing and Electronic Commerce*. He teaches MSBA and Ph.D. courses at the Carlson School of Management.

Radhika Santhanam holds the Michael F. Price Endowed Chair and serves as the director of the MIS Division at the Price College of Business, University of Oklahoma. Her research focus is on enhancing human–technology interactions that can help employees learn, engage, and become productive users of information systems. From a more macro perspective, her research examines how organizations can support employees in appropriating the benefits of investing and implementing new information technologies. Her recent research explores gamification as a more enjoyable way to interact with technology. Her publications have appeared in a variety of journals and she has served on the editorial boards of several journals, including *MIS Quarterly* and, more recently, as a senior editor for *Information Systems Research*.

Jane Webster received her Ph.D. from New York University and is the E. Marie Shantz Chair of MIS in the Smith School of Business at Queen's University in Canada. She has served as a senior editor for *MIS Quarterly*, vice president of Publications for the Association for Information Systems, and program chair for the *International Conference on Information Systems*. She has published in a variety of journals including the *Academy of Management Journal*, *European Journal of Information Systems, Information and Organization*, *Information Systems Journal*, *Information Systems Research*, *Journal of Organizational Behavior*, *MIS Quarterly*, and *Organization Science*. Her research investigates the impacts of technologies in the support of distributed work, organizational communication, employee recruitment and selection, employee monitoring, training and learning, and human–computer interaction issues. Her current research interests concern information systems and technologies to support environmental sustainability and gamification.

MIS Quarterly

RESEARCH COMMENTARY

TOWARD MEANINGFUL ENGAGEMENT: A FRAMEWORK FOR DESIGN AND RESEARCH OF GAMIFIED INFORMATION SYSTEMS

De Liu
Carlson School of Management, University of Minnesota,
Minneapolis, MN 55455 U.S.A. {deliu@umn.edu}

Radhika Santhanam
Price College of Business, University of Oklahoma,
Norman, OK 73019 U.S.A. {Radhika@ou.edu}

Jane Webster
Smith School of Business, Queen's University,
Kingston ON K7L 3N6 CANADA {jane.webster@queensu.ca}

Appendix A

Organizational Gamification Examples

Successful Gamification Examples			
Organization and Application Area	**Goals**	**Gamification Elements**	**Outcomes**
University College London's Transcribe Bentham project[1]	Motivate volunteer transcribers worldwide	Points for every edit made, leaderboard, progress ladder from "probationer" to "prodigy," recognition (virtual gifts from editors to users), avatars, community features (profile page, personal message board, "add friends," discussion forum).	1000+ handwritten documents transcribed in a six-month period.
Liveops Inc.'s gamified virtual community for call center agents[2]	Convert 20,000 call center agents into brand ambassadors, measured by shorter call times and improved customer satisfaction rates	Badges and points for completing additional training modules and certification, points for increased call conversion and demonstrated skill attributes, public daily leaderboards, "LiveOps Learning" social forum, badges for knowledge sharing, coaching, networking, and feedback.	80% of agents opted in and three quarters of them returned on a bi-weekly basis. Participants outperformed peers by 23% in call-handling times and boosted customer satisfaction by 9%.
Microsoft's Ribbon Hero for Office 2007 and 2010[3]	Training customers to use ribbon features in Word, Excel, Powerpoint, and One Note	A time-traveling narrative by an animated avatar Clippy, short, relevant challenges, progress tracking, fantasy-based visuals, background music and sound effects, points and leaderboards, integration with Facebook for sharing achievements.	Although there are no specific statistics, it is a fan favorite and as a result, a sequel (Ribbon Hero 2) was launched. Sixty percent of users who completed two challenges went on to play all 10.

Organization and Application Area	Goals	Gamification Elements	Outcomes
Verizon Wireless' community web site[4]	Create a community of socially connected Verizon wireless users	With a third-party vendor's help, it provides users with Social Login—a service that allows users to easily log in using their existing social network accounts. It further uses achievements, points, levels, contests, and a leaderboard to reward users for logging-in, commenting, sharing, uploading photos, entering sweepstakes, etc.	More than 50% of the site's users participated, and users who logged in via Social Login spent 30% more time and generated 15% more page views.
Less Successful Gamification Examples			
Organization and Application Area	**Goals**	**Gamification Elements**	**Outcomes**
Omnicare's gamification initiative for helpdesk[5]	To improve long helpdesk waiting times and enhance efficiency	Reward employees with cash if they achieve the fastest time. Introduce a scoring system with a leaderboard.	Employees felt like "Big Brother" was watching and that the gamified system was too intrusive.
JetBlue's JetBlue Badges program[6]	To engage the airline's customers and motivate spending	Badges for sharing on social media, purchasing from partners ("Hertz Hotshot"), and other travel and loyalty activities. Leaderboards, personalized interactive travel map, over 25,000 achievements to unlock.	Failed to take off. Customers felt that it asked for too much personal information. It failed to incorporate existing travel, had unattractive badges, and was intrusive (e.g., "post tweets for you").
Adobe's LevelUP for Photoshop[7]	To increase revenue with gamified on-boarding training to new Adobe Photoshop customers	Guided levels and step-by-step tutorials, points and badges, extra points for sharing on social media, quiz questions for each level, leaderboard, monthly drawing for every 400 points earned.	Although gamification was found to change user behaviors, it did not meet the company's goals: that is, to drive immediate conversions and revenue.

Notes:

[1]http://www.digitalhumanities.org/dhq/vol/6/2/000125/000125.html

[2]http://www.wsj.com/articles/SB10001424052970204294504576615371783795248

[3]http://www.gamification.co/2011/04/26/microsoft-ribbon/

[4]http://venturebeat.com/2012/07/23/verizon-wireless-gamifies-its-site/

[5]http://www.cio.com/article/2453330/careers-staffing/how-to-use-gamification-to-engage-employees.html

[6]http://www.webinknow.com/2013/07/jetblue-badges-gamification-marketing-fails-to-take-off.html

[7]http://www.cmo.com/articles/2012/10/24/game-over-for-gamification.html; http://www.slideshare.net/gzicherm/mira-dontcheva-learning-how-to-use-adobe-photoshop-through-gamification

Appendix B

Inconsistent Descriptions of Commonly Used Gamification Terms

Term	Source	Description
Game elements	Academic	• building blocks or features shared by games • anything that is found in most games and readily associated with games • game design principles, game mechanics, game dynamics and storytelling • general term to encompass design features • mechanics, aesthetics, and game-thinking in non-game contexts
	Practitioner	• points, badges and leaderboards
Game aesthetics	Academic	• emotions evoked by a game • emotional responses the player experiences as a result of dynamics • art, beauty, and visual elements • graphics and sounds • visual and aural characteristics of the game, including the general look and feel • content that adds style and artistic depth to the player experience
Game mechanics	Academic	• recurring parts of the design of a game • elements used by game developers • instructions for a game • functional components of a gamified application • processes that engage players • processes that drive action forward • rules of the game • rules that provide dynamics of game play • rules and sequence of events in the game
	Practitioner	• elements such as points, badges and leaderboards • tools and techniques used as building blocks for gamification
Game dynamics	Academic	• interactions of users with mechanics (gamification elements) • emergent behavior of both the game and the player during player-game interaction • high-level aspects of games that have to be considered and managed, but not directly implemented into games • the big-picture aspects of the gamified system that include constraints, emotions, narrative, progression, and relationships
Game principles	Academic	• evaluative guidelines • mechanics, dynamics and emotions
Game play	Academic	• gameplay (experience) involves the interaction between the player and the game (artifact) • the challenges, rewards, and decisions encountered by a player • performance-oriented simulation
	Practitioner	• a term to rate or score the quality of the experience of the gamer while playing a particular game • the specific way in which players interact with a game • the pattern defined through the game rules, connection between the player and the game, challenges and overcoming them, plot and player's connection with it

Academic and Practitioner Sources for Appendix B

Andersen, E., Liu, Y.-E., Snider, R., Szeto, R., and Popović, Z. 2011. "Placing a Value on Aesthetics in Online Casual Games," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Vancouver, BC, Canada, pp. 1275-1278.

Beal, V. 2016. "What Is Gameplay? Webopedia Definition," *Webopedia.com* (http://www.webopedia.com/TERM/G/gameplay.html; retrieved May 26, 2016).

Borges, S. S., Durelli, V. H. S., Reis, H. M., and Isotani, S. 2014. "A Systematic Mapping on Gamification Applied to Education," in *Proceedings of the 29th Annual ACM Symposium on Applied Computing*, New York: ACM Press, pp. 216-222.

Bui, A., Veit, D., and Webster, J. 2015. "Gamification—A Novel Phenomenon or a New Wrapping for Existing Concepts?," in *Proceedings of the 36th International Conference on Information Systems*, Fort Worth, TX.

Burke, B. 2014. "Gartner Redefines Gamification," Gartner.com (http://blogs.gartner.com/brian_burke/2014/04/04/gartner-redefines-gamification/; retrieved May 25, 2016).

Cheong, C., Cheong, F., and Filippou, J. 2013. "Using Design Science Research to Incorporate Gamification into Learning Activities," in *Proceedings of the 2013 Pacific Asia Conference on Information Systems*, Jeju Island, Korea, pp. 156-171.

da Silva, D. G. 2016. "Points, Badges, and Leaderboards," *Agile Gamification* (http://www.agilegamification.org/gamification/points-badges-leaderboards/; retrieved May 25, 2016).

Deterding, S., Dixon, D., Khaled, R., and Nacke, L. 2011. "From Game Design Elements to Gamefulness: Defining 'Gamification,'" in *Proceedings of the 15th International Academic MindTrek Conference on Envisioning Future Media Environments*, New York: ACM Press, pp. 9-15.

Galli, L. 2014. "Matching Game Mechanics and Human Computation Tasks in Games with a Purpose," in *Proceedings of the 2014 ACM International Workshop on Serious Games*, Orlando, FL, pp. 9-14.

"Game Mechanics." 2016. Badgeville.com (https://badgeville.com/wiki/Game_mechanics; retrieved May 25, 2016).

"Gameplay." 2016. Wikipedia (https://en.wikipedia.org/wiki/Gameplay).

Hofferbert, S., Cahalane, M., and Finnegan, P. 2015. "Gamification as an Architecture of Participation: An Investigation of an Innovation Maker Community," in *Proceedings of the 23rd European Conference on Information Systems*, Münster, Germany, pp. 1-10.

Hunicke, R., LeBlanc, M., and Zubek, R. 2004. "MDA: A Formal Approach to Game Design and Game Research," *Proceedings of the Workshop on Challenges in Game AI* (4), pp. 1-5.

Khaleel, F.L., Ashaari, N. S., Meriam, T. S., Wook, T., and Ismail, A. 2015. "The Study of Gamification Application Architecture for Programming Language Course," in *Proceedings of the 9th International Conference on Ubiquitous Information Management and Communication*, New York: ACM Press, pp. 1-5.

Nelson, M. J. 2009. "A Requirements Analysis for Videogame Design Support Tools," in *Proceedings of the 4th International Conference on Foundations of Digital Games*, Orlando, FL, pp. 137-144.

Nummenmaa, T., Kultima, A., Alha, K., and Mikkonen, T. 2013. "Applying Lehman's Laws to Game Evolution," in *Proceedings of the 2013 International Workshop on Principles of Software Evolution*, Saint Petersburg, Russia, pp. 11-17.

Ralph, P., and Monu, K. 2015. "Toward a Unified Theory of Digital Games," *The Computer Games Journal* (4:1-2), pp. 81-100.

Robson, K., Plangger, K., Kietzmann, J., McCarthy, I., and Pitt, L. 2014. "Understanding Gamification of Consumer Experiences," *Advances in Consumer Research* (42), pp. 352-356.

Shang, S. S. C., and Lin, K. Y. 2013. "An Understanding of the Impact of Gamification on Purchase Intentions," in *Proceedings of the 19th Americas Conference on Information Systems*, Chicago.

Sicart, M. 2010. "Wicked Games : On the Design of Ethical Gameplay," in *Proceedings of the 1st DESIRE Network Conference on Creativity and Innovation in Design*, Aarhus, Denmark, pp. 101-111.

Teh, N., Schuff, D., Johnson, S., and Geddes, D. 2013. "Can Work Be Fun? Improving Task Motivation and Help-Seeking Through Game Mechanics," in *Proceedings of the 32nd International Conference on Information Systems*, Milan, Italy.

Thiebes, S., Lins, S., and Basten, D. 2014. "Gamifying Information Systems-A Synthesis of Gamification Mechanics and Dynamics," in *Proceedings of the 20th European Conference on Information Systems*, Tel Aviv, Israel.

Tractinsky, N. 2004. "Toward the Study of Aesthetics in Information Technology," in *Proceedings of 25th International Conference on Information Systems*, Washington, DC, pp. 771-780.